OECD Trade Policy Studies

The Economic Impact of Export Restrictions on Raw Materials

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Foreword

The last few years have witnessed a sharp increase in prices for commodities such as minerals, metals and agricultural products. At the same time, export restrictions on raw materials have been used more frequently. This includes several emerging economies which have applied export taxes in response to high prices for agricultural products. Among industrial products, export restrictions on metals and mineral products have been broadly applied by many countries in response to the metals boom, with a view to securing domestic supply and to addressing the problem of resource depletion.

The increased use of export restrictions has focused the attention of policy makers and the business community on their economic consequences, specifically their impact on the trade of raw materials. There is growing concern about the relatively weak multilateral disciplines on export restrictions and the lack of transparency in this area. The *OECD Workshop on Raw Materials* in October 2009, which received financial contributions from the European Union and Japan, addressed the subject and these proceedings present a selection of the papers presented.

Particular focus was given to evaluating the economic impact of export restrictions and examining the policy objectives of the measures designed to restrict trade of raw materials. Export restrictions by nature affect industries and consumers of importing countries, which in turn are confronted with reduced import volumes and higher import prices. When restrictions are applied by large countries with a significant market share of a particular product, such measures can raise international prices.

Export restrictions are designed to meet diverse policy objectives that range from environmental protection and increasing fiscal revenue to development of processing sectors. In view of existing alternative policy options, the question is under what conditions are export restrictions effective in achieving the stated policy objectives. The answer will depend in part on whether export restrictions affect the price and quantity of the product as expected.

Export restrictions on raw materials affect global competition and supply chains. They create a difference between prices for domestic consumers and those for foreign importers. Although providing a price advantage to domestic consumers could aim to attract investment in the processing sector, the lack of transparency on export restrictions leads to an insecure business environment which can negatively affect the investment and long-term supply capacity of the subject sector. The relevance of the measures to global sourcing emphasizes the importance of business perspectives to understand the economic consequences of export restrictions. Reflecting this point, the perspectives of several industry representatives are included in these proceedings.

These proceedings begin with an overview chapter that outlines the recent trends in export restrictions against a background of current multilateral disciplines. The following chapters describe the economic impact and the effectiveness of export restrictions in the context of specific industries and policy objectives. Considering that export restrictions affect a wide range of raw materials, each chapter examines specific industries. This analysis also aims to evaluate the effectiveness of measures along with their economic costs to both exporting and importing countries.

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Acronyms

BOF	Basic Oxygen Furnace
BRIC	Brazil, Russia, India and China
CGE	Computable General Equilibrium
CIC	China Investment Corporation
CIS	Commonwealth of Independent States
CITES	Convention on International Trade in Endangered Species of Fauna and Flora
CTG	Council for Trade in Goods (WTO)
CUA	Customs Union Agreement
DDA	Doha Development Agenda
EAF	Electric Arc Furnace
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
f.o.b.	Free on Board
GATT	General Agreement on Tariffs and Trade
GOI	Government of India
ICDA	International Chromium Development Association
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
LAC	Latin American and the Caribbean
LDC	Least Developed Countries
LRMC	Long-Run Marginal Cost
MENA	Middle East and North Africa
MMTC	Minerals and Metals Trading Corporation (India)
MOFCOM	Ministry of Commerce of the People's Republic of China
NAFTA	North American Free Trade Agreement
NAMA	Non-Agricultural Market Access (WTO)
NMDC	National Mining and Development Corporation (India)
NTM	Non-tariff Measure
OECD	Organisation for Economic Co-operation and Development
REO	Rare Earth Oxides
RTA	Regional Trade Agreement
SCM	Subsidies and Countervailing Measures (WTO)
SOE	State-Owned Enterprise
SPSF	Support and Price Stabilization Fund (Turkey)
STE	State Trading Enterprise
SWF	Sovereign Wealth Fund
TPR	Trade Policy Review (WTO)
TRIM	Trade-Related Investment Measures (WTO)
UNCTAD	United Nations Conference on Trade and Development
USGS	United States Geological Survey
USTR	United States Trade Representative
VAT	Value Added Tax
WTO	World Trade Organization

Executive Summary

The papers presented here are a selection of those discussed at the OECD *Workshop on Raw Materials*, held in October 2009. This workshop was organised in response to growing concerns about the use of export restrictions on raw materials.

Export restrictions are maintained to achieve diverse policy objectives, including protecting the environment, conserving natural resources, promoting downstream processing industries, controlling inflationary pressures, and increasing fiscal revenue. Export restrictions take various forms, such as export bans, quotas and taxes, minimum export prices, reduction of VAT rebates, and licensing requirements.

The number of countries applying export taxes has increased in the last decade and in 2009 export taxes were applied by half of the WTO member countries. Such taxes were introduced primarily by developing and least developed countries; examples of items most subject to export taxes were mineral and metal products and agricultural and forestry products.

There are similarities between export taxes and import tariffs, in terms of their impact on world prices and on the economic outcomes for exporting and importing countries. Despite these similarities, export taxes are not subject to specific disciplines under current WTO regulations, while import tariffs are. Export taxes are also different from quantitative export restrictions in that the latter are in principle prohibited under the WTO.

There have been some efforts to discipline export restrictions at the multilateral and bilateral levels. The WTO accession process has imposed several disciplines on acceding countries. Export restrictions have also been discussed during the Doha Development Agenda (DDA) negotiations in both NAMA (Non-Agricultural Market Access) and agriculture negotiations. Several regional trade agreements (RTAs) go beyond WTO provisions by including prohibition of export taxes.

Export taxes raise the border price of exported products, resulting in decreased export volumes. Reduced exports may divert some supply to the domestic market, leading to a downward pressure on domestic prices, and creating a wedge between domestic prices and the price charged to foreign consumers. A supplier with a large world market share will induce a stronger effect on world markets. Reduced exports from the countries applying export restrictions divert demand to other countries; if these other countries then apply similar measures to limit their exports there will be a spiralling effect on world markets.

Export restrictions can affect long-term investment and production. In countries applying export restrictions, their imposition reduces incentives for suppliers to increase investment and long-term supply. Furthermore, the lack of transparency or predictability regarding export restrictions creates an uncertain investment environment which is

especially critical in the mining sector where investments are long-term and require large amounts of capital.

The recent experience with export taxes applied by large suppliers to address domestic food price or availability objectives leads to higher international prices and makes achieving global food security more difficult. Such measures are not effective in controlling domestic food price inflation, in particular over the longer term.

Regarding industrial raw materials, many export restrictions are put into place for environmental reasons or conservation of natural resources. Even setting aside negative international impacts, in order for them to satisfy this objective they must lower production levels. However, available empirical evidence suggests that an export restriction does not necessarily lead to a decrease in production without corresponding measures to restrain domestic consumption. This is particularly the case in developing countries that see a rapidly rising domestic demand for metals and minerals. Regulating or taxing production activities that have undesired environmental impacts, rather than using trade policy instruments, are alternative options.

Export restrictions are sometimes used to develop downstream processing sectors, and in some cases this is being motivated as a counter measure to tariff escalation. The measures can be used as a means to utilize the market power of the applying country in export markets, in cases where its market share is sufficiently large. In either case, the applying countries aim to maximize their domestic welfare through the measures at the expense of trade partners.

The use of export restrictions on raw materials can lead importing countries to rely on foreign direct investment (FDI) through acquisition of, or mergers with, foreign firms involved in the raw materials sector. Several countries applying export restrictions, however, have also maintained barriers regarding inward FDI in raw material sectors. When export restrictions on raw materials are accompanied by policies that restrict inward FDI, impacts on the global supply chains are further complicated.

Several policy implications can be drawn.

- Export restrictions distort trade flows and negatively affect the welfare of trade partners; when applied by large countries, export restrictions can enhance domestic welfare of the applying countries, at least in the short term. The long-term effect, by raising prices, will limit the effectiveness of the measures which in many cases are responses to high prices of raw materials.

- By reducing domestic prices in the countries applying the measures and increasing uncertainty associated with lack of transparency, export restrictions on raw materials can have a negative impact on investment which will reduce long-term supply of raw materials.

- Several countries rely on alternative policy options with different trade impact and which are more directly targeted at the source of the policy concerns. The effectiveness of export restrictions, relative to alternative policy actions, requires close scrutiny.

- When raw materials are produced in a limited number of countries, export restrictions that are imposed in one country may motivate other countries to follow if importers move to purchase their raw materials. The restrictions imposed by the first

country then lose their effectiveness and this can in principle lead to a situation of mutually spiralling export taxes.

- Considering the negative impacts on trade and the existence of alternative policy options, several factors should be carefully considered in designing export restrictions: (1) whether the measures are effective in achieving intended policy objectives; (2) whether the benefit of the measures outweighs the cost; and (3) whether the measures achieve the objectives in the least trade distorting ways.

- Noting the high level of interdependence between exporting and importing countries, the significance of export restrictions for the world economy should be more broadly recognised. Since no economy is fully sufficient of every raw material, it is a global challenge which requires coordinated responses. Transparency regarding the use and implementation of export restrictions should be substantially improved. Exploring a framework to discipline export restrictions at the WTO could enhance predictability and facilitate free trade of raw materials.

Chapter 1

Recent Trends in Export Restrictions on Raw Materials

Jeonghoi Kim[1]

Prices for commodities such as minerals and metals have increased significantly over the past few years. At the same time, there has also been an increase in restrictions on the export of raw materials which has led policy makers and the business community to address the free trade of raw materials. This chapter provides information on the present situation regarding the use of export restrictions on raw materials. The chapter then examines the policy objectives of export restrictions and their effectiveness to achieve their stated goal. Finally, current disciplines on restrictions as well as multilateral and bilateral efforts to enhance disciplines are examined.

In recent years, export restrictions have continued to attract the attention of trade policy makers, both as a perceived means to achieve certain objectives and because of perceived gaps in international disciplines on their use. For example, following the peso devaluation in 2002, Argentina once again applied export duties to all exports in order to cushion the effects of exchange-rate fluctuations on domestic products and to counter the sharp fall in tax revenue. After successive increases in rates, the applicable duties were 5, 20, 15, 20, 25 and 45% (depending on products) as of mid-2006.[2] In 2007, China eliminated value added tax (VAT) rebates on exports for 553 items to restrain the export of products regarded as highly energy consuming, highly polluting, and consuming large amount of raw materials.[3] Since 1999, Cameroon has gradually prohibited exports of logs in order to promote the processing industry. From 1999 until the prohibition of log exports in 2004, a certificate of registration had to be obtained to export timber; this was intended to ensure that 70% of production was processed locally and only 30% of the annual harvest exported as logs.[4] These examples display various objectives and methods by which governments apply export restrictions.

By affecting the price and quantity of trade, export restrictions produce trade distorting effects in the same way as import restrictions, but their incidence differs. However, multilateral disciplines on export restrictions are not as clearly defined as those on import restrictions. The WTO accession negotiation in general complemented disciplines on export restrictions, especially regarding export duties. During the Doha Development Agenda (DDA) negotiations, countries communicated their positions on the scope and modalities of future negotiations, *inter alia* in the case of export restrictions. Bilateral negotiation of RTAs has been another channel for providing more discipline.

On the basis of this background, this paper offers an overview of the current situation, as well as updating two previous papers on export restrictions which described the situation as of 2002.[5] The present paper analyses factual information of such measures based on Trade Policy Review (TPR) reports and describes key findings. Current discipline on export restrictions in the WTO is examined. It also analyses recent trends with respect to disciplines at both the bilateral and multilateral levels. Finally, this paper provides policy considerations regarding such measures.

Definition of export restriction

Defining the term "export restriction" is the first challenge. A WTO Dispute Settlement Understanding panel, in the context of the application of the Subsidies and Countervailing Measures (SCM) Agreement, delineated the scope of export restraint as "a border measure that takes the form of a government law or regulation which expressly limits the quantity of exports or places explicit conditions on the circumstances under which exports are permitted, or that takes the form of a government-imposed fee or tax on exports of the products calculated to limit the quantity of exports."[6] The WTO's Trade Policy Review (TPR) papers deal with export restrictions in the section on "measures directly affecting exports." Under this heading, in addition to export-incentive measures (i.e. export subsidies; duty and tax drawback; export processing zone; export finance, insurance and guarantees; and other export promotion measures), the TPRs cover export-restrictive measures (typically, export prohibitions, export quotas, export licensing, export duties and levies, and minimum export prices). Considering the fact that minimum export price and reduction of VAT rebates have similar effects as other traditional export restrictions, this paper follows the broader definition of export restriction used in the WTO TPR papers.

One of the most popular forms of export restrictions is export duties. This paper makes no distinction between the terms "export duties" and "export taxes," both are used here in the sense of (customs) duties on export. This does not include tax credit on exports, which might be discussed as export subsidies in the context of the Agreement on Subsidies and Countervailing Measures. A variety of similar or complementary terms also exist, such as export tariffs, export fees, export charges, and export levies. This paper, however, prefers "export duties" or "export taxes".

Export duties can take different forms. It can be an *ad valorem* tax, specified as a percentage tax of the value of the product; or a specific tax, specified as a fixed amount to pay per unit of a product. All types of export taxes have the effect of raising the cost of exports, and thereby reducing the volume of exports.[7] As shown below, minimum export price and reduction of VAT rebate rates may produce effects similar to export duties.

Other forms of export restrictions directly affect the quantity of exports. The most extreme case of restrictions is export prohibition. Export quotas are restrictions or ceilings imposed by an exporting country on the total volume of certain products. Export license requirements establish that an application or other documentation should be submitted as a condition for exportation and depending on whether license acquisition is automatic, the requirements may affect the volume of exports. However, despite the potentially negative impact on exports, export licensing has drawn relatively less attention, partly because it is difficult to acquire information on this measure. Enhancing transparency on export licensing was proposed during the WTO DDA negotiations.

Use of export restrictions during 2003-2009

The most systematic information available on export restrictions is found in Trade Policy Review (TPR) country reports. TPR reports of WTO members include a section on measures affecting exports, and more or less address export duties, quotas, licensing and other similar measures. The contents vary reflecting each country's situation at the time the reviews were undertaken. Therefore, it is difficult to compare between members and to draw quantitative conclusions; certain tendencies can be observed, however, from these reports.

Export duties and other measures affecting export prices

The number of countries applying export duties (65 of 128 WTO members) during 2003-2009 is higher than it was in the previous analysis (39 of 100 WTO Members during 1997-2002). On a regional basis, the increase in the number of countries imposing export duties is clear regarding the Americas and Africa, where in 1997-2002 the numbers were 9 out of 26 and 17 out of 26 countries respectively.[8] As was the case in the earlier 2002 analysis, export duties were imposed mainly by developing and least developed countries during 2003-2009 period (Table 1.1).

Table 1.1. Number of countries applying export duties, by regions and other groupings 2003-2009

	Number of WTO Members reviewed by TPRB	WTO Members imposing export duties
Europe/Middle East	39	4
America	31	18
Asia/Pacific	23	13
Africa	35	30
Total	**128**	**65**
LDCs	25	21
OECD	31	4
Others	72	40

TPR reports from 2003 to 2009. Some Members were reviewed two or three times, but are here counted as one. The EU is counted as 25 (considering 2 other countries were under TPR review during this period before they became EU members).

The items most affected by export duties are agricultural products, mineral and metal products, leather, hide and skin products, forestry products, and fishery products (Table 1.2).

Table 1.2. TPR Summary of current situation on export duties, by product 2003-2009

Selected products	Number of WTO members applying export duties (based on 65 TPRs)
Forestry products	15
Fishery products	13
Mineral products, metals, precious stones	28
Leather, hides and skins	17
Agricultural products (sugar, coffee, etc.)	36

TPR reports do not specify precise HS number of products subject to export duties. This classification is based upon the description of the products in the reports. In this table, hides and skins have been grouped with leather rather than agricultural products. Products listed are not exhaustive; comprehensive details are found in Annex 1.A.

Quantitative restrictions

TPR country reports describe export prohibitions and export licensing in various ways. Because of the different lengths of the sections in the member reports, it is hard to analyse these points quantitatively, although certain tendencies can be observed. It is noted that no systematic distinction between automatic and non-automatic export licensing is made in these reports and that export prohibitions and licensing are being reviewed jointly.

In many cases, quantitative restrictions are applied by governments in relation to Articles XI:1(a), XX and XXI of GATT 1994. This includes conservation of exhaustible natural resources, environmental protection, and control of weapons and arms trade. Where there are multilateral agreements or arrangements, the legitimacy of export restrictions is well recognised, particularly in such areas as security, life, public health, safety and environmental reasons. A good example is CITES, the convention on

international trade of endangered species of fauna and flora. This explains why most WTO members maintain quantitative restrictions regarding exports of some products. Even countries which do not apply export duties generally maintain quantitative restrictions on some exports. To a lesser degree, quantitative restrictions are used for industrial policy objectives to help develop higher value-added downstream industries. (See Annex 1.B for comprehensive details.)

In OECD (2003), about 20 members described export quotas in response to restrictions by importing members under the WTO Agreement on Textiles and Clothing (ATC). However, 1 January 2005 marked the end of the ten-year transition period towards the elimination of quantitative restrictions on imports of textile and clothing under the WTO ATC. Therefore, export quotas for this purpose disappeared in many countries. International commodity agreements or arrangements are also stated as justification for measures taken for agricultural products — such as sugar and coffee — diamonds and crude oil.[9]

Box 1.1. Illustrative list of rationales for export restrictions in TPRs

1. Export restrictions for non-economic reason: security

- The United Nations Security Council Resolutions (e.g. sanctions against particular countries).
- The Convention on Chemical Weapons.
- The Treaty on Nuclear Non-Proliferation.
- Multilateral export control arrangements (the Australia Group (to prevent the spread of chemical and biological weapons); the Missile Technology Control Regime; the Nuclear Suppliers Group; the Zangger Committee (control of nuclear materials and related high technology); the Wassenaar Arrangement (control of exports of conventional weapons and dual use products).

2. Export restrictions for non-economic reason: life, public health, safety, and environmental reason

- The Basel Convention on the Transboundary Movement of Hazardous Waste and their Disposal.
- The Convention on International Trade in Endangered Species of Fauna and Flora (CITES).
- The Montreal Protocol on Substances that Deplete the Ozone Layer.

3. Export restrictions for economic reasons but in accordance with international or bilateral agreements or arrangements

- International commodities agreements on sugar, coffee, and petroleum.

4. Export restrictions for maintenance of adequate supply of essential products; or for promotion of downstream industries

- Forestry products (such as log and timber).
- Fishery products (including seasonable restraint for a biological rest period of fish).
- Mineral products, metals, precious stones.
- Hides and skins and leather.
- Agricultural products (seasonal measures are introduced in some cases).

Note: This list is illustrative, not exhaustive.

Major policy objectives

The major policy objectives of export restrictions are listed below.

- Fiscal receipts or revenue purposes (export duties).
    - Export duties may be seen as a reliable source of revenue, particularly in LDCs.[10] The relative ease of implementing tax regulations through customs may make this an attractive option for governments. Especially when international price is high, applying high tax rates is sometimes used to address equity issues.
    - This source of revenue is becoming less important for many countries. Although TPR reports do not provide consistent data for all countries, the share of export duties in government revenue is falling in several countries. In Ghana, the share of export duties in total government revenue decreased from 11.4% (1998) to 2.3% (2005). In Thailand, the contribution of export taxes to government revenue was only 0.3% of total tax revenue in 2005/06. The Philippine authorities also indicated that revenue from export taxes was minimal.
    - The exception is Argentina. Between 2002 and 2005, income from export duties represented 9.9% of total public revenue. Following the peso devaluation in 2002, all Argentine exports were again made subject to export duties. Since 2002, successive resolutions have altered export tax rates, with increases on a significant number of products. As of mid-2006, the applicable duties were 5, 10, 15, 20, 25 and 45% on the f.o.b. value, depending on the products in question. However, during the TPR Q&A in 2007, several Members questioned the necessity of this high tax rates considering change of the economic situation during the last five years.

- To protect and promote downstream processing industries by providing domestic industries with cheap raw materials and inputs.
    - Even in cases where countries do not present this as an explicit policy objective, this can be a major implicit motivation for export restrictions. Either export duties or quantitative restrictions are used for this purpose.[11] Still, considering the fact that the price differential between domestic and export price is the key component for this purpose, export duties are preferred for this purpose.
    - Export restrictions provide downstream processing industries with an advantage. Differential export duty rates play an important role in this regard: higher rates for raw materials or input products while lower rates apply for finished products. For example, in Argentina the export duty rates for soybean, soybean oil and biodiesel were 27.5%, 24.5%, and 5% respectively as of 2007.[12] The price advantage provided to domestic downstream industries can distort and reduce competition in both domestic and foreign markets. (OECD, 2009c).

- Social policy objectives, such as environmental protection or conservation of natural resources
    - This is the most popular and basic policy objective of quantitative restriction on exports. For these objectives, limiting the volume of trade is the key factor and that is why quantitative restrictions are preferred in this regard. To a lesser degree, export duties are also used to achieve these policy objectives.[13]

- As stipulated in Article XX of GATT 1994, this objective is consistent with WTO rules under certain conditions.[14] Therefore, even quantitative restrictions, which are generally prohibited, can be justified if such measures meet certain conditions of WTO provisions.
- During the questions and answers exercise of the TPR, the Chinese government explained that the application of interim export duties and the reduction of VAT rebates were aimed at reducing exports of products that are highly energy consuming and polluting. Some Members questioned the effectiveness of these measures, displaying concern that such measures could result in increased domestic supply of products without a reduction in production.[15] The Indonesian government stated environmental conservation as the rationale for its export taxes on logs. In response to this justification, the TPR report pointed out that lowering domestic log prices by export taxes would encourage processors to expand production, but reduce the financial incentives for processors to adopt efficient, less wasteful technology and processing practices, and that the incentives for owners of natural resources to engage in conservation practices were diminished. Therefore, the export taxes risk reducing incentives both for owners and processors to conserve and use natural resources efficiently.[16]
- Objectives such as conservation of natural resources could be effectively addressed with export restrictions if they actually result in a production decrease. However, without corresponding measures to restrain domestic consumption, an export restriction does not always lead to a decrease in production (OECD, 2009b).[17] In this regard, regulation on production itself, rather than on trade, is an alternative option considering that market imperfections arise in the production stage regardless of the domestic or international destination of the products.[18]

- Controlling inflationary pressures and securing domestic supply (especially regarding agricultural products for food security).
  - An increase in the international price of a commodity may create inflationary pressures. Several governments rely on export restrictions as a policy tool to keep inflation under control and thus maintain stable price for basic products. An export restriction, by increasing domestic supply, reduces the domestic price of the product, thus partially offsetting the inflationary pressures coming from higher prices abroad.[19] However, such measures when applied by large countries that can influence world prices can have a negative impact on the welfare of trading partners, especially those of small countries, by reducing the supply to the world market and thus amplifying the negative aspects of the initial high price (OECD, 2009c).
  - Several governments responded to high food prices in 2007/08 with more trade-friendly policy options. One of the most common policy responses has been to reduce or suspend import tariffs on food products. Another response has been targeted cash transfers to vulnerable groups. (FAO, 2008 and OECD, 2009a)

- Other objectives: improving terms-of-trade and counteracting tariff escalation.
  - An export tax on a particular commodity can improve the country's terms-of-trade — the relative price of a country's exports compared to its imports — when applied by a large country that has market power. Such a measure increases the

world price of the commodity, thus allowing the country to import more for each unit of the exported commodity.

- Many developing countries, representing a small fraction of world exports in a particular commodity, do not possess such market power. This objective can be achieved under the assumption that other countries do not retaliate by raising their tariffs (Piermartini, 2004). Considering the difficulty of calculating optimal tax rates, there is a risk that application of rates that are too high will lead to a large welfare loss of the exporting country (Piermartini, 2004 and OECD, 2009c).
- Export restrictions can also be used to counteract tariff escalation by importing countries. Tariff escalation is the practice of charging higher import tariffs on processed goods than on unprocessed ones. The use of export taxes was suggested by several countries as a policy choice to reduce the impact of tariff escalation on their exports of processed products.
- A study of tariff data suggests that the degree of escalation differs greatly across countries and the tariff escalation found in some developing countries is more prominent than in developed countries (Piermartini, 2004). Furthermore, to be an effective countermeasure, the application of export taxes should focus on countries with the most significant level of tariff escalation. However, in most cases identical duty rates are applied among importing countries, therefore making the effectiveness of this approach doubtful.

Although several governments apply export restrictions to achieve diverse policy objectives indicated above, not all governments rely on these measures but use instead alternative policy options with different trade impacts. This leads to the question of whether export restrictions are the most effective option in achieving policy objectives and whether the measures achieve the objectives in the least trade distorting ways compared with alternative options.

Normally, export duties are applied on a limited number of products. However, in some countries, export duties are applied generally covering all products. Especially among the LDCs, a general export tax is more widely used as evidenced in Bangladesh, Chad, Gambia, and Niger for example. When generally used, the rates tend to be in the low range. For example, both Bangladesh and Pakistan applied a general export tax of 0.25%, and Cameroon applied a general 2% export tax. In several countries, actual tax rates are lower than statutory rates, and administrative bodies can raise applied rates under the ceiling rates without the legislative body's approval or consent.[20] This creates an element of uncertainty.

Export duties, export quotas, and other forms of restrictions can be applied simultaneously so that the overall assessment of measures is necessary to understand their total implications. For example, in 2005 China removed an 8% VAT rebate for exports of primary aluminium and, in addition, imposed a 5% interim export tax. Reducing VAT rebate rates has the same effect as export duties in that they raise the cost of exports, resulting in reduced exports volume. One interesting point regarding reduction of VAT is that such measures are aimed at curbing exports while VAT rebate schemes for exports normally work as export stimulus.

Minimum export prices are applied either to achieve target export prices which are set to control world market prices or to facilitate customs procedure – preventing under-invoicing. According to TPR reports, the minimum export prices applied in the

Philippines for rice and corn could have similar economic effects as export taxes. In Brazil, however, a minimum export price was not used except as a base to calculate export taxes. It is not clear, in some cases, whether minimum export prices are binding in nature or just reference prices.

Export restrictions of one country may induce similar measures from other exporting countries. Once an export restriction is applied, it is likely that importing countries will shift their source of imports to other countries (Dollive, 2008). The other exporting countries may then be forced to apply similar measures in order to meet domestic demand by limiting their exports.[21] For example, according to Paraguayan authorities, the main reason cited for their application of export taxes on hides and soybeans is the lack of raw materials for the domestic processing industry and the increase in exports of unprocessed products, taking into account the distortion created in subregional trade by the taxes on hide exports applied by Argentina and Uruguay.[22] This interaction can lead, in principle, to a situation of competitive policy practices — and of increasingly higher export taxes (OECD, 2009b).

The lack of predictability is a concern for several WTO Members. In the 2007 TPR process of Argentina, some Members expressed concern that although export duties were applied in 2002 on a temporary basis under Resolution No.11/2002, neither the resolution itself nor its complementary or amendatory regulations have contained any timetable for the phasing out of these duties.

The WTO accession process can contribute to the discipline on export duties, but results vary across countries. At the time of its WTO accession in 1996, Bulgaria applied a range of export taxes for the purpose of preventing or relieving critical shortages of foodstuffs and other essential products. However, it undertook commitments to minimize such measures upon accession, and the TPR paper in 2003 provided that Bulgaria no longer imposed any duties on exported products. During the accession negotiations, China committed not to apply export duties other than on 84 items listed in its Annex.[23] According to the TPR report in 2007, China applied statutory export duties on 88 items. In addition, China applied interim export duties on 174 products, 64 of which were also subject to statutory export duties. In January 2008, the coverage of interim export duties increased to 334 lines at the HS 8-digit level. Considering this binding commitment, a question arose regarding the consistency of the interim export duties with WTO disciplines. China replied that like other WTO members, China had the right to invoke Article XX of GATT 1994 to implement necessary export restriction measures on exhaustible natural resources, and its measures were based on this clause.

Economic implications

Export duties raise the cost of exported products, resulting in decreased export volumes. Reduced exports may divert some supply to the domestic market, leading to a downward pressure on domestic prices. Through this supply-side effect on international and domestic markets, export duties can create a differential between the price available to domestic processors and the price charged to foreign processors. This differential can provide an advantage to domestic downstream processors *vis-à-vis* foreign processors. In this sense, an export duty acts as an implicit subsidy for the domestic processing industries, providing them with an artificial competitive advantage. The economic implications vary according to the extent to which the exporting country can affect the world market price of the taxed product. A supplier with a large world market share will

induce a stronger effect on world markets than will a small supplier. Quantitative restrictions, by reducing the quantity of exports, induce similar effects as export duties.

Export restrictions result in an efficiency loss in both the exporting and the importing country. Consumption distortions result from the fact that too much of the taxed product is consumed domestically, while foreign consumers consume too little. Production distortions result from the fact that too much is produced in the exporting country's downstream industry, while too little is produced in the importing country's downstream industry. This production efficiency loss is sometimes justified by the "infant industry" argument, *i.e.* to provide an incentive for the development of a higher value-added industry. It is not clear whether this infant industry strategy leads to successful results. [24]

Export restrictions can also affect long-term investment and production response. For example, when international food prices are high, one observed policy response is to ensure household food security by lowering domestic food prices. Although there are other methods for this purpose, such as reducing tariffs, some food exporting countries have chosen to reduce domestic prices by applying export duties on agricultural products. However, imposition of export duties reduces incentives for the suppliers to increase their production and investment, which will decrease long-term supply, thereby aggravating international price increases. The long-term solution to high international prices would be to increase the international supply of the products (World Bank, 2008 and OECD, 2008). Price volatility and unstable supplies caused by export restrictions create an insecure business environment. This is important regarding the mining industry where investments are long-term and require large amounts of capital. The uncertainty, by delaying investment in this industry, can have a negative impact on the supply of raw materials.

Current disciplines in the WTO

Substantive regulations: uneven discipline between export duties and quantitative restrictions

There is no single GATT/WTO article dealing exclusively with export restrictions. Still, Article XI of the GATT 1994 is the key provision regarding export restrictions. It prohibits the use of quantitative restrictions regarding both imports and exports. It states that "no prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licences or other measures, shall be instituted or maintained by any contracting party (on the importation of any product destined for the territory of any other contracting party or) on the exportation or sale for export of any product for the territory of any other contracting party." Therefore, export duties are in principle not subject to Article XI and thus not prohibited under this article, while quantitative restrictions are.

Regarding quantitative restrictions which are generally prohibited, the issue is whether these measures can be exceptionally allowed under Article XI:2 (a) (critical shortage of foodstuffs), Article XX (General Exceptions) and Article XXI (Security Exceptions). Article XI:2(a) allows each Member to apply export restrictions "temporarily" to prevent or relieve "critical" shortage of foodstuffs or other products essential to the exporting country. Article 12 of the Agreement on Agriculture (disciplines on export prohibition and restriction) stipulates in detail when quantitative restrictions on exports are exceptionally allowed.[25] Article XX allows exceptional quantitative restrictions for policy objectives such as conservation of exhaustible natural resources, and ensuring essential materials for domestic processing industry under "certain

qualifications."[26] However, the article also makes it clear that the exception should not be abused for protection purposes.[27] Article XXI exception applies to measures for the purpose of international safety.[28]

Article II:1 (b) of the GATT 1994 prohibits all import duties other than ordinary customs duties on products bound in Schedules of Concessions.[29] In contrast, no provisions specifically require a binding obligation of export duties like import duties. Still, the MFN principle explicitly applies to export duties in Article I of the GATT 1994 and relevance of the WTO Agreement on Subsidies and Countervailing measures was invoked under the WTO dispute setttlement scheme.[30]

As is evidenced in WTO dispute cases[31] and in WTO TPR reports, export duties and quantitative restrictions are just different forms of export restrictions, and in this sense are substitutes or supplements to each other. It is also clear that prohibitively high export duties will induce the same effect as export prohibitions. However, under the current WTO scheme, quantitative restrictions on exports are in principle prohibited while export duties are allowed, and will lead to more frequent use of export duties than quantitative restrictions. Export duties will increase government revenue, which is especially important to LDCs; in addition, tax schemes are more transparent and less subject to discretion than are quantitative restrictions. However, lack of substantive regulations on export duties means there is no multilateral agreement to prevent the abuse of export duties.

Transparency and notification

Article X of the GATT 1994 requires a Member to: 1) publish its trade-related laws, regulations, rulings and agreements in prompt and accessible manner; 2) abstain from enforcing measures of general application prior to their publication; and 3) administer the above mentioned laws, regulations, rulings and agreements in a uniform, impartial and reasonable manner. The paramount objective of this article is transparency. Export restrictions are subject to this article considering its regulatory nature and effects on trade. Therefore, the general rule of transparency applies to both export duties and quantitative restrictions but no more than that; no obligation of notification under this article.

The Decisions at Marrakesh include a Notification Procedure that has an indicative list of notifiable measures. This list includes: quantitative restrictions, other non-tariff measures such as licensing; export taxes, and export restrictions, including voluntary export restraints and orderly marketing arrangements.[32] However, a note to this indicative list states that it does not alter existing notification requirements in the Multilateral Trade Agreements and the Plurilateral Trade Agreements of the WTO. In this sense, the initiative proposed by the United States, Japan, Korea and Chinese Taipei regarding export licensing is one example of efforts undertaken to enhance transparency regarding export restrictions.

After the Uruguay Round, a decision by the Council for Trade in Goods (CTG) in 1995 created procedures on biennial notification of quantitative restrictions.[33] The format of the notification does not include export duties or taxes, seeming to reflect current disciplines on Article XI and relevant provisions which exclude export duties from the application. The other decision by the CTG in 1995 established so called reverse notification procedures to allow Members to indicate specific non tariff measures of other Members for transparency purpose, but this process has rarely been used by Members.[34] Therefore, no decisions specifically entail a notification obligation of export duties.

In summary, explicit disciplines on export duties are very limited except the MFN principle under Article I of GATT 1994 and the general transparency requirement (*e.g.* publication of regulations) under the Article X of the GATT 1994. No country engages in the scheduling and notification of export duties, in contrast to the strict scheduling of import duties.

WTO accession

Since the creation of WTO, the accession process has provided certain disciplines on export restrictions thus complementing GATT 1994,[35] especially regarding export duties for several countries (Table 1.3). Regarding export duties, although there is no binding schedule for the existing Members, many new Members committed to bind their export duty rates. Notably in the case of China, 84 specific items have been scheduled, with the commitment to eliminate all export duties except on these items. The schedule indicates the rate of bound export duties. Export restrictions were also one of the topics in the discussion on Russia's accession.[36]

Table 1.3. Examples of disciplines undertaken at the time of WTO accessions Since 2001

China (2001)	China shall eliminate all taxes and charges applied to exports unless specifically provided for in Annex 6 of this Protocol or applied in conformity with the provisions of Article VIII of the GATT 1994. (section 11.3. of protocol) (Annex 6 indicates 84 products and rate of export duties.(ANNEX 2)) The representative of China confirmed that China would abide by WTO rules in respect of non-automatic export licensing and export restrictions. The Foreign Trade Law would also be brought into conformity with GATT requirements. Moreover, export restrictions and licensing would only be applied, after the date of accession, in those cases where this was justified by GATT provisions. The Working Party took note of these commitments.
Armenia (2003)	The representative of Armenia confirmed that any export licensing requirements or other export control requirements would be applied in conformity with WTO provisions including those contained in Articles XI, XVII, XX and XXI of the GATT 1994. The Working Party took note of this commitment.
Cambodia (2004)	The representative of Cambodia said that Cambodia levied export taxes on certain unprocessed raw materials and products to encourage local processing, encourage exports of finished products and to protect human health. The representative of Cambodia stated that, from the date of accession, Cambodia would ensure that it applied its laws and regulations governing export measures and would act in conformity with the relevant provisions of the WTO, including Articles I and XI of the GATT 1994 and the Agreement on Subsidies and Countervailing Measures. The Working Party took note of this commitment.
Vietnam (2007)	The representative of Vietnam confirmed that with regard to export duties on ferrous and non-ferrous scrap metals (35, 45%), Vietnam would reduce export duties in accordance with its commitment on export duties (Table 17 in Annex 2). The representative of Vietnam confirmed that, upon accession, any remaining export restrictions and management measures would be applied in a manner fully consistent with WTO provisions. The Working Party took note of this commitment.
Ukraine (2008)	The representative of Ukraine confirmed that Ukraine would reduce export duties in accordance with the binding schedule, and that as regarding these products, Ukraine would not increase export duties, nor apply other measures having an equivalent effect, unless justified under the exceptions of the GATT 1994. The representative also confirmed that from the date of accession, Ukraine will not apply any obligatory minimum export prices. The representative of Ukraine confirmed that from the date of accession, the export licensing requirements and other export restrictions and control requirements listed or any introduced in the future would be applied in conformity with WTO provisions, including those contained in Articles XI, XVII, XX and XXI of the GATT 1994. The export ban on nonferrous scrap metal would be eliminated and Ukraine would remove current export restrictions on grains and precious metals and stones other than gold, silver, and diamonds, as from the date of accession. The Working Party took note of this commitment.

The necessity and efforts to provide more discipline on export restrictions were not always shared among WTO members. During Ukraine's accession negotiation, some Members stated that Ukraine's export duties were very high, with a strong trade-distorting impact, and in some cases too prohibitive for trade. A member noted that Ukraine appeared to apply trade-related investment measures (TRIM) by granting an exemption from export duties to agricultural producers, contingent on the production of certain agricultural commodities. In contrast, some developing country members had a positive view of export duties as a development instrument. Other members noted that the imposition of export duties was not inconsistent with WTO rules.[37]

Evolving disciplines in bilateral/multilateral levels

Regional and bilateral disciplines

Regional trade agreements (RTAs) include, to a varying degree, disciplines on export restrictions. Several regional trade agreements, in contrast to the WTO, include disciplines on export duties. For example, NAFTA, EU-Mexico, Australia-New Zealand (ANZCER), and Japan-Singapore (JSEPA) agreements in principle prohibit export duties. The growing tendency in Europe and in the Western Hemisphere to restrict export duties has been well recognised in both a bilateral context and in regional trade agreements.

In the EU, Article 25 of the Treaty establishing the European Community stipulates that custom duties on imports and exports and charges having equivalent effect shall be prohibited between Member States. This prohibition shall also apply to customs duties of a fiscal nature. Article 29 provides that quantitative restrictions on exports, and all measures having equivalent effect, shall be prohibited between Member States. Although there are exceptions to this general prohibition on quantitative restrictions, these exceptions do not apply to export duties. [38]

The North American Free Trade Agreement (NAFTA) is also stringent regarding export restrictions. Article 314 of the NAFTA imposes a prohibition on export taxes, subject to a Mexican exception for basic foods set out in Annex 314. Regarding quantitative restrictions, it provides general rules in line with Article XI of the GATT 1994. Article 315 further specifies the conditions of exceptions in Articles XI:2(a) or XX(g), (i) or (j) of the GATT 1994 by articulating detailed requirements such as comparison of trade volumes.[39] Overall, these provisions help to enhance transparency and narrow the scope of unpredictability by articulating regulations in annexes and detailed requirements in the provisions.

In Article 2.8 of the US-Morocco FTA agreement, the Parties undertook not to adopt or maintain any prohibition or restriction on the export of any good to the other Party, except as provided in the Agreement and in accordance with Article XI of the GATT 1994. Article 2.10 provides that except as provided in Annex 2-C, neither Party may adopt or maintain any tax, duty, or other charge on the export of any good to the territory of the other Party, unless the tax, duty, or charge is also adopted or maintained on the good when destined for domestic consumption.[40]

Other RTAs include disciplines similar to those under the WTO. For example, Article 2.5 of the India-Singapore FTA agreement provides that neither Party may adopt or maintain any non-tariff measures on the export of any goods to the other party except in accordance with its WTO rights and obligations or in accordance with other provisions of the agreement. The Australia-Thailand RTA stipulates that the Parties are not allowed

to adopt or maintain any prohibition or restriction on the export or sale for export of any good, except in accordance with Article XI of the GATT, but this does not deal with export duties.[41] Some RTAs do not include any discipline at all. There is no provision in either China-Chile or China-Pakistan RTAs on export duties. China, in its question and response paper regarding its RTA with Chile, made it clear it did not have any clause regarding export duties in its FTAs with other countries.[42]

The fewer countries involved in negotiations, the easier to compromise and reach a conclusion, and hence several RTAs were relatively more successful in disciplining export restrictions than the multilateral forum of the WTO. However, it should be also noted that bilateral negotiations were not very successful in restraining export restrictions of countries which were major users of such measures.[43]

Doha Development Agenda (DDA) negotiations

Non-Agricultural Market Access (NAMA) negotiations

Since the creation of the Negotiating Group on Market Access for Non-Agricultural Products in the context of the Doha Development Agenda (DDA), countries have communicated their thoughts about the scope and modalities of the future negotiations, *inter alia* in the non-tariff field. Export duties have been mentioned several times. Included in its draft modalities is a textual proposal from the EU on export taxes.[44] In that proposal, the EU provided the following reasons as to why export taxes pose serious difficulties for trade liberalization: 1) export taxes can have serious distortive effects on global commodity trade especially when applied by major suppliers; 2) when used for industrial or trade policy purposes, export taxes can serve as indirect subsidization of processing industries and influence international trading conditions of these goods; and 3) export taxes can serve to displace imports on the market of the country imposing the taxes, both for imported goods in direct competition with the taxed products and for imported processed products. Among the reasons for the growing importance of export taxes today are *inter alia*: the recent proliferation in the use of these instruments, which is possible under the weaker WTO rules on export taxes compared to those on import restrictions or other forms of NTMs; and the shortfall of global supply of some specific commodities, despite their abundance in a few countries – a situation that is aggravated by export taxes in key supplying countries.[45]

The European Union (EU) emphasized that any approach should ensure increased transparency and predictability. Concerning transparency, Members should be fully informed of measures taken by any other Member that may influence trade. The EU also considered that scheduling and binding of Members' export taxes could offer an appropriate route of ensuring adequate predictability. This approach would imply that (1) WTO Members should notify the introduction or modification of export taxes and (2) WTO Members should undertake to schedule export taxes in their Schedules of Concessions and bind the export taxes at a level to be negotiated with exceptions.[46]

Regarding transparency, there was a significant initiative by several countries including the United States, Japan and Korea.[47] This initiative concentrates on export licensing which is another form of export restrictions. According to this proposal, export licensing is defined as any administrative procedures involving the submission of an application or other documentation (other than that required for customs purposes) to the relevant administrative body or bodies as a prior condition for exportation. It requires each country to notify, in writing, existing measures on export licensing and any new

measures on export licensing within 60 days after the effective date of the new measures. Each country, upon request by any WTO member, is also required to provide all relevant information including, among others, the export licenses granted over a recent period and other measures taken in conjunction with export licensing regarding restrictions on domestic production or consumption. Finally, according to this proposal, the Committee on market access would review at least once every two years the implementation and operation of this protocol.

Agriculture negotiations

Export restrictions were also discussed during the DDA agriculture negotiations. Most participants agreed that some disciplines were needed to ensure stable supplies for importing countries. Japan stated that in view of redressing the imbalances of the rights and obligations between importing and exporting countries, and of maintaining the food security of food-importing countries, rules and disciplines on export-promoting and export-restricting measures should be established.[48] They proposed converting export restrictions to taxes that would then be reduced (similar to tariffication of import restrictions). Korea proposed that rules and disciplines on export competition should be transparent and contribute to the overall balance of rights and obligations between exporting countries and importing countries. In this regard, disciplines with the following objectives are needed: (i) to prohibit exporting countries from imposing export restrictions and prohibitions arbitrarily; and (ii) to prohibit the use of export tax for the purpose of export restrictions.[49] Switzerland stated that disciplines are necessary in order to ensure that measures taken for the purpose of achieving social objectives do not harm the interests of other countries, and proposed the elimination of all export restrictions on agricultural products and the binding at zero of all export tariffs (with a flexibility clause for the LDCs).[50] The United States proposed to prohibit the use of export taxes, including differential export taxes, for competitive advantage or supply management purposes.[51] The most recent draft modalities for agriculture includes clauses that introduce tightened disciplines for new export restrictions with increased transparency and monitoring.[52]

Exporting countries, while agreeing that tighter disciplines would provide Members with more stable access to agricultural products, emphasized the interrelation between tariff escalation and export restrictions.[53] According to them, tariff escalation hinders the capacity of exporting countries to develop processing industries. In particular, it prevents developing countries from adding value to their exports. As a response to tariff escalation, some developing countries have taken recourse to restricting or taxing their raw material exports. The Cairns Group proposed that the agriculture negotiations should (i) develop both improved disciplines on export restrictions and taxes and eliminate tariff escalation; and (ii) preserve Article 12.2 of the Agreement on Agriculture and provide additional special and differential treatment provisions to address the legitimate needs of developing countries, including least developed and net food-importing developing countries.

Conclusion and policy implications

Export restrictions are applied to achieve diverse policy objectives: increasing government revenue, stabilizing inflationary pressure, promoting downstream industry, conserving natural resources, etc. However, the effectiveness of these measures is questionable. Furthermore, export restrictions may result in efficiency losses. Furthermore, export restrictions, by lowering domestic prices, can reduce incentives for the suppliers to increase their production and investment, which can aggravate international price instability. In this sense, when designing and applying such measures, policy makers should consider several factors: (1) whether the measures are effective in achieving policy objectives, (2) whether the benefit outweighs the cost of the measures, and (3) whether the measures achieve the objectives in the least trade distorting ways.

Export duties and quantitative restrictions are substitutable policy tools as indicated in TPR papers. Considering this nature, uneven discipline under the current WTO scheme may induce more use of export duties. More reliance on export duties is, in a sense, consistent with the tariffication scheme of the WTO regarding imports restriction. The problem is that unlike imports tariff which is regulated by binding schedule, export duties are not restrained by any substantive discipline. Lack of discipline may result in abuse of export duties.

The growing number of bilateral and regional trade agreements has introduced disciplines to prohibit export duties. In the WTO, accession procedures have provided a multilateral framework for making progress with respect to individual countries, as in the case of China. During the DDA negotiations, countries have communicated their thoughts on these measures. However, it is questionable whether these efforts to introduce multilateral or bilateral discipline have been very successful.

Although the TPR reports are the most trustworthy source regarding the documentation of export restrictions, it is not satisfactory.[54] The review process takes place every two to six or more years, depending on the countries involved and therefore cannot reflect the most up-to-date information. The WTO notification procedure is not effective especially regarding export duties, and this partially reflects lack of substantive regulation on export duties. Transparency regarding the use and implementation of export restrictions should be substantially improved.

Notes

1. Jeonghoi Kim is a policy analyst of the OECD Trade and Agriculture Directorate.
2. See WTO Trade Policy Review Report by the Secretariat on Argentina (WT/TPR/S/176).
3. In China, exporters are entitled to VAT rebates although VAT is not necessarily rebated fully on exports. When VAT rebate rates on exports are lower than the VAT rates actually paid, the difference between the two rates constitutes a levy on exports. See WTO Trade Policy Review Paper on China (WT/TPR/S/199).
4. See WTO Trade Policy Review Report by the Secretariat on Cameroon (WT/TPR/S/187).
5. Analysis of non-tariff measures: the case of export duties, TD/TC/WP(2002)54/FINAL and Analysis of non-tariff measures: the case of export restrictions, TD/TC/WP(2003)7/FINAL.
6. This case deals with the relation between export restrictions and subsidy. The question was whether US regulations that treat a restraint on exports of a product as a subsidy to other products made using or incorporating the restricted product was consistent with the WTO SCM Agreement (WT/DS194/R).
7. Export duties should be distinguished from fees and formalities, prohibiting fees and other charges rendered in connection with exportation (or importation) that are addressed under Article VIII (a) of the GATT 1994. It stipulates that fees and other charges shall not represent an indirect protection to domestic products or a taxation of imports or exports for fiscal purposes. It applies to all fees and fomalities whatever its nature, but explicitly states that "export duty" is excluded from the application. Therefore, a distinction should be drawn between export duties and fees or charges, even though in specific cases the substance of the measures might be similar and thus difficult to distinguish.
8. The Members reviewed in previous and present analysis are different, and the increase in the numbers results partially from the fact that there were Members not subjected to analysis during 1997-2002. Still, several Members which did not maintain export duties during 1997-2002 applied new measures during 2003-2008.
9. For example, the Kimberley Process Scheme certifies the origin of rough diamonds so as to prevent rebel groups and their rivals from financing their war from diamond sales.
10. Among the 25 LDCs under TPR review between 2003-2009, 21 countries maintained export duties.
11. For example, the WTO TPR paper provided that one of the major objectives of Indonesia's quantitative restrictions was to promote higher value-added downstream industries. Mongolia's export prohibition of raw hides and cashmere was also maintained to protect domestic processors.
12. The rationale for differential export taxes was discussed during TPR process. When asked for the reason for maintaining differential export taxes, Argentina stated that its

existence and permanence was closely linked to the payment capacity of each industry. Argentina further provided that the export tax rate differential was an instrument permitted by WTO rules and was equivalent to taxes on imports or the tariff escalation applied by the majority of importing countries to stop entry of processed products.

13. According to the TPR report on Angola, the authorities indicated that export duties were levied for the purpose of environmental protection, particularly of flora and fauna.

14. This policy consideration is reflected in Article XX(g) of GATT 1994 which allows exceptional quantitative restrictions if such measures are made effective in conjunction with restrictions on domestic production or consumption.

15. See *WTO Trade Policy Review Minutes* of Meeting on China (WT/TPR/M/199/Add.1).

16. See *WTO Trade Policy Review Report* by the Secretariat on Indonesia (WT/TPR/S/184).

17. Although China applied export restrictions on molybdenum for conservation purposes, the production of molybdenum in China has risen continuously, making the measure ineffective in fulfilling the stated policy objective.

18. As the world's leading producer and supplier of copper, Chile responded to resource depletion by applying a mining tax on the operating income of mine operators rather than relying on export restrictions. (OECD, 2009c).

19. For example, in Argentina, MEP Resolution No. 114 of 8 March 2006 suspended exports of bovine livestock, of the hoof, and of certain cuts and preparations and preserves of bovine meat for a period of 180 days. The government justified this measure as necessary to maintain the stability of beef prices in the face of price increases caused by external demand. Kazakhstan applied a temporary ban on wheat export in 2008 for the same reason.

20. For example, Pakistan can impose regulatory duties up to 100% on exports without parliamentary approval. Egypt, although it does not currently impose export duties, can apply export tax up to 100% at any time according to the relevant regulation. In Thailand, the persistence of relatively high statutory export taxes leaves an element of uncertainty, as export taxes on important products, such as rice or rubber which are subject to 0% export tax, could in principle be reintroduced up to the level of statutory rates (10% for rice, 40% for rubber) without legislative approval.

21. A similar case can be also found in Ukraine. Ukraine applied wheat export restraints throughout 2007 in an attempt to combat the impact of their drought and to keep local bread prices low. As a result, wheat export from Ukraine decreased from 4 669.01 MT in 2006 to 1 056.65 MT in 2007. Exports of wheat from Russia and Kazakhstan grew significantly in 2007, by 47.9% and 53.4% respectively. Although many factors may have contributed to this export growth, export restraints in countries like Ukraine may have contributed to this shift in market share. By 2008, Russia and Kazakhstan also implemented export restrictions. In late January 2008, Russia announced that it would levy a 40% export duty on wheat for exports bound outside of its customs union. In February, Russia tightened the export restrictions, extending the export duties to its customs union. Kazakhstan followed by levying export duties on wheat in March. It banned wheat export from 15 April 2008 until 1 September 2008. Ukraine export restrictions not only forced importing countries to look elsewhere, but also

may have contributed to the decision by other exporting countries to apply similar measures, further limiting the international supply of the commodity. See Dollive, Kendall (2008) *The Impact of Export Restrictions on Rising Grain Prices*, USITC, www.usitc.gov and OECD (2009) *Agricultural Policies in Emerging Economies 2009: Monitoring and Evaluation*.

22. See *WTO Trade Policy Review Report* by the Secretariat on Paraguay (WT/TPR/S/146).

23. See Report of the Working Party on the Accession of China (WT/ACC/CHN/49).

24. For example, in Cameroon, to encourage value added and ensure the supply of local wood for processing industries, the entire log production must be processed on site, and for many species log exports are prohibited since 2004. For the others, exports require a prior permit from the National Forestry Development Office (ONADEF). Also, exports are subject to a tax of 17.5% of the f.o.b. value of log (unprocessed wood), and a tax of 2% on other products. However, according to the authorities, the loss brought about by prohibiting exports of most logs has not been offset by an increase of processed timber.

25. It requires members introducing new export restrictions on foodstuffs in accordance with Article XI:2(a) of GATT 1994 to give due consideration to the effects of such restrictions on the importing member's food security. Members, except non-net exporting developing countries, must notify the Committee on Agriculture before introducing new export restrictions on foodstuffs, and must consult with affected members.

26. For example, (g) relating to the conservation of exhaustible natural resources if such measure are made effective in conjunction with restrictions on domestic production or consumption; (i) involving restrictions on exports of domestic materials necessary to ensure essential quantities of such materials to a domestic processing industry during periods when the domestic price of such materials is held below the world price as part of a governmental stabilization plan; Provided that such restrictions shall not operate to increase the exports of or the protection afforded to such domestic industry, and shall not depart from the provisions of this Agreement relating to non-discrimination; (j) essential to the acquisition or distribution of products in general or local short supply; Provided that any such measures shall be consistent with the principle that all contracting parties are entitled to an equitable share of the international supply of such products, and that any such measures, which are inconsistent with the other provisions of the Agreement shall be discontinued as soon as the conditions giving rise to them have ceased to exist.

27. The introductory paragraph (Chapeau) of Article XX provides that exception is allowed "subject to the requirement that measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade."

28. For example, (b)(ii) relating to the traffic in arms, ammunition and implements of war and to such traffic in other goods and materials as is carried on directly or indirectly for the purpose of supplying a military establishment; (c) any action in pursuance of its obligation under the United Nations Charter for the maintenance of international peace and security.

29. The products described in Part I of the Schedule relating to any contracting party, which are the products of territories of other contracting parties, shall, on their

importation into the territory to which the Schedule relates, and subject to the terms, conditions or qualifications set forth in that Schedule, be exempt from ordinary customs duties in excess of those set forth and provided therein. Such products shall also be exempt from all other duties or charges of any kind imposed on or in connection with the importation in excess of those imposed on the date of this Agreement or those directly and mandatorily required to be imposed thereafter by legislation in force in the importing territory on that date.

30. See WTO panel report on measures treating export restraints as subsidies (WT/DS194/R). Herbert Smith (2009) even discusses the possibility of applying the WTO Anti-dumping Agreement (ADA). Dumping occurs when the export price of a product is less than its normal value. Although normal value is usually the domestic price in the exporting country, the ADA allows members to construct normal value when domestic price does not represent normal value. If processed products are benefiting from a raw material price advantage caused by export restrictions, it may be possible to construct normal value reflecting this market condition.

31. In two dispute cases, the agreed solution was to transform quantitative restrictions to export duties. The solution after the EC-Pakistan dispute on Pakistan's export prohibition on hides and skins resulted in the replacement of prohibition by a 20% export duty. When disputed by EC, India also removed export restrictions on hides/skins and leather and introduced export duties on these products. In both cases, the parties to the dispute reached an agreement without establishment of panel.

32. Notifiable measures; Tariffs (including range and scope of bindings, GSP provisions, rates applied to members of free-trade areas/customs unions, other preferences), tariff quotas and surcharges, Quantitative restrictions, including voluntary export restraints and orderly marketing arrangements affecting imports, Other non-tariff measures such as licensing and mixing requirements; variable levies, Custom valuation, Rules of origin, government procurement, technical barriers, safeguard actions, anti-dumping actions, Countervailing actions, Export taxes, Export subsidies, tax exemptions and concessionary export financing, Free-trade zones, including in-bond manufacturing, Export restrictions, including voluntary export restraints and orderly marketing arrangements, Other government assistance, including subsidies, tax exemptions, Role of state-trading enterprise, Foreign exchange controls related to imports and exports, Government-mandated countertrade, Any other measure covered by the Multilateral Trade Agreements in ANNEX 1A to the WTO Agreement (Ministerial Decision on Notification Procedures adopted by the Trade Negotiating Committee on 15 December 1993).

33 G/L/59 "Members shall make complete notification of the quantitative restrictions which they maintain by 31 January 1996 and at two-yearly intervals thereafter…"

34 G/L/60 Decision on Reverse Notification of Non-Tariff Measures. Only two reverse notifications for this purpose have been found in the WTO documents.

35 Paragraph 1.2 of Part I of the Accession Protocol makes it clear that the Protocol, including the commitments referred in the Working Party Report, shall be an integral part of the WTO Agreement.

36 In the accession process of Russia, export duties on minerals, petrochemicals, natural gas, raw hides and skins, ferrous and non-ferrous metals and scraps, etc., were discussed. WTO Members argued that in case where Russia is the dominant supplier, third country buyers would suffer from increased costs because of the high price of the product and would encounter insufficient supplies of the goods. They pointed out

that the loss of relative competitiveness in the global market for downstream products *vis-à-vis* Russian products should be taken into account. Wheat (40%), log (25%), palladium/rhenium/titanium (6.5%), copper (10%) are several examples of products subject to export tax since 2008.

37. See Ukraine Accession document WT/ACC/UKR/152.

38. Article 30 provides that Article 29 shall not preclude prohibitions or restrictions on imports, exports or goods in transit justified on grounds of public morality, public policy or public security; the protection of health and life of humans, animals or plants; the protection of national treasures possessing artistic, historic or archaeological value; or the protection of industrial and commercial property. Such prohibitions or restrictions shall not, however, constitute a means of arbitrary discrimination or a disguised restriction on trade between Member States.

39. Article 315 (Mexico is exempted by Annex 315) provides that a Party may adopt or maintain a restriction otherwise justified under Article XI:2(a) or XX(g), (i) or (j) of the GATT with respect to the export of the Party to the territory of another Party, only if: (a) the restriction does not reduce the proportion of the total export shipments of the specific good made available to that other Party relative to the total supply of that good of the Party maintaining the restrictions as compared to the proportion prevailing in the most recent 36-month period.

40. Annex 2-C stipulates that Article 2.10 shall not apply to a tax on exports of processed or unprocessed phosphates, provided that the tax rate is no higher than 34 dirhams per ton of unprocessed phosphates, for five years beginning on the date of entry into force of this agreement.

41. See Factual Presentation regarding Australia-Thailand Free Trade Agreement (WT/REG185/3).

42. See Question and replies regarding China-Chile FTA (WT/REG230/2).

43. For example, although China is one of major users of export restrictions, there is no effective discipline on such measures in six RTAs (including Hong Kong and Macao) it joined.

44. See Draft Modalities for Non-agricultural Market Access, Fourth Edition (TN/MA/W/103/Rev.3).

45. According to 2006 EC proposal (TN/MA/W11/Add.6), export taxes are used for the purpose of (or otherwise having the effect of) (1) artificially transferring gains from trade between WTO Members; (2) creating unfair advantages for domestic industries involved in international trade at the expense of other WTO Members' producers; or (3) evading existing WTO disciplines on export restrictions by shifting to more or less prohibitive taxes on the exportation of goods.

46. The exception includes that (a) least-developed countries would undertake to schedule export taxes but may maintain these export taxes unbound and (b) paragraph 6 countries (developing country Members with no final bound total AMS commitments) would schedule export taxes but may maintain these export taxes unbound for a certain number of tariff lines (the number is to be negotiated), in reflection of their specific development interests and concerns.

47. See Protocol on Transparency in Export Licensing to the General Agreement on Tariffs and Trade 1994 (TN/MA/W/15/Add.4/Rev.5) which was proposed by Chinese Taipei, Japan, Korea, Ukraine and the United States.

48. Japan specifically proposed: (1) to tariffy all export prohibitions and restrictions (by replacing them with export taxes); (2) to bind all export taxes (including those possibly introduced in the future) (for products subject to the export tax, to establish quotas in which a certain amount of exports will be exempt from the export tax), and (3) in the case where temporary and short-term measures to restrict exports become necessary before export taxes are introduced, to clarify the disciplines applied on such emergency measures used in order to adjust the volume of exports. Measures for clarifying such disciplines are (i) to establish strict requirements for the application of such emergency measures; (ii) to introduce consultations with other Members as a prerequisite for imposing emergency measures, and to clarify the measures to be taken when the consultations do not result in a satisfactory solution; (iii) to obligate Members, when introducing emergency measures, to maintain the proportion of exports to domestic production at the level of preceding x years, in order to allow importing countries to secure the necessary level of imports; and (iv) to limit the duration of such emergency measures. (G/AG/NG/W/91)

49. See Korea's Proposal for WTO negotiation on Agriculture (G/AG/NG/W/98).

50. See Switzerland's Proposal for WTO negotiation on Agriculture (G/AG/NG/W/94).

51. See US Proposal for comprehensive long-term Agricultural Trade Reform (G/AG/NG/W/15).

52. See Revised Draft Modalities for Agriculture (TN/AG/W/4/Rev.4). Regarding Article 12 of the Agreement of Agriculture, it proposes that the member instituting export prohibitions and restrictions shall consult, upon request, with any other member having a substantial interest as an importer and shall report the progress made in the consultations to the Committee on Agriculture. The Committee on Agriculture shall provide for annual notification update and surveillance of the obligations and any member may bring to the attention of the Committee on Agriculture any measures which it considers ought to have been notified by another member. Existing export prohibitions and restrictions in foodstuffs and feeds under Article XI.2 (a) of GATT 1994 shall be eliminated by the end of the first year of implementation. Any new export prohibitions or restrictions under Article XI.2(a) of GATT 1994 should not normally be longer than 12 months, and shall only be longer than 18 months with the agreement of the affected importing members. These clauses emphasize that export restrictions, even when applied for food security, should be applied only temporarily.

53. The Cairns Group, which included Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, Philippines, South Africa, Thailand and Uruguay, submitted its proposal paper (G/AG/NG/W/93).

54. TPR reports do not cover countries that are not member of the WTO and hence additional sources should be consulted to have a more complete information covering these countries.

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ANNEX 1.A1

Description of Export Duties/Taxes in TPR Reports

Europe / Middle East	
Bahrain (2007)	No export taxes. Export fees on ready-made clothes were eliminated in 2005.
Bulgaria (2003)	No export taxes. At the time of its WTO accession in 1996, Bulgaria applied a range of export taxes for the purpose of preventing or relieving critical shortage of foodstuffs and other essential products. However, it undertook commitments to minimize the use of such measures upon accession, and no longer imposes any duties or other charges on exported goods.
European Union (25) (2009, 2007, 2004)	No export taxes.
Georgia (2009)	No export taxes.
Iceland (OECD) (2006)	No export taxes. According to Act 66/2002, a fee of ISK 500 should be paid for every horse exported into a fund established with the purpose of protecting the species. The authorities stressed that this fee is not collected by the Directorate of Customs.
Israel (2006)	No export taxes.
Jordan (2008)	An export tax of JD 30 per tonne is collected by the Customs authorities on exports of scrap and waste of iron, brass, and aluminium, to secure the needs of the domestic industry. Mining and quarrying products are subject to export fees, which are collected by the Natural Resources Authority. In 2006, these fees generated tax revenues of JD 0.4 million. The Ministry of Agriculture collects fees on exported agricultural products. These charges relate to services rendered, such as quarantine, fumigation, and inspection.
Liechtenstein (2004)	No export taxes.
Norway (OECD) (2008, 2004)	Exporters of fish and fish products are subject to a levy between 0.2% and 1.05% of the export value (f.o.b.), depending on the species and stage of processing. The levy is used to finance the activities of the Norwegian Seafood Export Council (NSEC) which assists in the marketing of fish and fish products.
Oman (2008)	No export taxes.
Qatar (2005)	No export taxes
Romania (2005)	No export taxes.
Switzerland (OECD) (2008, 2004)	No export taxes. Export duties may be levied on goods listed in the "export tariff" schedule, to guarantee the national supply (48 tariff lines at the HS eight-digit level). Nonetheless, no export duties were applied during 2004-08.

Turkey (OECD) (2007, 2003)	Turkey applies export taxes at a rate of USD 0.5 per kg on raw skins (HS 41.01, 41.02. and 41.03; excluding processed raw skins); and USD 0.04 per kg for unshelled hazelnuts, and USD 0.08 per kg for shelled hazelnuts. The taxes finance the Support and Price Stabilisation Fund (SPSF).
United Arab Emirates (2006)	An export tax on steel scrap has been levied at the rate of Dh 250 per tonne since 2003.

Asia / Pacific

Australia (OECD) (2007)	No export taxes.
Bangladesh (LDC) (2006)	A tax at source on all export earnings remains at 0.25%, but no product-specific taxes, charges or levies seem to affect exports.
Brunei Darussalam (2008)	No export taxes.
China (2008, 2006)	Export taxes are levied at statutory rates in relation to f.o.b. values and on an MFN basis. In addition, lower interim rates may be applied on an MFN basis. The Tariff Commission under the State Council sets and publishes the statutory rates annually and revises the list of items subject to interim duty together with the rates of duty. In 2007, statutory export taxes applied to 88 tariff lines at the HS 8-digit level, including metals, phosphorous, benzene, and eel; 64 of these lines were also subject to lower interim export duties. In the same year, interim export duties applied to an additional 110 lines at the HS 8-digit level, which were not subject to statutory export taxes. They included: some mineral products; iron, copper, nickel, and aluminium ores; certain chemical products; as well as iron and steel products. The interim duty rates on 142 tariff lines were increased on 1 June 2007, with a view to reducing exports of products that are highly energy consuming and polluting, as well as those consuming large amounts of raw materials. On 1 January 2008, the coverage of interim export duties increased again to include some more steel products; in total, 334 lines (at the HS 8-digit level and including 4 "ex-" lines) are now subject to interim export duties. In addition to these products, exports of grain, rice, maize, and soybeans are subject to interim export duties, to discourage their export. Though the main objective of these export taxes may be to improve the environment by reducing exports of products considered to be highly energy consuming or polluting, such taxes tend to increase the domestic supply of the products concerned. As a consequence, their domestic prices tend to be lower than would otherwise be the case; thus, export taxes may implicitly assist domestic downstream processing of the products concerned. Not fully rebating VAT on exports of certain products has a similar outcome. The VAT rebate rates are adjusted from time to time to, *inter alia*, meet industrial development goals, and control exports of certain products. For example, in September 2006, rebate rates were lowered on, *inter alia*, some steel products, cements, and some textiles, as well as furniture, plastics, and wood products. In July 2007, China eliminated rebates for some 553 items regarded as highly energy consuming, highly polluting, and consuming large amount of raw materials, and lowered rebate rates for 2 268 lines (HS 8-digit) that the authorities considered prone to trade friction; such items included textiles and steel products. In December 2007, China removed the VAT rebate on exports of 84 agricultural tariff lines, such as wheat, maize, rice, and soybean, with a view to easing inflation. As a consequence, current VAT rebates are: 17%, 13%, 11%, 9%, and 5%. The authorities state that VAT rebates on exports amounted to CNY 487.7 billion in 2006 (CNY 420 billion in 2004), or about 6.3% of total merchandise exports.
Chinese Taipei (2006)	No export taxes.
Fiji (2009)	Export taxes of 3% apply to gold, silver, sugar, molasses, and, following the 2009 Budget, unprocessed fish and timber to promote domestic value added. The export tax base is the f.o.b. value or, if not easily ascertainable or accepted by Customs, an estimated value in accordance with legislation. Government policy is to ensure that the export tax and royalty rate on any metallic mineral does not exceed 5% f.o.b.

Hong Kong, China (2006, 2003)	No export taxes. However, exports of clothing and footwear continue to be subject to a clothing industry training levy of HKD 0.30 per every HKD 1 000 exported.
India (2007)	With the exception of tanned and untanned hides, skins and leathers (except manufactures of leather), all other exports otherwise subject to tax have been exempted through notifications. The export tax rates for leather range from 10% to 25% of the f.o.b. value of the product. An export cess applied to various products including coffee, spices, tobacco and other agricultural commodities has been repealed by the Cess Law (Repealing and Amending) Act, 2005 enacted in 2006. No information was provided on which exports remain subject to cess.
Indonesia (2007, 2003)	In 1998, Indonesia cut export tariffs on 34 commodities and revamped procedures for export tax payments. It reduced export taxes by 20% at end 1998 and another 25% at end 2000. They covered paper pulp, wood chips, veneer railroad sleepers, rattan, logs, sawn timber and natural sand, and the raw materials for producing these products. Export taxes on these goods had been as high as 200% for logs but have now fallen to just 10% The export tax on rattan fell to 5%. The export tax on crude palm oil, one of Indonesia's largest export products, was cut to 3% (from 10%) in 2001, and in December 2005 the Minister of Agriculture announced plans to reduce the tax further to 1.5%. The rate on crude palm oil by-products (including olein) was cut to 1% (from 6-8%) in 2001. In 2005, the Government imposed export tariffs on raw skins (25%), white tanned hides (15%) and coal (5%).
Japan (OECD) (2009, 2007, 2005)	No export taxes.
Korea (OECD) (2008, 2004)	No export taxes.
Kyrgyz Republic (2006)	No export taxes.
Macau, China (2007)	No export taxes.
Maldives (LDC) (2009, 2003)	Fisheries exports are subject to a 5% royalty, based on weight.
Malaysia (2006)	Export duties are generally imposed on main commodities, such as crude petroleum and palm oil. Out of 10 580 tariff lines, 512 lines are subject to export duties, the majority being in 15-20% range. The purpose of Malaysia's export duties is to discourage the export of raw materials and to encourage downstream activities in the country. For example, a 5% export duty is levied on cockles (molluscs), live cattle, buffaloes, goats, and wild animals and birds. The export of wildlife is discouraged for conservation purposes. Export duties are also imposed to fund research and development and promotion activities for commodities in downstream and upstream industries and to maintain an adequate supply of certain goods in the domestic market. Currently export duties are 15% on logs and range from 10% to 30% for crude palm oil, based on tonnage. The Government imposes an export levy on selected species of sawn timber to ensure an adequate supply for timber-based industries and for research and development. With the exception of crude petroleum, which is subject to a flat rate duty of 20%, duties on commodities are based on the "cost plus" concept: the duty is only imposed on the excess over a threshold price that reflects the cost of production. In September 2003, export duties were reduced for 41 items and abolished for another 208 items.
Mongolia (2005)	As of January 2004, Mongolia applies export taxes on several products, such as raw cashmere, cut timber, scrap metals and worn rails, copper, zinc alloys/brass, aluminium unwrought, etc. In so far as such taxes reduce the domestic price of these products, they constitute assistance to their domestic processing. Upon accession to the WTO, Mongolia made a commitment to eliminate export duty on raw cashmere within ten years of the date of accession. With a view to protecting metal-smelting plants, due to the increasing shortage of raw metals and a large increase in the world prices of metals since 1997, export taxes on scrap metals were raised from Tog 140/kg to Tog 350/kg in May 2004.

New Zealand (OECD) (2009, 2003)	No export taxes.
Pakistan (2008)	Although export taxes are prohibited, the Central Board of Revenue (CBR) can impose "regulatory duties" up to 100% on exports, by notification without parliamentary approval (Customs Act). Duties of 25% were applied to exported ferrous and non-ferrous waste and scrap in June 2006 and of 35% on pulses in 2006/07, due to domestic shortages; "regulatory duties" also apply at 15% on exports of sugar, 30% on leather goods, 20% on hides and skins and, from the 2007/08 Budget, 25% on specified metals and articles thereof. The authorities indicate that such measures are used to control supply of commodities for local consumption and not to raise revenue or assist domestic users of these goods; nevertheless export taxes can implicitly subsidize users of affected goods by reducing domestic prices. The All-Pakistan Textile Association no longer sets minimum export prices on cotton yarn. According to the authorities the special mechanism mentioned in the 2006 Export Trade Order for monitoring metal exports, including prices, was not established. An export development charge of 0.25% of the f.o.b. value is levied on all exports (except from export processing zones) to finance the Export Development Fund.
Philippines (2005)	Only plantation (non-native) logs are subject to an export tax (20% of f.o.b.). However, provisions still appear to exist that enable export taxes to be re-imposed on other products, although the authorities indicate that these may no longer apply. The authorities indicate that the export tax on non-native logs is imposed to ensure an adequate, stable and sustainable supply of domestic timber. However, export taxes are distorting and implicitly subsidize downstream processors by providing logs at below world prices, thereby encouraging domestic value added, which may be an inefficient use of resources if reliant on the subsidy. The authorities indicate that revenue from the export tax is minimal. Minimum export prices seem to apply for rice and corn; according to the authorities, they are generally based on world prices. Minimum export prices could have similar economic effects to export taxes.
Singapore (2008, 2004)	No export taxes.
Solomon Islands (LDC) (2009)	Export taxes are levied mainly on fish, minerals, and timber. Taxes on timber and fish are levied on a value determined by the authorities. Between 2003 and 2007, export duties represented almost 18% of total customs and inland revenue.
Sri Lanka (2004)	Export cesses are currently imposed on, *inter alia*, tea, coconut products, unshelled raw cashew, raw hides and skins. It would appear that these cesses are earmarked to finance specific activities such as financing R&D in the tea sector and supporting small-scale growers. Exports of silica quartz are still subject to a minimum price of USD 300 per tonne. Exports of sawn rubber wood are also subject to a minimum export price to prevent the indiscriminate felling of rubber trees, and thereby protect the rubber industry. As in the case of imports, several types of border charges are levied on certain exports. While these charges may be justified by the authorities on grounds of national security, environmental protection, financing export promotion, and encouraging downstream processing, the use of such levies on the export of locally produced materials is in effect, an input subsidy to processors. Insofar as export sales of such materials are diverted onto the home market, the domestic prices of these materials are reduced by the export restriction. While processors benefit from lower domestic prices, domestic suppliers of materials are penalized. Encouraging production and exports of processed products through export levies on inputs, risks developing inefficient industries. Export duties and cesses may be imposed to: ensure the availability of raw materials for higher-value-added industries and to promote further processing of local materials; finance export promotion activities; and protect national security, archaeological items, and the environment.
Thailand (2007, 2003)	There has been no change in Thailand's export duties since 2003. Export taxes consist of statutory rates and applied rates; applied rates involve specific (hides of bovine animals) and *ad valorem* (wood sawn and articles thereof, from zero to 40%) duties. The contribution of export taxes to government revenue remains negligible (0.3% of total tax revenue in 2005/06). The persistence of relatively high statutory export taxes, nevertheless, leaves an element of uncertainty in Thailand's trade regime, as export

	taxes on important products, such as rice or rubber, could in principle be reintroduced up to the level of the statutory rates without legislative approval. According to the authorities, the collection of export taxes is primarily for the purpose of conserving the environment, although it also constitutes a form of assistance to downstream processing.
Africa	
Angola (LDC) (2006)	Export duties are levied on: ivory, powder and scrap (10%); raw hides and skins (20%); tanned hides and skins (20%); and worked ivory, bone, etc., (10%). The authorities indicate that these duties are levied for purposes of environmental protection, particularly of flora and fauna.
Benin (LDC) (2004)	Although export duties were abolished in 1993, a fiscal tax on the export of cocoa beans, crude petroleum and precious metals still seems to apply.
Botswana (2009, 2003)	The Cattle Export and Slaughter Levy Act 10 of 2005 provides for the imposition of a levy per head of cattle exported from Botswana. The levy rate is currently P 10 per animal.
Burkina Faso (LDC) (2004)	Burkina Faso imposes a levy of CFAF 500 (USD 0.83) for each export certificate for works of art, which goes to the National Cultural Promotion Fund (FNPC). A special livestock sector contribution is levied on the export of live animals.
Burundi (LDC) (2003)	Most products are subject to a 5% export tax on the sales price plus packing costs. Higher rates are applied to certain primary commodities: 15% on fresh vegetables, flour, cereals and grains; and 6% on tea. Green coffee beans are subject to the 31% rate, but the tax has not been collected since 1999. Raw hides and skins, leather, fur skins and articles thereof are taxed at 3% and mineral ores at 1%. The government plans to eliminate export taxes and charges from 1 January 2003.
Cameroon (2007)	The CAEMC (Central African Economy and Monetary Community) customs regime allows member countries to levy export taxes. Cameroon applies export taxes of 2% of the f.o.b. value of exported goods, with the exception of logs, which are subject to a higher rate. Exports of wood (raw or semi-processed logs) are subject to an export tax of 17.5% of the f.o.b. value. Export taxes on logs have been imposed to encourage processing and hence local added value. Exports worth CFAF 500 000 or more are subject to the inspection and control tax. Exports of fish and meat are subject to a sanitary inspection tax at the same rate as imports.
Central African Republic (LDC) (2007)	Gold, diamonds, wood, cattle and live wild animals are the subject of special regime as regards export duties and taxes.
Chad (LDC) (2007)	A statistical tax on exports (RSE) is levied at the rate of 2% of the export value, on all tariff lines whatever the destination of the goods. The Community preferential tax (TPC) of 0.4% is also collected, on behalf of the CAEMC (Central African Economic and Monetary Community), on all exports. Export duty is levied on certain, mainly agricultural and fish-breeding, products to finance the export "Rural Intervention Fund" (FRE).
Congo (LDC) (2006)	Merchandise exports are subject to several export duties and taxes, in particular: the 2% automation fee; the 2% supplementary exit duty, from which certain products are exempt; and the 2% levy on rough diamonds. Timber is taxed as follows: 1% levy for the public service responsible for controlling forest product exports, the tax on timber exports assessed on the basis of transport costs, the f.o.b. value, the species and the degree of processing. In addition, there is a 15% surcharge on rough timber exported over and above the quota of 85% of the production of each forestry enterprise, as well as the contribution to the road fund assessed on timber for export or in transit.
Djibouti (LDC) (2006)	Djibouti levies an export tax of DF 500/tonne on salt.
Egypt (2005)	No export taxes. However, according to Article 8 of the Import and Export Regulations, a duty up to 100% of the value of the good may be imposed at any time by the Minister responsible for trade; according to the authorities, this duty has never been imposed.

Gambia (LDC) (2004)	A 10% export duty is levied on all items, except diamonds, which are taxed at 3%; exports of fish, fish products, groundnuts and their by-products, and all exports to the European Union are exempted.
Ghana (2008)	Export taxes are applied on cocoa and hydrocarbons. The rates on hydrocarbons are USD 0.09 per litre on aviation turbine kerosene and USD 0.03 per litre on gas oil. The share of export taxes in total Government revenue has decreased significantly, from 11.4% in 1998 to 2.3% in 2005.
Guinea (LDC) (2005)	A fiscal duty (DFE) is applied on the following scale: 0% for all agricultural or industrial products harvested or manufactured in the Republic of Guinea; 3% for exports of gold and diamonds; 2% for re-exports of goods of foreign origin previously imported against payment of duties and taxes in Guinea. The DFE applicable to mining products is determined in the various agreements signed with the mining companies. The tax payable by the Guinean Bauxite Company (CBG) is USD 8 to 9 per ton of bauxite (it depends on the trend in global prices), USD 1.75 per ton of alumina produced by the Alumina Company of Guinea (ACG) and USD 0.5 per ton of bauxite used to produce alumina. A tax of USD 13 is payable per ton of coffee.
Kenya (2006)	An export tax of 25% applies to hides and skins, and scrap metal. The tax was introduced in 2004 to encourage local processing.
Lesotho (LDC) (2009, 2003)	Sales tax is levied at 15% on every diamond found in and exported from Lesotho.
Madagascar (LDC)(2008)	According to the authorities, Madagascar does not impose any export taxes. However, some products are subject to a charge. Given that these products are almost entirely exported, these charges are *de facto* applicable almost exclusively to exports. Also, a charge is applied to fishery products; a charge of 1.5% of the f.o.b. value is applied to worked wood; and a mining charge of 2% is applied to mining products. Furthermore, forestry charges are levied on the exportation of specimens of fauna and flora: at the rate of 4% of the f.o.b. price for live specimens; 2% of the f.o.b. price for processed products; and 1% of the f.o.b. price for specimens that have been reproduced.
Mali (LDC) (2004)	Production of gold, which for the most part is exported, is subject to a levy of 3% *ad valorem* under the CPS (export duty). Exports of cotton are also subject to a CPS of 3%.
Mauritius (2008)	No export taxes.
Morocco (2009, 2003)	The DH 0.50 tax on every quintal of maize exported was abolished in 2005. The levy of DH 7/tonne on plant fibre exported was also abolished in 2005. The levy on the exploitation of phosphates, amounting to DH 34/tonne of crude phosphate equivalent, payable on exports was abolished in January 2008.
Mozambique (LDC)(2009)	Mozambique imposes an export tax of between 18% and 22% of the f.o.b. customs value on raw cashews. Although no other specific export tax appears to be applied, certain items, which are almost entirely exported, are subject to charges, e.g. cotton, fishery products, forestry products, and mining products. For instance, a royalty of Mt 2 000 applies to exports of unprocessed precious tropical wood, with a 25% reduction applying if processed.
Namibia (2009, 2003)	A 10% tax is imposed on unprocessed diamond exports. Export levies apply to live exports of slaughter-ready cattle at N$39.50 per head, and small stock (sheep and goats) at N$7.90 per head.
Niger (LDC) (2009, 2003)	A 3% statistical export charge (RSE) applies to all goods except mineral substances, together with a special re-export tax (TSR). Tobacco products are subject to a TSR of 5% when exported to countries that are outside the franc zone but are members of the ECOWAS (for example, Nigeria), and a TSR of 15% when exported to other countries outside the franc zone. For all other goods, the TSR rate is 10%. Niger has a large re-export trade (for example, cigarettes), mainly going to Nigeria, which is Niger's second most important trade partner, and live animals are the second largest export.

Nigeria (2005)	The export amendment decree of 1992 prescribes that all raw material or unprocessed commodities, whether mineral or agricultural, may be subject to the payment of an export levy as may be prescribed, from time to time, by order of the Nigerian Export Promotion Council (NEPC). In this respect, an administrative levy of US$5 per tonne is applied to exports of cocoa, and of US$32 per tonne to exports of other raw materials.
Rwanda (LDC) (2004)	No export taxes.
Senegal (LDC) (2009, 2003)	An annual royalty of 3% of the pit-head value (difference between the f.o.b. value of the mineral substance and all the costs incurred from the pit-head to the delivery point) is levied on gold exported.
Sierra Leone (2005)	Exports of cocoa and coffee products remain subject to a levy, currently set at 2.5% of the f.o.b. export value. As from 1980, a 3% tax has been levied on all diamond exports valued by the Government Gold and Diamond Office (GGDO), in conjunction with Diamond Counsellors International.
South Africa (2009, 2003)	South Africa levies a tax on exports of unpolished diamonds in order to promote the development of the local economy, develop skills, and create employment. As of 2008, export levy of 5% based on the value of exported unpolished diamonds has been applied. South Africa also imposes an export levy of R 0.05 per litre of exported wine.
Suriname (2004)	All exports are subject to a consent fee of 0.1%. A statistical fee of 0.5% applies to exports of all products except bauxite, which is subject to a statistical fee of 2%. These fees are assessed on the f.o.b. value of exports and are applied regardless of their destination. Suriname applies additional taxes on exports of raw and roughly processed timber. Rates are expressed as *ad valorem* rates of minimum f.o.b. values determined by the Government. In April 2004, the rates were 20% for logs, and 5% and 10% for hewn-squares, sleepers (ties), and other semi-processed timber. In 2002, wood export taxes accounted for some 0.1% of current Government revenue.
Swaziland (2009, 2003)	The only tax or fee collected on exports is the Sugar Levy, which is charged at a rate of 5.75% of the proceeds from the net ex-mill export protocol sales to the EU, and applies two years in arrears.
Tanzania (LDC) (2006)	Tanzania applies an export tax on raw cashed nut, and a cess of 20% on raw hides and skins, to encourage local processing of these goods.
Togo (LDC) (2006)	Exports of agricultural, livestock and fishery products are subject to a levy by a way of advance payment on income tax or flat-rate taxes payable in their stead.
Tunisia (2005)	Since Tunisia's last TPR in 1994, many export taxes have been abolished, in particular, those on olive oil, fruit and vegetables, hides and skins, and cork. Tunisia now has two export taxes: one cyclical tax on exported scrap iron (90 dinars per ton), levied when scrap iron prices rise in order to discourage exports; and a "customs services fee" on crude oil exports (HS 2710), calculated as 3% of their value.
Uganda (LDC) (2006)	Uganda maintains a cess of 1% on exports of coffee (collected by the Uganda Coffee Development Authority), 2% on cotton (collected by the Cotton Development Organisation), and 20% on raw hides and skins. While the taxes on cotton and coffee are in place to finance promotional activities, the tax on raw hides and skins was introduced to encourage local processing of these goods.
Zambia (LDC) (2009)	The 2008 Budget encouraged local value addition by introducing an export levy of 15% on the export of copper concentrates and cotton seed (subsequently raised in the 2009 Budget to 20% for cotton seed), in recognition of the availability of local capacity to process these products. An export tax exists on scrap metal, which is considered an important input for manufacturing.

Americas

Antigua and Barbuda (2007)	Export taxes are applied on lobsters (ECD 0.10/lb) and fish (ECD 0.05/lb).
Argentina (2007)	Following the peso devaluation in 2002, all Argentine exports were again made subject to export duties. Resolution No. 11/2002 of the former Ministry of the Economy and Infrastructure established export duties of 10% on a specific set of goods and of 5% on all other goods except fuels, in addition to duties existing at that time. Since 2002, successive resolutions have altered export tax rates, with increases on a significant number of products. As at mid-2006, the applicable duties were 5, 10, 15, 20, 25 and 45% on the f.o.b. value, depending on the goods in question. Export duties were introduced as price policy tools, to cushion the effect of exchange-rate fluctuations on domestic prices, particularly those of household necessities, and to counter the sharp fall in tax revenue. As a result, export duties have again become a major source of public revenue. Between 2002 and 2005, revenue collected from these duties averaged nearly 2.2% of GDP, the highest level recorded in the historical series that began in 1932. During that period, income from export duties represented 9.2% of exports and 9.9% of total public revenue. Official f.o.b. prices are set for several dutiable agricultural exports, and the declared f.o.b. value of a given sale is accepted only if it corresponds to the value previously established by the competent authority. This procedure aims to establish the basis on which rates are applied in settlement of export duties, refunds, drawback, contributions, charges, services and other items that are levied on, or benefit, exportation of goods listed in Law No. 21.453.
Barbados (2008)	Barbados applies no taxes, charges or levies on exports, other than a levy on cotton exports of BDSD 0.17 per pound. The proceeds of this levy go to the Barbados Cotton Growers Association.
Belize (2004)	Taxes on the export of logwood, mahogany, pine, cedar, coconut, and sugar are established by the Produce Export Duties Act and the Sugar Act. However, the authorities indicate that all export taxes have been repealed. Under the Meat and Livestock Act 1977, the Belize Livestock Producers Association can impose a cess on both exports and domestic sales of cattle. The cess on exports is specified in the legislation at BZD 10 per head plus 2% of sales value for cattle for slaughter; and 2% of sales value for cattle for breeding. The legislation does not specify the amount to be applied to domestic sales of cattle.
Bolivia (2005)	Pursuant to the General Customs Law, no customs duty is imposed on exports unless otherwise specified in the Law. Nevertheless, in the case of minerals, exports are subject to the *Impuesto Complementario a la Mineria* – ICM (complementary mining tax), whose rate is higher than that applicable to minerals sold on the domestic market.
Brazil (2009, 2004)	Brazilian legislation allows for the application of an export tax of 30%, which can be decreased or increased (to up to 150%) by the *Camara de Comercio Exterior* (CAMEX). The export tax applies, in principle, to all exports, but with the exception of a few products, the tax is zero-rated. Exports may be exempt from this tax according to their destination; coffee, sugar, alcohol, and related products are exempt. Export taxes are levied on three product categories down from seven product categories at the time of the previous review in 2004. In one case (leather and skins) levies are charged on all exports, while, in the other two cases (cigars and arms and ammunition), taxes are levied only on exports to certain markets, all of them in the western hemisphere. Minimum exports prices are not used, except as a base to calculate export taxes.
Canada (OECD) (2007, 2003)	Export duties are imposed on Canadian-manufactured tobacco products and as of 12 October 2006, on softwood lumber destined for the United States. Exports of Canadian-produced cigarettes, tobacco sticks, and other manufactured tobacco to all destinations are subject to a two-tiered tax, with different rates for exports up to a threshold of 1.5% of a manufacturer's annual production (CAD 0.075 per cigarette) and for exports above the threshold (CAD 0.178 per cigarette). The tax on exports up to the 1.5% threshold is refundable to the foreign importer and Canadian manufacturer upon proof of payment of taxes. The tax on exports over the 1.5% threshold is not refundable

	and approximates the total federal and provincial taxes otherwise applicable in the lowest-tax jurisdiction in Canada. The purpose of the export tax scheme is to reduce the incentive to smuggle Canadian-produced products back into Canada from export markets. On 12 September 2006, Canada and United States signed an agreement with respect to exports of Canadian softwood lumber. This followed a long-running trade dispute regarding U.S. anti-dumping and countervailing duties on imports of Canadian softwood lumber, which had been the subject of challenges. Canadian softwood lumber exporters will pay an export charge when the agreed reference price of lumber is at or below USD 355 per thousand board feet. Under the NAFTA and Canada's FTAs with Chile, Costa Rica and Israel, Canada has undertaken not to maintain any duty, tax or other charge on goods exported to the territory of the party(s) unless such levies are adopted or maintained on such goods for domestic consumption.
Chile (2009, 2003)	No export taxes.
Colombia (2006)	There are contributions of a parafiscal nature applied to exports of certain products, such as coffee, emeralds, precious stones and some fuels. The coffee contribution tax is levied on exported coffee and is equivalent to 5% of the price of the mild coffee exported. The emerald contribution amounts to 1%, in foreign currency, of the export price of the unset emeralds.
Costa Rica (2007)	Banana exports are subject to a tax irrespective of their destination. A tax of USD 1 per box or container of 40 lb net of bananas exported is imposed. Banana producers receive USD 0.011 per box exported from this tax. Since 1 January 2006, the Government imposed a minimum price for banana exports f.o.b. from Costa Rican ports amounting to USD 5.70 per 18.14 kg net box of top quality bananas. As far as coffee is concerned, in order to finance the operation, maintenance and administration of the ICAFE, Law No. 2762 determined a tax corresponding to 1.5% of the f.o.b. value of the coffee exported per 47kg unit of green coffee or its equivalent.
Dominica (2007)	There are export royalties of ECD 0.50/ton on sand and ECD 0.45/ton on stone.
Dominican Republic (2008)	In order to protect marine resources, Decree No. 11-01 of November 2001 introduced levies on the export of fish, molluscs and live crustaceans. The tax on fish is 0.03 Dominican pesos per kilogram (around USD 0.0009 per kilogram), while for molluscs and live crustaceans it is 5% *ad valorem*. Pursuant to the Mining Law of June 1971, exports of mineral substances in their natural form or in the form of metalliferous mineral concentrates is subject to a royalty or minimum tax of 5% of the f.o.b. selling price; this royalty can be credited against payment of income tax (ISR) for the same fiscal year.
Ecuador (2005)	Ecuador abolished export taxes through the Law on Facilitation of Exports and Waterborne Transport. However, the exports are subject to the "redeemable quota," and minimum prices apply to exports of certain products. The redeemable quota applied to exports amounts to 0.15 % of their f.o.b. value, except for petroleum and petroleum products, which are subject to a redeemable quota of 0.05 %. Exports of ungrounded coffee, roasted ungrounded coffee and roasted ground coffee are subject to a contribution amounting to 2 % of their f.o.b. value. The proceeds of the contributions go to the National Coffee Board. Exports of banana and plantains, cocoa, coffee, shrimp and fish products are subject to minimum reference prices. The value declared on the single export form may not be less than the minimum reference price set for each product.
El Salvador (2003)	No export taxes.
Guyana (2009, 2003)	Export taxes are applied to almost all exported products, apart from manufactured goods and exempted items. Unless otherwise specified, a general rate of 1.5% is applied. Since 2003 the only change to the items subject to export duties is the removal of shrimp. A wide range of articles are exempt from export duties: raw gold; agricultural products and their by-products (excluding cane sugar and molasses); forest products including timber and lumber; alumina; manganese; goods exported to CARICOM (Caribbean Community) states.

Grenada (2007)	No export taxes.
Guatemala (2009)	The only export taxes concern the coffee sector. Coffee growers must pay 1% of the f.o.b. export value of coffee, of which Q 0.10/100 kg go to the municipal authorities and the rest to Anacafe.
Haiti (LDC) (2004)	No export taxes. According to Article 167 of the Customs Code, goods for export are subject to payment of duties that appear in the tariff as exit duties. However, the liberalization process initiated in 1986 has led to the gradual and complete abolition of customs duties on exports.
Honduras (2003)	No export taxes.
Jamaica (2005)	No export taxes.
Mexico (OECD) (2008)	Export taxes applied to 19 tariff lines at the HS 8-digit level, including shells and claws of turtles, bone substances, human blood, skins of wildcats, etc. (Also Exports are subject to the DTA (*Derecho de Tramite Aduanero*) unless they are going to a country that is party to a free-trade agreement signed with Mexico. The general rate is MXN 202 (around USD 18) per transaction.)
Nicaragua (2006)	No export taxes.
Panama (2007)	There are no taxes on exports, except for exports of finished products made of native woods, which are subject to a 1% tax under Forest Law.
Paraguay (2005)	No export taxes were levied between 1997 and 2001. An export tax of 12% on fresh or salted bovine hides was introduced in 2002. Initially, the tax was applied on f.o.b. value of exports, but Decree No. 20.135/03 established a minimum unit value for customs purpose of USD 35 for exported hides, and the tax is applied on this value, irrespective of the place of destination. An export tax of 4% on soybeans, concerning the 2003/2004 harvest, and irrespective of the place of destination, was introduced in 2004. The dutiable value is set at US$80 per ton exported. The declared purpose of the taxes on hides and soybeans is to promote the local processing of those products. In both cases, the main reason cited for their application is the lack of raw materials for the domestic processing industry and the increase in exports of unprocessed products, taking into account, according to the Paraguayan authorities, the distortion created in subregional trade by the taxes on hide exports applied by Argentina and Uruguay.
Peru (2007)	No export taxes. The notional 0% tax levied on exports for statistical purpose was repealed in 2004.
St. Kitts and Nevis (2007)	Export taxes are applied on live animals, lobster and cotton. Revenue from this tax represents less than 2% of tax revenue.
St. Lucia (2007)	No export taxes.
St. Vincent and the Grenadines (2007)	No export taxes.
Trinidad and Tobago (2005)	No export taxes.
United States (OECD) (2008, 2006, 2004)	No export taxes.
Uruguay (2006)	Exports of bovine, sheep, pig, horse and poultry meats, irrespective of their form but with the exception of preserved meat, are subject to the FIS tax at a rate of 1% of the f.o.b. value of the exports. The FIS also applies to some sales on the domestic market. Exports of raw, salted, pickled and wet-blue hides pay a 5% tax. Exports of some other agricultural products are subject to payment of taxes or levies intended to finance bodies such as the Uruguayan Wool Secretariat (SUL), and the National Agricultural Research Institute (INIA).

Descriptions are drawn from TPR reports, but in some cases have been abbreviated or changed as appropriate to meet the analytical objective of this paper. For further details, see the TPR reports.

ANNEX 1.A2

Description of Other Export Restrictions in TPR Reports

Europe/Middle East	
Bahrain (2007)	Bahrain prohibits exports of some products including certain foodstuffs and fuels. Export restrictions apply to, *inter alia*, live horses, camels, and antiques.
Bulgaria (2003)	Since January 2000, Bulgaria has liberalized its export licensing procedures. Currently, export licences are required in a limited number of cases such as fulfilment of international treaties and conventions to which Bulgaria is a signatory; protecting public morals; maintaining public order and national security; and safeguarding national artistic, historical, and architectural masterpieces. Licences are issued by the competent government ministries depending on the product and are valid for up to three months from the date of issue. Automatic licensing (registration) is applied to precious metals and unsawn timber exports (except for fire-burnt timber). Before its accession to the WTO, Bulgaria imposed quantitative restrictions on certain exports in order to ensure adequate supplies in the domestic market and prevent or relieve critical shortages. For instance, autonomous quotas were applied to the exports of goats, wheat, and barley. Upon accession in 1996, Bulgaria abandoned all quantitative restrictions on exports of agricultural products.
European Union (25) (2009, 2007, 2004)	Export restrictions are allowed on grounds of public morality, the protection of health and life of humans, animals and plants, and national cultural treasures. The restrictions are under the competence of both the Commission and Member States. An export authorization or license is required for the export of cultural goods and certain products under the Common Agriculture Policy (CAP), and for the control of exports of dual-use items and technology according to provisions set out in Regulation 1334/2000 (last amended by Regulation 1183/2007). The export of software or technology by electronic media, fax or telephone is also subject to authorization under the dual-use regime. Export licences are required to export goods covered by the CAP from the EU.
Georgia (2009)	Georgia does not apply export quotas. Export licensing restrictions are applied only for reasons of healthcare, environmental protection, national heritage and security.
Iceland (OECD) (2006)	Export restrictions, prohibitions, and licensing apply in a number of cases including narcotics, and ozone-depleting substances.
Israel (2006)	Currently some 35 items, by broad category, require a licence for various reasons, such as the control of quality and standards of goods, compliance with international agreements (including those regarding dangerous drugs and protection of plants and animals), and conservation of local resources. Most of the goods covered by the control requirement are agricultural products or chemicals.
Jordan (2008)	Export prohibitions, restrictions, and licensing are regulated through Import and Export Law No. 21 of 2001, as amended by Temporary Law No. 18 of 2003. Automatic licensing applies to, *inter alia*, wheat and other wheat-based products (including macaroni and vermicelli) to ensure that the consumer subsidies granted on these products are reimbursed by exporters when the products are exported. Jordan is introducing non-automatic licensing to dual-use products (the goods covered by the dual-use export control system of the European Communities).

Liechtenstein (2008, 2004)	Lichtenstein continues to maintain export controls on certain products on grounds of safety, security, and environment, and to ensure compliance with international obligations under treaties and conventions to which they are signatories.
Norway (OECD) (2008, 2004)	Norway applies trade embargos on the basis of US Security Council Resolutions relating to Iran, North Korea, Sierra Leone, Sudan, etc. Since 2004, Norway has amended the Customs Act to prohibit the export or re-export of counterfeit goods. Seven categories including hazardous waste, minke whale products, cultural objects are subject to export prohibitions or licensing.
Oman (2008)	Oman prohibits exports of antiques, and ancient manuscripts. Export restrictions apply to date seedlings and to three species of fish (lobster, abalone, and shark) during the breeding and reproduction seasons when fishing is not allowed.
Qatar (2005)	Export prohibitions apply to alcoholic products. They also apply to, *inter alia*, species of fish and seafood products for food security reasons.
Romania (2005)	Exports are prohibited or controlled for various reasons, including environment, health, public morality, national security, or to give effect to Romania's obligations under international conventions.
Switzerland (OECD) (2008, 2004)	Switzerland continues to maintain export controls on certain products on grounds of safety, security, and environment, and to ensure compliance with international obligations under treaties and conventions to which they are signatories.
Turkey (OECD) (2007, 2003)	Turkey prohibits exports of 14 items (by broad category) for environment, health, cultural reasons, or to give effect to obligations under international conventions. Each firm producing oil products is subject to an export quota of 35% of production. An export license is required for 25 categories of products including endangered species of wild fauna and flora. The government has a power to make goods for export subject to quality control, and the Undersecretariat for Foreign Trade (UTF) is responsible for enforcing quality control of these commodities. Some 200 agricultural products (at the 12-digit HS level) are subject to compulsory export controls for quality purposes. The coverage includes citrus fruit, a variety of edible oils, and some hazelnuts.
United Arab Emirates (2006)	The UAE maintains export controls (through permits) on certain products for safety, security, and environmental reasons, and to ensure compliance with international obligations under treaties and conventions (*e.g.* the Basel Convention, CITES, the Convention on Chemical Weapons, the Treaty on Nuclear Non-Proliferation) to which it is a signatory.
Asia/Pacific	
Australia (OECD) (2007)	Exports of some goods are restricted, unless permission or a licence is granted. These include asbestos; biological agents; cetacearns (whales, dolphins, and porpoises); chemical compounds; some cultural and heritage goods; defence and strategic goods; diamonds (Kimberley process); drugs; endangered animal and plant species (subject to the CITES); firearms, parts, accessories, and ammunition; hazardous waste; human blood and other body fluids, organs and tissue; human embryos; ozone depleting substances. Discretionary export licensing restrictions are maintained for reasons related to SPS, the environment, and alignment with international agreements.
Bangladesh (LDC) (2006)	Goods subject to export prohibition are listed in the Export Policy 2003-2006; the number of goods on the list has been reduced from 19 to 16 since the previous review. According to the authorities, the bans on exports of agricultural commodities and manufactured goods are in place mainly for reasons of health, eco-balance, security, archaeological value, or maintenance of adequate domestic supply. There is no export licensing requirement *per se*, although an export certificate may be required from the relevant authorities for certain products.
Brunei Darussalam (2008)	Export prohibitions remain in place for prawn refuse and copra cake, and exports of timber, oil palm, rice, and sugar are still restricted. Export licenses are required for cigarettes, diesel, gasoline, kerosene, and salt.

China (2008, 2006)	In 2007, China maintained general export prohibitions on 40 items at the HS 8-digit level (up from 25 items in 2004). Prohibited items include mainly materials relating to State precious and rare animals and plants. The added lines are mineral products (HS Chapter 25) and some chemicals (HS Chapter 29). China maintains both global export quotas and destination-specific quotas regarding Hong Kong and Macao. When determining the size of quotas, the authorities consider, *inter alia*: national security, availability of domestic resources for downstream processing, development plans for certain domestic industries, and international and domestic demand. In 2007, 447 tariff lines at HS 8-digit level were subject to export quotas and licensing administration (316 in 2005, and 319 in 2004). Global export quotas applied to 146 lines at the HS 8-digit level in 2007 (down from 179 lines in 2004). From 1 January 2008, global export quotas are also applied to flours of some grain products. China's non-automatic export licensing requirements are implemented mainly to fulfil its obligations under international agreements, such as: Articles XX and XXI of GATT 1994; the Montreal Protocol on Substances that Deplete the Ozone Layer. Export licenses have also been used to reduce exports of certain products: some steel products (83 tariff lines at the HS 8-digit level) have been subject to licensing requirements since 20 May 2007. Automatic export licenses, which apply largely for statistical purposes, were required for 284 lines (at the US 8-digit level) in 2007 (40 in 2004).
Chinese Taipei (2006)	Export prohibitions cover some 48 tariff lines (HS 10-digit level), mainly products that are banned under international conventions, such as toxic chemicals, arms and ammunition, and narcotics. In addition, exports of trout and salmon products, plants used for pharmaceutical purposes and antiques are prohibited. Exports of certain fish, including trout and salmon, are prohibited for reasons of fishery conservation. Another 41 items are currently subject to export licensing (7 February 2006).
Fiji (2009)	Prohibited exports are dangerous drugs (i.e. narcotics) as well as all live fish, and turtle flesh and shells not meeting certain size limits. Exports of round logs are banned for environmental reasons and to promote downstream processing, which provides an implicit subsidy to processors at the expense of forest owners, by lowering the domestic price. Exports of a wide range of agricultural products require an export licence from the relevant authority, e.g. live cattle, manufactured sugar in consignments exceeding 5 kg, wheat brain, copra, oil cake and copra meal, various wood and wood products, and coffee.
Hong Kong, China (2006, 2003)	Exports of ozone-depleting substances to non-parties to the Montreal Protocol are banned. Hong Kong also complies with trade sanctions imposed by the UN Security Council.
India (2007)	Export prohibitions are in place for environmental, food security, marketing, pricing, and domestic supply reasons, and to comply with international treaties. In addition to these export prohibitions, India also issues *ad hoc* prohibitions on exports of sensitive products; for example, export prohibitions have recently been issued for wheat, pulses, and sugar. Also, 171 lines at the HS 8-digit level (excluding special chemicals, organisms, materials, equipment, and technologies) are currently subject to restrictions; products may only be exported if a licence is issued by the Directorate General of Foreign Trade (DGFT), on the approval of its Export Facilitation Committee.
Indonesia (2007, 2003)	During 2003-06, export licensing, prohibitions, and restrictions were maintained to ensure protection of natural resources and endangered species (e.g. in accordance with CITES); promote higher-value-added downstream industries; upgrade the quality of export products; and provide an adequate supply of essential products. Before 2005, Indonesia exercised export control by dividing exports into two types, "supervised" exports and "regulated" exports. Export approval requirements had to be met for "supervised" products, including certain live bovine animals, live fish, palm nuts/kernels, lead and bauxite ores/concentrate, petroleum oils/products, urea fertilizer, crocodile leather, unprotected wild animals and plants, unprocessed silver/gold, and waste/scrap of metals. Indonesia also conducted licensing and quota administration over regulated exports, including: coffee, textiles and clothing, rubber, veneer and plywood or similar laminated wood, teakwood, and mixed rattan and semi-prepared rattan. New export-import regulations issued in 2005 lifted restrictions on the export of tapioca, semi-processed rattan and silver.

Japan (OECD) (2009, 2007, 2005)	Export controls (prior approval) are maintained to ensure national security and public safety and to ensure adequate domestic supplies of certain agricultural and other primary products. For certain agricultural products, including wheat bran, rice bran, oat bran, clams, mussels and eels, the Minister of Economy, Trade and Industry needs the consent of the Minister of Agriculture, Forestry and Fisheries prior to granting export approval.
Korea (OECD) (2008, 2004)	Export prohibitions, affecting 11 six-digit HS items, are maintained to protect animal rights, endangered species, and preserve natural resources. Exports of sand and gravel-related items have to be approved by the Korean Aggregate Association to protect natural resources.
Kyrgyz Republic (2006)	Export licences, administered by the Ministry of Industry, Trade and Tourism, apply to a range of products for reasons of human safety and public health, environmental protection (including under international conventions), national security, and preservation of art, historical and archaeological treasures, and exhaustible natural resources. Goods include weapons; explosives; nuclear materials and technology for military use; virulent poisons; narcotics (including used in pharmaceuticals) and psychotropic substances; art works and antiquities with historical, cultural or scientific value; ferrous, precious, and rare-earth metals and their fragments; and rare raw materials of vegetable or animal origin having pharmacological applications. According to the authorities, except for non-ferrous metal fragments and waste, licensing is not intended to restrict exports but to control exports of stolen materials.
Macao, China (2007)	No products are subject to export restrictions and controls except CITES species, ozone depleting substances, toxic chemicals and precursory substances, etc.
Maldives (LDC) (2009, 2003)	Exports of live fish are subject to licensing, and trade in timber is controlled. Exports of certain marine species are prohibited for environmental reasons.
Malaysia (2006)	The Customs (Prohibition of Exports) Order 1998, under the Customs Act 1967, sets out export control requirements in three schedules. The first schedule consists of items that are absolutely prohibited from being exported, for example arms and related materials of all types, including weapons and ammunition, military vehicles and equipment, police equipment, and spare parts. Exports of turtle eggs are prohibited as are exports of rattan from peninsular Malaysia. The second schedule comprises goods subject to export licensing. Licences are required for all exports to Israel, and for 43 product groups. The third schedule consists of items that can be exported only after meeting certain criteria for the protection of wildlife, health, security, and antiquities. In 2001, 36% of Malaysia's tariff lines were subject to export licensing requirements; this level does not appear to have changed, although current data were not provided. The list of products subject to export licensing requirement also appears to be identical to that of 2001.
Mongolia (2005)	Exports of drugs and narcotics (and raw materials and equipment that can produce them) and certain dangerous and poisonous chemicals are prohibited; exports of raw hides, skins, and cashmere are prohibited with a view to protecting domestic processors. There are no licensing requirements for exporters in Mongolia, except on some items including guns, explosives and certain drugs.
New Zealand (OECD) (2009, 2003)	Export restrictions are maintained mainly for health and safety reasons, but also in the case of some agricultural products, including meat and dairy products, in order to manage trade partners' import requirements, and in the case of some horticulture products and kiwifruit, for marketing reasons.
Pakistan (2008)	Export prohibitions focus on health, social, religious, or environmental protection under international treaties e.g. CITES. They also cover exports of wood and timber generally. Wheat flour exports were also banned in 2007 due to domestic supply shortages. Precious and semi-precious stones and gold jewellery are subject to special procedures.
Philippines (2005)	Exports are prohibited or regulated on grounds of national interest, security, and public health, and to fulfil the requirements of international agreements and conventions (e.g. the CITES). The authorities indicate that exports of logs from native forests are also banned for environmental reasons. Regulated exports require prior export clearance from the relevant government agencies. Exports of rice and corn remain restricted. In order to ensure food security and price stability, these commodities may be exported only if there is a surplus, according to the authorities. Fish exports are also regulated on grounds of domestic food security.

Singapore (2008, 2004)	Security, health, and environmental concerns underlie Singapore's export restrictions and mainly involve endangered species under the CITES Convention, arms, explosives and explosive precursors, chemicals, and radioactive materials. Licensing controls are also maintained on rice, excluding rice bran, under which all rice traders must be licensed.
Solomon Islands (LDC) (2009)	Timber exports require "specific authority" from the Central Bank. The purpose of this measure is "to ensure that log exporters obtain open market prices for their log exports and remit the full proceeds to Solomon Islands". A licence is required to export other products subject to export taxes, war relics, live fish, and wildlife specimens.
Sri Lanka (2004)	Export prohibitions and licensing remain in place to protect the national heritage, public health, and the environment (including endangered species). Exports of tea are subject to quality check prior to exportation. Exporters of gems must obtain a Gem Dealers Licence (renewable on a yearly basis) from the National Gem and Jewellery Authority.
Thailand (2007, 2003)	Changes in Thailand's export licensing and prohibitions since 2003 include the elimination of prohibitive export licensing requirements on jute and kenaf seed, live bovine animals, 277 kinds of wild animal, fuel oil and products thereof, and fertilizer. Since May 2003, Thailand has issued export certificates for rough diamond under the Kimberly Process Scheme before export. The Export-Import Control Law regulates the export of items that are in short supply domestically or that might unduly affect prices. The quota system is ostensibly applied to help improve the livelihood of farmers and food security in the country. For example, a portion of sugar production is reserved for domestic consumption; the remainder may be exported to the world market.
Africa	
Angola (LDC) (2006)	Exports of some products including poisonous or toxic substances or drugs, animals, and gold and silver are restricted.
Benin (LDC) (2004)	With a view to preserving natural resources and in the wake of a shortage on the domestic market, since 1997 exports of teak in the rough and charcoal have been prohibited. On the other hand, exports of sawn teak in the form of boards, parquet flooring and planks are authorized. Exports of seed cotton are prohibited. The export of precious metals requires approval from the Ministry of Finance, except in the case of items containing a small quantity of metal, items weighing less than 500 grams or up to 10 gold coins.
Botswana (2009, 2003)	Export licences are required for all exports, including to Southern Africa Customs Union (SACU) members, for food security, sanitary and phytosanitary, and statistical reasons, and under international conventions to which Botswana is a signatory.
Burkina Faso (LDC) (2004)	Works of art are the only export subject to an authorization and a permit from the Ministry of Culture.
Burundi (LDC) (2003)	Coffee berry exports are banned. Exports of sugar are subject to a quota which varies depending on local demand. The sugar quota is managed through the SOSUMO company (*Société sucrière du Moso*), which has a production monopoly. The State determines the quantity of sugar to be sold to distributors in each region according to their estimates of demand and the market price for sugar. As a party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Burundi prohibits ivory exports.
Cameroon (2007)	In principle, quantitative restrictions (including prohibitions) and controls in force on exports derive for the most part from treaties to which Cameroon is a party (Basel Convention on the Control of Transborder Movements of Hazardous Waste, CITES, or Chemical Weapons Convention *inter alia*). Restrictions are, however, maintained on exports of logs for economic reasons. Following the adoption of Ordinance No. 99/001 in 1999, Cameroon has set about gradually prohibiting exports of logs in order to promote the processing industry. From 1999 until the prohibiting of log exports in 2004, a certificate of registration had to be obtained to export timber, which was intended to ensure that 70% of production was processed locally and only 30 % of the annual harvest exported as logs. However, the Ordinance also provides for log exports to continue, subject to surtax, with the aim of promoting certain species. The export of two species

	(Sapelli and Ayous) is subject to quantitative restrictions with exporters being given quotas proportionate to the efforts invested in processing or exporting the species being promoted which may be exported as logs. However, according to the authorities, the loss brought about by prohibiting exports of most logs has not been offset by an increase of processed timber.
Central African Republic (LDC) (2007)	The Central African Republic has eliminated all quantitative export restrictions. It has participated in the Kimberley Process for trade in rough diamonds since April 2003.
Chad (LDC) (2007)	In general, the only quantitative restrictions and controls in force on exports should be those derived from the treaties to which Chad is party (Basle Convention, CITES, Chemical Weapons Convention, Treaty for the Non-Proliferation of Nuclear Weapons). In practice, there are few restrictions or controls.
Congo (LDC) (2006)	An export declaration must be filed for all goods being exported or re-exported. Under the Forestry Code, only processed wood in the finished or semi-finished state may be exported, but in practice each forestry enterprise is required to limit rough timber exports to 15% of its total production volume. This threshold is often exceeded, triggering payment of the 15% surcharge. Under the Mining Code, every shipment of precious minerals requires an export authorization issued by the central mining authority.
Djibouti (LDC) (2006)	The export of sawn timber and coral is prohibited. According to the authorities, apart from the restrictions imposed under the international agreements signed by Djibouti, there are no other export restrictions. Djibouti does not currently require export licences.
Egypt (2005)	Pursuant to Article 7 of Law 118/1975, the export of certain commodities can be prohibited or restricted through Ministerial decree. The authorities indicate, however, that Egypt does not maintain any export quotas, licences, or prohibitions.
Gambia (LDC) (2004)	Export prohibition, controls, and limitations are decided by the President. The current list is identical to the list of prohibited or restricted imports; that list includes counterfeit or non-standard coins or currency notes, firearms that are not properly licensed, narcotic drugs, rough or uncut diamonds, certain types of noxious gases.
Ghana (2008)	Exports of unprocessed logs, raw rattan cane and bamboo are prohibited. Export permits or certificates are required for a number of products, including mineral ore, and chemicals.
Guinea (LDC) (2005)	The exports of raw diamonds are subject to the Kimberley process certification scheme. One important focus of Guinea's action is improving the quality of local products and products for export (in particular, agricultural, livestock and fisheries products) through the adoption of international quality and health safety standards.
Kenya (2006)	Export prohibitions apply to round-wood and, if sent by post, to firearms and ammunition of all types, and to other articles having the appearances of lethal weapons. A licence is required for exports of most agricultural products, food, minerals, and mineral products. Exports of certain agricultural and food products are subject to special licences for self-sufficiency purposes.
Lesotho (LDC) (2009, 2003)	Some livestock and livestock products are subject to export controls. Only licensed diamond dealers or producers, or their accredited agents, may export diamonds.
Madagascar (LDC) (2008)	Madagascar has prohibited exports of certain species of wood in rough or semi-finished form since July 2007, but authorizes exports in finished form.
Mali (LDC) (2004)	Export prohibitions are either absolute or restrictive. The absolute prohibition regime applies to exports of young bovine breeding animals, whereas the restrictive regime affects the following: (i) exports of meat and live animals (which require a health or animal health certificate issued by the Ministry of Livestock); (ii) hunting trophies (submission of a permit or certificate in conformity with the CITES issued by the competent technical services); (iii) plants (submission of a phytosanitary certificate issued by the competent technical services); and (iv) works of art (authorization from the Ministry responsible for art and culture).

Mauritius (2008)	Export bans are maintained under international convention to which Mauritius is a signatory. Export permits are required for products considered “strategic” or “sensitive” to the economy, and such products include sugar, sand, and limestone.
Morocco (2009, 2003)	Since 2003, a number of changes have been made to the list of products subject to quantitative restrictions (and thus to export licensing). Consequently, in addition to cereal flour (except rice flour), charcoal, collections and specimens for various collections (zoological, botanical, mineralogical, and archaeological); and antiques over 100 years old, since May 2003 the list has included substances and equipment using ozone-depleting substances, and since August 2008, wheat and meslin, rye, barley, oats, maize, rice, grain sorghum, other cereals, groats and semolina of common flour and barley. Tanned hides and skins or crust leather of bovine animals, sheep and goats were removed from the list in December 2006.
Mozambique (LDC) (2009)	Special export regulations apply to certain products including plant and vegetable matter; animals and products thereof; products subject to export taxes, such as cashews; precious metals, gemstones, and mineral products; gold and silver, which may only be exported by the Bank of Mozambique. Since 2002, a prohibition applies to exports of unprocessed wood, reserved to local processors, but not to exports of unprocessed precious tropical wood species, such as ebony and rosewood.
Namibia (2009, 2003)	Exports, except to SACU members, are subject to automatic licensing, except for some products that require a non-automatic permit. These include medicines; live animals and genetic materials; all ostrich breeding materials; meat and game products; protected species under CITES; plants; firearms and explosives; and minerals, including diamonds and gold. Export permits from the Meat Board of Namibia are required for exports of livestock. Export permits for maize, wheat and mahangu are required from the Namibian Agronomic Board.
Niger (LDC) (2009, 2003)	Since 1998, Niger has imposed an export ban on seed cotton in order to guarantee the development of the cotton subsector. As part of the measures taken to offset the 2005 food crisis, the re-export of milled rice has been banned since 2005.
Nigeria (2005)	Under Nigeria's Export Prohibition Act, certain exports are prohibited for purposes of domestic food security, value-added considerations, and preservation of cultural heritage. Currently, the ban covers raw hides and skins, timber (rough or sawn), scrap metals, unprocessed rubber latex and rubber lumps, rice, yams, maize, beans, and artefacts and antiquities. Nigeria's food safety regulations require export licences for unprocessed food products; in certain cases, the Minister for Agriculture is empowered to prescribe grades and standards of quality for these products.
Rwanda (LDC) (2004)	According to the authorities, other than restrictions under international agreements of which Rwanda is a signatory, there are no restrictions on exports.
Senegal (LDC) (2009, 2003)	Senegal does not currently apply any prohibition or quantitative restriction on exports. The export of the following goods requires an authorization: gold, hides and skins, and petroleum products. Senegal also imposes prohibitions and licensing under the multilateral environmental agreements it has signed such as the CITES.
Sierra Leone (2005)	Export restrictions are maintained for health, safety, and environmental reasons. A special permit issued by the Ministry of Agriculture and Natural Resources is required for the exportation of plants and charcoal. Gold and diamonds, as well as any other goods or materials as may be prescribed by law, are subject to export licensing requirements.
South Africa (2009, 2003)	A number of products are still subject to export control, including export permits (licences) and prohibition. Controls are maintained on grounds of safety, security, and the environment, and to ensure compliance with international obligations under treaties and conventions to which South Africa is a signatory (for example, the Montreal Protocol). Exports of meat require a health certificate and the payment of fees, depending upon the province, prior to export. Exports of any alcoholic product with an alcohol content of more than 1%, except for beer, sorghum beer, and medicines, require an export certificate.

Suriname (2004)	The Negative List Decision adopted under the Law on the Movement of Goods lists the products that are currently subject to export restrictions, which can take the form of prohibitions or non-automatic licensing requirements.
Swaziland (2009, 2003)	Export restrictions apply to products controlled under the various conventions on threatened species, etc. to which Swaziland belongs. Export prohibitions may also be imposed in case of food shortages resulting from drought or other natural disasters.
Tanzania (LDC) (2006)	Since June 1998, export restrictions in the agriculture sector have been in place for white maize, rice, cereals, beans, and unprocessed fish products; these are due to the precarious food supply situation brought about by the ongoing drought conditions.
Togo (LDC) (2006)	Commodity exports (coffee, cocoa, cotton fibre) have been free of all licensing requirements since 1996. Coffee, cocoa and seed cotton are subject to quality, packaging and marking standards. The exportation of rough diamonds from Togo is subject to the Kimberley Process certification system.
Tunisia (2005)	There are several product groups that can only be exported with the prior authorization of the Ministry of Trade, valid for six months. The main purpose of authorization is to prevent shortages and ensure the availability of inputs for domestic industry.
Uganda (LDC) (2006)	Exports of items that appear on Uganda's negative list are not allowed, and certain exports require authorization from regulatory bodies. The negative list of exports includes timber, charcoal, and whole fresh fish. For items covered by international conventions to which Uganda is a signatory, such as some wild animals and their trophies, prior authorization must be obtained from the Uganda Wildlife Authority; this is granted only if the exporter can satisfy the authorities that the export is sustainable without endangering the species.
Zambia (LDC) (2009)	Export prohibitions apply to certain types of logs under international agreements, and occasionally for grains (during drought years). There are no general export licensing requirements (except for prescribed goods) although certain goods, such as fertilizers and gemstones require special export permits.
Americas	
Antigua and Barbuda (2007)	Exports of wild birds are prohibited, as well as exports of any live or dead wildlife or parts, in accordance with the CITES.
Argentina (2007)	Since the previous trade policy review, export prohibitions have been reintroduced for commercial reasons. In July 2005, it was decided to suspend exports of tailings of copper and aluminium and their alloys for 90 days. The export ban was extended in March 2006 for a period of 180 days. MEP Resolution No. 114 of 8 March 2006 suspended exports of bovine livestock on the hoof and of certain cuts and preparations and preserves of bovine meat for a period of 180 days, except for foreign sales of "Hilton beef" subject to tariff quotas and sales covered by bilateral agreements. The MEP justified the measure as necessary to maintain the stability of beef prices in the face of price increases caused partly by external demand. This was prompted by the National Government's priority of maintaining supply to the domestic market at reasonable prices. In May 2006, the export ban was replaced by a quantitative restriction under MEP Resolution No. 397/2006. Specifically, an export quota was set for the period between 1 June and 30 November 2006, equivalent to 40 % of the volume recorded in the same period in 2005, with a requirement not to exceed 50 % of this total in each quarter. The established quota is shared among exporters in proportion to the physical volume exported in the reference period. In addition to the rules officially restricting exports, the Government has concluded agreements whereby exporters of certain goods agree to voluntarily restrain their foreign sales, so as to control price trends for these goods in the domestic market.
Barbados (2008)	At the end of 2007, an export license was required for: black coral, live sheep and goats; tortoiseshell; and radioactive chemical elements. These licenses are not automatic and apply irrespective of destination.

Belize (2004)	Under the Supplies Control Act, 1963 (Cap. 293, 2000) and the Supplies Control (Import/Export) Regulations, exports of certain products require a licence, regardless of their destination. Licences for beans and sugar are automatic; for all other products – live animals, fish, crustaceans and molluscs, logs and lumber and citrus fruit – the Supply Control Unit must generally consult with the government body or association responsible for the product before granting the licence. No export licences are granted for rosewood or medicate log and lumber, and all other unfinished articles manufactured therefrom. According to the authorities, in 2003, the Supplies Control Unit granted five export licences for live animals, 77 for fish, crustaceans and molluscs, 113 for logs and lumber, 16 for beans, and 67 for sugar; no export licences were issued for citrus.
Bolivia (2005)	In general, export of products affecting public health, State security, conservation of fauna and flora and the cultural, historical and archaeological heritage is banned. Other exports may also be prohibited by law. Pursuant to the 1996 Forestry Law (Law No. 1.700 of 12 July 1996), the export of unprocessed forestry products is subject to restrictions and is strictly regulated.
Brazil (2009, 2004)	Exports of some organic chemicals included in HS Chapter 29 are prohibited to non-signatories of the Montreal Protocol. Brazil also restricts exports to comply with United Nations resolutions: exports of weapons and military equipment to Iraq, Liberia, Sierra Leone, and Somalia are forbidden. Exports of certain wood (pine, imbuia, and virola) are subject to specific rules and require prior authorization from the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA). Exports of a relatively large number of products are subject to prior authorization from different agencies, generally for safety, health, security or environmental reasons, or when they are subject to export quotas. The list included some 663 tariff headings at the HS eight-digit level in April 2008, representing some 6.8% of all tariff headings.
Canada (OECD) (2007, 2003)	Most Canadian export controls are in place under the Export and Import Permits Act, administered by the Export and Import Control Bureau. Section 3 of the Export and Import Permits Act, the Export Control List (ECL), contains articles controlled for any of the following purposes: to ensure that any action taken to promote and encourage the further processing in Canada of a natural resource that is produced in Canada is not rendered ineffective by reason of the unrestricted exportation of that natural resource; to limit or keep under surveillance the export of any raw or processed good that is produced in Canada in circumstances of surplus supply and depressed prices and that is not an agricultural product; to implement an intergovernmental arrangement or commitment; to ensure that there is an adequate supply and distribution of the article in Canada for defence or other needs; or to control the export of arms, ammunition, implements or munitions of war or articles of a strategic nature or value the use of which might be detrimental to the security of Canada. The vast majority of controlled exports are controlled pursuant to international agreements that Canada has signed.
Chile (2009, 2003)	Chile does not have an export licensing regime. No Chilean exports are subject to export quotas, which are prohibited by Law No. 18.840. Export prohibitions or controls apply to goods whose trade is regulated by the Convention on International Trade in Endangered Species (CITES). Chile also prohibits exports of goods such as: (i) anthropological, archaeological, ethnic, historic, and paleontological objects and their parts; (ii) Chilean pine (botanical name *araucaria araucana*) and larch; and (iii) psychotropic substances and other chemicals.
Colombia (2006)	Colombia has commitments to apply restrictions on the exportation of certain products under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Montreal Protocol on Substances that Deplete the Ozone Layer. Exports of goods that form part of Colombia's cultural, artistic, archaeological and historical heritage are also restricted. Coffee exports are prohibited if they do not comply with the quality standards established by the National Coffee Growers' Committee.

Costa Rica (2007)	Export prohibitions are mainly imposed for reasons of national security, protection of Costa Rica's heritage and for environmental reasons. Article 26 of Forestry Law No. 7575 of 13 February 1996 bans the export of logs and roughly squared wood from forests of specific species. The objective of the Forestry Law is, inter alia, to ensure the conservation of natural forests, the industrialization of forestry resources intended for this purpose and the creation of employment. The authorities have pointed out that Article 26 of Forestry Law No. 7575 is part of the policy for the recovery and sustainable use of forests, an area in which Costa Rica has made substantial progress over the past two decades.
Dominica (2007)	Exports of any wildlife or parts thereof are forbidden. This export prohibition is for the protection and conservation of wildlife.
Dominican Republic (2008)	The export of some products can be prohibited for environmental, public health or food safety reasons. Although exporters' licences have been abolished, some products are subject to special export licences or certificates. In order to protect public health and the environment, the Dominican Republic prohibits the export of some products, including human blood and blood products, amber in its natural state, certain types of wood, and sand, gravel and soil suitable for cultivation. In accordance with its CITES commitments, the Dominican Republic bans the export of tortoiseshell in its natural raw state.
Ecuador (2005)	Ecuador has undertaken to apply export restrictions to certain products pursuant to the Convention on International Trade in Endangered Species of Wild Flora and Fauna and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, and the Montreal Protocol on Substances that Deplete the Ozone Layer. The exportation of roundwood is prohibited except in limited quantities for scientific and experimental purposes. The exportation of semi-finished forest products is authorized only when "domestic needs and the minimum levels of industrialization have been met."
El Salvador (2003)	In general, export prohibitions are applied in order to protect the environment or the cultural heritage or for economic reasons. At the end of 2002, the only prohibited exports were exports of plants and animals in danger of extinction, in accordance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and exports of gas for domestic consumption whose price is controlled on the internal market.
Guyana (2009, 2003)	A number of items are subject to export licensing including: poultry feed; rice bran; rice chips, rice dust, rice stock feed; wheat bran, wheat middlings, and wheat screenings; cane sugar in solid form; fertilizers; hides and skins; feathers, bird skins with feathers, prepared feathers, ornamental feathers, and other feather articles; gold; jewellery of precious metal or rolled precious metal; scrap metal; articles made out of base metals; and arms and ammunition. Under the Guyana Timber Export Act of 1973 (Cap. 67:03), written approval of the Guyana Timber Export Commission must be obtained in order to export timber. State-owned companies are involved in the export of sugar and gold.
Grenada (2007)	Grenada prohibits exports of prepared opium, Indian hemp; and unfermented cocoa. The export of a number of products is subject to licensing requirements. Exports of gas cylinders, coral, all mineral products (HS chapter 25), live sheep, and live goats are subject to approval and receipt of an export license.
Guatemala (2009)	Export restrictions are mainly imposed for reasons of national security, protection of Guatemala's heritage or for environmental reasons. Under the Forestry Law of 2 December 1996 (Decree No. 101-96), exports of logs of more than 11 cm in diameter is banned, unless they come from plantations or nurseries registered with the INAB, in which case they require an export licence. The ban does not apply to furniture and processed products made from wood.
Haiti (LDC) (2004)	Controls are carried out in order to prevent tax fraud, particularly in the case of re-export. These are carried out when an export permit is issued. As a general rule, the export of animal and plant products requires prior authorization. Some types of live animals belonging to endangered species (green anoles, mabuyas, snails) may not be exported so as to protect the national heritage. The shipment of mangoes without proper fumigation treatment is also banned. Quality controls and phytosanitary and animal health measures also apply to exports of coffee, cacao, mangoes and animal products.

Honduras (2003)	Decree No. 323-98 of 18 December 1998 prohibits the export of wood from certain forests that has not been incorporated into finished products, furniture or manufactured furniture parts. It also bans the export of all forestry products from certain forests without due approval from the State Forest Administration. As a contracting party to the International Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Honduras has undertaken to prohibit exports of certain plants and animals threatened with extinction, in accordance with the Convention.
Jamaica (2005)	Goods generally prohibited for export are listed in the Customs Act; the list is made up of arms, ammunition, and naval stores; and spirits and wines. In addition, some exports such as shells and some live animals are prohibited under international conventions. A number of products are subject to export licensing. Export licences are required for environmental concerns, such as the protection of crocodiles, shells and some live animals.
Mexico (OECD) (2008)	The export of some goods is prohibited, including certain products of animal origin, plants, narcotics and archaeological goods. This prohibition is based on the commitments in international agreements signed by Mexico, the control of dangerous substances, sanitary, phytosanitary and health reasons, and protection of the cultural and historical heritage. A prior export licence issued by the Ministry of Economy (SE) is required for the export of 16 tariff headings; the grounds for these licenses are the Mexican State's exclusive right to exploit and market non-renewable natural resources. Since the previous review, the number of HS headings subject to a prior licence has almost been halved from 28 headings.
Nicaragua (2006)	Nicaragua still bans export of the following: caoba roundwood (only the export of caoba in the form of sawn wood, plywood or veneered wood is allowed), spiny lobsters during their reproductive phase or spawning (with eggs), with shells (with sperm receptacle) or moulting, and estuary shrimps in the larval or juvenile phase. Nicaragua imposes export licensing requirements to ensure compliance with quality and health controls or to meet international commitments on international trade in wildlife under the CITES (CITES export certificate). Exports of sawn wood also require a licence in the form of an authorization.
Panama (2007)	As a contracting party to the CITES, Panama prohibits exports of certain plants and animals in danger of extinction in accordance with that Convention. Wood exports are governed by Executive Decree No. 57 of 5 June 2002, which prohibits the exportation of wood in the form of logs, stumps, roundwood or blocks, sawn or roughly dressed, of any species from natural forests, as well as wood submerged in water. The authorities have noted that the purpose of the measure is to guarantee the domestic supply of wood, in order to encourage the manufacture of furniture at national level.
Paraguay (2005)	Law No. 96/92 prohibits the hunting, commercial exploitation and export of wild animals in order to guarantee the adequate protection, conservation and rational use of Paraguay's biodiversity; this prohibition applies only to wildlife species not covered by express authorization of the Environmental Secretariat. The authorities noted that Paraguay does not apply temporary measures on exports of agricultural products for reasons relating to domestic supply, except in the case of hides. The Ministry of Industry and Trade established a prior licensing requirement in 2003 for exports of waste and scrap of aluminium or copper and copper/tin based alloys (bronze).
Peru (2007)	The exportation of wood in log form and other forest products in their "natural state" is prohibited, except where obtained from nurseries or forestry plantations and "not requiring processing for their final consumption." A further export prohibition applies to seeds, specimens and products of maca in the natural state or having undergone primary processing. The purpose of this measure is to promote maca exports with higher value-added.
St. Kitts and Nevis (2007)	Export licences are required for vegetables, monkeys, and several types of seafood. Export restrictions are generally for safety and health purposes.
St. Lucia (2007)	Restricted exports products include ginger and dry coconut, narcotics and drugs. Export-licensing requirements apply for any goods covered by CITES.

St. Vincent and the Grenadines (2007)	Exports of birds under HS 0106.99 are restricted and, in general, CITES rules are followed. Under Import and Export (Control) Regulations No. 10 of 1992, a licence is required for exports of: live swine; live sheep and goats; and live, frozen, fresh or chilled, and prepared or preserved lobsters. In 2002, restrictions were lifted on exports of dried coconuts, potatoes, oranges, and plantains. A phytosanitary certificate from the Ministry of Agriculture must be obtained for the export of local produce or plants and plant materials.
Trinidad and Tobago (2005)	A number of products require export licences from the Ministry of Trade and Industry. The products covered include non-ferrous metal scrap and ores, planting material, including tissue culture and other plant propagation material of (CITES) listed species.
United States (OECD) (2008, 2006, 2004)	The United States maintains export restrictions and controls for national security or foreign policy purpose, or to address shortages of scarce materials. Export controls can be based on US domestic legislation, policy decisions, UN resolutions or on US participation in four non-binding export control regimes: the Wassenaar Arrangement, which deals with controls of conventional arms and dual-use exports, the Missile Technology Control Regime (MTCR), the Nuclear Suppliers Group (NSG), and the Australia Group (AG, chemical and biological non-proliferation).
Uruguay (2006)	Some exports are prohibited or subject to special requirements for reasons such as environmental protection, to meet "the country's needs," for sanitary reasons, or to protect consumers. Decree No. 359/000 of 30 November 2000 imposed an initial temporary 180-day ban on the export of steel and cast iron scrap. Subsequently, Decree No. 209/02 of 12 June 2002 definitively banned the export of these products.

Descriptions are drawn from TPR reports, but in some cases have been abbreviated or changed as appropriate to meet the analytical objective of this paper. For further details, see the TPR reports.

Chapter 2

The Economics of Export Taxes in the Context of Food Security

Antoine Bouët and David Laborde Debucquet[1]

Rising global food prices during 2006-08 contributed to high food price inflation in many countries with the consequent distributional impact of rising food prices that created serious concern in several countries. In response, several governments applied export taxes to limit exports and thereby increase domestic supplies at low prices. This chapter provides a theoretical and empirical background to better understand the use of export taxes when these are applied towards maintaining food security. The analysis emphasizes the negative impact of such measures on the welfare of trade partners and the effects of non-cooperative trade policies.

The nature of the world trading system is deeply mercantilist. As a consequence, policy decisions usually seek to increase exports and/or decrease imports, and governments implement import tariffs and export subsidies. Nevertheless, export restrictions have also become a common practice. For example, during the recent food price hike (2006-2008), some developing countries (Bangladesh, Brazil, Cambodia, China, Egypt, India, Madagascar, Nepal, Thailand, Vietnam on rice; Argentina, India, Kazakhstan, Nepal, and Pakistan) implemented export taxes and quantitative restrictions on wheat (Annex). On 9 August 2010, Russia banned exports of grains and asked its regional custom union partners, Kazakhstan and Belarus to adopt similar policy decisions.

Regarding export taxes specifically, during 2007-2008, Argentina increased export taxes on soybeans (from 23.5% to 35%), wheat (from 20% to 28%), and maize (from 20% to 25%). In 2008, China introduced export taxes: 5% on maize, rice, soybeans; 20% on wheat, rye, barley and oats. India introduced export tax of INR 8 000 per tonne (approximately USD 200) on Basmati rice. In Indonesia, export tax on crude palm oil was raised from 1.5% in 2006 to 6.5% in June 2007, and to 20% in April 2008. Russia introduced 10% tax on wheat and meslin which were exported to countries outside the Customs Union Agreement (CUA) in 2007 and raised the rate to 40% in 2008. In July 2008, Vietnam also established an export tax on rice that increased proportionally with export prices, starting when prices exceed USD 600 per tonne. (OECD, 2010)

Prior to the recent crisis, export restrictions had been used by many countries to achieve diverse policy objectives. Piermartini (2004) noted that approximately one-third of WTO Members imposed export taxes, giving as examples the export taxes implemented by Indonesia on palm oil, by Madagascar on vanilla, coffee, pepper and cloves, by Pakistan on raw cotton, by Philippines on copra and coconut oil, and by Indonesia on palm oil. Economic analysis provides several motivations for using these instruments.

- *Improving terms of trade.* By restricting its exports, a country which supplies a significant share of the world market of a commodity can raise its world price. This implies an improvement of its terms of trade, allowing the country to import more for each unit of the exported commodity. The reasoning behind this motivation is similar to the optimum tariff argument (Bickerdike, 1906 and Johnson, 1953) which states that by implementing a tariff on its imports, a "large" country can decrease significantly the demand for a commodity that it imports, leading to a decrease of its world price and improving its terms of trade.

- *Food security and stabilization of final consumption price.* By creating a wedge between the world price and the domestic price, export tax lowers the latter by reorienting domestic supply towards the domestic market. Piermartini (2004) provides the example of the Indonesian government imposing export taxes on palm oil products, including crude and palm cooking oil in 1994, as it considers cooking oil as an "essential" commodity. During the food crisis of 2006-2008, this was the major motivation for several governments to implement export taxes and other forms of export restrictions.

- *Stabilizing Intermediate consumption price and developing processing industries.* Export taxes on primary commodities (especially unprocessed) work as a subsidy to higher value-added processing industries by lowering domestic price of inputs compared to their world price. For example, in Indonesia an export tax on lumber aimed

at developing the domestic wood processing industry while such measures had a negative environmental consequence since it contributed to the depletion of forests (World Bank, 1998). In 1988, Pakistan imposed an export tax on raw cotton in order to stimulate the development of its yarn cotton industry. Export taxes on palm oil were imposed in Indonesia and Malaysia in order to support the development of biodiesel and cooking oil industries (Amiruddin, 2003).

- *Increasing public receipts.* Export taxes provide revenues to developing countries, especially where there is limited capacity to rely on domestic taxation. This is a second-best argument; in order to raise a given amount of revenue, imposing lump-sum taxes is considered a first-best policy (Ramsey, 1927 and Diamond, 1975).
- *Income redistribution.* Like import tariffs, export taxes are measures that imply redistribution of income: export taxes are implemented to the detriment of domestic producers and in favour of domestic consumers and public revenues while import tariffs are detrimental to domestic consumers, but benefit domestic producers and increase public revenues.
- *Stabilization of export earnings.* In order to stabilize domestic prices and export earnings for export producers, some developing countries apply variable tax rates – high rates when export prices are above threshold prices and low rates in the opposite case. Piermartini (2004) provides the example of Papua New Guinea which established an export tax/subsidy rate for cocoa, coffee, copra, and palm oil equal to one half of the difference between the reference price — calculated as the average of the world price in the previous ten years — and the actual price for the year.

These motivations are behind broad application of export taxes by many countries, mostly developing countries, and that can be partially explained by the fact that the World Trade Organization (WTO) rules do not specifically prohibit use of export taxes. Quantitative restrictions such as export quotas or prohibitions, however, are prohibited in principle under Article XI of GATT 1994. Exceptions are allowed under Article XX of GATT 1994 when these measures are related to the "conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption" (Korinek and Kim, 2010). More precisely, Crosby (2008) clearly summarizes that "general WTO rules do not discipline Members' application of export taxes", but "they can agree – and several recently acceded countries, including China, have agreed – to legally binding commitments in this regard."

In addition, Article 12 of the Uruguay Round Agreement on Agriculture stipulates that when implementing a new export restriction, a WTO member must (i) consider the implications of these policies on food security in importing countries; (ii) give notice to the Committee on Agriculture; (iii) and consult with WTO Members that have an interest. This article, however, does not institute any penalty for countries ignoring these rules. Partially reflecting the lack of substantive discipline on this measure, it is only recently that trade policy concerning export taxes has drawn some attention from the public and academic circles.

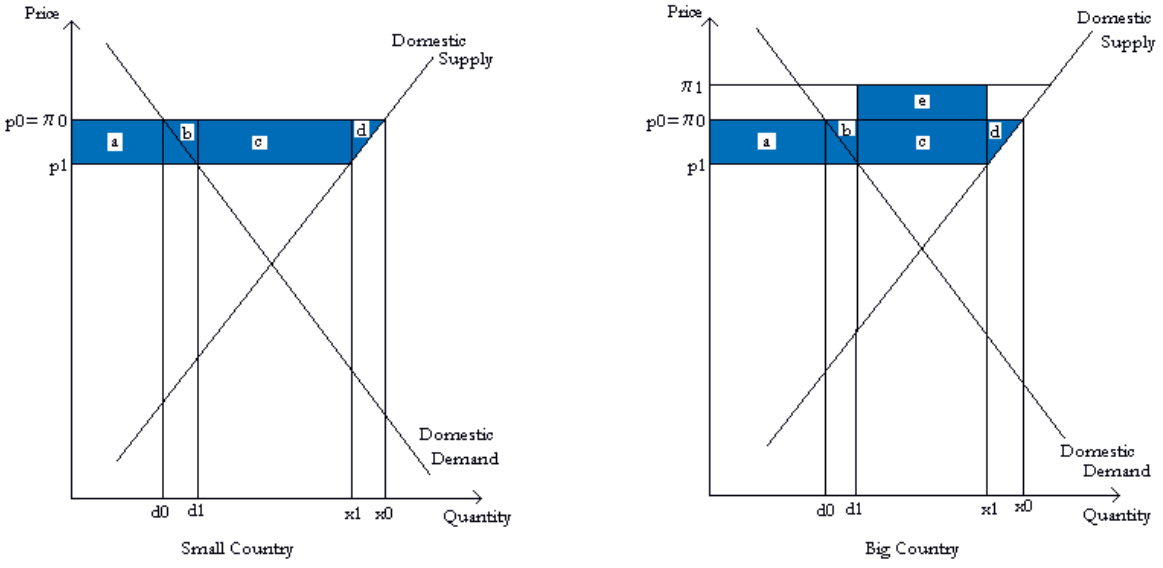
This paper provides a theoretical and empirical background for a better understanding of export taxes, particularly in the context of food security. The following sections provide an analytical framework to help better understand these trade policies. The first section uses a partial equilibrium framework, which is a simple theoretical framework that focuses on the sector where the policy is implemented and puts aside real income effects and the interdependence with the rest of the economy. The next section uses a

general equilibrium model, a more complex theoretical framework that focuses on real income effects and interdependence relations with the rest of the economy. The analysis focuses on the application of export taxes with the objective of food security. Finally, the MIRAGE model is used with the aim of illustrating the potential impact on world prices when countries respond to high commodity prices by using either increased export taxes and/or reduced import tariffs. The analysis will emphasize the effects of non-cooperative trade policies in this context.

The economics of export taxation: a partial equilibrium analysis

The objective of this section is to provide a simple theoretical framework to understand the effects of export taxes. Figure 2.1 depicts the impact of an export tax imposed by a small country (on the left side) and by a large country (on the right side). The difference between taxation in a small and large country consists in the impact of a variation in net supply (exports) on world prices. A change in a small country's exports does not lead to a change of world prices as this country is too small to have an influence on world markets. However, when a large country modifies its net supply (the level of its exports) on the world markets, it can exert an influence on world prices.

Figure 2.1. A partial equilibrium analysis of an export tax



The case of a small country

Consider the case of a small country imposing an export tax t (representing the value between π_0 and p_1, defined in specific terms). The initial domestic price is p_0 while the initial world price is π_0. At these initial prices, domestic demand is d_0 and is less than the domestic supply which is x_0, the difference (x_0 - d_0) being exported on the world market. As these exports are taxed, domestic producers prefer to offer their supply on local markets (untaxed) rather than on world markets (taxed). The domestic market supply is

increased, thereby reducing the domestic price until $p_1 + t = \pi_0$, while world price is, by definition, unchanged. At this level of prices, domestic producers are indifferent to selling their products on local markets or to exporting them.

Domestic consumers benefit as they consume more ($d_1 > d_0$) at a lower price ($p_1 < p_0$). Their surplus is increased by the area denoted as *a*. Domestic producers, on the other hand, are hurt as they produce and sell less ($x_1 < x_0$) at a lower price ($p_1 < p_0$). Their surplus is reduced by the area ($a+b+c+d$). Finally, the export tax increases public revenues by the area, denoted as *c*, as post-tax level of exports is the difference between x_1 and d_1 and as the unit tax is (π_0-p_1).

If we assume that one dollar of consumers' surplus has the same value as one dollar of a producers' surplus and one dollar of public revenue, costs will outweigh benefits in applying this policy; indeed, the tax policy is detrimental to a small country as the loss of the producers' surplus ($a+b+c+d$) is larger than the gain in consumers' surplus (a) and in public revenue (c). All these effects sum up in a loss of domestic national real income, measured by the areas ($b+d$).

This policy also has distributional effects. For instance, if policymakers aim at a food security objective which implies a decrease in the domestic price, taxing exports is effective in the sense that they increase domestic consumption and reduce local consumer prices. This increases the surplus of food consumers that, in this case, may weigh heavily in the government decisions. A consumption subsidy would be a first policy option since it is more efficient in that it does not distort price signals and resource allocation. However, this alternative option implies government spending, and government might have difficulties to raise taxes on other products and/or sources of income (*e.g.* tax on firm profits). Both arguments explain why one dollar of increase in the surplus ($a+c$) can be perceived as more important by the government than one dollar of inefficiency losses ($b+d$).

The case of a large country

The case of a large country differs in the sense that the world price is affected by the export tax. The reason is that a large country is assumed to export a significant share of world exports such that if these exports are reduced, world supply significantly declines and, as a result, the world price increases. Consumers' and producers' surpluses are affected in the same way with the case of a small country, but public revenues are increased by ($c+e$) as the world price is raised up to π_1: post-tax level of exports is still the difference between x_1 and d_1, but the unit tax is now ($\pi_1 - p_1$). This is important as the implementation of this policy can lead to an increase of domestic national real income if the area denoted by *e* is larger than the sum of the areas ($b+d$). While ($b+d$) represent welfare losses coming from these new distortions, *e* represents an improvement in national terms of trade. Final exports (x_1-d_1) are sold at π_1, the difference (π_1- π_0) representing a gain in terms of trade for each unit exported. Simultaneously, the same political economy elements are still in play as domestic consumers and public budget are favoured, while domestic producers are hurt by this decision.

It is noteworthy that in the long run implications could be different since "producers in the rest of the world will increase their supply in response to higher prices" (Mitra and Josling, 2009). As a result of increased supply, the price adjusts downward from the short-run level, but still remains above the pre-restriction level (Mitra and Josling, 2009). Therefore, it is possible that export restrictions could be beneficial in the short run while

these benefits will disappear in the long run for the country that implements this measure thanks to a downward adjustment of terms of trade through an increase of production in other countries.

Finally, if we consider the case of an export tax on a primary commodity used as intermediate input in manufacturing final products, the export taxes could decrease the domestic price of the intermediate input below the world price and thus provide downstream industries with a price advantage. This kind of "degressive/differential export tax structure" — higher rates on raw commodity; lower rates on processed goods — exists in Pakistan (raw cotton), China (steel products, metal ore sand, and ferro-alloy), Indonesia and Malaysia (palm oil). It results in the expansion of production volume of the processed products to the detriment of the raw commodity in the country which applies export taxes. Corden (1971) clearly indicates that "an export tax on an exportable input reduces its domestic price and so raises the effective protection for the using industry, irrespective of whether the latter produces an exportable or an importable. Thus a country which exports raw cotton and imposes an export tax on it reduces the costs of its textile industry and hence protects the latter."

The economics of export taxation in a context of food security: a general equilibrium analysis

This section aims to provide a more complete theoretical framework in order to understand the effects of export taxes in a general equilibrium framework. We develop a general model that presents international trade as a simple trade relation between three countries: two large and one small. This section will demonstrate that as far as food security is concerned, there is a distinction between (i) large food-exporting countries that can increase world prices of the commodity that they export while decreasing the domestic price of this commodity, (ii) large food-importing countries that can also have an impact on world prices and accept a deterioration of their terms of trade in order to decrease domestic price of agricultural commodity, (iii) and small countries that cannot affect world prices and are hurt by "beggar-thy-neighbour" policies of large countries. The entire process is a "trade game" with strategic interdependence and decisions on import tariff and export taxes.

The case of three countries and two goods[2]

We consider a model of international trade between three countries: two large countries (Country 1 and 2) that are price-makers in the world market, and the third one (Country 3), a small country that is a price-taker. They produce and trade two commodities, agricultural (A) and industrial (I). Country 1 has a comparative advantage in and exports the agricultural good, while it imports the industrial good. On the other hand, countries 2 and 3 have a comparative advantage in and export the industrial good, while they import the agricultural good.

This model seeks to point out an asymmetry in the impacts of trade policy between large countries that can increase their real income by imposing or raising an import tariff when they are importers, or an export tax when they are exporters, and small countries that cannot affect world prices by any change in their trade policy.

When a large country is an importer of a commodity, for example wheat, the application of an increased import tariff reduces its demand for wheat on the world market. As it is a large country, its policy significantly affects world demand and reduces

the world price of wheat. As far as this country is concerned, the terms of trade are improved and real income is increased provided that the volume of trade does not decrease by much.

The same sequence is valid for a large country exporting a commodity, maize, when it increases the export tax. As this policy reduces the global supply of maize on the world market and its international price is increased, its terms of trade are improved. Details of these mechanisms will be provided below.

Consider first an import tariff in the large food-importing country 2. When this country imposes an import tariff, four mechanisms are at play:

- *A substitution effect on domestic consumption*: other things being equal, a tariff increase leads to a domestic agricultural price increase, which reduces domestic consumption of the agricultural commodity in favour of other goods.
- *A substitution effect on domestic production*: other things being equal, a tariff increase leads to a domestic agricultural price increase which expands domestic production of the agricultural commodity to the detriment of other goods.
- *An impact on world price:* a tariff increase, by reducing world demand on the commodity, reduces its world price which implies that terms of trade are improved for this country importing this commodity.
- *A multiplier effect*: an increase in real income, through improved terms of trade, increases the demand for imports which, in turn, increases tariff receipts, which then increases real income.

Consider now an export tax in the large food-exporting country 1. When this country imposes a tax on its agricultural exports, similar four mechanisms are at play:

- *A substitution effect on domestic consumption*: other things being equal, a tax on agricultural exports leads to a decrease in domestic consumer price which, in turn, increases the domestic consumption of the agricultural good, which can be called the "*food security effect*".
- *A substitution effect on domestic production*: other things being equal, a tax on agricultural exports, through a reduced domestic price, leads to a decrease of domestic production of the commodity, which is an "*anti-farmer effect"*.
- *An impact on world price*: imposing a tax on exports of an agricultural commodity increases its world price as this is a large country, and this increased price implies that terms of trade of the exporting country are improved.
- *A divisor effect*: an increase in real income, through improved terms of trade, increases the demand for the agricultural commodity which decreases the export supply and in turn reduces export tax receipts and as result decreases real income.

As far as country 3 is concerned, the problem is similar to country 2 as it imports agricultural commodity with a comparative disadvantage in the production of such commodity. The difference is that it is a small country such that the commodity's world price remains constant when it levies a tariff on its imports. A small country cannot expect its terms of trade to improve either from an import tariff or an export tax.

Based on the above analysis, the following conclusions can be drawn:

- Applications of export taxes and import tariffs exhibit strong similarities, or are even equivalent in terms of their impact on world prices and welfare of both exporting and importing countries.
- When the large country raises either its import tariff or export tax on agricultural commodity, this move has a double effect. The first one is the terms of trade effect, which means that the terms of trade of the country applying these measures are improved while those of at least one trade partner are deteriorated.[3] The second one is a traded volume effect which consists of a decrease of the trade volume for both the country implementing the policy and its trade partners. Any change in small country's trade policy does not have an impact on its terms of trade and affects only the trade volume.
- Concerning large countries, as any policy change in this context has the two effects as indicated above, a country may decide at a certain stage to decrease its tax and accept a deterioration of its terms of trade while benefiting from an increase in trade volumes.
- If the objective of a government is to decrease domestic price of the agricultural good, one possible policy choice would be a decrease of the import tariffs in the large food importing country and an increase of the export tax in the large food exporting country, both policies having the effect of increasing the world price of the agricultural good. Small food importing countries can achieve the same objective with reduction of import tariffs but its real income will decrease.

These conclusions indicate that there is a possibility of governments engaging in a non-cooperative policy equilibrium for food security purposes whereby they respond to increases in agricultural world prices by increasing export taxes in agriculture-exporting country and decreasing import tariffs in agriculture-importing country. The application of an export tax by large countries will raise the international price and thus make it necessary for importing countries to reduce their import tariff rates much more than in the case where no export tax was applied.

The calculation of optimal export taxes requires the estimation of consumption, production, and trade elasticities. Broda, Limao, and Weinstein (2006) find that non-WTO members have market power and implement relatively high tariffs compared to WTO members. As far as export taxes are concerned, Warr (2001) concludes that available econometric estimates for the world demand elasticity of rice faced by Thailand imply optimal export taxes ranging from 25% to 100%. The market situation should be interpreted carefully in applying this method since a false interpretation could lead to implementation of the wrong policy; Bautista (1996) gives the example of the Philippines government implementing an export tax on copra and coconut oil based on the principle that this country has a large market share of these products on the world market and faced a "negative elasticity" in world export demand. Nevertheless, this evaluation did not take into account the substitutability with other vegetable oil and the consecutive low share of the Philippines in the world market. The Philippines should have been treated as a "small country" in this analysis.

Demand and supply elasticities may change over time and consequently a country may gain in the short run while losing in the longer run. In particular, by applying export taxes, a country may benefit in the short run from inelastic agricultural supply in other countries that results in substantial short term world price increases. In the longer run,

however, other countries may increase their agricultural supply, and world prices may decrease as a result.

The fact that WTO rules do not specifically regulate the use of export taxes is clearly a supportive factor of this sequence of policy options, which can hurt trade partners, in particular small countries. Small countries hurt by these "beggar-thy-neighbour" policies do not have any policy option with which to respond. Although small food-importing countries can decrease import tariffs, this would reduce tariff revenues and would not affect world prices, thus not affecting the welfare of trade partners.

Finally, analysing the impact on poverty is worthwhile. Trade policy has an impact on poverty in various ways, in particular through domestic consumption prices of traded goods, domestic activity and demand for unskilled labour, public revenues, and transfers from governments to households, among others (McCulloch *et al*, 2001). An export tax on agricultural commodities would reduce demand for unskilled labour in agricultural sectors while decreasing the domestic price of food. The first effect increases poverty, while the second decreases it. Warr (2001) undertakes a general analysis of export taxes on rice in Thailand and shows that the factor effects on poverty (reduced demand for unskilled labour) are greater than the expenditures effects (reduced price of agricultural products). His conclusions on the Philippines and coconut oil are similar (Warr, 2002).

Impact of export taxes on agricultural commodities: the MIRAGE model of the world economy

This section uses the MIRAGE model of the world economy in order to assess economic consequences of various trade policies.

The model

The MIRAGE model is a multinational, multi-sector CGE model (Bchir *et al.*, 2002 and Decreux and Valin, 2007). In this section, the MIRAGE model is used under its static version, with a perfect competition hypothesis and without modelling foreign direct investment. Assumption of imperfect competition requires supplementary data (number of firms, mark-up, and magnitude of scale economies) that is more difficult to gather for many regions for calibration purpose. Moreover, we focus on agriculture which is usually characterized by strong competition. The use of the static version is also justified by the fact that we are not interested in the dynamics of export taxes, but only in the long term impact on world prices and various regions' macroeconomic variables.

The first source of data is GTAP7 (see Narayanan and Walmsley (2008) for a full documentation), which provides world macroeconomic accounts and trade flows for the year 2004. The market access data comes from the MacMap-HS6 version 2.1 database (Boumellassa *et al.*, 2009), which measures protection in 2004 and includes all regional agreements and trade preferences existing to this date.

The geographic decomposition is a key element in designing the study. On the basis of the GTAP7 database, we select countries that are wheat net exporters and wheat net importers.[4] Table 2.1 presents the geographic decomposition. The sector decomposition focuses on agriculture and identifies 25 sectors, 13 of which are agricultural (Table 2.1).

Table 2.1. Geographic and sector decompositions

Country/region	Commodity
Australia	Paddy and processed rice
Rest of Asia	Wheat
China	Other grains
Thailand	Vegetable and fruits
Viet Nam	Oilseeds
Bangladesh	Sugar
India	Plant fibre
Pakistan	Other crops
Rest of South Asia	Livestock
Canada	Other natural resources
United States	Other food
Mexico	Fossil fuels
Rest of Europe	Meat
Argentina	Vegetable oil
Rest of Latin American and the Caribbean (LAC)	Dairy products
Brazil	Textile
Oil exporters	Clothing Apparel
EU27	Leather
Rest of Commonwealth of Independent States (CIS)	Other manufacturing products
Russia	Chemical products
Ukraine	Motor vehicles and transport equipment
Middle East and North Africa (MENA)	Capital goods
Egypt	Services
West Africa	Construction
East Africa	Transportation
Southern Africa	
South Africa	

We implement six scenarios (Table 2.2). The first one is called Base and represents a demand shock in the wheat sector. We assume that the demand from oil exporting countries increases such that the world price of wheat increases by about 10%. Similar results could be driven by alternative assumptions such as an increased demand of wheat for biofuel production or increased demand from large Asian countries. We chose to locate the demand increase in oil exporters' countries considering the diversity of their suppliers and the desire not to blur the results for other important importing regions.

Table 2.2. Scenarios

Scenario	Description
Base	Base demand shock such that world wheat price increases by 10%
ET	Implementation of export taxes in countries that are net exporters of wheat such that real domestic price of wheat is constant.
IT	Reduction of import tariffs (or increase of import subsidies) in countries that are net importers of wheat such that real domestic price of wheat is constant.
IT0	Implementation of import tariffs (import subsidies are forbidden) in countries which are net importers of wheat such that real domestic price of wheat remains constant: domestic price is not constant if the strategic rigidity (no import subsidies) is binding
ETIT	Implementation of scenario IT's import tariffs in countries which are net importers of wheat and of export taxes in countries net exporters of wheat such that real domestic price of wheat is constant.
ETIT0	Implementation of scenario IT0's import taxes in countries which are net importers of wheat and of export taxes in countries net exporters of wheat such that real domestic price of wheat is constant - import subsidies are forbidden

Following this demand shock and the consequent increase in world price, we assume that countries exporting wheat apply export taxes such that the real domestic price of wheat remains constant (scenario ET). The next scenario is an endogenization of import tariffs (scenario IT) with the same objective in net importing countries of wheat. As scenario IT may imply the adoption of import subsidies which means negative import tariffs (the government gives a subsidy to agents who purchase wheat on the international market), we implement another scenario where the decrease of import tariffs is limited to 0 (free trade); this scenario is called IT0. When import subsidies are not allowed as in the scenario IT0, the removal of import tariffs may be not big enough to neutralize the 10% price increase.

Finally, we analyse two scenarios which cumulate two situations described earlier: import tariffs are fixed at the level of scenario IT and export taxes are applied such that the real domestic price of wheat remains constant (called scenario ETIT), and import tariffs are fixed at the level of scenario IT0 — no import subsidy — and export taxes are implemented such that the real domestic price of wheat remains constant (called scenario ETIT0).[5]

Results

Table 2.3 presents changes of import tariffs required in net importers of wheat to keep domestic price of wheat constant. Variations of import tariffs are substantial, in particular in Middle East and North Africa and the region "Rest of Europe". Egypt and Thailand must implement an import subsidy in order to keep domestic price of wheat constant.

Table 2.4 presents the additional export tax rates required to keep the domestic price of wheat constant in net exporting countries under three scenarios. When only export taxes are implemented in wheat exporting countries, the changes of export taxes are less than 6%. Export tax required is less than 10% illustrating the effects of large market share of the exporting countries in the global market. When import tariffs are reduced in wheat importing countries, the changes of export taxes are more than 45% (scenario ETIT). Reduction of import tariffs will increase world prices, thus requiring higher export tax rates. If no import subsidies are implemented (scenario ETIT0), which is a more realistic

case, the changes in export taxes required are less significant, ranging from 19% to 50%, but remain substantial, in particular as compared to the scenario ET. This illustrates the interdependence of trade policies and how combination of policy responses could raise world price and thus make such responses less effective in achieving policy objective of maintaining domestic prices low.

Table 2.3. Reduction of import tariffs required for food security purpose

Country / region	IT
Rest of Asia	-19.9%
China	-29.8%
Thailand	-28.1%
Vietnam	-12.6%
Bangladesh	-18.6%
Pakistan	-28.8%
Rest of South Asia	-19.3%
Mexico	-27.5%
Rest of Europe	-32.0%
Rest of Latin America	-30.0%
Brazil	-25.2%
Rest of CIS	-29.8%
Middle-East and North Africa	-41.9%
Egypt	-25.8%
West Africa	-21.3%
East Africa	-24.3%
Southern Africa	-18.7%
South Africa	-27.7%

Source: Authors' calculations.

Table 2.4. Additional export taxes required for food security purpose

	ET	ETIT	ETIT0
Australia	3.3%	47.0%	19.0%
India	3.9%	46.0%	21.0%
Canada	3.6%	52.0%	25.0%
US	4.2%	52.0%	27.0%
Argentina	3.8%	50.0%	25.0%
Russia	5.6%	57.0%	37.0%
Ukraine	4.5%	50.0%	50.0%

Table 2.5. World prices
% changes compared to reference situation

Sector	Base	ET	IT	IT0	ETIT	ETIT0
Wheat	10.84	16.76	27.31	12.62	41.10	20.58
Dairy products	0.04	0.05	0.00	0.02	0.03	0.04
Livestock	0.19	0.21	0.18	0.13	0.24	0.17
Meat	0.07	0.08	0.06	0.06	0.07	0.07
Oilseeds	0.09	0.06	0.09	0.08	0.05	0.04
Other crops	0.16	0.17	0.18	0.12	0.18	0.13
Other Food	0.04	0.08	-0.04	0.00	0.04	0.04
Paddy and processed rice	0.21	0.13	0.32	0.20	0.10	0.11
Plant fibre	0.13	0.11	0.14	0.10	0.13	0.09
Sugar	0.14	0.12	0.20	0.12	0.16	0.10
Vegetable and fruits	0.20	0.21	0.25	0.14	0.27	0.14
Vegetal Oil	0.01	0.01	-0.01	0.00	0.00	0.00

Table 2.5 indicates how world prices of agricultural commodities are affected in various scenarios. Almost all agricultural prices are positively affected by various shocks on either demand or supply sides, but wheat is by far the most exposed commodity to world price shocks. While the world price of wheat increases by 10.8% due to the original demand shock, it increases by 16.8% when net exporters of wheat respond by increasing export taxes. The price rises even higher (27.3%) when net importing countries reduce import tariffs along with the implementation of import subsidies. When no import subsidies are implemented, the impact of import tariffs reduction on world prices (12.6%) is comparable to the one of export taxes (16.8%). Finally, the combination of increased export taxes by wheat-exporters and reduced import tariffs by wheat-importers causes an increase of the world price by 41.1% when import subsidies can be implemented while 20.6% when they are not.

These various policy responses can affect the national income of countries. From the previous section, it was expected that net wheat-exporters' welfare could increase with the initial price increase and their policy response of increased export taxes while net wheat-importers' welfare would decrease. That is clearly confirmed by this modelling exercise: welfare of Argentina, an exporting country, increases under all scenarios, but most significantly in case when export taxes and import tariffs with allowed import subsidies are combined (scenario ETIT): its real income increases by 0.6%. Other beneficiaries are Australia (which experiences 0.23% increase of its real income under ETIT), Canada (0.18%), and Ukraine (0.07%). On the other hand, net wheat-importers are negatively affected by these responses in terms of real income: for Egypt, the data imply a 0.85% real income decline under ETIT scenario and Eastern Africa experiences a decline of 0.37% under the same scenario. These results rely on low value of supply and demand elasticities that are compatible with a short-term situation. In reality, these parameters can change in the long run when both producers and consumers modify their respective behaviours. Producers, including new producers, will invest more (technology,

irrigation, etc.) and world supply elasticity will increase in the long run. Consumers will shift to other products and/or new suppliers.[6]

The case of Argentina also reveals how increased export taxes on primary commodities can be used to promote processed sectors which rely on the primary commodity as an intermediate input. According to the simulation undertaken, when the demand shock increases the world price of wheat by about 10%, the Argentinean production of wheat is increased by 4.5% (in volume) while production of the 'Other food' including milling industries and other flour related products is reduced by 0.6%. Under the ET scenario where wheat-exporting countries increase their export taxes, however, the production volume of wheat and 'Other food' sectors is constant. An increased export tax on a primary commodity is clearly a way of promoting the production of sectors using this commodity.

Conclusions

This chapter provides an economic analysis of export taxes and illustrates why the measures have been frequently used during the recent food price hike. Several rationales can justify the implementation of such a trade policy: (i) export taxes can raise the world price of exported products and therefore improve terms of trade; (ii) export taxes can reduce the domestic price of the taxed commodity and thus benefit final consumers of this commodity; this element is especially important when food security is at stake; (iii) export taxes can reduce the domestic price of the taxed commodity and benefit consumers of this commodity as inputs; this element is important when downstream industries using this commodity provide higher value-added than the taxed industry; (iv) export taxes increase public revenue which is beneficial in a country where fiscal receipts on domestic base are limited; (v) export taxes are a means of redistributing income from domestic producers to domestic consumers and the public sector.

All these factors make export taxes a trade policy option in achieving several policy objectives. However, this paper also emphasizes that export taxes are typically "beggar-thy-neighbour" policies that deteriorate terms of trade and real incomes of trading partners. When export taxes are applied by large exporting countries to keep domestic prices low, higher international prices resulting from these measures make it more difficult for trade partners to achieve the same policy objective. Trade partners should apply higher export taxes or reduce import tariffs by a larger margin when export taxes increase world prices. The small countries are in a worse situation since they are price takers. The policy responses during 2006-2008 food price hike periods clearly illustrate the possibility of the spiral of individual policy responses. Considering the fact that there is no multilateral discipline on export taxes and the exporting countries could be motivated to increase its real income in the short-term, while hurting those of trade partners, policy makers should pay more attention to the issue of export taxes.

Several policy conclusions can be inferred: (i) interdependence between exporting and importing countries implies the possibility of non-cooperative policy equilibrium and calls for an international cooperation; (ii) while large exporting countries can implement "beggar-thy-neighbour" policies which increase national welfare at the expense of trading partners, small countries do not have this policy option and changes in their own policy neither improves their welfare nor hurts partners' situation; (iii) there is a key asymmetry between net exporters and net importers of an agricultural commodity in a situation of

high food prices as net exporters can benefit from an increase in world prices while net importers are hurt.

Recently, China raised export taxes on certain metal resource products such as steel products, metal ore sand, and ferro-alloy. The objective of this policy is to re-orient the supply of these goods on the domestic market in order to decrease the price of intermediate goods for domestic manufacturing sectors. Several other countries also applied export restrictions more frequently as prices of several commodities significantly rose.

Under these conditions, it is understandable that the European Union (EU) has proposed to bring these practices under WTO discipline.[7] While this proposal has been well received by countries like Canada, the United States, Switzerland, and Korea, it has been highly criticized by several developing countries such as Argentina, Malaysia, Indonesia, Brazil, Pakistan, Cuba, India, and Venezuela. The reason advanced by this group of countries is that "export taxes are a right and a legitimate tool for developing countries; they help increase fiscal revenue and stabilize prices; there is no legal basis for a negotiation; there is no explicit mandate for a change in WTO rules on this issue" (Raja, 2006). It is noteworthy that the EU makes a distinction between trade-distorting taxes and "legitimate" export taxes like those applied in the context of Balance-of-Payments imbalances. The EU and the US frequently implement bans of export taxes in their bilateral agreements.

This chapter shows that export taxes and import tariffs exhibit strong similarities, and are even equivalent in terms of their impact on (domestic and foreign) welfare. This calls for some WTO discipline on export taxes as there exist disciplines in the domain of import tariffs. This is especially important considering that small net food-importing countries can be strongly hurt in the case of a food crisis and by a world-wide escalation of export taxes, and they do not have many policy instruments to face these kinds of issues. Export taxes and export restrictions could clearly become a major bone of contention in trade negotiations between countries which import agricultural products and exporting countries.

Notes

1. Antoine Bouët, International Food Policy Research Institute (IFPRI) and Larefi, Universite Montesquieu Bordeaux IV and David Laborde Debucquet, International Food Policy Research Institute (IFPRI).
2. The detailed analysis can be found in Bouet and Laborde Debucquet (2010).
3. Improvement of the terms of the trade means that export price increases relative to import price.
4. In the GTAP7 database (base year 2004), the EU-27 position shows no net exports for wheat. Therefore, we do not treat the EU as a net exporter (or a net importer).
5. In a scenario where export taxes and import tariffs are both endogenous countries would enter in a never-ending escalation of export taxes and import subsidies since on the importing countries side, the government is assumed to have no fiscal constraints and can finance the subsidies using a lump-sum transfer from household.
6. For more information, see Antoine Bouet and David Laborde-Debucquet (2010), "The Economics of Export Taxation in a context of food crisis: A Theoretical and CGE-Approach Contribution", IFPRI Discussion Paper, 00994, June.
7. The EU's proposal is available on WTO website (TN/MA/W/11/add. 6).

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ANNEX 2.A1

Implementation of Export Restrictions During the Food Crisis 2006-2008

Country	Trade restriction
Thailand	Export ban on rice (05/08)
Russia	Russia raised wheat export tariffs from 10 to 40% (02/08)
Indonesia	The government passed new exports laws to prevent produce from flooding out of the country, selling at high international prices. Under Indonesia's new rules, only state procurement agency Bulog is allowed to sell overseas, and only when national stocks are above 3 million tonnes and domestic prices are below a government target price. (04/08)
Bolivia	Ban on exports of grain and meat products has been introduced. (04/08) Ban on export of vegetable oil.
Egypt	Ban on rice exports from April to October 2008. (04/08-10/08)
Pakistan	Banned private wheat exports to Afghanistan. (04/08) Imposed a 35% tariff on wheat and wheat products exports. (04/08)
Vietnam	Extended ban on rice exports until June. The permitted rice exports will be cut to 3.5 million tonnes in 2008, from 4.5 in 2007 between the months of January to September. (03/08)
Nepal	The government announced on April 30th, 2008 that it would ban exporting paddy, rice and wheat until mid-November 2008. (04/08)
Bangladesh	The government banned exports of all but aromatic varieties of rice for six months, until 7 November 2008. (05/08) The government banned exports of soybeans and palm oil for six months (04/08)
Madagascar	The government banned rice exports. (05/08)
Kazakhstan	The government banned wheat exports, which led to the World Food Program (WFP) not purchasing 5 500 mt as planned. (04/08) The government restricted exports of sunflower seeds. (06/08) The government has set new export tariffs on cereals. (02/08)
Ethiopia	The government has banned exports of major cereals and grain stockpiling, and suspended WFP's local purchases for emergency interventions. (02/08)
China	The government has banned rice and maize exports to ensure sufficient domestic supply and to prevent further increase in food prices. (01/08) China began to adopt export quota license administration on some grain powder products. (01/08) The government increased taxes on food exports. (02/08) The government announced that it will remove the value added tax (VAT) rebate for grain exports and levy provisional export taxes on grains and their flour products to discourage grain exports. (03/08)

Country	Trade restriction
China (*cont*.)	Government introduced export duties of 20% on wheat, buckwheat, barley and oats and stepped up wheat and maize sales from state reserves (early 2008).
	China began to collect a one-year-long provisional export tariff on 57 categories of raw grain and powder products such as wheat and corn in the range of 5-25%. (02/08)
Brazil	The government has temporarily banned rice exports (04/08)
Niger	The government imposed export controls on key agricultural commodities. (03/08)
Iran	The government imposed USD 300 000 export tax on the World Food Program and as a result the WFP had to cancel 3 000 mt of wheat. (05/08)
Cambodia	The government issued a two-month ban on rice exports. (04/08)
India	The government banned exports of maize until 15 October 2008. (07/08)
	The government has banned exports of non-basmati rice, wheat, and edible oils, raised the minimum export price of basmati rice from USD 1 100 to USD 1 200, and has extended the ban of exports of pulses for one more year beginning 1 April 2008. (03/31/08)
	The government banned exports of rice at less than USD 650 per ton, which is a 30% increase. This does not include the 500 000 tons bought by the Bangladesh under a state-to-state deal negotiated 15 November 2007. (03/08)
	The government banned milk powder exports (2007)
	The government banned rice exports priced under USD 505/ton. (12/07)
	The government banned rice exports priced under USD 425/ton. (10/07)
	Export of non-basmati rice has been restricted, with the imposition of a high minimum export price of USD 500/ton (02/08)
Tanzania	The government will ban re-exports of rice in order to curb a looming food shortage. (05/08)
	The government banned exports of agricultural commodities (02/08)
Argentina	To guarantee domestic grain supplies during an election year and keep prices under control, the government closed its wheat export registry in March 2007. (05/08)
	The government has halted rice exports except to Brazil. (04/08)
	The government has delayed the reopening of its export registry from 17 March 17 to 21 April (04/08)
	The government raised export taxes on soybeans from 35% to 45% and increased a tax on exports of corn, wheat and beef to curb rising fast-rising domestic food prices. (04/08)
	The government in order to boost revenue introduced a new system of sliding-scale export taxes on grains and oilseeds, which significantly raised levies on soy and sunseed products. (04/08)
	The government reinforced the variable tax system for oilseeds and cereal exports.
	The government postponed the renewal of the liberalization regime for bovine meat exports.
Malaysia	Flour exports are only allowed with a special license. (03/09)
Zambia	The government has reinstated the export ban applicable for any new maize contracts.

Source: IFPRI.

Chapter 3

Export Barriers and the Steel Industry

Alan H. Price and D. Scott Nance[1]

A healthy world steel industry depends on the free trade of the raw materials used to make steel. At present, trade in these raw materials is not free, as major producing countries impose a variety of restrictions on exports. These measures distort international competition by providing domestic companies with an advantage. In this way, export restrictions distort not only the world markets for these raw materials, but the broader world markets for steel and products made from steel. This chapter describes the export restrictions that a number of producing countries have imposed on raw materials which are used to produce steel. It aims to identify the impact such restrictions have had on international prices and on the availability of raw materials. Three raw materials are used as the basis for this analysis: iron ore, coke and steel scrap.

The global steel industry is dependent upon a small set of basic raw materials, including iron ore, scrap, coke, and various alloying elements. Most of these materials are actively traded around the world. While some materials, such as iron ore and scrap, are relatively widely distributed, sources of others are limited to a few suppliers. Moreover, international trade in some materials that are widely distributed, such as iron ore, is nonetheless dominated by a handful of countries. Very few countries are self-sufficient in all of these inputs.

A number of countries have imposed restrictions on export of these raw materials. These restrictions include export prohibitions, export quotas, taxes, and various administrative measures. The overall effect of these measures is to raise global raw material prices. At the same time, by increasing domestic supply of the raw materials, these measures depress domestic prices. In this way, the restrictions provide domestic downstream industries in the countries applying these export restrictions with an advantage. Exporting countries cite a variety of justifications for export restrictions of raw materials, including resource conservation, environmental protection, and revenue generation.

While export restrictions are generally subject to less international discipline than are restrictions on imports, the international rules of trade do impose certain limits on the ability of countries to restrict exports through the use of quotas and fees. The United States, Mexico, and the European Union (EU) have invoked these disciplines in three related requests for dispute settlement with the World Trade Organization (WTO). Canada and a number of other countries are participating in these proceedings as third parties. While resolution of these cases will go far in clarifying the extent to which WTO rules apply to export restrictions, at least one major loophole in those disciplines — the lack of any international agreement on limits to export duties — remains.

At the same time, many steel companies have undertaken efforts to acquire raw materials assets in countries around the globe. The apparent aim of these acquisitions is to ensure reliable sources of supply. While such acquisitions of assets do not constitute restraints on exports *per se* (to the contrary, they are premised on the ability to export), they could result in the removal of substantial quantities of key raw materials from world markets.

This paper will begin with a brief overview of the global steel industry. It will describe the restrictions that a number of producing countries have imposed on each of these raw materials which are used to produce steel, and identify the impact the restrictions have had upon international prices and availability. The international disciplines that do or do not exist regarding these measures will be reviewed. The paper will then discuss the potential role of asset acquisitions in restricting international trade in raw materials. It will finally examine in some detail the actual effects of these restraints upon the three most important raw materials for steel making: coke, iron ore, and steel scrap.

The global steel industry

Steel is one of the most widely produced industrial products in the world, with around 90 countries making steel (World Steel Association, 2010). World steel production in 2009 was approximately 1.2 billion metric tons (MT) (World Steel Association, 2009). Not surprisingly, the scale of production varies widely. By far the largest producer in the world is China, which made nearly 568 million MT of steel in 2009. China alone

accounted for nearly 47% of world steel production in 2009; its production in that year exceeded the next top ten counties combined by over 25%. In order, the next largest producers are Japan (88 million MT in 2009); the Russian Federation (Russia) (60 million MT); the United States (58 million MT); and India (57 million MT).[2] On the other hand, 19 countries produced less than 1 million tons in 2009.

While global steel production has historically been split almost evenly between the developed and developing countries, developing countries accounted for two-thirds of world steel production in 2009. Three of the five largest producers (China, Russia, and India) are developing countries.[3] Other major developing country producers include Brazil and Ukraine.

Table 3.1. World steel production, 2009
million MT

Asia	Europe	Commonwealth of Independent States (CIS)	NAFTA	Other Western Hemisphere	Middle East	Africa	Oceania	World
795.4	168.3	97.5	81.3	47.5	17.2	15.2	6.0	1 219.7

Source: World Steel Association (2010).

Raw materials used in steelmaking

There are two main processes for making steel: ore-based and scrap-based. The ore-based process either combines iron ore and coke in a chemical reaction that yields molten iron,[4] or heats iron ore with natural gas to make direct reduced iron. The molten iron can be allowed to cool to make pig iron, or be placed directly in a basic oxygen furnace (BOF) with small amounts of carbon and up to 30% steel scrap to produce steel. In the scrap-based process, steel scrap, often with small amounts of pig iron or direct reduced iron, is melted in an electric arc furnace (EAF) to produce steel. These three materials — iron ore, coke, and steel scrap — constitute by weight and volume the vast majority of the raw materials used in steel making.

Other elements and compounds are frequently added to impart specific qualities to the steel. The main alloying agents used in steel include aluminium, manganese, molybdenum, nickel, tin, and tungsten (Taube and Thomas, 2009).

A number of other materials are used in connection with steel production, even if they are not necessarily incorporated in the steel itself. Both processes use fluorspar to lower the melting point of the iron or steel scrap and to help remove impurities from the molten steel. Zinc is frequently used to produce galvanized steel — steel with a thin coating of zinc that prevents oxidization. Tin is used both as an alloying agent and as a coating as well. Because of its very high melting point, magnesium carbonate is a vital component of refractory bricks, which are used to line both basic oxygen and electric arc furnaces.

Export restrictions

No country is self-sufficient in the production of all of these raw materials. A healthy global steel industry requires that all of these materials be freely traded and widely available. Yet all of the materials described above are subject to export restrictions by major producers.

China, India, Russia, and Ukraine are among the countries applying export restrictions on the raw materials for steel production. China is the world's leading producer of a number of these inputs including coke, so that restrictions on its exports of raw materials can have a huge impact on world availability of these materials. The most commonly restricted material is steel scrap, which is currently subject to export restrictions by at least 13 countries.

Types of export restrictions

Export restrictions take a variety of forms. The simplest is a straightforward ban on exports. Flat-out export bans are relatively rare, as they violate many of the rules of world trade. However, several countries have banned exports of steel scrap, including Argentina, Indonesia, Jamaica, Kenya, Mongolia, Saudi Arabia, Uruguay, and Zimbabwe (Price *et al*., 2008).

The most commonly used export restrictions are export taxes. These are taxes on exports of a given raw material. The tax can be expressed either *ad valorem* (as a percentage of the value of the exported good) or as a fixed tax (for example, per ton). The tax is often applied to wastes and scraps, to encourage recycling of the scrap within the country. Export taxes may be combined with reference prices, the government-set prices on which taxes are calculated. Export taxes can accordingly be increased either by raising the tax rate itself, or by increasing the reference price on which the tax is based. Table 3.2 identifies raw materials that are subject to export taxes; the country imposing the tax; and the amount of the tax. The commodity may include the element or material; ores and concentrates; and waste and scrap.

Countries deliberately change export tax levels to influence exports of raw materials. In June 2008, for example, India imposed an export tax of 15% on both iron ore lumps and fines. It subsequently lowered the export tax on fines to differentiate them from lumps. When exports of Indian iron ore fell sharply in late 2008, India cut the export tax on iron ore lumps to 5%, and eliminated the tax on fines completely. Then, in 2009, as prices rose, it reinstituted a 5% export duty on iron ore fines, and raised the export tax on lumps to 10%.[5] In April 2010, in response to requests by the domestic steel industry for curbs on iron ore exports, India raised the export tax on iron ore lumps still further to 15%. The purpose of the increase was to ensure future supplies of iron ore for the Indian steel industry.[6]

A less obvious way to tax exports is to deny reimbursements of value added taxes (VAT) on exports. Most countries with a VAT system will rebate the VAT on exports. By denying VAT reimbursement, as China has done for various raw materials, it is less advantageous to export a product than to sell it domestically. This in turn encourages exports of products produced domestically that use the input to produce downstream (and more valuable) products.

Table 3.2. Export taxes imposed on steel raw materials

Commodity	Country	Amount of tax
Steel scrap	China	10%
	Russia	15% or EUR 15/MT (whichever is larger)
	Ukraine	EUR 25/MT
	India	15%
	Argentina	20%
	Guinea	GNF 25 000/MT (USD 4.98 at current rates)
	Iran	30%
	Kazakhstan	15%
	Pakistan	25%
	United Arab Emirates	Dirham 250/MT (USD 67.94)
	Vietnam	35%
Iron Ore	India	8 -15%
	Vietnam	20%
Coke	China	40%
	Russia	6.5%
Aluminium	China	15%
	Russia	6.5%
	Ukraine	30%, but not less than EUR 0.4/kg
	Indonesia	10%
Manganese	China	20%
	Gabon	3%
	Ghana	6%
Molybdenum	China	15-20%
	Russia	6.5%
Nickel	Russia	5-30%, depending upon form
	Ukraine	30%, but not less than EUR 5.50/kg
Tin	China	10-20%
	Russia	6.5%
	Ukraine	30%, but not less than EUR 1.60/kg
	D.R. Congo	11%
	Indonesia	10%
Tungsten	Russia	6.5%
	Ukraine	30%, but not less than EUR 10/kg
Zinc	China	5-15%
	Ukraine	30%, but not less than EUR 0.32/kg
Magnesium carbonate	China	5-10%

Source: Price *et al.* (2008).

Less common are export quotas, which fix a limit on the volume of exports of a given material. China, for example, imposes export quotas on a number of steelmaking raw materials, including coke,[7] fluorspar, magnesium carbonate, molybdenum, silicon carbide, tin, and tungsten.[8] These quotas may be supplemented by an export quota bidding system. Under this system, qualified companies are allowed to bid for the right to export a given quantity of a material subject to an export quota.[9]

Quotas may also be imposed by state-owned enterprises with the right to export materials. India's single largest iron ore producer, the state-owned National Mining and Development Corp. (NMDC), has imposed quotas on exports of high grade (greater than 64% iron content) ore from some of its mines (India Planning Commission, 2006).

Governments may also use various administrative methods to restrict exports of raw materials. One common method is to require licenses for firms to export a given commodity. Through the implementation of export licenses, the government can limit both who can export and how much they can export (Price *et al*., 2008). As well as limiting the number of companies that can export a commodity, the licensing authority may review the terms for export before granting the license. In this way, countries can influence exports. Countries that impose license requirements on exporters of raw materials for steel production include China (coke, molybdenum, zinc, magnesium carbonate) and Ukraine (scrap metal). India permits only designated state-owned enterprises to export certain types of iron ore, manganese ore, and chrome ore.

Finally, governments can use more indirect means to restrict exports. Between November 2009 and April 2010, for example, the state-owned India Railways increased the freight charges for iron ore intended for export by nearly 50%.[10] Most Indian iron ore exporters ship their material by rail. Because rail freight constitutes around 80% of the cost of exported Indian iron ore, an increase in freight costs of this magnitude would have a direct impact on iron ore exports.[11]

The impact of export restrictions

Export restrictions of raw materials have two obvious effects. When applied by large economies with substantial market share, the measures, by limiting international supply of the material in question, raise international prices (i.e. prices outside the country of production), which in turn raises the overall production cost of importers. In some cases, actual shortages of the material may arise, as has occurred periodically with steel scrap. Conversely, export restrictions increase domestic supply, causing domestic prices to fall, so that domestic consumers of the material enjoy lower costs of production. Domestic consumers pay less, and international consumers pay more. This gap between domestic and international prices provides domestic consumers of the materials (in this case, steel producers) with an advantage in international competition. If the gap is significant, and the material represents a sizable portion of the total cost of raw materials, the advantage can be potentially decisive.

By lowering world supply of a given material, and raising its world price, export restrictions create pressure on exports from non-restricting countries. As discussed below, for example, export restrictions of steel scrap by Russia, Ukraine, and other countries have brought about higher exports from non-restricting countries like the United States and Canada. The prices in these countries for this input rise even further because domestic supply of the raw material has been partially diverted to exports.

Export restrictions also create uncertainty in markets. Countries frequently change their export restrictions, often with little or no notice. Recently, India has changed export tax rates on iron ore several times unexpectedly. China frequently adjusts the export quota for coke. Moreover, even the rumour of possible restrictions on exports can affect current and future prices. This uncertainty makes it very difficult for steel producers to estimate their raw material costs or to plan their purchases and operations. Uncertainty may affect producers in less-developed countries disproportionately, as they may lack the ability to shift to alternative sources of supply.

Finally, export restrictions distort investment in raw materials mining and production. If the prices for a given raw material are high, or the supply is constrained as a consequence of export restrictions, investments may be made in the development of high-cost sources. The reduction or removal of export restrictions can result in sharp drops in world prices, making formerly-economical sources of supply uncompetitive. Development of raw materials sources can require large capital, so that the measures can cause massive misallocation of capital.

International disciplines on export restrictions

As with imports, the international rules of trade impose some disciplines on export restrictions. In principle, members of the WTO are prohibited from imposing quotas on exports.[12] Article XI of the General Agreement on Tariffs and Trade (GATT) states that "{n}o prohibitions or restraints other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party … on the exportation or sale for export of any product destined for the territory of any other contracting party." Unless an exception under GATT Article XX applies, therefore, WTO members cannot place prohibitions or quotas on exports of goods, including raw materials.

The GATT 1994 also places limits on the charges countries can impose on exports. According to Article VIII:1(a) of the GATT 1994, fees and other charges associated with the processing of exports cannot exceed the approximate cost of the service rendered. In addition, the same article specifies that such fees can neither serve as a form of protection for domestic industries nor as a form of taxation for fiscal purposes. The impositions subject to this requirement include all fees, charges, and formalities imposed in connection with exports, including those associated with licenses, document processing, etc. While this provision does not prevent countries from imposing fees on exports to recoup the cost of government services rendered, it does limit their ability to adjust such fees to encourage or discourage exports of particular products.

The GATT Article X requires that WTO members publish laws, regulations, judicial decisions and administrative rulings of general application regarding imports and exports. One recurring problem with export restrictions has been the lack of public information about them. Indeed, in their requests for consultations regarding China's raw material measures, the United States, Mexico, and the EU allege that China has violated GATT Article X with respect to export restrictions.[13] Japan, in another forum, also emphasized that "{m}ore transparency on export restriction is essential for smooth trade of rare metals and {to} enhance international trade and production of industrial goods (Takashina, 2009)." In particular, Japan along with the United States and Korea proposed that WTO members be required to notify the WTO within 60 days of any new measures regarding export licensing, and that they be required to respond to inquiries from other WTO members regarding export licensing.

The WTO rules do not impose disciplines on one major type of export restrictions, though: export duties. To the contrary, GATT Article VIII explicitly exempts export duties from the requirements described above. Unlike import duties, export duties are not generally subject to binding agreements among WTO members. However, China for example agreed in its Protocol of Accession to limit export duties on certain identified products (WTO, 2001). Those levels are quite high, though, with duties on exports of steel scrap and various alloying metals being as high as 40% being permitted.

Justifications for export restrictions

GATT Article XX provides for a number of exceptions to the rules controlling, among other things, export restrictions. The exceptions under Article XX (b) and (g) include measures intended to protect human, animal, or plant health and to conserve exhaustible natural resources. The article makes it clear that measures under these exceptions cannot operate as a disguised restraint on international trade. Countries offer a range of justifications for restrictions on exports of raw materials that would take advantage of these exceptions. These justifications include the need to conserve natural resources; to protect the environment; to ensure orderly markets; and to generate revenue. Each of these justifications demands closer scrutiny.

The most common justification for restricting exports of raw materials is the need to conserve natural resources. However, the measures would accomplish this only if the country also imposes limits on mining or domestic consumption of the material. GATT Article XX (g) recognizes this by allowing trade-restricting measures for the purpose of conserving exhaustible natural resources only if such measures are made effective in conjunction with restraints on domestic production or consumption. Yet none of the restrictions described above have been combined with such limits on domestic production or consumption.

Nor is there any evidence that export restrictions do, by themselves, lead to conservation of exhaustible resources. To the contrary, a high-level review of mineral policy by the Indian government concluded, for example, that Indian iron ore reserves were more than sufficient for the foreseeable future, and that restrictions on iron ore exports were not necessary to conserve this exhaustible resource (India Planning Association, 2006). Absent incentives to reduce production for domestic consumption as well, raw materials producers are likely to maintain production at high levels, considering strong demand for the materials.

A related justification for export restrictions on raw materials is environmental protection. There have been arguments that Chinese export restrictions of coke in particular represent a form of environmental protection. The reasoning behind this argument is that the production of these materials consumes large amounts of energy, and that, by discouraging exports, the measures discourage production and thus reduce greenhouse gas emissions (Houser *et al*., 2008). As with the conservation rationale, this reason is plausible only if the export restrictions are combined with measures to reduce domestic consumption.

GATT Article XX (j) also allows export restrictions where such measures are necessary to the acquisition or distribution of products in short supply. In an apparent attempt to justify export restrictions under this provision, some countries claim that licensing of exporters is needed to ensure an orderly market.[14] There is no clear evidence that such procedures are necessary to avoid market disruption, however. Licensing

procedures allow the licensing government to control who can export, as well as the quantities, and in some cases, the prices they can charge. In addition, the GATT article specifies that "all contracting parties are entitled to an equitable share of the international supply of such products," so that any export restrictions intended to establish orderly markets would have to allocate export equitably.

A final justification for export restrictions, and especially export taxes, is to raise government revenue. As noted above, while revenue generation may be a valid reason for export duties, it is a proscribed purpose for export license fees and similar charges. In some cases, the amount of revenue raised from export taxes is trivial compared to other sources of government funds. For example, applying 6.5% rate of the export tax on tin waste and scrap to its exports of that material in 2008, as reported by the United Nations, reveals that Russia raised an estimated USD 270 from this tax on the materials in 2008.

Government measures which are truthfully intended to raise revenues focus on total production, not just exports. For example, Australia recently announced its intention to impose a tax on "above normal" profits from mining operations. The tax would apply to the profits from all mining operations in Australia, and would therefore affect materials consumed domestically, as well as those exported. There are concerns that, while such measures may be technically non-discriminatory, Australia's step will encourage other countries to take similar steps."[15] There are reports that several countries may be considering such a tax as well.[16] In India, the mining ministry has formally proposed a "windfall tax" on "mineral exporters who are making super profits."[17]

Occasionally, governments are more forthright in admitting the real reason for export restrictions. In examining India's policy regarding iron ore, the Indian government concluded that "{i}t is clear from the description of the export licence regime that it is GOI (Government of India)'s intention to restrict exports of iron ore with Fe content higher than 64%, with a view to ensuring that the exports do not take place at the cost of supplies to domestic steel producers (India Planning Commission, 2006)." Similarly, in its National Steel Policy, China's National Development and Reform Commission stated that exports of coke, iron ore, and steel scrap should be discouraged in the context of ensuring raw material supply for the Chinese steel industry (National Development and Reform Commission, 2005).

The USTR (2009) commented on the reason for export restrictions in a discussion of the impact of China's decision to end VAT rebates for exports of lead:

> "Sometimes the objective of these adjustments {in this case, removal of the VAT rebate} is to make larger quantities of a product available domestically at lower prices than the rest of the world. For example, China decided in 2006 to eliminate the 13% VAT rebate available on the export of refined metal lead and then, in 2007, imposed a duty of 10% on refined metal lead exports. These actions caused a steep decline in China's exports of this intermediate product and have contributed to a sharp rise in world prices, which have gone from approximately USD 1 300 per MT at the time of China's elimination of the export VAT rebate in 2006 to approximately USD 3 200 per MT in recent months. Meanwhile, Chinese domestic prices have reportedly declined because of China's captive refined metal lead production, giving China's downstream producers a substantial competitive advantage over foreign downstream producers. "

The Turkish government was equally clear in identifying the reasons for export restrictions: to support the competitiveness of domestic industries and to keep materials "at home for future usage" (Koca, 2009).

Acquisitions of assets

Another significant development affecting international trade in raw materials for steel making has been a surge of acquisitions of raw materials sources abroad. The rise of prices for raw materials evidenced world-wide since 2004, and the changes in 2010 to the global scheme for pricing iron ore, have heightened concerns about stable access to raw materials. By acquiring assets in resources, processing industries would secure supply of raw materials both in terms of price and quantity (Antkiewicz and Whalley, 2006).

Acquisitions of raw materials assets[18]

The Chinese case of asset acquisitions is unique in that public sector has bigger role compared with other countries. In some cases, investments have been made by state-owned investment funds or financed by state-owned banks (Price *et al*, 2008). In other cases, the purchaser is itself a state-owned enterprise. In 2008 Chinalco, which is state-owned, acquired with Alcoa a 12% stake in Rio Tinto plc, one of the world's largest mining companies.[19] More recently, China Investment Corp., which is also wholly state-owned, acquired a 17% stake in Teck Resources Ltd., a major Canadian producer of copper, metallurgical coal, and zinc.[20]

China's acquisitions have covered many of the major raw materials used to make steel. Since 2008, Chinese companies have purchased large stakes in various Australian iron ore prospectors and producers in particular (Price *et al*, 2008). Australia is the world's third-largest producer of iron ore, after China and Brazil. Because iron ore production in Brazil is largely dominated by a single company, Vale, the world's largest iron ore producer,[21] Australia represents the largest potential target for acquisition of iron ore assets. In early April 2010, Chinalco also acquired a 47% stake in an iron ore project in Guinea.[22]

Chinese companies are also investing heavily in other raw materials needed for steel production, such as the non-metallurgical bauxite used to produce refractories. In 2010, China's Bosai Minerals Group purchased an 80% stake in a large bauxite mine in Ghana.[23] Bosai also owns a refractory grade bauxite mine in Guyana. [24]

Asymmetry in asset acquisitions

The acquisition of raw materials assets does not in itself restrict world trade. However, broad involvement of public sectors can induce subsidy issues (Antkiewicz and Whalley, 2006). The major concern regarding acquisition of raw material assets around the world arises from the asymmetry in foreign direct investment (FDI) policy in several countries. For example, while the Chinese companies aggressively acquired sources of raw materials in other countries, China makes it difficult for foreign investors to purchase raw materials assets in China. In fact, foreign investment in prospecting for and mining of antimony, molybdenum, tungsten, and tin has been simply prohibited (Price *et al*, 2008). China has erected a number of barriers to foreign investment in and ownership of raw materials assets, including restrictions on foreigners regarding surveying and mapping activities in China (an essential activity for identifying new sources of minerals) and lack

of transparency in the bidding process for exploration and mining (China International Mining Group, 2007). Even if they are granted a license to explore for minerals, foreign investors have no guarantee that they will then be granted a license to exploit their discoveries.

The prosperity of the global steel industry depends upon the free flow of raw materials as, with the possible exception of Australia, no major steel producer is wholly self-reliant. Actions by companies and governments that deliberately restrict those flows by making raw materials available to some purchasers but not others would place many producers at a substantial competitive disadvantage. In this regard, those acquisitions can represent another obstacle to free international trade in the raw materials needed to make steel. The ability of firms to explore and exploit raw material assets around the world is vital to the continued prosperity of the global steel industry, and indeed to all industries that use internationally traded raw materials.

Individual raw materials

An examination of individual raw materials illustrates the corrosive impact that export restrictions have on the global steel trade. All three of the most important inputs in steel making — iron ore, steel scrap, and coke — are subject to export restrictions by major producing countries.

Coke

Coke represents the most striking example of the impact of export restrictions on international raw material trade and prices. China dominates the global market for coke, with nearly 47% of total coke exports in 2007. The Chinese government "has been directly controlling coke export through quotas and export tax policy (Sun and Xu, 2009)." These restrictions have had a measurable impact on coke prices in international markets.

World production and trade

Coke is produced by heating coal in a furnace. This process produces a number of harmful by-products. As a consequence, many developed economies, including the United States and the EU, have in place laws that strictly regulate coke production. China is by far the world's largest coke producer, with around 66% of world production in 2009 (Table 3.3). For environmental reasons, some countries with a large coal reserves, including the United States, produce small amounts of coke.

Table 3.3. World coke production, 2009
million MT

	Quantity	World share(%)
China	345.0	66.0
NAFTA	14.4	2.8
Asia	63.6	12.2
Europe	36.3	7.0
CIS	44.7	8.5
Other	2.4	0.4
Oceania	16.0	3.1
World	522.4	100.0

Source: Resource net, Coke production 2009.

China is also the world's largest exporter of metallurgical coke. In 2007, China exported 15.3 million MT of coke, which accounted for nearly 47% of total world coke exports (Jones, 2008).

Table 3.4. World coke exports, 2007
million MT

	Exports	World share (%)
China	15.3	47.0
European Union	8.6	26.6
CIS	4.2	12.9
Other	1.5	4.9
Japan	1.5	4.9
Colombia	1.2	3.7
World	32.3	100.0

Source: Jones (2008).

Impact of export restrictions

In recent years, China has applied both export quotas and export taxes. Although the quotas are of long standing, they really became effective only in 2004, when the amount of exports permitted was cut by 25%. In 2006, the quota was 14 MT,[25] while in 2007 it was 13.3 MT[26] The export quota for coke in 2008 was reduced by nearly 10%, to 12.0 MT[27] The quota for 2009 is 11.9 MT.[28] Currently, 40% export tax is also applied.

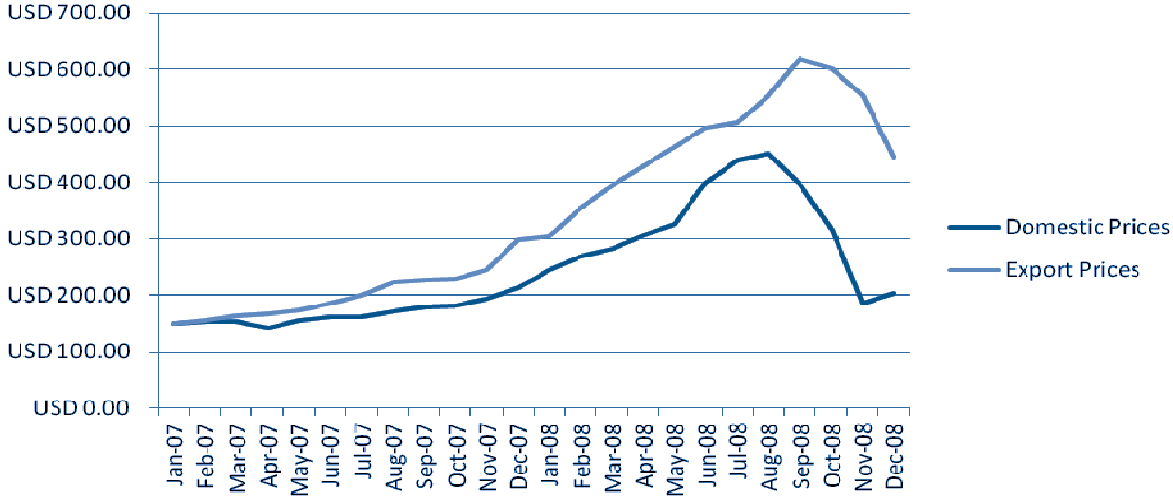
Jones (2010) indicates that Chinese exports of coke have practically ceased. In 2008, China exported 12 million MT of coke; for 2009, the total was only 0.5 million MT. The massive decline in Chinese coke exports can be explained by the export tax on coke, and not the global economic situation.

Sun and Xu (2009) indicates that because China dominates the global coke market, limitations on Chinese coke exports have had a measurable effect on world coke supply and prices:

> "The reduction of export quotas, imposition of export tax and the increase in export tax rate all pushed up bid-ask spread between prices at home and abroad, which enhanced China's coke export market power; at the same time, coke quota policy mainly restricts the market entry of medium and small-scale exporters, and benefits those large-scale coke exporters with more economic rents considering the upward trend of coke exporting quantity. So, China's trade policy adjustment also helps to raise coke export price, and to explain China's strong coke export market power. "

In November 2006, China imposed a 5% export tax on coke (along with the existing quota). In January 2007, shortly after the new tax went into place, Chinese domestic and export prices for coke were at USD 150.63/MT and USD 150.29/MT, which were almost exactly the same. Over the course of 2007 and 2008, the Chinese government increased the export tax on coke, first to 15%, then 25%, and finally 40% (Sun and Xu, 2009). By November 2008, Chinese domestic coke prices were USD 184.88/MT, while export prices were USD 554.62/MT. Figure 3.1 displays the gap between domestic and export prices following the imposition of the export tax in 2006.

Figure 3.1. Chinese coke domestic and export prices



Source: Metal expert and Global Trade Atlas.

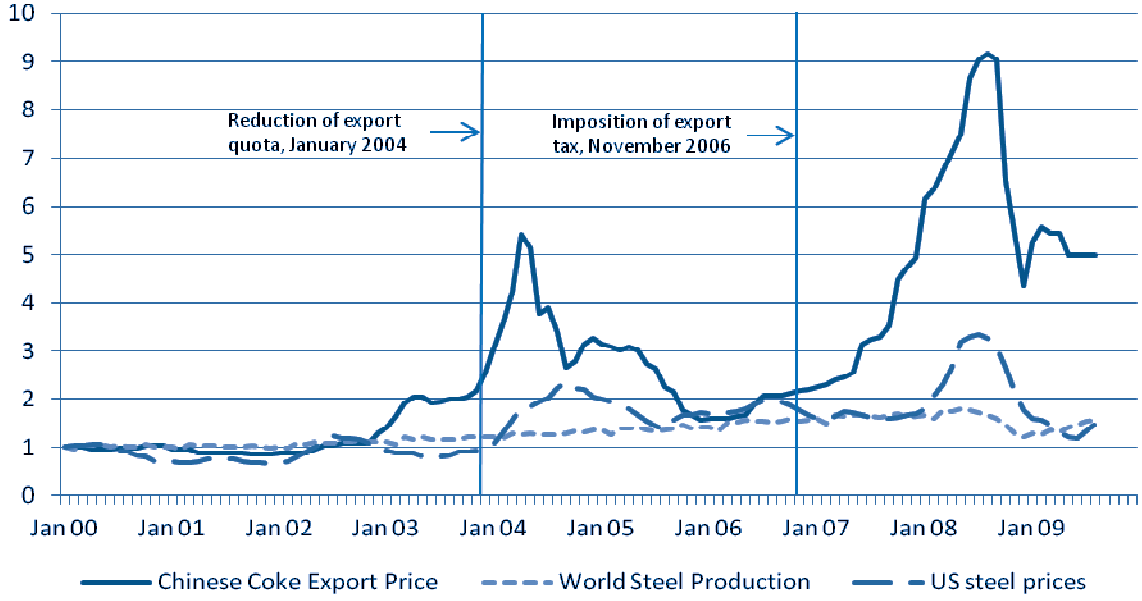
In December 2008, domestic Chinese prices for coke were USD 241/MT lower than the export price. Production of one ton of steel requires around 0.6 tons of coke (World Coal Institute, 2008). This meant that a cost advantage of nearly USD 145/MT for certain inputs was allowed to Chinese steel producers over their international competitors. MEPS, a leading source of steel industry statistics, calculated a "global composite carbon steel price" for December 2008 of USD 676/MT. Export restrictions provided domestic steel producers with a cost advantage equal to more than 20% of the world market price for carbon steel.

An examination of other factors that could conceivably affect the export price for Chinese coke confirms that export restrictions, and not these other factors, mostly explain the high levels of export prices. Two of the chief factors that should influence coke prices are demand for coke and the price of steel. Demand for coke has a self-evident effect on prices, while the price for the finished product (in this case, steel) can influence the price of the input (coke). Figure 3.2 compares world steel production (a proxy for demand for metallurgical coke) and the price for hot-rolled steel in the United States to Chinese export prices for coke.

It shows there has been little if any connection between either steel production or steel prices and export prices for Chinese coke. On the other hand, coke prices rose sharply when the export quota was lowered in January 2004, and again when export taxes were imposed in November 2006. Interestingly, in each case steel prices climbed after the increase in coke prices, indicating that coke prices were causing steel prices to rise, and not the other way around.

The restrictions on exports of coke have caused "a drying out of Chinese exports to the global markets that drives prices up and leaves non-Chinese steel producers competing for an increasingly scarce resource (Taube and Thomas, 2009)." Most of the world's steelmakers outside of China, Poland, and a handful of other countries are wholly or mostly dependent upon imported coke. Japan, the world's second-largest steel producer, produces no coke at all.

Figure 3.2. World steel production and United States steel prices
Index : 2000 = 1



Source: World Steel Association, World Trade Atlas, Purchasing magazine.

Iron ore

Iron ore is, with coke and steel scrap, one of the primary materials for steel production. Total world production of iron ore in 2009 was 2.3 billion MT (USGS, 2010). The vast majority of iron ore is ultimately used to produce steel.

World production and trade

Iron ore is widely distributed, with 15 countries producing more than 1 million MT per year. China is by far the world's largest producer, accounting for 39% of world production in 2009 by volume (USGS, 2010).[29] The next two largest producers are Australia and Brazil, both of whom export a substantial portion of their output.

Table 3.5. World iron ore production, 2009
million MT

	2009 Production	World Share (%)
China	900	39.1
Brazil	380	16.5
Australia	370	16.1
India	260	11.3
Rest of World	223	9.7
Russia	85	3.7
Ukraine	56	2.5
United States	26	1.1
World	2300	100.0

Source: USGS (2010).

While several of the largest iron ore producers, including China, the United States, Russia, India, and Brazil, are substantial steel producers, other major producers of steel lack sizable reserves. In 2008, the EU produced 198 million MT of steel, but only 26.5 million MT of iron ore (World Steel Association, 2010). Japan produced no iron ore at all, and South Korea only a very small amount (less than 1 million MT/year). As a consequence, Japan, the EU, and South Korea must import most of their iron ore requirements.

All iron ore is not created equal. Iron ores differ dramatically in iron content. Australian iron ore, for example, averages 65% iron content, and Indian ore over 64%, while Chinese ore averages only 30.4% (USGS, 2010).[30] This difference affects both the value of the iron ore and the size of reserves in terms of actual iron content. While China is by far the largest producer by weight, the iron content of its 2009 production was only modestly larger than that of Brazil or Australia. China ranks fourth in the world in size of iron content reserves, behind Russia, Australia, and Brazil (USGS, 2010).

Iron ore is widely traded. In 2007, about 52% of total iron ore production was exported (World Steel Association, 2010). While China is the world's largest iron ore producer, it exports only a very small amount of iron ore. The world's largest exporters are, in order, Brazil (269 million MT in 2007); Australia (268 million MT); India (94 million MT); and Russia (32 million MT). Many countries, including the United States and Canada, both import and export iron ore.

Several major steel producers, including the EU, Japan, and Korea, are heavily or wholly dependent on imported iron ore. Even substantial producers of iron ore, including China and the United States, import a significant portion of their iron ore needs. Table 3.6 identifies the percentage of their total iron ore consumption imported in 2008 by some of the larger steel producers as well as their steel production in that year. A number of smaller producers, including Libya, Trinidad and Tobago, Serbia, and the Philippines, are wholly dependent upon imported iron ore as well.

Table 3.6. Reliance on imported iron ore, 2008
million MT

Country	Steel production	Iron ore imported (%)
China	500.3	54.8
European Union	198.0	83.9
Japan	118.8	100.0
Korea	53.6	99.6
Turkey	26.8	65.1
Taiwan	19.9	100.0
Egypt	6.2	64.0
Argentina	5.5	100.0
Saudi Arabia	4.7	100.0
Indonesia	4.0	92.9

Iron ore consumption was derived by adding imports to production and subtracting exports. In some cases, as with the European Union, imports are greater than consumption, as some imported iron ore is re-exported.

Source: World Steel Association (2010).

Impact of export restrictions

India is the world's fourth largest producer of iron ore. India has repeatedly adjusted the level of export taxes on different types of iron ore with the aim of affecting prices and export levels. Currently, India imposes an export tax of 15% on iron ore lumps, and 5% on iron ore fines. In addition, the state-owned National Mining and Development Corp. (NMDC) has imposed quotas on exports of high grade ore. India Railways has increased freight rates for iron ore bound for export by 50%. These measures were implemented in response to a recent rise in Indian exports of iron ore, and consequent complaints by Indian steel producers of increases in costs.

At least one other major iron ore producer has indicated that it may follow India's lead. Brazil's Energy and Mining minister recently stated that "{i}t makes no sense to export iron ore to China and then buy Chinese steel plates."[31] The Minister stated specifically that Brazil is considering imposing an export tax on iron ore to encourage the consumption of iron ore in Brazil. This raises the possibility of a ripple effect throughout the world, as other iron ore producers follow India's lead and impose new restrictions on iron ore exports.

Steel scrap

Unlike coke and iron ore, steel scrap is produced in practically every country in the world. Like them, though, it is subject to an array of export restrictions. Indeed, in the recent past as many as 20 countries applied some type of limit to exports of scrap, ranging from taxes to outright bans on exports.

World production and trade

In 2008, the world produced around 441 million MT of steel scrap (World Steel Association, 2009). The main sources of scrap steel include recycled automobiles, appliances, and steel from construction. Not surprisingly, scrap supply is largely a function of economic development, with the most developed countries having the largest supply.

The vast majority of steel scrap is used to make new steel. Therefore, scrap consumption is to some extent a function of steel production in general. Scrap is used primarily in electric arc furnaces, although ore-based production consumes substantial quantities of scrap as well. For this reason, regions where a high percentage of steel is made in electric arc furnaces, such as the North American Free Trade Agreement (NAFTA) countries, will consume a large amount of scrap relative to their total steel production.

Table 3.7 shows that the world experienced a scrap deficit in 2008, with consumption exceeding supply by a significant margin. That consumption exceeded supply indicates that existing inventories of scrap were drawn down slightly. The regions with the greatest export potential for scrap are the NAFTA countries and the Commonwealth of Independent States (CIS) countries. Two regions experienced substantial scrap shortfalls — Asia (especially China), and "Other Europe," primarily Turkey, which relies heavily on scrap-based steel production.

World trade in steel scrap in 2008 was around 101 million MT. Because supply of scrap is so dispersed, many countries both export and import substantial quantities of scrap. The EU, for example, is the largest exporter of scrap, yet it imports nearly as much, so that its scrap balance of trade is rather small.

In terms of balance of trade in scrap, the largest net exporters were the United States, Russia, and Japan. The largest net importers of scrap in 2008 were Turkey, South Korea, and Taiwan. One measure of dependence on scrap imports is the ratio of net scrap imports to total steel production. By this measure, countries that can be considered extremely dependent upon scrap imports include Belarus and Turkey (with scrap imports equalling more than 50% of steel production), as well as Egypt, Thailand, and Malaysia (with scrap imports equalling more than 30% of steel production).

Table 3.7. World scrap supply and consumption, 2008
million MT

Region	Supply	Consumption	Difference
Asia	154.5	175.4	-20.9
European Union	106.2	111.3	-5.1
NAFTA	92.5	81.6	10.9
CIS	50.2	50.7	-0.5
Latin America	14.8	14.8	0.0
Other Europe	9.8	26.8	-17.0
Other World	13.5	12.7	0.8
World	441.5	473.3	-31.8

The difference reflects the region's surplus or deficit in scrap for the year, i.e. the amount available for exports (if positive) or the amount to be imported (if negative).

Source : World Steel Association (2009).

Table 3.8. World trade in scrap, 2008
thousand MT

Region	Exports	Imports	Balance
European Union	39 972	40 279	-307
Commonwealth Independent States	8 390	2 556	5 834
NAFTA	26 296	6 702	19 594
Other Latin America	2 131	332	1 799
Africa	4 170	2 657	1 513
Middle East	2 396	147	2 249
Asia	11 032	31 456	-20 424
Oceania	2 034	7	2 027
Other Europe	4 888	18 769	-13 881
World	101 309	102 905	-1 596

Source: World Steel Association (2010).

The impact of export restrictions

It is difficult to isolate the impact of any single country's actions because so many countries impose so many different types of restrictions on scrap exports. In total, world scrap exports in 2008 were 7.5% higher than in 2004, while steel production increased by 24% over the same period (World Steel Association, 2010).

An examination of scrap export patterns from individual countries confirms that export restrictions have affected trade patterns in scrap. Table 3.9 shows scrap exports by

three major exporters (the United States, Canada, and the EU) who do not have export restrictions, and three exporters (Russia, Ukraine, and Kazakhstan) who do.

Table 3.9. Scrap exports of selected countries
thousand MT

	2004	2008	Change (%)
Canada	2 965	4 080	37.6
United States	11 899	21 710	82.5
EU	38 603	12 880	-66.6
Russia	12 836	5 130	-60.0
Kazakhstan	1 978	1 800	-9.0
Ukraine	2 451	636	-74.1
World	94 281	101 309	7.5

Source: World Steel Association (2010).

Between 2004 and 2008 exports from all three of the producers who restrict scrap exports fell by large amounts, with exports from Russia (the world's third largest scrap exporter) declining by nearly 60%, and those from Ukraine by nearly 74%. Over the same period, scrap exports from the United States and Canada increased significantly. This phenomenon highlights an important external effect of export restrictions. While the measures initially restrict world supply of a commodity, they do not necessarily reduce demand. Higher prices in world markets stimulate new exports from other countries that do not apply restrictions. This in turn lowers domestic supply and increases prices in the countries that export additional amounts of the material, imposing additional costs on the consumers of the commodity in the country. In this case, export restrictions of Russia, Ukraine and Kazakhstan caused lower prices for scrap in those countries, while raising prices for United States and Canadian scrap consumers.

The impact of export restrictions on scrap can be also clearly identified in case of Turkey, which is heavily dependent upon imported scrap from Russia and Ukraine for steel production. Since 2004, Turkish imports of scrap from Ukraine have declined by 10%, and imports from Russia by 44%, reflecting at least in part the effect of those countries' restrictions on scrap exports. Over the same period, scrap imports into Turkey from the United States rose by 647%, as Turkish steel producers substituted United States for Russian and Ukrainian scrap, contributing in part to a substantial rise in United States scrap prices.

Conclusion

A healthy world steel industry and a world economy depend on the free trade in raw materials. Currently, trade in these raw materials is not free, with major producers imposing a variety of restrictions on exports. These restrictions drive up global prices, increase price volatility, and give domestic processors in the countries with export restrictions an advantage in international competition. In this way, export restrictions distort not only the world markets for these raw materials, but the broader world markets for steel and for products made from steel.

Recently, questions have arisen on whether export restrictions are consistent with international trade rules. In fact, the United States, Mexico, and the EU have asked the WTO to determine whether some of China's restrictions violate WTO rules. The

international rules are generally lacking regarding export duties, one of the most common forms of export restrictions. Disciplines of export restrictions are an appropriate subject for future negotiations.

Justifications for restrictions on exports of raw materials include resource conservation, environmental protection, and fiscal revenue. Export restrictions are an inefficient and ineffective means of achieving the first two, however, unless they are combined with restrictions on production or domestic consumption as well. In several cases, export restrictions rather aim to ensure a source of low-cost supply of raw materials for domestic consumers.

Faced with high prices of raw materials and instability on supply of such materials, many steel companies, including those of emerging economies, have undertaken efforts to acquire raw materials assets abroad. The main concern on this movement arises from the asymmetry of FDI policy in several countries which maintain barriers toward inward FDI in raw materials sector.

The impact of restrictions on exports of raw materials can be seen with respect to the three chief raw materials for steel making: coke, iron ore, and steel scrap. Coke price data has shown that the export restrictions as applied by China have led to a significant differential between the domestic price and the price available to foreign companies. Furthermore, although changes in world coke prices have not significantly been associated with changes in either steel production or steel prices, the changes that have occurred are a direct reflection of export restrictions. In case of iron ore, export restrictions applied by India, the world's fourth-largest producer of iron ore can intrigue similar measures from other exporting countries. Steel scrap is subject to the most export restrictions. Limits on scrap exports imposed by Russia and Ukraine have resulted in lower exports from the countries, while exports from countries such as the United States and Canada, which do not limit exports, have increased significantly.

Notes

1. Alan Price is a partner with Wiley Rein LLP in Washington, DC, and is head of the firm's international trade practice. Scott Nance is a special counsel to Wiley Rein LLP.

2. US steel production in 2009 was 36% below that in 2008. Over the past decade, the United States has consistently been the world's third-largest steel producer

3. In making this calculation, all members of the OECD and of the European Union have been treated as "developed."

4. For a good overview of the production of iron from iron ore, *see* American Iron and Steel Institute, *How a Blast Furnace Works*, available at http://www.steel.org.

5. "TIMELINE – India's iron ore export tax tweaks since 2008," Reuters (29 April 2010)

6. R. Roy and A. Mukherjee, "India Ups Export Tax, Rail Freight Charge on Iron Ore," *India Business News* (30 April 30 2010).

7. MOFCOM Export Quota No. 90, 2007; Measures for the Administration of Export Commodities Quotas, issued by the MOFCOM on 20 December 2001

8. *Chinese Second Export Quota for Rare Metals*, 27 July 2008, available at http://metalsplace.com/news/articles/21670/chinese-second-export-quota-for-rare-metals/.

9. Measures for the Invitation for Export Commodity Quotas Bidding, issued by the MOFCOM on 20 December 2001; The Supplementary Measures on Industrial Product Export Quota Bidding

10. A. Shanker, "India's Ore Exports May Fall on Waning China Demand, Higher Tax," *Bloomberg* (30 April 2010).

11. "India Ups Export Tax, Rail Freight Charge on Iron Ore."

12. Russia is not subject to these disciplines because it is not a member of the WTO.

13. *China – Measures Related to the Exportation of Various Raw Materials*, Request for Consultations by the United States, WT/DS394/1 at 4 (25 June 25 2009); *China – Measures Related to the Exportation of Various Raw Materials*, Request for Consultations by the European Communities, WT/DS395/1 at 4 (25 June 25 2009); *China – Measures Related to the Exportation of Various Raw Materials*, Request for Consultations by Mexico, WT/DS398/1 at 4 (26 August 2009). The United States, the European Union, and Mexico have filed requests for dispute resolution with the WTO regarding China's exports restrictions of certain raw materials. The requests are directed at China's measures on coke, fluorspar, manganese, and zinc, among others. The United States and the European Union claim that these restrictions violate China's commitments under the GATT (including Articles VIII, X and XI) and its protocol of accession to the WTO. The dispute resolution process began in 2009 and

these proceedings could have a decisive impact upon the use of export restraints by WTO members.

14. See *Measures for the Administration of Licenses for the Export of Goods* issued by the Ministry of Commerce of the People's Republic of China, 10 December 2004.

15. M. Pearson and J. Riseborough, "Mining Tax 'Contagion' Set to Spread from Australia (Update 3)," Bloomberg.com (20 May 2010).

16. "Mining Tax 'Contagion' Set to Spread from Australia (Update 3)."

17. "India May Ban Iron-Ore Exports; Proposes Windfall Tax.", *Bloomberg*, 19 May 2010, *http://www.bloomberg.com/news/2010-05-19/india-may-ban-iron-ore-exports-to-increase-supplies-proposes-windfall-tax.html*

18. China's spree of raw materials acquisitions is not limited to the raw materials for steel. Lithium, for example, is essential to the production of lithium ion batteries, which are used for a wide variety of electronics, and potentially in electric cars as well. China is the world's third-largest producer of lithium, and holds the world's fourth-largest reserves (USGS, 2010). Nonetheless, China is actively pursuing lithium assets elsewhere, especially in Bolivia, which has the world's largest lithium reserves.

19. E. Onstad and L. Hornby, "Chinalco and Alcoa buy stake in Rio Tinto," *The New York Times* (1 February 2008).

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23. "Bosai closes Ghana bauxite buy," *Industrial Minerals* (4 February 2010).

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25. MOFCOM *Export Quota* No. 77, 2005.

26. MOFCOM *Export Quota* No. 190, 2006.

27. "China coke export quota keeps stable," *China Mining* (16 July, 2008).

28. "MOFCOM announces second batch of coke export quotas for 2009," *Highbeam Research* (20 June 2009).

29. The production totals for China are somewhat overstated, as they are reported in terms of crude ore, rather than usable ore, which is the measure for all other countries.

30. Average iron content is obtained by dividing iron content reserves by crude ore reserves.

31. "Brazil May Tax Iron Ore Exports, Seeks More Steel Plants," *Bloomberg Businessweek* (9 February 2010).

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Chapter 4

Export Restrictions on Strategic Raw Materials and Their Impact on Trade and Global Supply

Jane Korinek and Jeonghoi Kim[1]

This chapter examines how export restrictions impact on trade and the global supply of selected strategic metals and minerals. The metals and minerals examined are of particular interest for a number of reasons: they are generally geographically concentrated in a few countries, many are used in the production of high-technology goods in strategic sectors, and there are few substitutes for these raw materials given the present state of technology. Case studies of export restrictions concerning three raw materials — molybdenum, chromite and rare earths — shed some light on the potential global effects of export restrictions on strategic raw materials.

This chapter seeks to shed light on the presence and impact of export restrictions on selected metals and minerals. Export restrictions usually take the form of quantitative restrictions or taxes imposed by the exporting country. In general, export restrictions are not notified to any international body and there is therefore no comprehensive list of such measures that one can refer to. Nor are such restrictions *per se* included in WTO disciplines, although Article XI of the GATT does stipulate there is a general prohibition on quantitative restrictions.[2] A notable exception, however, exists for reasons that relate to the "conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption" (Article XX, GATT).

The strategic metals and minerals selected for this study have a number of shared characteristics. First, the exploitable mineral reserves are generally found in one or a few geographical regions of the world implying that their potential mining and export are concentrated in a few countries. This in turn leads to a dependence on such imports by countries that consume these materials or the finished goods produced from them. It also suggests that producing countries may control the prices and quantities of the raw materials made available on world markets. Second, the strategic minerals and metals covered in this study are generally used as inputs into high-technology or strategic sectors; many are used in the development of environmental technologies. Third, there are few substitutes available in the short-term for these raw materials. Although generally used in small quantities, they are often essential for the development of technologically sophisticated products.

The raw materials covered in this analysis do not necessarily satisfy all of the above criteria, but can be viewed as representative of materials which share several common characteristics. Due to the specific nature of these characteristics, export restrictions on these raw materials result in economic impacts which can be distinguished from those of other products.

Many of the strategic metals and minerals are inputs into products in fast-changing markets. Technological change often brings sharp changes in demand, which, in turn, may lead to strong price volatility. An example is the tantalum capacitor industry. Two-thirds of world tantalum production is used in electronic components. When the tantalum price increased sharply in the late 1990s, the electronics industry encouraged capacitor designers to improve their niobium capacitors and multiple ceramics capacitors in order to replace the tantalum components. The demand for tantalum, and its price, fell sharply as a result.

The global economic crisis has weakened demand for many strategic metals and minerals since mid-2008. In the case of some metals and minerals examined here, however, the fall came earlier – in late 2007 or early 2008. This was due to some over-buying by China, in particular, and over-optimistic forecasts of growth more generally by raw materials producers and consumers.

This chapter takes a medium-term view. In many OECD countries, the geological structures are well known. Prospecting activity continues, however, in some OECD countries, one example being Canada.[3] There are new mining possibilities in some areas where past prospecting has been patchy, for example, Mongolia. Since the time span between prospecting and actual extraction of minerals can sometimes be measured in decades, some industry investments are necessarily long-term. Known reserves of the minerals examined here are included in this report, but in principle these may change in the longer term.

In some cases export restrictions may be introduced in the pursuit of macro-economic objectives. For example, fiscal revenues or broad development objectives may underlie export restrictions in specific sectors. Although the general economic context in which export restrictions are introduced is important, it is beyond the scope of this paper which focuses on the specific sectoral and product impacts of export-restricting policies.

This chapter begins by outlining the specific nature of the selected minerals and metals examined here: their uses, and where production and reserves are found. The presence of export restrictions on these products is then examined. Three case studies of the impact of export restrictions in different raw materials — molybdenum, chromium and rare earths — shed some light on potential global effects on producers and consumers of the raw materials and their downstream products. A concluding section offers general insights and questions the use of export restrictions from efficiency and a policy perspective.

Uses of selected metals and minerals

The metals and minerals under study here are generally used as inputs in high-technology or strategic sectors (Table 4.1). Although often needed in only small quantities, these metals are increasingly essential to the development of technologically sophisticated products. They play a critical role in the development of innovative "environmental technologies" to boost energy efficiency and reduce greenhouse gas emissions. Hydrogen fuel based cars, for example, require platinum-based catalysts; electric-hybrid cars need lithium batteries; rhenium super alloys are an indispensible input for modern aircraft production. The European Commission has stated that the EU will not accomplish the shift towards sustainable production and environmentally friendly products without such metals (EC, 2008).

Many of the metals under study here are also used in sectors such as semi-conductors. The semi-conductor industry is dominated by Chinese Taipei, South Korea, the United States, and Japan. The role of this industry is that of a technology enabler: the semiconductor industry is widely recognized as a key driver for economic growth throughout the electronics value chain. The semiconductor market represented USD 213 billion in 2004 and the industry was an enabling factor in the generation of USD 1 200 billion in electronic systems business and USD 5 000 billion in services, representing close to 10% of world GDP that year. The semi-conductor industry is also a high-growth industry, experiencing 13% growth on average per annum over the last 20 years.[4]

Many of the metals studied here are also combined with steel to create alloys with particular properties, withstanding friction or heat for example, and are therefore necessary inputs in the automotive and airplane industries. All countries with major automobile or aircraft industries (e.g. Brazil, China, European Union, India, Japan, Korea, United States) are users of some of the strategic metals examined here.

Lithium is a strategic raw material that has become an important component in hybrid vehicles. Lithium compounds are used in batteries, especially rechargeable batteries. Several major automobile companies are pursuing the development of lithium batteries for hybrid electric vehicles — vehicles with an internal combustion engine and a battery-powered electric motor. Demand for rechargeable lithium batteries has also continued to grow for use in cordless tools, portable computers and telephones, and video cameras. Non-rechargeable lithium batteries are used in calculators, cameras, computers, electronic games, watches, and other devices.

Table 4.1. Main uses of strategic metals and minerals

Antimony	Batteries; antifriction alloys; medicines, antiprotozoan drugs, small arms, buckshot, and tracer ammunition; matches.
Chromium	Jet engines and gas turbines; cookware and cutlery; magnetic tape used in high performance audio tape; high temperature refractory applications, like blast furnaces, cement kilns.
Cobalt	Used in surgical instruments and hard metals for cutting tools and drills used in metal-working and mining industries; prosthetic parts such as hip and knee replacements ; batteries ; adhesion of the steel to rubber in steel-belted radial tires.
Copper	Piping, electrical applications, construction industry and household uses.
Gallium	Semiconductor use is now the primary industrial market for gallium, but new uses in alloys and fuel cells continue to be discovered.
Germanium	Semiconductor material used in transistors and various other electronic devices. Its major end uses are fiber-optic systems and infrared optics, but it is also used for polymerization catalysts, in electronics and in solar electric applications.
Indium	Liquid crystal displays (LCD) for televisions. Used for the manufacture of thin film solar cells. Used in light-emitting diodes (LEDs) and Laser Diodes (LDs).
Lithium	Electric and hybrid car batteries.
Manganese	Standard and alkaline disposable dry cells and batteries ; stainless steels ; aluminium alloys (e.g. beverage cans)
Molybdenum	Missile and aircraft parts; valuable catalyst in petroleum refining; filament material in electrical applications alloying agent for ultra-high strength steels.
Nickel	Many industrial and consumer products, including stainless steel, magnets, coinage, rechargeable batteries and special alloys.
Platinum, palladium	Jewelry, laboratory equipment, resistant thermometers, dentistry, catalytic converters; many electronics including computers, mobile phones, multi-layer ceramic capacitors, component plating, low voltage electrical contacts, and SED/OLED/LCD televisions; fuel cells
Rare Earths[1]	Automobiles, including hybrid vehicles, air conditioners, wind power generators, fluorescent lights, plasma screens, portable computers, hand-held electronic devices.
Rhenium[2]	Jet engine parts, platinum-rhenium catalysts, which are primarily used in making lead-free, high-octane gasoline.
Silicon	Power transistors ; the development of integrated circuits such as computer chips as well as in construction industry as a principal constituent of natural stone, glass, concrete and cement.
Silver	Jewelry, high-value tableware, utensils, and currency coins, electrical contacts and conductors, mirrors and in catalysis of chemical reactions. Its compounds are used in photographic film.
Tantalum	Electronic components, mainly capacitors and some high-power resistors ; tools for metalworking equipment and in the production of superalloys for jet engine components, chemical process equipment, nuclear reactors, and missile parts.
Titanium	Strong lightweight alloys for aerospace (jet engines, missiles, and spacecraft), military, industrial process (chemicals and petro-chemicals, desalination plants, pulp, and paper), automotive, agri-food, medical prostheses, orthopedic implants, dental and endodontic instruments and files, dental implants, sporting goods, jewelry, mobile phones, and other applications.
Tungsten	Light bulb filaments, television tubes, X-ray tubes (as both the filament and target), superalloys, and hard metals for cutting tools and drills used in metal-working and mining industries.
Vanadium	High speed tool steels used in surgical instruments and tools.

1. Rare earth elements or rare earth metals are a collection of 17 chemical elements in the periodic table, namely scandium, yttrium, and the fifteen lanthanoids.
2. Obtained as a by-product of molybdenum and copper refinement.

Main producers and reserves of strategic metals and minerals

Many of the strategic metals and minerals used in such industries as electronics, alternative energies, energy storage and conservation, specialised tool making and the automotive and aircraft industries are produced in a small number of countries. For most of these strategic raw materials, the top three producing countries account for over half of world production (Table 4.2). For some raw materials, close to the entire world production takes place in the top three mining regions. This is the case for rare earths, where 99.7% of world production occurs in the top three producing countries, and for vanadium (98%), antimony (95%), platinum (93%), and gallium and germanium, where all of world production occurs in two or three countries. Notable exceptions in the metallic minerals covered by this project are silver (where 44% of world production occurs in the top three producing countries) and nickel (47%).

In some cases, production is so concentrated that over half of world production occurs in a single country. This is the case for China as regards rare earths, antimony, tungsten, indium, silicon, gallium and germanium, South Africa as regards platinum and Australia as regards tantalum.

Table 4.2. Top three producing countries for selected metallic minerals

Metal	First	%	Second	%	Third	%	Cumulative %
Gallium[2]	China	83,00%	Japan	17,00%			100,00%
Germanium[1]	China	79,00%	United States	14,00%	Russia	7,00%	100,00%
Rare Earths	China	96,99%	India	2,18%	Brazil	0,53%	99,69%
Vanadium	South Africa	38,33%	China	33,33%	Russia	26,67%	98,33%
Antimony[2]	China	91,19%	Bolivia	2,13%	South Africa	1,82%	95,14%
Platinum	South Africa	76,61%	Russia	12,52%	Canada	3,61%	92,74%
Palladium	Russia	42,80%	South Africa	38,91%	Canada	6,08%	87,79%
Tungsten[2]	China	75,09%	Russia	5,86%	Canada	4,76%	85,71%
Tantalum	Australia	53,37%	Brazil	22,09%	Rwanda	9,45%	84,91%
Lithium[2]	Chile	43,86%	Australia	25,22%	China	12,79%	81,87%
Molybdenum	United States	28,97%	China	28,21%	Chile	21,23%	78,41%
Indium	China	58,10%	Japan	10,56%	Korea	8,80%	77,46%
Chromium[2]	South Africa	44,65%	Kazakhstan	17,21%	India	15,35%	77,21%
Rhenium	Chile	48,68%	Kazakhstan	14,11%	United States	13,58%	76,37%
Silicon	China	57,85%	Russia	11,22%	Brazil	4,73%	73,81%
Cobalt	Congo	44,57%	Canada	11,56%	Zambia	10,86%	66,99%
Manganese	South Africa	21,66%	China	20,22%	Australia	15,88%	57,76%
Titanium	Australia	22,17%	South Africa	19,34%	Canada	15,97%	57,48%
Copper	Chile	35,62%	United States	8,33%	Peru	7,76%	51,72%
Nickel	Russia	17,47%	Canada	15,82%	Indonesia	13,35%	46,64%
Silver	Peru	17,23%	Mexico	14,36%	China	12,45%	44,04%

1. *Source*: World Mining Data (2008).
2. US production data withheld from world total by USGS to “avoid disclosing proprietary data”.

Source: USGS (2009).

Although production of some strategic metallic minerals is very concentrated, this does not necessarily suggest that future production will be similarly geographically restrained. In order to determine future production possibilities, the reserve base must be examined. The reserve base includes all known deposits of the metallic minerals, whether or not they are actually mined, including deposits that are not economically viable given present technologies, prices and production strategies.

The future production situation is mixed. For some strategic metallic minerals, the reserve base is more geographically concentrated than the present production. For others, the raw materials are more widely dispersed (Table 4.3). In the case of some of the most concentrated raw materials under examination, particularly those largely found in China, such as rare earths, vanadium and antimony, the future reserves are less concentrated than present production would suggest. For others, however, such as platinum group metals and manganese, the largest quantities of which are found in South Africa, the concentration of reserves is significantly higher than that of present production.

In some cases, the country with the most important reserves is not presently among the top producers. This is the case for lithium in Bolivia, titanium in the United States, and silver in Poland. In these cases, mining may not be economically viable given present prices and technologies, or sufficient investments have not been undertaken to exploit the natural resources or get them efficiently to market.

Table 4.3. Reserve base of strategic metallic minerals

Metal	First		Second		Third		Cumulative %
Chromium	Kazakhstan	48,11%	South Africa	40,09%	India	11,76%	99,96%
Platinum***	South Africa	87,68%	Russia	8,27%	United States	2,51%	98,46%
Tantalum	Brazil	50,00%	Australia	46,67%	Canada	1,67%	98,33%
Manganese	South Africa	78,66%	Ukraine	10,23%	Australia	3,15%	92,04%
Vanadium	China	36,84%	South Africa	31,58%	Russia	18,42%	86,84%
Molybdenum	China	43,57%	United States	28,35%	Chile	13,12%	85,04%
Rhenium	United States	44,20%	Chile	24,56%	Canada	14,73%	83,50%
Lithium	Bolivia	47,26%	Chile	26,25%	China	9,63%	83,14%
Tungsten	China	66,96%	Canada	7,81%	Russia	6,70%	81,47%
Rare Earths	China	57,71%	CIS	13,62%	United States	9,10%	80,43%
Antimony	China	55,68%	Thailand	10,44%	Russia	8,58%	74,70%
Indium*	China	62,34%	Peru	3,62%	Canada	3,49%	69,45%
Cobalt	Congo	36,13%	Australia	13,84%	Cuba	13,84%	63,81%
Silver	Poland	24,60%	China	21,09%	United States	14,06%	59,75%
Titanium**	United States	29,90%	China	17,04%	Germany	8,33%	55,27%
Copper	Chile	36,04%	Peru	12,01%	United States	7,01%	55,06%
Nickel	Australia	19,34%	Cuba	15,34%	Canada	10,00%	44,68%

Reserves data omitted for Germanium, as USGS reserves data for Germanium available only for United States reserves.
Data for gallium reserves also omitted due to unavailability. According to USGS, "Most gallium is produced as a byproduct of treating bauxite, and the remainder is produced from zinc-processing residues. Only part of the gallium present in bauxite and zinc ores is recoverable, and the factors controlling the recovery are proprietary. Therefore, an estimate of current reserves that is comparable to the definition of reserves of other minerals cannot be made. The world bauxite reserve base is so large that much of it will not be mined for many decades; hence, most of the gallium in the bauxite reserve base cannot be considered to be available in the short term." (USGS, 2009).
Silicon reserves estimates unavailable, as "the reserve base in most major producing countries is ample in relation to demand. Quantitative estimates are not available." (USGS, 2009).
1. Source: USGS (2008)
2. Titanium ilmenite.
3. Platinum data consists of data concerning platinum metals group: platinum, palladium, rhodium, ruthenium, iridium, osmium.

Source: USGS (2009).

Presence of export restrictions

There is no formal mechanism, such as within the WTO, for reporting export restrictions and export taxes in the international domain. Export restrictions and taxes are therefore made known by a variety of ways and differ by country. One of the aims of this study is to gather as much information as possible on the export restrictions that are applied on the metals and minerals examined here. Some of this information has been gathered from different national geological services. Other sources include reports in the specialized industry press and on specialized websites, the few articles that have been written on this issue, statements by importing countries, data from private firms, and a survey of known export restrictions by OECD members and selected non-members. The information included here regarding the presence of export restrictions on the 21 metals and minerals covered by this study can therefore only be considered as indicative.

Export restrictions come in a variety of forms. They include quantitative export restrictions (quotas), export taxes, duties and charges and mandatory minimum export prices. In so far as they can affect export volumes, the reduction of VAT rebates as well as stringent export licensing requirements may also be considered forms of export restrictions. One of the most used forms of export restrictions is export taxes or duties. Export taxes can take the form of an *ad valorem* tax, specified as a percentage of the value of the product, or as a specific tax specified as a specific amount to be paid per unit or per weight of a given product. Export quotas are restrictions or ceilings imposed by an exporting country on the total volume of specified products. Export licensing requirements regulate which exporters can effectively sell their products abroad. In the case where licensing requirements are particularly stringent, procedures are complex or costly, or the number of exporters accorded licenses is small, license requirements may affect the volume of exports. Another less obvious form of export restriction is the reduction of VAT rebates. If, in a given country, exporters receive a full rebate on VAT for their traded products, with the exception of some targeted products, the volume of exports of those products may be affected. Producers may choose to supply more products to domestic markets and export products that are further downstream (or upstream) in the production chain so as not to be penalized for exporting non-rebated products.

Export restrictions of all kinds exist among major exporters of the 21 metals and minerals under study. Appendix Table 4.1 lists all known export restrictions applied to the products examined here. Quantitative restrictions can be found on 13 of the 21 metals and minerals in at least one exporting country in at least one year since the late 1990s. Export taxes ranging from 3% to 30% are levied on some of the 21 metals and minerals. Some export taxes are combined tax rates, which imply an *ad valorem* rate, with a maximum or minimum rate per unit or unit of weight of the exported good. Tungsten waste and scrap exported from Ukraine, for example, is subjected to a tax of 30% but not less than 10 /kg.

In some cases, non-automatic export licensing is used. Although non-automatic export licensing is not a restriction in itself, if the licenses are granted in a stringent or non-transparent fashion, export volumes may be affected. There are many types of legislation other than export taxes and restrictions that significantly impact the mining industry. These may include licensing for mining, prospecting and exploration, production quotas and taxes, and the complex issue of mining rights. A case in point is the mining of the platinum group metals in South Africa which is not subject to export restrictions and taxes, but is regulated through other mechanisms (Box 4.1).

Box 4.1. Other legislation that regulates the mining industry: the case of the platinum mining industry in South Africa

At present, the platinum mining industry in South Africa falls under three key pieces of legislation: the Mineral and Petroleum Resources Development Act 2002 (and subsequent Mineral and Petroleum Resources Development Amendment Bill, 2007), the Mineral and Petroleum Royalty Bill 2008, and the Precious Metals Act 2005.

The Mineral and Petroleum Resources Development Act encompasses the Mining Charter. This sets out the rules governing the application for, and issue or transfer of mining rights in South Africa. It includes statutory provisions for Black Economic Empowerment and the increased participation of historically disadvantaged South Africans in the mining industry.

The Mineral and Petroleum Royalty Bill (final draft released in June 2008) introduces royalties on platinum group metals production as well as other commodities. The royalty rate that applies to a particular company is calculated using a formula based on earnings before interest and tax. The royalties were due to be applied from 1 May 2009 but have been postponed until 1 March 2010. The effective rate on refined platinum is likely to be around 2.7%.

The Precious Metals Act makes a number of stipulations about the development, local beneficiation (smelting, refining, etc.) and sale of precious metals. Permits are required to refine and export precious metals. The written approval of the relevant Minister is required for the export of any unwrought or semi-fabricated precious metal.

So whilst there are no specific export duties or quantitative restrictions imposed on exports of platinum group metals from South Africa, there are a number of legislative provisions that might be viewed as restrictions on exports. Any impact on trade flows is indirect and therefore difficult to ascertain.

Source: South African Department of Minerals and Energy; South African Chamber of Mines, www.bullion.org.za.

A large number of quantitative export restrictions or high export taxes exist in some countries on "waste and scrap" of the selected metals examined in this paper. This may be partly due to the difficulties in verifying the purity of the contents or their origin. An industry specialist indicated that there have been cases in which exports of some metals that have been declared "waste and scrap" are actually closer to a purity that could be classified as powder or unwrought metal, for the purposes of avoiding import duties or due to licensing issues. A government official of one country which imposes export restrictions and taxes on waste and scrap indicated that it was due to difficulties in determining the origin of the materials: "it is to avoid individuals pulling up railroad ties" and other articles made from the metals.[5]

Policy objectives of export restrictions

Export restrictions are used by policymakers to respond to a number of social, economic and political objectives. These include objectives such as environmental protection and promotion of downstream industries, revenue maximization, and preservation of reserves for future use. Export restrictions are therefore sometimes in place in sectors where global reserves are sufficient to respond to demand but reserves in the specific country applying the measure are not.

Environmental protection is among the most frequently cited policy objective of export restrictions. The mining or processing procedures can be either highly energy consuming or polluting. In some cases, export taxes on relevant products are applied to make it less profitable to maintain mining or processing facilities, and thereby aim to reduce production.

Another consideration for policymakers implementing export restrictions is the promotion of downstream processing industries. This can occur when foreign demand raises the price of raw materials, which may be too high for the domestic downstream industry. Policymakers may also resort to using export restrictions in the case when processed products generate a higher value-added than raw materials used for those products.

Impact of export restrictions on selected strategic minerals, metals and their products

Export restrictions and taxes exist on a number of products in a number of countries (Appendix Table A4.1). A few of these have been selected for more detailed review to ascertain whether or not the presence of export restrictions has impacted trade and production levels and, if so, in what ways. In this section, the impact of export restrictions in molybdenum and rare earths in China will be examined, as well as the impact of those on chromium in India.

Molybdenum

According to available information, China placed an export tax of 10% on molybdenum concentrates and oxides and ferromolybdenum and a 15% tax on molybdenum powder, unwrought molybdenum and scrap on 1 January 2007. This tax was raised to 20% on exports of ferromolybdenum in 2008. In mid-2007, an export licensing system was implemented raising the level of criteria for potential exporters of molybdenum and its products. On 1 July 2007, the VAT rebate was rescinded on molybdenum hydroxides and reduced to 5% on more processed molybdenum products. In 2007, an export quota was also placed on molybdenum and its level was further reduced in 2008.

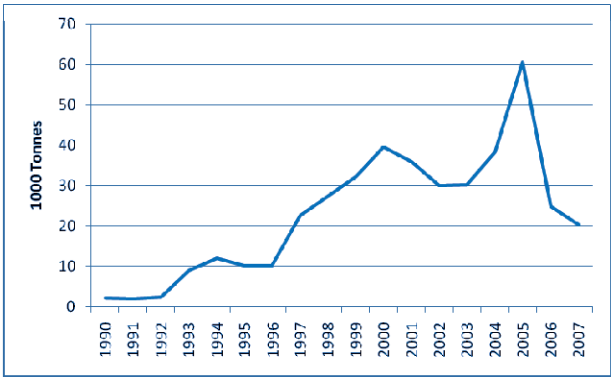
The rationale given by the Chinese government for the imposition of the export restrictions measure was for environmental reasons (residue from the mining industry, for example, and excessive use of energy to process products of the extractive industries) and for reasons of preservation of natural resources. China holds 44% of known worldwide reserves of molybdenum and is responsible for 28% of its production.

The recent export restrictions were implemented by the Chinese government in a different context than in the past. In 2000, the European Union suggested that Chinese suppliers of ferromolybdenum were involved in dumping practices and imposed an anti-dumping duty on imports of ferromolybdenum from China. (Molybdenum is not mined in the EU, but there is a processing industry). Chinese authorities responded in August 2001 by enforcing an export limit of 8 861 tonnes of ferromolybdenum to the European Union in order to relieve the impact of dumping duties.

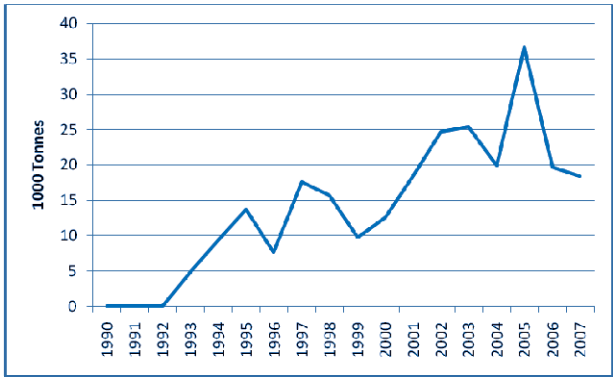
Exports of ferromolybdenum by China fell in 2002 and stagnated in 2003 after an almost continuous climb from 1990 to2000 (Figure 4.1). This may have been due in part to the “voluntary” export restraint policy put into place by China *vis-à-vis* the European Union.

Figures 4.1 — 4.4. Exports of molybdenum and products, China

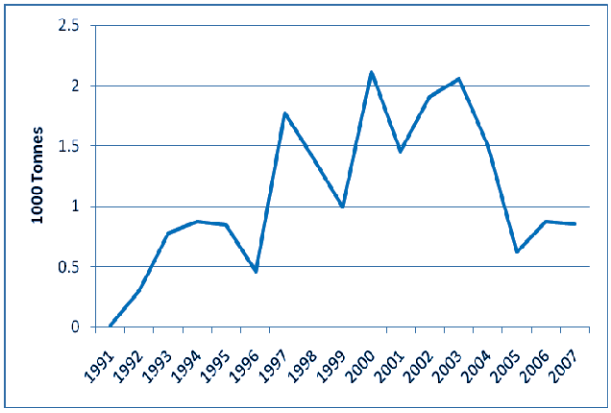
4.1. Ferro-molybdenum



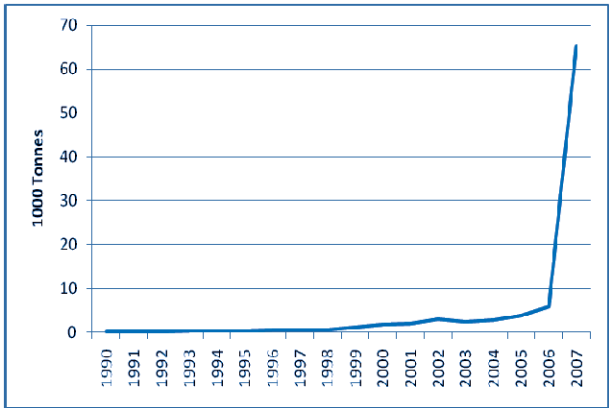
4.2. Molybdenum ores and concentrates



4.3. Molybdenum oxides



4.4. Molybdenum articles

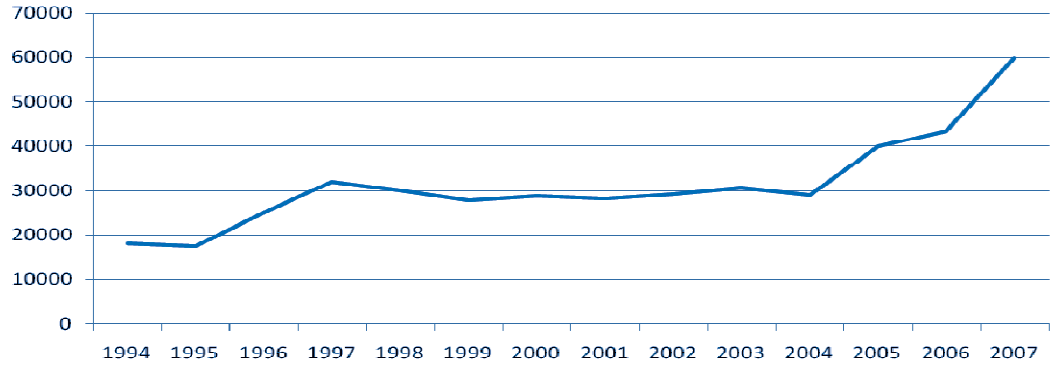


Source: UN Comtrade.

There is little evidence, however, that the export taxes and quotas on molybdenum and its products put into place in 2007 and 2008 have had a significant effect on exports. Exports of molybdenum ores and concentrates, oxides and ferro-molybdenum were falling in 2005 and 2006, *i.e.* prior to the implementation of export restrictions and taxes (Figures 4.1-4.3). On the other hand, exports of molybdenum articles, that have undergone further processing, increased sharply (by 120%) in 2007 despite the restrictions placed on them that year (Figure 4.4). Restrictions included a 15% export tax, a reduction in VAT rebate to 5%, and an export licensing system.

There is no evidence either that the export restrictions implemented in 2007 had the desired effect on production. In order to fulfil the stated policy objectives of environmental stability and preservation of natural resources, the export restrictions would have had to have resulted in a decrease in the production of molybdenum in China. This has not been the case as the production of molybdenum has risen continually since 2004 by approximately 30% per year (Figure 4.5). It is clear, therefore, that the measures introduced did not achieve their *stated* objectives.

Figure 4.5. Molybdenum Production, China



Source: USGS.

Chromium

The main producing countries of chromite ore and chromite concentrates are South Africa, India and Kazakhstan, representing 70% of 2008 world production as a whole (Table 4.4). According to USGS Mineral Commodity Summaries (2009), about 95% of the world's chromite reserves are in Kazakhstan and South Africa.

Table 4.4. Chromite production and reserves

Country	Mine production		Reserves	Reserve base[1]
	2007	2008		
South Africa	8 720 330	9 267 848	77 000 000	150 000 000
India	3 320 000	3 900 000	21 000 000	44 000 000
Kazakhstan	3 687 200	3 629 000	6 100 000	180 000 000
World total	22 154 309	24 003 004	NA	NA

1. Reserve base means that part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources). USGS Mineral Commodity Summaries (2009) Appendix C: A Resource/Reserve Classification for Minerals.
Source: ICDA Statistical Bulletin 2009 edition (2009), USGS Mineral Commodity Summaries (2009).

Over 90% of the world's chromite production is converted into ferrochrome for metallurgical applications (Table 4.5). Most ferrochrome is used to produce stainless steel. Reflecting this industrial structure, chromite ore mines tend to be owned and operated by ferrochromium producers[6].

Around 30% of the chromite produced is consumed outside the producing countries, and China is by far the biggest importer. In 2008, it imported more than 6.8 million metric tonnes of chromite, or 70% of world imports that totalled around 9.6 million metric tonnes (Table 4.6). This is partially due to the fact that compared with its minor production of chromite, China is a major producer of ferrochromium. Although China's share of world chromite production was around 1% (220 000 tonnes) in 2008, that same year its ferrochromium production share was 19%, or 1 505 800 tons (Table 4.7).

Table 4.5. Chromite ore and concentrates production by end use sectors
Metric tonnes

End Uses	2006	2007	2008
Metallurgical	17 722 856	20 755 861	22 684 810
Refractory	189 423	179 729	166 050
Chemical	671 856	530 642	485 577
Foundry sands	657 036	688 077	666 567
Total	19 241 171	22 154 309	24 003 004

Source: ICDA Statistical Bulletin 2009 edition (2009).

Table 4.6. Chromite imports by country
Metric tonnes

Country	2006	2007	2008
China	4 324 746	6 090 840	6 848 668
Russia	898 230	989 405	1 112 028
Sweden	315 000	350 000	337 933
World Total	6 437 106	8 561 252	9 673 335

Source: ICDA Statistical Bulletin 2009 edition (2009).

Table 4.7. Production by country: Chromite and Ferrochromium 2008
Metric tonnes

Country	Chromite ore and concentrates	Ferrochromium
South Africa	9 267 848	3 300 985
India	3 900 000	750 000
Kazakhstan	3 629 000	1 027 387
Turkey	1 885 712	75.840
China	220 000	1 505 800
Total	24 003 004	7 906 553

Source: ICDA *Statistical Bulletin 2009* edition (2009).

In March 2007, India imposed an export tax of INR 2 000/tonne on chromite in order to provide a greater supply of this mineral to the domestic market. Although demand for chromite has increased in India, higher demand from foreign countries, especially China, made it more attractive to export the products than to supply the domestic market. The downstream industry in India producing ferrochrome had difficulty paying the high price of chromite. The export tax was raised to INR 3 000/tonne in April 2008. India is a major country regarding production and export of chromite. In 2006, India was the second largest exporter and represented 22.5% of world export of chromite ore with exports of 1 432 740 tonnes.

Table 4.8 shows how this measure actually reduced the amount of exports from India. Inferred from import data of the International Chromium Development Association (ICDA) *Statistical Bulletin* 2009, India's export of chromite decreased from 1 432 740 tonnes in 2006 to 550 532 tonnes in 2008. Most of it was exported to China.

Reduced exports to China combined with increased demand of chromite for ferrochrome production led to an increase in import prices in China. The unit value of Chinese imports of chromite increased from 171.10 USD/ton in 2006 to 396.84 USD/ton in 2008 (Table 4.9).

Table 4.8. India's exports of chromite
Metric tonnes

Destination	2006	2007	2008
China	1 339 597	984 159	550 532
World	1 432 740	1 104 756	630 413

Source: ICDA *Statistical Bulletin 2009* edition (2009).

Table 4.9. China's import of chromite

	Quantity (1 000 tonnes)	Change (%)	Value (million USD)	Change (%)	Unit price (USD/tonne)	Change (%)
2004	2 170	21.8	381 310	152.8	175.71	
2005	3 020	39.6	595 569	56.2	197.21	12
2006	4 320	42.9	739 174	24.2	171.10	-13.9
2007	6 090	41.0	1 549 656	109.6	254.46	48.7
2008	6 840	12.3	2 714.382	75.4	396.84	55.9

Source: Chinese General Administration of Customs.

Reduced exports to China had the effect of diverting its source of imports from India to other countries. Imports from India decreased by 59% from 1 339 597 tonnes in 2006 to 550 532 tonnes in 2008. To make up for this decrease in imports, China increased imports from other countries. The most striking example is South Africa, with imports from that country increasing by 200% from 868 427 tonnes in 2006 to 2 603 517 tonnes in 2008 (Table 4.10).

This increase in cromite exports to China created concern in South Africa on the long-term profitability of its own downstream industry, which is in part a result of the fact that South Africa and China are competing in the downstream industry of ferrochromium (Table 4.11). This concern led South Africa to consider introducing export restrictions on chromite. In 2007, the Deputy President Phumzile Mlambo-Ngcuka indicated the government was planning new legislation to prevent South African chromite producers from exporting chromite. This reflected the fact that the processed product was more valuable than chromite, and the concern that South Africa was losing the value-added benefits as well as employment opportunities in the downstream industry by exporting raw chromite.

Application of the export tax did not significantly change the level of production of chromite in India. Regarding both chromite and ferrochromium, production data does not show a consistent decrease between 2006 and 2008. This, combined with reduced exports as shown in Table 4.12, indicates that the export tax in this case only raised the share of domestic consumption at the expense of exports while not significantly changing total production in India.

Table 4.10. China's source of imports of chromite
Metric tonnes

	2006	2007	2008
India	1 339 597	984 159	550 532
South Africa	868 427	1 964 284	2 603 517
Kazakhstan	144 214	198 083	203 934
Turkey	740 875	1 082 913	1 179 782
World	4 324 746	6 090 840	6 848 668

Source: ICDA Statistical Bulletin 2009 edition (2009).

Table 4.11. Production of downstream products: South Africa and China
Metric tonnes

	South Africa		China	
	Ferrochromium	Stainless steel	Ferrochromium	Stainless steel
2005	2 581 578	564 900	854 000	3 350 000
2006	2 893 400	689 700	1 042 500	5 363 000
2007	3 626 871	657 100	1 296 000	7 610 000
2008	3 300 985	528 500	1 505 800	7 344 000

Source: ICDA Statistical Bulletin 2009 edition (2009).

Table 4.12. Production of relevant products in India
Metric tonnes

	2005	2006	2007	2008
Chromite	3 255 162	3 600 400	3 200 000	3 900 000
Ferrochromium	611 373	634 200	820 000	750 000

Source: ICDA Statistical Bulletin 2009 edition (2009).

Export restrictions resulted in diverting China's imports from India to other countries, especially South Africa. This increase of imports from South Africa almost led to the application of similar export restrictions by the government of South Africa. This example indicates that export restrictions in one country can induce similar measures in other exporting countries. The intended effect of the Indian export tax may have been to reduce exports of chromite by raising its export price compared with other countries. However, if South Africa had applied an export tax, it would have offset the impact of the Indian measure by reducing the price gap between products of India and South Africa. Furthermore, such measure, by further reducing international supply, would have led to an even higher international price of chromite. In that case, India would have had to raise the export tax rates further to achieve the policy objective as originally intended. In this sense, the effectiveness of export restrictions depends on how other exporting countries respond to such measures.

Rare earths[7]

Despite their name, rare earths are neither rare nor earths. The term "rare earths" refers to a series of 17 chemically similar metals, consisting of the 15 elements known as the lanthanides, plus yttrium and scandium. These rare earth metals and oxides are of particular interest here due to their unique chemical, magnetic and fluorescent properties.[8]

Rare earths are a critical constituent of many high technology goods that are essential inputs to the manufacture of items such as hybrid vehicles, mobile telephones, computers, televisions and energy efficient lights. Although rare earths have a relatively high unit value, the impact of their cost has little, if any, impact on the selling price of the final item because they are present in minute concentrations.

The rare earths market represented approximately USD 1.25 billion in 2008. Over the past decade, market growth has been in the range of 8-11% per year, with the exception of the correction in 2001/02 due to the fall in technology markets and the current global economic crisis. While the current global financial and economic crisis is expected to reduce consumption in 2009, it is anticipated that industry growth will return to 8-11% in late 2010 (Kingsnorth, 2009).

There are limited commercially viable rare earth resources and reserves. The largest proportion of these reserves lie in China (27 million tonnes) and are equivalent to about 30% of the world's reserves, while the US accounts for another 13 million tonnes, Australia 5 million tonnes and India 2.3 million tonnes. China supplies approximately 95% of global demand and consumes about 60% of the global supply, but its reserves of rare earths are finite. The Chinese government has indicated that if the exploitation of these resources is not controlled, they could be exhausted in 20-30 years.

Current production of rare earths in India and Russia is limited by the low quality and a lack of industry structure that would support their expansion. Currently, there is only one green field rare earths project outside China that has all the necessary environmental and commercial approvals in place and which are under construction: the Mt. Weld Project based in Australia (mining and beneficiation) and Malaysia (processing and separation of the rare earths). The Australian Foreign Investment Review Board placed "unacceptable conditions" on funding from the China Non Ferrous Metal Corporation, as a result of which required funds were raised through equity issues.

There are significant barriers to enter the rare earths market as a new producer:

- Process technology is specific to each ore body.
- High capital cost: typically more than USD 30 000 per tonne of annual separated capacity.
- Marketing is customer specific — rare earths are not traded on any recognised exchange.
- Limited operational expertise outside China.
- Industry is dominated by China where input costs are low.

A major ongoing issue for the rare earths industry is balance. Due to the incongruity between the supply and demand of individual rare earths, there always exists a situation in which there is a shortfall of some rare earths while others are in surplus. On the basis of known analyses of major resources it is considered that some of the 'heavy' rare earths are more likely to be in short supply in the future.

The Chinese government has stated that its reserves of rare earths are finite and, therefore, they will be developed for the prime benefit of China's manufacturing industry. As a result, a series of measures has been implemented to "conserve resources and to maximise the benefits" of its rare earths endowment.[9] To help generate manufacturing jobs and move up the value chain, China has adopted policies that encourage downstream

industries that produce goods with higher value added to locate in China. The following measures have been put into place, indicating that China's rare earth resources are a priority for its domestic manufacturing industries.

- Export quotas.
- Export taxes.
- Withdrawal of the VAT refund on exports.
- Production quotas.
- Foreign investment in rare earth resources/mines is prohibited.

Chinese rare earth export quotas

The rare earth export quotas for the second half of 2009 amount to a 12% annual reduction in the quota compared to 2008. The size of this reduction is greater than in previous years (Table 4.13). It should be noted however that due to the global economic crisis the total Chinese rare earth export quotas for 2009 are likely to be less than total non-Chinese demand.

Table 4.13. Chinese rare earth export quotas

Year	Export quotas	Per cent change year on year	Estimated non-Chinese demand
2004	65 609		57 000
2005	65 609	0	46 000
2006	61 821	-6	50 000
2007	59 643	-4	50 000
2008	47 449		50 000
	56 939[1]	*-5.5*[1]	
2009	50 145	-12	35 000

1. Adjusted for 12-month allocation for comparative purposes.
Source: IMCOA.

Export taxes on rare earth exports from China

In late 2006, the Chinese government introduced a tax on rare earth exports of 10%, which was increased to 15% on selected rare earths in 2007. Effective from 1 January 2008, export taxes were raised to the following levels (Appendix Table 4A.1):

- Europium, terbium, dysprosium, yttrium as oxides, carbonates or chlorides – 25%
- All other rare earth oxides, carbonates and chlorides – 15%
- Neodymium metal – 15%
- All other rare earth metals– 25%
- Ferro rare earth alloys – 20%.

Refund of VAT on rare earth exports from China

In 2007, China withdrew the refund of VAT (16%) on exports of unimproved rare earths, while the refund on higher value-added exports such as magnets and phosphors remains in place. The effect of this decision, combined with the export tax regime above,

is that non-Chinese rare earth processors such as cerium polishing powder producers and rare earth magnet producers pay 31% more for rare earth raw materials (plus transport and storage costs) than their Chinese counterparts.

Impact of export restrictions

Rare earths export taxes and withdrawal of the VAT refund may have an effect on world prices of some rare earths. However, these materials are used in such small quantities that such policies are expected to have a limited impact on the prices of final goods. Quotas on exports from China have not had a visible effect on the volume of export of most rare earths as they have been higher than the estimated non-Chinese demand through 2009. As demand grows, however, and if quotas are made more restrictive in the way they have been in the last few years, supply constraints will exist among non-Chinese downstream producers of high technology goods using rare earths as one of their components. It is suspected that supply constraints will be greatest in heavy or "yttric" rare earths.

For the owners and financiers of non-Chinese rare earths projects, the major risk is that China will reduce its export taxes and abolish its export quotas that impact the rare earth prices outside China. World prices are now typically 20-40% higher than Chinese domestic prices. A sharp fall in world prices due to changes in Chinese policies may make investments in the rare earths industry outside China non-competitive. The profitability of these investments is already threatened due to high capital costs, strong competition from China where environmental controls are less onerous, specialized processing techniques, and the necessity for customer-specific marketing.

Conclusion

Several policy objectives motivate export restrictions of strategic raw materials. Conservation of natural resources is one of them. Export restrictions are also applied to achieve social objectives, such as protection of the environment. Unlike promotion of downstream industries, these objectives can be understood as a response to market imperfections. The question remains, however, whether export restrictions are the most effective tool to achieve these objectives. Since export restrictions have a direct impact on export volumes, in principle, the effectiveness of such measures depends on whether a reduction in exports actually leads to a decrease in production. In this regard, regulation on production itself rather than on trade is one alternative option to achieve these social objectives.[10] Possible future work in this area could include establishing a hierarchy of policy measures with a view to better understanding which ones most efficiently achieve the policy objectives.

Specific characteristics of strategic raw materials provide cases with interesting impacts of export restrictions. The concentration of production in a few countries, combined with the fact that there are few substitutes for several materials, result in a higher dependence on imports of these materials for non-producing countries.

To be effective in achieving objectives such as the conservation of natural resources and protection of the environment, export restrictions should affect production levels. The government applying the restrictions expects that, by reducing export volume, they will reduce the volume of production. However, this connection is not guaranteed, as shown in the molybdenum case where more production was sold domestically.

For conservation and environmental protection purposes, regulation on production itself rather than on trade is another option. Pollution emissions from a certain production process are the same whether the products are consumed domestically or in a foreign market. Indeed, many environmental tax schemes applied by several countries focus on taxation at the production level.

Export restrictions imposed by one country can produce similar measures from other exporting countries by diverting the source of imports. This is more important for strategic raw materials because a few major producing countries are responsible for most of the world exports. In this sense, the interdependence among these countries impacts the effectiveness of these measures in achieving policy objectives. This was seen in the case of chromium where export restrictions placed by India impacted policies in another producing country, South Africa.

The potential imposition of export restrictions creates more risk for end-use producers as well as producers of the raw materials, as seen in the rare earths case. Although the export quotas in place have not significantly limited export or production so far, the possibility that access to these strategic raw materials will be restricted in the future incurs an additional risk factor for downstream producers that import rare earths. Potential producers of rare earths incur the risk that export restrictions will subsequently be lifted, thereby decreasing world prices to levels that make their production facilities unprofitable. Greater uncertainty in future prices due to potential changes in supply caused by export restrictions may therefore contribute to lower investment in production facilities worldwide. This is particularly problematic in mining industries where investments in new production facilities are necessarily long-term.

The impact of export restrictions on some strategic metals and minerals are exacerbated because in many cases the producing countries have a quasi-monopoly on supply. Since some of these metals and minerals are essential in the production of some high-technology products, and are not easily replaceable in the medium term, industry participants in some importing countries are concerned about future access at sustainable prices.

Notes

1. OECD Trade and Agriculture Directorate.

2. "… no prohibitions of restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licences or other measures, shall be instituted or maintained by any contracting party on the importation … or on the exportation or sale or export of any product destined for the territory of any other contracting party" (Article XI, GATT 1994).

3. "If there are known deposits in an area, it is best to look next door" for further potential reserves, indicated one mining industry specialist.

4. See SEMI, the global industry association serving the manufacturing supply chains for the microelectronic, display and photovoltaic industries (*www.semi.org*).

5. Official presentation of the Russian Government at the OECD Workshop on Raw Materials, October 2009.

6. See *USGS 2006 Minerals Yearbook: Chromium*.

7. This section is taken from material graciously provided by Dudley Kingsnorth of Industrial Minerals Company of Australia Pty Ltd (IMCOA).

8. Rare earths are normally expressed in terms of rare earth oxides (REO) and often classified into three groups: light, medium and heavy. The light or "ceric" elements are: lanthanum, cerium, praseodymium and neodymium; medium elements are promethium, samarium, europium and gadolinium and the heavy or "yttric" elements are: terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium. Scandium is also part of the rare earths group.

9. The commitment to developing the rare earths resources in China primarily for the benefit of the domestic manufacturing industries has been reaffirmed recently through a Draft Development Plan (2009-14) for the Rare Earths Industry issued by the Ministry of Industry and Information Technology.

10 For example, Chile responded to resource depletion by applying a mining tax on the income of mine operators instead of relying on export restrictions. See summary report of the OECD Raw Materials workshop (TAD/TC/WP(2009)34/FINAL) for examples of alternative policies to export restrictions to achieve policy objectives.

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ANNEX 4.A1.

Known Export Restrictions on Strategic Metals and Minerals

Mineral	Country	Date	Product	Restriction	Tax
Antimony	China	2008		Export quota: 59 000T	
	China	2008	Ore/concentrate		10%
	China	2008	Unwroght antimony		5%
	Russia	2008	Waste and scrap		6.50%
	Tanzania		Scrap	Export ban	
Cobalt	Argentina		Cobalt waste and scrap; semi-processed products; articles of cobalt		5%
	Russia		Scrap		30% but not less than 1200EUR/tonne
	Tanzania		Scrap	Export ban	
	Ukraine		Cobalt waste and scrap; semi-processed products; articles of cobalt		27%
Copper	Ukraine		Unrefined copper, copper waste and scrap		30% (but not less than 1euro per kg)
	Argentina		Copper ore and concentrates		10%
	Russia	2008	Copper cathode		10%
	Russia	2008	Refined copper and copper alloys		10%
	Russia		Unrefined copper		10%
	Russia		Copper waster and scrap		50%
	China	2008	Ores and concentrate		10%
	Kazakhstan		Refine copper and alloys		30% (but not less than EUR 330 per ton)
	Tanzania		Copper scrap	Export ban	

Mineral	Country	Date	Product	Restriction	Tax
Chromium	Ukraine	2008			30% (but not less than EUR 0.4 per kg)
	India	Apr-08	Ore		INR 3 000/t
	China	2005	Ferrochromium		5%
	China	2008	Chrome ores and concentrate		15%
	China	2008	Unwroght chromium		15%
	China	Jun-05	Chromium scrap		15%
	Tanzania		chromium scrap	Export ban	
Gallium	Russia				6.5%
Germanium	China	2008	Oxide		5%
	China	2007			
	Russia		Waste and scrap		6.5%
Indium	China	2008 (Jun-07?)		Export quota: 240T	
	China				15%
	Russia				6.5%
	Tanzania			Export ban	
Manganese	China	2008			39%
	China	2008	Ores and concentrate		15%
	Gabon	Since 2001			3%
	Ghana	Since 2001			6%
	India	2006	Ore and dioxide		Rs 20 per tonne (ore), 20% (dioxide)
	Russia		Waste and scrap		6.5%
	Tanzania		Scrap	Export ban	

Mineral	Country	Date	Product	Restriction	Tax
Molybdenum	China	2008	Molybdenum	Export quota: 26 300T	
Molybdenum	China	(June?) 2007	Molybdenum	Export quota: 35 700T	
Molybdenum	China	1 Jan 2008	Ferromolybdenum		20%
Molybdenum	China	1 Jan 2007	Molybdenum concentrates and oxides and ferromolybdenum		10%
Molybdenum	China	1 Jan 2007	Molybdenum powder, unwrought molybdenum and scrap		15%
Molybdenum	China	1 Jul 2007	Molybdenum hydroxides and salts and ammonium molybdates	VAT rebate cancelled	
Molybdenum	China	1 Jul 2007	Molybdenum wire and other molybdenum products	VAT rebate reduced to 5%	
Molybdenum	China	Jun 2007		Export licensing system implemented granting export licenses to selected producers who meet certain criteria.	
Molybdenum	China	8 Aug 2001- 28 Feb 2002	Ferromolybdenum	Export limit of 8861T to the EU following dumping duties imposed by the EU in 2000.	
Molybdenum	Russia		Molybdenum ores and concentrates; waste and scrap		6.50%

Mineral	Country	Date	Product	Restriction	Tax
Nickel	Russia	2008	Waste and scrap		30%
	Russia	2008	Nickel matters and non-alloyed nickel		5%
	Ukraine	2008			30% (but not less than EUR 0.4/kg)
	Ukraine	2008			30% (but not less than EUR 5.5/kg)
	China	2008	Ores and concentrate		15%
	Tanzania		Scrap	Export ban	
Palladium	Russia				6.5%
Platinum	Russia				6.5%
Rare Earths	China	1999		Rare earth export quotas introduced to increase world prices (rare earths prices increased by USD120 in 2000 as compared to 1999)	
Rare Earths	China	2004		Export quota: 65 609T	
Rare Earths	China	2005		Export quota: 65 609T	
Rare Earths	China	May 2005		Export VAT rebate cancelled	
Rare Earths	China	Late 2006			10%
Rare Earths	China	2006		Export quota: 61 821T	
Rare Earths	China	2007		Export quota: 59 643T	
Rare Earths	China	2008	Europium, terbium, dysprosium, yttrium as oxides, carbonates or chlorides; rare earth metals (except neodymium)		25%

Mineral	Country	Date	Product	Restriction	Tax
Rare Earths	China	2008	All other rare earth oxides, carbonates and chlorides; neodymium metal		15%
Rare Earths	China	2008	Ferro rare earth alloys		20%
Rare Earths	China	2008		Export quota: 56,939T	
Rare Earths	China	2009		Export quota: 50,145T	
Rhenium	Russia				6.5%
Silicon	China	2008		Export quota: 216,000T	
	China				5-15%
	China	2008	Silicon metal		10%
Silver	China	2008		Export quota: 48,000T	
	China	2008	Ores and concentrate		10%
Tantalum	Russia		Waste and scrap		6.5%
	Tanzania		Scrap	Export ban	
Titanium	China	July 2007	Titanium white	VAT rebate increased from 0% to 13%.	
Titanium	Russia		Titanium scrap	30% but not less than USD 1091/ton	
	Russia		Unwrought titanium; powders, ingots, slabs and other products		6.5%
Tungsten	China	2008	Tungsten and tungsten products (metal content),	Export quota: 14,600T	
Tungsten	China	2007	Tungsten and tungsten products (metal content),	Export quota: 15,400T	

Mineral	Country	Date	Product	Restriction	Tax
Tungsten	China	2007	Ammonium paratungstate, tungsten carbide, tungsten trioxide, and unwrought tungsten metal and powder		5%
Tungsten	China	2006	Tungsten and tungsten products (metal content),	Export quota: 15,800T	
Tungsten	China	1 November 2006	Ferro-tungsten		10%
Tungsten	China	1 November 2006	Tungsten scrap		15%
Tungsten	China	1 January 2006	Tungsten and tungsten products	VAT rebate reduced to 5%.	
Tungsten	China	1 May 2005	Tungsten and tungsten products	VAT rebate reduced to 8%.	
Tungsten	China	2005	Tungsten and tungsten products (metal content),	Export quota: 16,300T	
Tungsten	China	2004	Tungsten and tungsten products (metal content),	Export quota: 16,300T	
Tungsten	China	2004	Tungsten products with the exception of tungsten powder and concentrates and scrap	Export VAT rebate reduced to 5%.	
Tungsten	China	2004	Tungsten concentrates and scrap	Export VAT rebate cancelled.	
Tungsten	China	2003	Tungsten and tungsten products (metal content),	Export quota: 16,300T	
Tungsten	China	2002	Tungsten and tungsten products (metal content),	Export quota: 16,300T	
Tungsten	China	2000		Export quotas assigned to approved traders who meet export guidelines.	

Mineral	Country	Date	Product	Restriction	Tax
Tungsten	Russia	December, 2002			0%
Tungsten	Russia	Through end 2002			6.5%
	Tanzania		Scrap	Export ban	
Tungsten	Ukraine	May 16, 2008, date of WTO accession	Tungsten waste and scrap		30% but not less than EUR 10/kg
Tungsten	Ukraine	Prior to 16 May 2008	Tungsten waste and scrap	Export ban	
Vanadium	Russia				6.5%

Sources: Industrial Minerals Company of Australia Pty Ltd. (IMCOA), International Chromium Development Association (ICDA) *Statistical Bulletin* 2009, Metal Pages *http://www.metal-pages.com/*, Price *et al. (*2008), USGS Minerals Yearbook, and responses from various country questionnaires.

Chapter 5

The Economic Impact of Export Restraints on Russian Natural Gas and Raw Timber

David G. Tarr[1]

Export restraints by the Russian Federation (Russia) on natural gas and timber have created concerns in European importing countries. The analysis in this chapter focuses on development perspective of export restrictions in that the restrictions are applied to improve the exporter's terms of trade. The analysis focuses on Russian policies concerning natural gas and timber, which share the dual effect of decreasing domestic prices while increasing export prices.

Export restraints by the Russian Federation (Russia) on natural gas and timber have been a source of controversy between the European Union (EU) and Russia. This issue was raised by EU as part of the World Trade Organisation (WTO) accession negotiations of the Russia, and although the dispute concerning natural gas has been reported to be resolved, as of May 2010, the dispute on raw timber was still unresolved. As such, it remains as one of the few issues blocking Russian WTO accession.

Domestic prices for natural gas and timber are lower than export prices, although the causes and economic consequences are different for the industries tied to these two raw materials. In the case of natural gas, Russia grants an export monopoly to Gazprom, allowing it to charge profit-maximizing prices on its exports, with a 30% export duty applied since 2004. The domestic price of natural gas, however, is regulated by the Russian government, resulting in dual pricing of natural gas, where export prices have far exceeded domestic prices in Russia. In the case of raw timber, as of 1 April 2008, Russia imposed export taxes on raw timber of about 25%, and planned to increase them to about 80% in 2009 but has so far delayed the implementation of the higher export taxes. The export taxes raise export prices of timber while reducing domestic prices by diverting some supply to domestic market.

This paper shows that Russia possesses market power on the exports of both natural gas and raw timber. This implies that from the perspective of the economic welfare of Russia, some export restraint by Russia is optimal in both natural gas and raw timber. Further analysis of the economic impacts suggests that while domestic price regulation restrains the monopoly power of Gazprom in Russia, export restraints are designed to exploit its market power. In raw timber, although export taxes aim to diversify the economy by developing processing industries, the optimal export tax to maximize welfare is about 12%. The conclusion is that the contemplated raw timber export tax of 80% vastly exceeds the optimum level to exploit the monopoly power of Russia; export taxes above 12% are counterproductive to Russian welfare.

Natural gas

During the accession negotiations to enter the WTO, the question arose whether Russia should charge the same price for the exports of its natural gas as charged on the domestic market. This issue was highly controversial in Russia and a major issue in the bilateral market access negotiations between EU and Russia. The analysis of Tarr and Thomson (2004) shows that from Russia's perspective, there is a strong rationale for discriminatory pricing between gas sold domestically and that which is exported. The economic analysis suggests that pipelines allow Gazprom to segment the Russian market from the European (including Turkey) market, and that Russia has market power in the European market. It is in Russia's interest to exploit that market power on export markets by charging a price above its long run marginal costs (LRMC) and this is made possible by providing Gazprom exclusive export rights.

Russia's domestic natural gas market would be better served by competition. But while Gazprom retains a near monopoly, the analysis suggests that the Russian government may have a policy rationale to regulate domestic prices of natural gas so that gas producers recover the full LRMC, but not more. These conclusions imply that maintaining higher export prices than domestic prices of natural gas would serve Russia's interests. There have been a number of significant changes in the Russian gas market since Tarr and Thomson (2004), with the most important changes analysed below.

Significant changes in the Russian domestic market situation suggest that the recommendation to increase competition within the Russian gas market is even more important today than it was in the early 2000s.

Russia is endowed with significant natural gas resources. Proved reserves at the end of 2008 were 43.3 trillion cubic meters, which constitute 23.4% of the world's proven reserves.[2] Its 2008 production of 602 billion cubic meters (BCM) constituted 19.6% of world production. Its reserves to production ratio in 2008 of 72 years, is higher than any other significant producer except Saudi Arabia. Russia is also by far the world's largest exporter of natural gas. In 2008, Gazprom exported about 154 BCM to Europe (including Turkey).

Optimal export prices

Given the need to ship natural gas from Russia to Europe through a pipeline, Russia is able to "segment" the European market from the Russian market. In 2008, Russia had a market share of approximately 28% of natural gas sales in Europe. In the same year, Europe, including Turkey, consumed about 547 BCM of natural gas, while importing 154 BCM from Russia.[3] This relatively large market share implies that changes in Russian supplies have an impact on prices, in other words, that Gazprom has market power on the European market. The Russian government has given Gazprom exclusive right to use the pipelines for the export of natural gas to Europe.[4] In this situation, it is optimal for Gazprom to price above long run marginal cost.

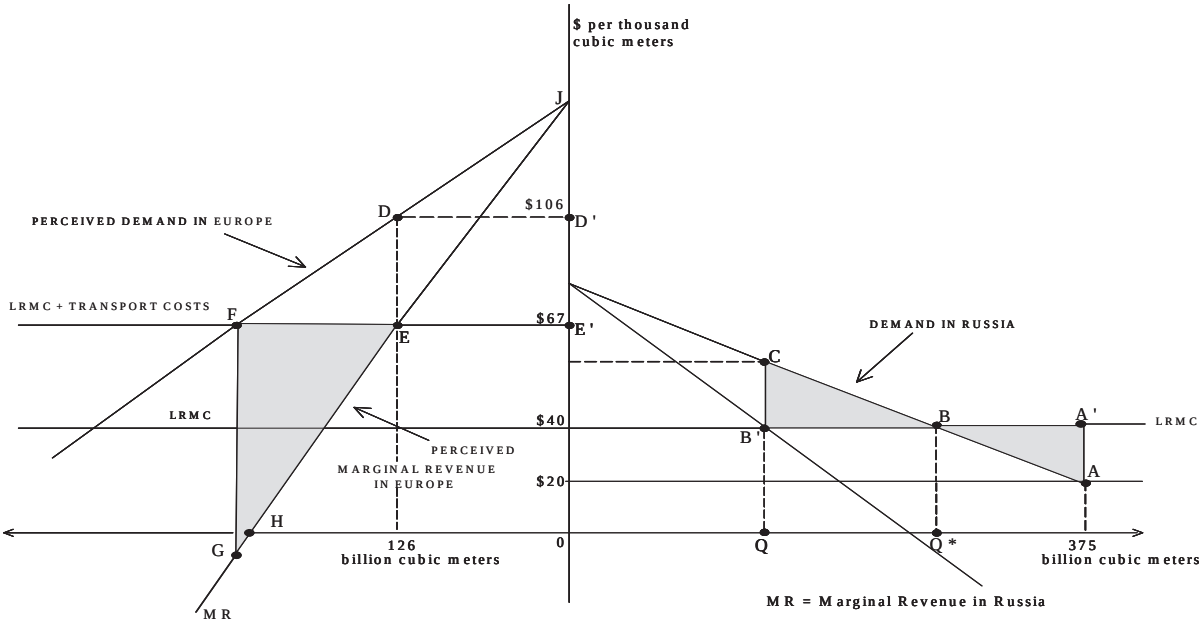
Given the significant role it plays in supplying the European market, Gazprom can influence prices on the European market.[5] The extent of this market power, however, is tempered by the existence of competing sources of gas. In addition, Gazprom wants to benefit from being perceived as a reliable supplier that can be trusted to continue to deliver gas (potentially in increasing quantities) at a fair price to European markets.[6] In the long run, Gazprom faces risks that new competitors will erode its market share and those risks are greater the higher its mark-up over marginal costs.[7] Volumes for the next several years are constrained by transportation facilities and long-term contracts. This limitation, of course, can be overcome and new entrants are likely to emerge. However, the longer-term constraint is the demand of export markets. Russia's proven reserves are sufficient to support a doubling, or even tripling, of its production capacity. In order to absorb this volume of gas, markets in Europe would have to increase dramatically.

The key point is that Gazprom cannot sell significantly more natural gas in Europe without impacting the price of gas there. Russian domestic consumption in 2008 of 420 BCM was 2.7 times Gazprom sales in Europe. To sell significantly more gas in Europe, Gazprom would have to accept a lower price, i.e. it faces a downward sloping demand curve. This means that there is no "world price" of gas that Russia faces. Rather, Gazprom will calculate an optimal price for its gas sales in Europe that reflects the trade-off it faces between the additional revenue from additional sales of gas and the lost revenue from the reduction of price to sell additional gas. Gazprom's optimal price of gas in Europe will have to change over time as the demand for gas in Europe changes, but it is in Gazprom's interest to maximize its profits on exports.

Figure 5.1 presents the Tarr and Thomson (2004) model. Although the data have changed since the analysis was first made, the principles still apply and the data from the original article are used to illustrate the argument. Some key changes and how this affects

the results of the analysis are indicated below. The calculation of economic surpluses, the shaded triangle in Figure 5.1, is explained in more detail in Appendix A.

Figure 5.1. Optimal pricing of Russian natural gas in Europe and in Russia



It is assumed that Gazprom is optimizing the price and quantity that it sells in Europe — this was between USD 79 and USD 99 per thousand cubic meters (TCM) plus USD 27 transport costs in 2000 and 2001 (Prices were about USD 380 per TCM in 2008).[8] This price is represented as D'. The analysis reveals that if Russia were to sell its natural gas to Europe at only full long run marginal cost plus transportation costs which represent E', Russia would lose between USD 5 billion and USD 7.5 billion per year at 2001 values. On the other hand, consumers in Europe would gain even more (between USD 7.5 billion and USD 10 billion per year), as they would consume more gas at lower prices.

If Russia were to raise its domestic prices to the prices it charges in Europe, Russian industries using natural gas would incur very large adjustment costs as the gas cost increases would adversely impact on investment and unemployment in the short run. Absorbing the cost increases would induce Russian industries to switch to alternate fuels and produce less gas intensive products that cannot be justified on the basis of Russia's comparative advantage.

Domestic market pricing in Russia

Gazprom had a virtual monopoly on domestic gas sales for many years and it also controls the gas pipeline within Russia. Legally, "Third Party Access" to the pipelines is granted under Russian law to Russia's independent gas producers who are both vertically integrated oil companies and specialized gas companies. However, in practice, independent gas producers have difficulty accessing this pipeline and have frequently complained about this.[9] Nonetheless, the share of the Russian market captured by independent gas producers in Russia has grown steadily since 2002, and reached an

estimated 12-15% of the Russian market in 2008.[10] Moreover, independent gas producers control about 30% of the natural gas reserves.

Gazprom, while not a monopoly in Russia's domestic market, is clearly a dominant firm with considerable market power. This significant market power is one of the reasons why the price of gas sales in Russia is regulated by the Federal Tariff Service of the Russian Federation. Until more effective competition is introduced in the Russian market, regulation can be justified to constrain the exercise of that monopoly power. Efficient regulation of monopolies calls for a price in the domestic market at levels that reflect the true alternate economic value of the commodity in question.[11] If there were a world price, the opportunity costs of selling gas domestically would be the world price and it would be optimal for Russia to charge a unique price on its domestic and export sales.[12] However, there is not a world price of natural gas for Russia.

In Russia's domestic market, the opportunity costs then correspond to the LRMC of natural gas. In 2001, this implied that it was necessary for Russia to raise the domestic price of natural gas to achieve this economically efficient price; otherwise the capital stock will deteriorate and supplies will not be forthcoming over time. Many market economies, in fact, regulate the maximum price of monopolies such as gas and electricity distribution to achieve this pricing objective (Scherer, 1980 and Carlton and Perloff, 2000). The analysis summarized in Figure 5.1 suggests that in 2001, Russia should have allowed Gazprom to raise its domestic prices of natural gas from about USD 15 to USD 20 per TCM which represents price at A to the full long run marginal costs, about USD 35 to USD 40 per TCM – price at B. This would have resulted in benefits to Russia of about USD 1.24 billion per year.

By 2007, natural gas prices in Russia had increased to between USD 64 and USD 72 per TCM.[13] Although there is no updated estimate of LRMC, it has surely increased considerably due to inflation and the substantial increase in steel and wage costs above the rate of inflation, coupled with the weaker dollar. It would appear, however, that with the substantial increase in the price of natural gas in Russia, prices are much closer to LRMC in 2007 than in 2001.

Moreover, with its decree N°333 in May 2007, the government announced plans to increase the price of natural gas to industrial users to international levels by 2011, less transportation costs and export taxes. In early 2008, prices on exports to Europe were about USD 378 per TCM. With transportation costs of about USD 35 per TCM and export taxes at 30%, to implement this plan today, prices in Russia would have to rise to about USD 225 per TCM. Russian government forecasts of domestic natural gas prices in 2011, however, are that prices would rise to about USD 120 per TCM. Thus, to implement this plan, Russian domestic market prices would have to rise dramatically more than what is planned.

More importantly, such high domestic prices would have a negative impact on consumer and economic welfare. High prices would induce significant reductions in Russian demand, to the point where the value to Russian consumers would be considerably greater than the long run marginal costs of production. This would imply substantial monopoly profits for Gazprom on domestic sales.

Restructuring of the natural gas industry in Russia

Why is Russia planning to allow domestic prices of natural gas to rise to such high levels? Two insiders, Nemtsov and Milov (2008), have argued that Gazprom is an inefficient company and that Russian consumers and taxpayers are being forced to pay for that inefficiency. As Russia's existing gas fields are being exhausted, a significant portion of the newer discoveries are available in more difficult places that require greater investment costs. But Nemtsov and Milov estimate that Gazprom's cumulative investments in its core business were only USD 27 billion from 2001 through 2007.

Meanwhile, Gazprom has failed to develop the key gas fields. For example, the gas deposits in the Yamal peninsula region, with an estimated USD 200 billion in investment costs, remain undeveloped. Gazprom's production has remained stagnant since 2003, and it has made up the gap between its supplies and demand by ever increasing purchases from central Asia. But these purchases are coming at increased costs. In 2008, the presidents of the gas companies of Kazakhstan, Turkmenistan and Uzbekistan announced that Gazprom would have to pay prices tied to European levels beginning in 2009.

The Russian domestic market would be best served if Russia were to fully introduce competition. Competition in Russian gas would be best accomplished by breaking up the production and distribution segments of Gazprom into separate independent companies, and effectively enforcing third party access to the pipelines. The pipelines could be operated as regulated monopolies. Licenses that Gazprom has failed to use to develop gas fields under the terms of the licenses could be provided to independent companies.

Competition in the Russian gas market would likely bring considerable additional production on-line. With full competition introduced in the domestic market, it will be unnecessary to regulate the domestic price. Competition will prevent exploitation of monopoly power and lead to lower domestic prices. If the additional Russian producers were allowed to export natural gas, competition among Russian firms would also erode Russian monopoly profits on European sales. That is, unconstrained access to export markets would result in unified pricing through structural reform of the Russian market.

In the absence of the Gazprom monopoly, however, in order to extract the available monopoly profits on its exports of gas to Europe, it would be in Russia's interest to impose export taxes on Russian gas exporters or to use a state trading monopoly as a marketing arm of Russian natural gas exports. Such export restraints would result in higher profits for Russia as a whole.

Efficient prices from the perspective of the world

Given that Europeans lose more dollars than Russia gains from dual pricing, a question is whether there is a cooperative solution that makes both Europe and Russia better off. A cooperative solution would involve Russia selling gas to Europe at LRMC plus transportation costs and Russia receiving compensation in return. Such compensation could take the form of any aspect of the relationship between European countries and Russia, and need not be tied directly to gas prices. For such an arrangement to be in Russia's interest, however, the compensation would have to be substantial, valued by Russia at not less than USD 5 to USD 7.5 billion per year. Alternatively, one can pose the question: can Gazprom develop a pricing strategy that would allow it to increase its profits?

Monopolists often employ "two-part tariffs" as a method to extract the maximum profits. If European buyers were offered gas at a lower per unit usage price, but had to pay a fee to access the gas each year, this would be, in effect, a two part tariff.[14] For Gazprom, the optimal two part tariff requires pricing gas at LRMC plus transportation costs, and charging an access fee equal to the entire value of the gas to European consumers above LRMC plus transportation costs (the entire consumers' surplus). In principle, Gazprom's profits could increase by not only the USD 2.5 billion in inefficiency losses from prices exceeding marginal costs in Europe, but by an additional USD 4.8 billion which is the additional value it can extract from consumers with high demand (the triangle DD'J in the figure). Gazprom's failure to maximize short run profits through optimum two-part tariffs likely reflects its perceived risks of losing profits in the long run to substitutes.

Energy diversification for Europe

The EU has been pressing Russia to introduce competition into the Russian natural gas market and to allow all producers access to the pipelines both within Russia (presently in Russian law) and for exports. Moreover, some press reports have indicated that Russia agreed to limit its export taxes as part of its bilateral agreement on WTO accession with the EU. If additional Russian producers were allowed to compete and export natural gas, as explained above, in order to extract the available monopoly profits on its exports of gas to Europe, it would be in Russia's interest to impose export taxes on Russian gas exporters or to use a state trading monopoly as a marketing arm of Russian natural gas exports. In this regard, a more promising avenue for European energy diversification would be new pipeline construction to open up new sources of supply independent of Russia, and liquefied natural gas purchases.[15]

Box 5.1. New pipeline projects

Several new pipelines are proposed or under construction between Russia, central Asia and Europe. The most important are: Nord Stream, South Stream, Nabucco and the Trans-Caspian pipelines. Since the first two traverse Russia, they do not offer energy diversification for Europe as Russia already supplies central Asian gas to Europe through its pipelines based on contracts with central Asian suppliers. The latter two offer real diversification of natural gas supplies.

Nord Stream. Russia and Germany agreed to construct the "Nord Stream" project through the Baltic Sea to Germany at an estimated cost of construction of USD 15 billion.* The alternate project is a second pipeline adjacent to the existing Yamal-Europe route at a cost of about USD 2.5 billion. The considerably higher transportation tariffs of the Nord Stream project will allow the gas to by-pass Belarus and Poland, which is seen as an advantage from Russia's perspective. However, it must traverse either the Finnish or Estonian seabed and then the Swedish seabed before reaching Germany, so other intermediary countries remain involved in the transportation route.

South Stream. On 15 May 2009, the gas companies of Russia, Italy, Bulgaria, Serbia and Greece signed an agreement on construction of the South Stream pipeline with a capacity of about 30 BCM per year. The pipeline would travel from Russia through the Black Sea and through Bulgaria. Although the exact route is not finally determined, the south-western portion should travel through Greece and the Ionian Sea to Italy, while the north-western portion would travel through Serbia and Hungary to Austria. The estimated cost of construction of the pipeline is about USD 20 billion.

From Russia's perspective, the idea is to by-pass Ukraine and Turkey, but the existing pipeline through Ukraine transports 130 BCM, so Ukraine will retain its dominant position. Moreover, maritime rights with either Ukraine or Turkey will have to be agreed, thereby negating a least part of the key advantage of this project.

continued

Nabucco. The Nabucco pipeline is a planned natural gas pipeline from Erzurum, Turkey through Bulgaria, Romania, Hungary to a major natural gas hub at Baumgarten an der March, Austria. It is a partnership of five companies, with one company from each of the five countries through which the pipeline runs. Construction is expected to begin in 2010 and be completed in 2014. It is a significant part of the European strategy for diversification of energy sources. The initial source of natural gas for the pipeline would be gas from Azerbaijan through existing pipelines that link Azerbaijan gas to Turkey.

There are estimates, however, that Azeri gas supplies are inadequate to justify construction of the pipeline, so additional supplies are sought. Turkmenistan is expected to feed the pipeline also, either through pipelines in Iran or through the proposed complicated Trans-Caspian pipeline across the Caspian Sea. If the Trans-Caspian pipeline were constructed, Kazakhstan could also become a supplier to the pipeline. Egypt and Iraq could supply the pipeline through the Arab Gas Pipeline. Finally, Iran could also supply the pipeline, but this is opposed politically by the European Union and the United States.**

Trans-Caspian Pipeline. The proposed Trans-Caspian gas pipeline would run under the Caspian Sea from Türkmenbaşy in Turkmenistan to the Sangachal Terminal in Baku Azerbaijan. From Baku it would connect with the existing South Caucusus pipeline through Tbilisi to Erzurum in Turkey, where in turn it would be connected to the Nabucco pipeline, thus taking natural gas from Turkmenistan to Central Europe. According to some proposals it would also include a connection from the Tengiz field in Kazakhstan to Türkmenbaşy. Thus, the Trans-Caspian pipeline would link Turkmen and possibly Kazakh gas with central Europe through a route independent of both Russia and Iran. The estimated construction cost is USD 5 billion.

In 2008, a German and Austrian company set up a joint venture named the Caspian Energy Company, to carry out exploration for a gas pipeline across the Caspian Sea that would feed into the Nabucco pipeline. Based on exploration outcomes the company plans to build and operate a gas transport system across the Caspian Sea. Both Russia and Iran, however, oppose the Trans-Caspian pipeline project and have objected on environmental grounds. Both nations maintain that any pipeline built under the Caspian Sea would require the approval of all five countries that border the Sea.

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* See "Nord Stream Gas Pipeline on right track," Euractiv.com, 11 March 2009. http://www.euractiv.com/en/energy/official-nord-stream-gas-pipeline-right-track/article-180127. Smith (2008) estimates that the costs would have been only USD 2.8 billion for an alternate pipeline, an enlargement of the Yamal pipeline that runs through Poland.

** For further details on the Nabucco pipeline, see http://en.wikipedia.org/wiki/Nabucco_Pipeline.

Conclusions: policy options for the Russian gas industries

The status of Gazprom as a practical monopolist in Russian natural gas industry has a significant role in dual pricing. Russia regulates domestic pricing in order to constrain the exercise of Gazprom's monopoly power. With strong market power in Europe, Gazprom maximizes its export profits by charging prices which are higher than domestic prices.

Export restraints, in the form of exclusive export rights and export duties, contributed to an increase of export prices. Their impacts on domestic prices are relatively limited since the domestic prices faced by Russian consumers are regulated by government.

The Russian domestic market would be best served if Russia were to fully introduce competition. With full competition introduced in the domestic market, it will be unnecessary to regulate domestic price. Competition will prevent exploitation of monopoly power and lead to lower domestic prices. If the additional Russian producers were allowed to export natural gas, competition among Russian firms would erode Russian monopoly profits on European sales.

In the absence of the Gazprom monopoly, however, in order to extract the available monopoly profits on its exports of gas to Europe, it is possible to foresee that Russia

would impose export taxes on gas exporters or to use a state trading monopoly as a marketing arm of natural gas exports to exploit its market power as a whole.

Timber

The Russian government has taken several policy actions in its efforts to diversify its economy. One of these actions has been the imposition of export taxes on raw timber. The export taxes were progressively raised over a period of years, reaching the maximum of 25% or EUR 15 per cubic meter as of 1 April 2008, and they were planned to increase further in January 2009 to the maximum of 80% or EUR 50 per cubic meter.[16] To date, however, the Russian Government has postponed implementation of the 80% export tax.

The hope of the Russian government is that export taxes will lower timber prices for the wood processing sector within Russia and thereby expand the downstream sector and value-added within Russia. Export taxes raise the cost of exported products, resulting in decreased export volumes. Reduced exports may divert some supply to the domestic market, leading to downward pressure on domestic prices. Through this supply-side effect on export and domestic markets, export taxes can create a differential between the price available to domestic processors and the price charged to foreign processors.

It is a well-known result in the international trade literature that absent market power on exports, the expansion of value-added through export taxes is socially undesirable, i.e. it will typically reduce economic welfare.[17] Although export taxes lead to increased consumer welfare through lower domestic prices as well as government revenue, the welfare loss associated with production and consumption distortion outweighs the benefits. Consumption inefficiency results from the fact that more than optimal amounts of the taxed product is consumed domestically while production inefficiency results from the fact that less than optimal amount of the product is produced.

On the contrary, in the case of a large country which has market power, export taxes can, in theory, increase welfare of the exporting country through enhanced terms of trade. When applied by a large country, an export tax increases the world price of the taxed commodity, and thus allows the country to import more for each unit of the exported commodity.

Russia possesses market power on the exports of timber. Russia possesses the largest share of world forest reserves (22%),[18] and Russian timber plays a significant role on world markets for some products. For example, about 40% of world conifer is produced in Russia.[19] For markets geographically close to Russia, such as Finland and Sweden, Russia's role is even more important. Finland imports about 25% of its timber consumption and about 80% of its imports are of Russian origin. Russia's share of the combined Finnish-Swedish timber market is about 11.4% (Khramov, 2008).

Optimal export taxes

Given some market power on world export markets for Russia, there is a positive export tax that would increase Russian economic welfare. The planned Russian government's export tax of 80%, however, may considerably exceed the optimal export tax so it is necessary to analyze the problem more carefully to estimate the optimal export tax.

The analysis of optimal export pricing for Russia on timber exports differs from the gas pricing problem discussed above. In the case of natural gas pricing, Gazprom has a monopoly on export sales of Russian gas. In the case of timber, there is competition among timber exporters from Russia. Even if Russia as a whole possesses significant market power on its timber exports, competition among individual timber exporters will prevent the firms from exploiting that monopoly power. In this regard, an export tax by the Russian government would aim to extract the monopoly profits that the Russian industry as a whole possesses.

In general, the Russian government would want the export price to be at a level where the marginal revenue from additional timber sales to the country equals marginal costs. We can use the mathematics of the gas pricing analysis, where the Russian government is playing the role of Gazprom on exports. Abstracting from transportation costs, it is optimal for the Russian government to have its firms charge a price where price exceeds marginal costs, and the mark-up of price above marginal costs depends on the perceived elasticity of demand for Russian exports of timber.

$$p(q_E) = [\varepsilon^p/(1+\varepsilon^p)]\, c$$

Where $p(q_E)$ is the price of exports on the export market, q_E is the quantity of exports, ε^p = the perceived elasticity of demand by the Russian government on the country's exports of timber (assumed to be less than negative one) and c = marginal costs of producing timber.

If the Russian government imposes an export tax of t, the price paid by foreign buyers equals $p(q_E) = p_R(1+t)$ where p_R denotes the price received by Russian exporters. Since competition among exporters will induce them to produce where price equals marginal cost ($p(q_E) = p_R(1+t) = c$), exporters will charge the optimal price to extract monopoly profits if t is set such that:

$$\varepsilon^p/(1+\varepsilon^p) = (1+t^*)$$

Then the optimal export tax t* is:

$$t^* = \frac{\varepsilon^p}{1+\varepsilon^p} - 1 = \frac{-1}{1+\varepsilon^p}$$

For competing Cournot oligopolists, the perceived elasticity of demand is equal to the market demand in the relevant market divided by the oligopolist's share of the market.

$$1/\varepsilon^p = \frac{s}{\varepsilon_E}$$

Khramov *et al.* (2008) estimate the market elasticity of demand for timber in Finland and Sweden at -1.16. With a market share of about 12%, the perceived elasticity of demand for Russia is -9.7, and the optimal export tax t* is 11.5%. If the market elasticity of demand for timber in Finland were -2, then the optimal export tax would fall to 6.4%. In summary, the 80% export tax which was planned to be imposed by the Russian government in 2009 on raw timber appears to be between 7 and 14 times higher than the optimal level. Even the current export tax of 25% (in effect at the time of this writing), is more than twice the optimum level. Production inefficiency costs to the Russian timber

sector and consumption inefficiency by the Russian wood processing sector as a whole exceed the gains in profits on exports by a substantial margin.

Conclusions: the optimal rate of export tax on timber

Russia has imposed export taxes on raw timber with the aim of developing its wood processing industries in an effort to diversify its economy. The reasoning is that export taxes will lower timber prices available to the domestic wood processing industry and contribute to value-added within Russia.

The Russian timber industry is competitive and in this regard, it is distinguishable from the natural gas sector where Gazprom maintains a monopoly status on exports. Government intervention through an export tax can be understood as a measure to exploit market power that the industry as a whole possesses in the export markets, but cannot exploit due to its competitive industry structure.

When applied by large countries that have market power on exports, export taxes can increase the welfare of the exporting country while the importing country's welfare decreases. However, based on the market power of the Russian timber industry in Finland and Sweden, the current export tax rate of 25% is more than twice the optimum level.

Notes

1. Consultant and former Lead Economist, The World Bank. The views expressed are those of the author and should not necessarily be taken to reflect the views of the World Bank or its Executive Directors.

2. See British Petroleum, *Statistical Review of World Petroleum*, various years. Russia's proved reserves are down from 47.6 trillion cubic meters and more than 30% of the world's proved reserves in 2001; its production is up from 2001 production of 542 billion cubic meters.

3. The largest importers of Russian natural gas are Germany (36 BCM), Italy (25 BCM) and Turkey (24 BCM). The next largest importers are Poland, Hungary, France and the Czech Republic, all of whom imported about 7-9 BCM in 2008. The other principal suppliers of gas to the European market are Algeria (through a pipeline across the Mediterranean), Norway, the Netherlands and the UK. See British Petroleum (2009)

4. Gazprom paid RUB 685 billion to the Russian government in taxes in 2008. At an average exchange rate of RUB 25 to the USD for 2008, this was USD 27 billion. *http://eng.gazpromquestions.ru/?id=12#c337*. Nemtsov and Milov (2008) argue, however, that due to gross inefficiency of Gazprom, Russia would be much better served with a state monopoly on exports, but competitive purchases by the state monopoly among competitive producers in Russia.

5. Based on data in the Europe market, calculations of the Lerner index of market power are presented in Appendix A. We find that it is significant in comparison with estimates of the Lerner index for other industries.

6. In the two episodes of suspension of gas deliveries to Ukraine, Russia was forced to resume deliveries to Ukraine, despite lack of resolution of this dispute, in order to supply its European customers.

7. Since higher prices will accelerate the entry of new competitors, optimal dynamic pricing by Gazprom would result in a lower price to deter entry. If in the future, supplies from new competitors increase faster than demand from Europe, the mark-up by Gazprom would fall. Moreover, elasticities of demand are greater in the long run than in the short run, since, for example, inter-fuel substitution is possible in the long run. Greater elasticities imply less market power and lower the optimal mark-up over marginal costs. We presume, however, that Gazprom has optimized its mark-up based on long run calculations.

8. Gazprom president Alexei Miller reported on 14 March 2008 that "the price [of Russian gas] in Europe now exceeds USD 370. We believe the average price in 2008 could be USD 378 and could even reach USD 400 per 1 000 cubic meters." He noted that the rise of national industries, such as producers of cement, building materials, and fertilizers and gas refineries, is also pushing up demand for gas in Russia. He also added that Gazprom planned to introduce market gas prices for Russian industrial consumers in 2011. See Johnson's Russia List, *http://www.cdi.org/russia/johnson/2008-56-39.cfm*.

   In 2009, however, the export price collapsed to an estimated USD 280 for 2009. Moreover, in its zeal to control natural gas sales to Europe, Gazprom entered into long term contracts with the central Asian suppliers Uzbekistan and Turkmenistan.

Gazprom reportedly is paying USD 340 per thousand cubic meters to Uzbekistan in 2009. In 2009, due to a decline in world demand, Gazprom was forced to close down its own wells that produce gas at much lower costs than it pays to central Asian suppliers. Gazprom has acknowledged losses on central Asian purchases in 2009, but argues these will become profitable contracts in the long term. See "Falling Gas Prices Deny Russia a Lever of Power," *New York Times*, 15 May 2009.

9. See Baranov (2008) and "Deputy Prime Minister Instructs Gazprom to Ease Pipeline Access for Russian Gas Producers," *Global Insight*, 7 July 2008. *www.globalinsight.com/SDA/SDADetail13190.htm*.

10. The largest independent seller of natural gas in Russia is the specialized gas company Novatek, followed by Rosneft. Other important independent sellers are Lukoil, Surgutneftegaz, TNK-BP and the Itera Group. See "Gazprom is Not the Only Player in the Russian Fields," *Oil and Gas—Eurasia*. August 2008. *http://www.oilandgaseurasia.com/articles/p/80/articles/684*.

11. This discussion is based on the monopoly structure of the natural gas market in Russia. Of course, production of natural gas is not a natural monopoly and it would therefore be desirable to have additional producers. We discuss below that if alternate producers of natural gas were given access to the gas pipelines, there would be economic gains as well as environmental benefits. Nothing in the argument developed in this paper implies that the current structure of Russia's gas market is efficient.

12. Given a domestic monopoly, unified pricing would call for a tax to prevent monopoly profits.

13. Estimates based on Rosstat and Ministry of Economy data. According to Gazprom, in 2008, the average price excluding VAT and excise taxes was RUB 1 653 per MCM, or about USD 66 per MCM at RUB 25 to the USD. See *http://old.gazprom.ru/documents/Background_09.06.09.pdf* .

14. Oi (1971) has shown that a monopolist will maximize profits if it charges a lump sum fee equal to the consumer's surplus and a per unit price equal to marginal cost. Such arrangements are common in industries such as telecommunications (fixed fee for a hookup plus charges for actual calls), the rate structures of electricity utilities (block discounts), rental of mainframe computers and copying machines and country club fees.

15. For example, Qatargas and Polish gas monopoly PGNiG signed an agreement in which PGNiG will import the equivalent of 1.5 BCM annually of liquified natural gas from 2014 to 2034. Poland's consumption in 2008 was 13.9 BCM. PGNiG will construct a re-gasification terminal in time for the deliveries.

16. In 2005, Russia introduced a 6.5% export tax on logs. As of 1 July 2007, export taxes were raised to the maximum of 20% or EUR 10 per cubic meter. As of 1 April 2008, export taxes were raised to the maximum of 25% or EUR 15 per cubic meter.

17. See Takacs (2008) for an excellent elaboration of how export taxes reduce economic welfare and also chapter 1 of this publication.

18. See *www.forest.ru* for the general information about the Russian forest sector.

19. Russian Newspaper (*Rossiiskaya Gazeta*), N°4317, 03.16.2007. *"Российская газета" - Федеральный выпуск №4317 от 16 марта 2007 г.*

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ANNEX 5.A1.

Derivation of the Optimal Pricing of Russian Natural Gas in Europe and in Russia by Gazprom

Model

We assume that the market for Russian natural gas is segmented between Russia and Europe. We assume Gazprom acts as a monopoly in Russia but faces rival oligopolistic competitors in the Europe market.

Define the following notation:

P	=	Price in Russia
Q	=	Quantity in Russia
p	=	price in Europe
q_E	=	total quantity in Europe
q_i	=	quantity supplied in Europe by supplier ***i***
q_R	=	quantity supplied in Europe by Russia
c	=	costs of producing natural gas in Russia (assumed constant)
t	=	transport costs of natural gas from Russia to Europe (assumed constant)

Then profits for Gazprom are:

$$(1)\quad \pi = P(Q)Q - cQ + p(q_E)q_R - (c+t)q_R$$

Assume that Gazprom and its rivals in the Europe market compete as non-cooperative Cournot oligopolists. (A cooperative equilibrium would imply a mark-up over marginal costs that is higher than derived below with a non-cooperative equilibrium.) Then the optimum prices and quantities in the two markets for Gazprom are obtained by solving (2) and (3):

$$(2)\quad \frac{\partial \pi}{\partial Q} = P'(Q)Q + P(Q) - c = 0$$

$$(3)\quad \frac{\partial \pi}{\partial q_R} = p'(q_E)\frac{\partial q_E}{\partial q_R}q_R + p(q_E) - (c+t) = 0$$

Since under the Cournot assumption $\frac{\partial q_E}{\partial q_i} = 0 \; \forall \; i \neq R$, we have that $\frac{\partial q_E}{\partial q_R} = 1$. Then (2) and (3) may be written as:

$$(4) \quad P(Q) - c = -\frac{dP}{dQ} Q$$

$$(5) \quad p(q_E) - (c + t) = -\frac{dp}{dq_E} q_R$$

Multiply the right hand side of (4) by *P/P* and divide both sides by *P* to obtain:

$$(6) \quad \frac{P(Q) - c}{p(Q)} = \frac{-1}{\varepsilon_R}$$

where ε_R = market elasticity of demand in Russia.

Equation (6) states that the optimal percentage mark-up over marginal costs that Gazprom desires is equal to the inverse of the market demand elasticity in Russia. This is the well-known Lerner market power measure.

For the European market, multiply the right hand side of (5) by pq_E / pq_E and divide both sides by p, then

$$(7) \quad \frac{p(q_E) - (c + t)}{p(q_E)} = \frac{dp}{dq_E} \frac{q_E}{p} \frac{q_R}{q_E} = \frac{-s}{\varepsilon_E}$$

where $\varepsilon_E = \frac{dq_E}{dp} \frac{p}{q_E} =$ market elasticity of demand in Europe and $s = \frac{q_R}{q_E} =$ the market share of Gazprom in Europe.

Define the perceived elasticity of demand by Gazprom in the Europe market as ε^P. Then:

$$1/\varepsilon^p = \frac{\partial p}{\partial q_R} \frac{q_R}{p} = \frac{dp}{dq_E} \frac{\partial q_E}{\partial q_R} \frac{q_R}{p} = \frac{dp}{dq_E} \frac{q_E}{p} \frac{q_R}{q_E} = \frac{s}{\varepsilon_E}$$

Thus, the right hand side of (7) is the absolute value of the inverse of the perceived elasticity of demand by Gazprom in the Europe market. Analogous to the monopoly condition in Russia, the optimum mark-up of price over marginal costs for Gazprom in Europe is equal to the inverse of its perceived elasticity of demand, where marginal costs includes transportation costs.

It is evident from equation (7) that the optimal mark-up of Gazprom in the European market increases with the market share *s* and decreases as the absolute value of market elasticity of demand increases. The optimal price also increases as marginal costs *c*, or transportation costs *t* increase.

The optimal price quantity combination is depicted in Figure 1 in the main text. The Russian market is depicted to the right of the origin. The Europe market is to the left of the origin, where the quantity increases further to the left. In Europe, perceived marginal revenue equals marginal production plus transportation costs at point *E*, where Gazprom sells 126 BCM of natural gas. At this quantity, the market clears at point *D*, where transport cost included price equalled USD 106 per thousand cubic meters (TCM) in 2000.

Lerner index of market power

Using data available in the text, or Figure 1, we calculate the Lerner index of market power in Europe; that is, we estimate equation (7); note that a perfectly competitive market would yield a value of zero for equation (7).

Using LRMC, the Lerner index equals 0.37 based on prices in 2000 or 0.47 based on prices in 2001. With short run marginal costs (about USD 20 per TCM) the Lerner index would rise to 0.56 or 0.63, depending on the year. So the Lerner index for Gazprom in Europe ranges from 0.37 to 0.63, depending on the year or the measure of marginal costs.

Bresnahan (1989, Table 17.1) surveyed the estimates in the literature of the Lerner index of market power in many industries. Bresnahan notes that the literature has focused on (United States) industries with high concentration ratios, that is, industries where we expect to find significant market power. There are several industries in which the Lerner index is higher than the value for Gazprom in Europe (e.g. tobacco, 0.65; aluminium between the two world wars, 0.59; banks before deregulation, 0.21-0.88). But most of the studies of market power in industries had estimates of market power lower than our measure for Gazprom in Europe (e.g. coffee roasting, 0.025-0.05; rubber, 0.05; textiles, 0.07; electrical machinery, 0.2; railroads, 0.4; retail gasoline, 0.1; automobiles, 0.1-0.34; banks after deregulation, 0.16-0.4). Thus, despite the fact that the sample of industries selected for study are those where the authors expected to find significant market power, our estimate for Gazprom is among those the estimates with a large amount of market power.

ANNEX 5.A2

Implied Welfare and (Relative) Quantity Effects of Changes in Russian Natural Gas Prices

Welfare and relative quantity effects of natural gas pricing in Russia

Relative decline in natural gas consumption in Russia

A crucial determinant of the demand for natural gas in Russia over time is the aggregate income of Russia. As the economy grows, Russia can be expected to increase its demand for natural gas in accordance with its income elasticity of demand for natural gas. The demand for natural gas is also responsive to price. In the analysis below, we focus on the price effects and estimate the impact of increases in the price of natural gas, and hold other variables like the income of Russia constant. In other words, the analysis employs the standard comparative static *ceterus paribus* assumption of economic analysis to evaluate the impact of a policy change. It is not a forecast of the change in demand for natural gas. One would expect that even with the price increases implied below, with enough time, the growth in Russian GDP will dominate the price impacts and the quantity demanded of natural gas will increase over time. With that understanding, we estimate the impact on the change quantity demanded and welfare as a result of price changes in Russia induced by pricing policies. To simplify the discussion, we refer to quantities and prices as of 2001, and measure changes in quantity demanded relative to the quantity demand in 2001, but actual quantities in the future will differ due to growth in demand and other factors.

Price elasticity of demand for natural gas

The amount of the decline in Russian consumption of natural gas following a price increase depends on the elasticity of demand. There have been estimates of the price and income elasticities of demand for natural gas by various authors, including Joskow and Baughman (1976) for 48 American states, and Beierlin, Dunn and McConnor (1981) for nine American states, Estrada and Fugleberg (1989) for France and West Germany, Hsing (1992) for the United States, Liu (1983) for regions and sectors of the United States, and Chaudry (1999) for Pakistan.

These estimates and others have been surveyed by Al-Sahlawi (1989) and earlier by Taylor (1977). Regarding the price elasticities of demand, the studies typically find that short run price elasticities are low while the long run elasticities are higher. From the survey of Al-Sahlawi (1989, Tables 1 and 2), the various studies of short run price elasticities of demand range from –0.07 to –0.63, with a modal estimate of about –0.25. Long run price elasticities of demand range from –0.56 to –4.6, with a modal estimate of about –2.3.

In the following analysis, we shall assume a value for the price elasticity of demand in Russia of –0.5. This is in between a short and long run price elasticity. The larger the elasticity estimate, the larger the welfare effects from a price increase. From a long run perspective, a value of –0.5 for the price estimate clearly underestimates the welfare loss from price converged in both markets.

Increase in the price in Russia to LRMC

If the price of natural gas were increased to the LRMC (that is, from USD 20 to USD 40 per TCM), consumption of natural gas would be more efficiently allocated and would decline compared to the current level of 375 BCM.

If we assume a market elasticity of –0.5, consumption would decline to 251 BCM. This would generate a welfare gain to the economy of USD 1.24 billion per year.

Details of the calculations are as follows:

The elasticity of demand in Russia is $\varepsilon_R = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$. Rearranging yields:

$$\Delta Q = \varepsilon_R \frac{\Delta P}{P} * Q$$

$\Delta P = \$20/TCM$; $P = \$30/TCM$ (at the midpoint); $Q = 375\,BCM$.

$$\therefore \Delta Q = \varepsilon_R \left(\frac{2}{3}\right) * (375\,BCM)$$

If $\varepsilon_R = -0.5$, then $\Delta Q = -124\,BCM$.

The welfare gain is equal to the value of the triangle AA′B in figure 1. This is $0.5 * \Delta Q \cdot \Delta P = 0.5 * (-124\,BCM) * (\$20/TCM) = \$1.24$ billion.

Increase in the price in Russia to export parity levels

If on the other hand, the price in Russia were increased to export parity levels, the price in Russia would have to increase to between USD (106 – 27)= USD 79 per TCM and USD (126 – 27) = USD 99 per TCM. Given that the present price is less than USD 20 per TCM, this means that the price would have to rise at least to a quadruple and the price increase would be at least USD 59 per TCM. At unchanged quantities, the increase in the consumers' cost of natural gas in Russia would be:

USD 59 per TCM * 375 BCM = USD 22.1 billion

The quantity demanded at these higher prices would depend on the elasticity of demand for natural gas in Russia. To estimate the implied decrease in natural gas consumption in Russia, suppose that the price increase is "only" USD 59 per TCM. Then the change in quantity would be as follows:

The elasticity of demand in Russia is $\varepsilon_R = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$. Rearranging yields:

$$\Delta Q = \varepsilon_R \frac{\Delta P}{P} * Q$$

$\Delta P = \$59/TCM$; $P = \$39.5/TCM$ (at the midpoint); $Q = 375\ BCM$.

$\therefore \Delta Q = \varepsilon_R * 1.5 * (375\ BCM)$

If $\varepsilon_R = -0.5$, then $\Delta Q = -280\ BCM$.

Then the new quantity demanded in Russia would be 95 BCM. That is, Russian quantity demanded would fall to roughly 25% of the original quantity demanded.

For constant elasticity demand curves with elasticities greater than 0.65 in absolute value, we estimate that this price increase would induce a fall in the quantity demanded to zero. Thus demand must be rather inelastic in order for any significant natural gas market to remain in Russia following a price increase of this magnitude. Most likely, the elasticity is sufficiently small for key buyers that there would be some demand even at high prices, but this shows that the contraction in demand and shrinkage in production would be very large for Russia. The implication is that there would be very large adjustment costs for Russia from this policy. These adjustments would be inefficient since they are not based on comparative advantage.

Welfare economics for Russia in the European market

If Gazprom lowers the export price in the Europe market to LRMC plus transport costs, the new equilibrium is at point F in figure 1. At point F, Russia will earn zero rents, since price equals costs at this price-quantity combination. At the higher prices in Europe, however, Gazprom earns rents equal to the rectangle DD'E'E. Thus, the loss to Gazprom is the value of this rectangle. (It can be equivalently measured by the triangle EFG.) Note that the estimated loss to Gazprom from moving to marginal cost pricing in the Europe market is independent of the elasticity of demand. The losses are simply the rents Gazprom earns on its prior sales in Europe. Depending on prices in year 2000 or 2001, the price reduction is USD 39 per TCM or USD 59 per TCM. Then the value of the losses to Gazprom is between USD 5 billion and USD 7.5 billion per year. (126 BCM * USD 39/TCM = USD 5 billion) or (126 BCM * USD 59/TCM = USD 7.5 billion).

Welfare economics for Europe in the European market

If Gazprom lowers the export price in the Europe market to LRMC plus transport costs, the new equilibrium is at point F. European consumers would receive the benefit of paying USD 5 to USD 7.5 billion less per year less on their present purchases (the rectangle DD'E'E). In addition, at the lower natural gas prices, European consumers can expand consumption of Russian gas until price exceeds the lower marginal cost. Thus, they would also receive the benefit of the resource allocation gain equal to the triangle DEF. The Europeans obtain a rent transfer from Russia plus a triangle of resource allocation benefits.

The value of the triangle DEF depends on the perceived elasticity of demand of Gazprom. Since it is natural to assume that Gazprom optimizes on its sales in Europe, it

follows that it charges a price where the perceived elasticity of demand exceeds unity in absolute value. (Otherwise marginal revenue is negative, i.e. it is operating in the portion of the demand curve to the left of point H, and it can increase profits by reducing sales.) We assume the elasticity is –1.5 in this calculation and we take a price decline of USD 50 per TCM, an average of the implied price decline in 2000 and 2001. Recall that the perceived elasticity of demand is the market elasticity of demand times the share of Gazprom in the European market, i.e. in absolute value the perceived elasticity is larger than the market elasticity of demand by a multiple of about (10/3). We calculate the value of the triangle as follows:

The perceived elasticity of demand is:

$$\varepsilon^P = \frac{\Delta q_E}{\Delta p_R}\frac{p_R}{q_E}.$$

The quantity change, implied by a USD 50 price reduction is:

$$\Delta q_E = \varepsilon^P \frac{\Delta p_R}{p_R}\cdot q_E$$

$$= -1.5 * \frac{-\$50}{\$92}\cdot 126\,\text{BCM} = 103\,\text{BCM}$$

where USD 92/*TCM* is the price midpoint.

Then the value of the triangle DEF is:

$$0.5 * (103\,BCM) * \$50/TCM = \$2.6\,\text{billion}.$$

The gain to consumers in Europe is the sum of the rectangle DD'E'E plus the triangle DEF. This value is between USD 7.5 billion an USD 10 billion per year.

Net welfare change in the European market

Since Europe gains the rectangle DD'E'E plus the triangle DEF, while Russia loses the rectangle DD'E'E, there is a net welfare gain equal to the triangle DEF associated with uniform pricing. This is a familiar triangle of distortion costs from monopoly pricing. Thus, Europe gains USD 2.5 billion per year more than Russia loses.

Full potential value of consumers surplus in European market

The full potential value of consumer surplus to Gazprom (potentially extractable through a two-part tariff) includes the rectangle DD'EE' (between USD 5 and USD 7.5 billion) plus the triangle DEF (USD 2.6 billion) plus the triangle DD'J. To calculate the value of the triangle above DD'J, we must estimate the price at which the demand curve intersects the vertical axis. In the triangle DD'J, the quantity change is equal to the negative of the initial equilibrium quantity of 126 BCM. Thus,

$$-\Delta q_E = q_E = 126\,\text{BCM}$$

The initial price is USD 116 TCM, if we take the midpoint of the prices in 2000 and 2001. The change in price implied by the quantity change to zero, with a liner demand curve with perceived elasticity –1.5 is therefore:

$$\Delta p_R = \frac{p_R}{\varepsilon^P}\frac{\Delta q_E}{q_E}\cdot = -\frac{p_R}{\varepsilon^P} = *\frac{\$116}{1.5}\cdot = \$77 \text{ TCM}$$

Then the value of the triangle DD'J is:

$$0.5 * (126\ BCM) * \$77 / TCM = \$4.8 \text{ billion.}$$

Consequently, the optimal two part tariff from Gazprom would extract between USD 12.2 and USD 14.7 [=(5-7.5) + 2.6 + 4.8] billion (DD'EE'+ DEF + DD'J). This is approximately double the rents that Gazprom extracts on their sales from the single price based on usage.

Optimum in the European market

We assume Gazprom maximizes profits on the quantity of natural gas sales in Europe. This occurs at point E, where perceived marginal revenue equals marginal production plus transportation costs. At this quantity (126 BCM), the market clearing price is at point D (USD 106 per TCM). For quantities greater than at point E, marginal revenue is less than marginal production plus transportation costs. Thus, expansion of sales to the point F, where the price (USD 67) equals marginal production plus transportation costs, will result in losses on Russia's exports (relative to point D) equal to the value of the shaded triangle (EFG) (which is equal to the rectangle DD'E'E). For quantities greater than point H, additional sales will reduce the revenues received, and additional costs are also incurred.

In the Russian market, Gazprom faces a controlled price at USD 20 per TCM, leading to quantity demanded (and sold) of 375 BCM of sales in Russia. The social optimum for Russia is at point B where long run marginal cost equals price at USD 40. An increase in the price in Russia from USD 20 to USD 40 results in an increase in welfare in Russia equal to the triangle AA'B. Gazprom would maximize profits where marginal revenue equals marginal costs, leading to point C. Since the value to Russia exceeds the marginal costs of production for quantities less than at Q*, there is a triangle of losses equal to BB'C for an increase in the price resulting in a movement from B to C.

Chapter 6

Increasing Demand For and Restricted Supply of Raw Materials

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Metals and minerals account for a relatively small share of world industrial output, but their supply is essential for economic development. As a greater number of countries emerge as strong economic forces on the world stage, the demand for raw materials has been accentuated. Uneven distribution across countries of metals and minerals reserves emphasizes the importance of free trade. This chapter provides the economic context of export restrictions with particular focus on the metal and mineral sector. The chapter also describes the potential role of asset acquisitions in restricting international trade in raw materials. Finally, it proposes three key areas that would benefit from further study.

The guiding principle for trade policy in the last decade has been the general acceptance of the potential for real productivity gains from trade liberalization. Not since the post war expansion of the 1950's has there been a decade when there have been greater strides made to reduce trade impediments amongst nations. Significant tariff barriers have fallen everywhere more often and much more quietly than the Berlin Wall. Against this advancing tide of trade liberalization, however, there has been, in recent years, a back current in the form of raw materials export restrictions. This back current is becoming more noticeable in the present context of tougher economic times. Introducing restrictive measures on exports in tough economic times is not a new development for either developed or developing countries. The range and number of measures that have been put into place in recent years are, however, troubling because of their scope and potential long term economic impacts.

This paper begins by sketching the economic context, with particular focus on the mining and metals sectors in which these barriers to raw materials trade have arisen. It then describes in summary form both the current measures and their motivation. Economic impacts of these measures from the industry perspective are then presented. Finally, it proposes several subjects of potential future studies that might provide a more comprehensive analysis of raw materials export restrictions.

Features of the extractive industries: metals and minerals

Metals and minerals account for a relatively small share of world industrial output. However, their supply is essential for the development of an economy. Materials such as steel, aluminium and copper are used in producing a broad category of products.

Uneven distribution across countries of metals and minerals reserves emphasizes the importance of free trade. Large portions of key raw materials are concentrated in a relatively small number of countries, while other economies have limited domestic supplies. Unequal distribution of resources is a potential source of trade friction among nations in situations where free trade could fill the gap between the supply and demand.

The major producers and exporters are located in developing economies while the major consumers are mainly from developed countries which rely heavily on imports. Since the 1990s, however, developing countries such as China and India have significantly increased their consumption of the resources to help fuel their economies, and are now among the leading consumers. For example, the share of developed countries in the consumption of iron ore, copper and zinc fell significantly in 2005 from that of a decade ago. This was matched by an increase in the share of developing Asian countries for these metals (UNCTAD, 2008).

Global markets for metals and minerals tend to be volatile, partly due to time lags in the supply response to changes in demand. Investments in the extractive industries are generally associated with a high capital intensity and a long-term payback characteristic. These features raise the risk that is associated with investment in this sector and is one of the reasons that supply does not immediately respond to price change.

Humphrey (2008) analyzes that much of the increasing price of metals and minerals from 2003 and 2008 can be explained by the strength of the demand and the lagged response of the supplying industry. With the global economy enjoying an average growth rate of 4.7% a year between 2002 and 2007, the role of the emerging markets was significant. The proportion of global growth accounted for by these countries exceeded

that coming from the advanced industrial countries by a considerable margin. On the supply side, mining and metal producers had difficulty in meeting the growth in demand. The extended period of low mineral prices during the 1990s had led to reduced investment in production resulting in a significant decline in spare supply capacity.

Table 6.1. Distribution of production and consumption of selected metals and minerals, 1995 and 2005

%

Metal	Developed countries		Latin America and the Caribbean		Developing Asia		South-East Europe and the CIS		Other regions	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
Iron ore production	17	29	31	24	27	29	19	14	6	4
Pig iron production	37	29	8	5	39	52	14	13	2	1
Copper production	41	43	19	21	12	6	22	21	6	9
Copper consumption	64	46	5	6	28	42	2	5	1	1
Zinc production	45	36	23	21	22	32	6	7	4	4
Zinc consumption	57	42	15	8	19	39	7	9	2	2
Bauxite production	39	36	28	27	12	19	6	8	15	10
Alumina production	40	48	28	20	14	19	16	12	2	1

Pig iron production is used as a proxy for iron ore consumption and aluminium production is used as a proxy for bauxite consumption.
Source: UNCTAD (2007) *World Investment Report*.

Economic context and challenges surrounding raw material supply

Current economic realities

With the Lehman Brothers collapse in October 2008, commodity markets, some of which showed signs of weakening at mid-year, dropped off a price cliff that did not find bottom until early to mid 2009. In response, the mining and metals industry went into survival mode through late-2008 and early-2009 by jettisoning projects, closing high-cost operations and reducing employment and operating levels. Compared with past recessions and business cycles, the adjustment of the industry to this new reality after a bullish seven years was relatively swift. The one area of exception was in gold, where metal prices increased rather than decreased and where industry profitability and investment remained strong.

The combination of recession and financial crisis resulted in some startling economic indicators and served to create significant stress on both developed and developing countries. The United States (US) unemployment rate hit a twenty-six year high in September of 2009 at 9.8%. The US residential construction industry declined 35%, at a half-million units below historic levels, while light vehicle sales for 2009 were forecast at 4 million units, 25% below historical levels. While the US market is highlighted because it remains the world's largest market, it should be noted that Europe and Japan were also dramatically affected by the financial crisis and subsequent recession — the US numbers can stand as a decent proxy for the larger picture.

Tough economic times bring a political reality not seen in good times. One of the consequences of the greater degree of trade liberalisation is the interconnected nature of world economies. Global supply chains for essential raw materials have become increasingly complex and interdependent. With this increased interdependency comes the temptation for governments to erect trade barriers to enhance domestic raw material supply and provide advantage to their domestic industries.

This problem is further exacerbated by the fact that raw material supplies can be concentrated in relatively few countries, particularly in metals. For example, in 2009 China produces 97% of world rare earths and 81% of tungsten while Brazil produces 91% of world niobium (USGS, 2010). In the case of many other metals it is quite common that two or three countries together represent 50-70% of global production. Most supplies of iron ore, manganese, rare earths, tungsten and vanadium are concentrated in three or fewer countries.

While, in principle, export restrictions can be applied to any sector of the economy, it is the measures specific to raw materials that have become increasingly important in the current economic context. The example of the steel industry is a particularly useful barometer of global economic activity and a stark example of how the global production and demand landscape is changing for many commodities.

The steel example

Trends within the world steel market illustrate which economies are expanding versus contracting in infrastructure and manufacturing capacity. During the robust period for commodities from 2000 to 2008, world steel capacity increased 600 million metric tonnes (MT), a 55% increase. China was a net steel importer until 2005 but became a net exporter by 2006/7, shifting from a 30 million MT deficit in 2003 to a 40 million MT surplus in 2007.

Steel is an important input for both the vehicle manufacturing and construction sectors. The access to reasonably priced and sufficient quantities of coking coal and additives are important factors in steel-making investment. The prices of these inputs have risen in the last decade. For example, from 2001 through the first half of 2008 iron ore and coke prices increased by 380% and 700% respectively, while the price of scrap metal doubled in the first half of 2008 (Price *et al.*, 2008). Access to both raw materials and scrap are very important for the steel industry. Export restrictions on coke and these additives will upset the normal flow of these goods between countries.

Potential constraints in raw material supply

China's economic growth with respect to the production, use and import of other raw materials is also a major factor in the changing landscape of commodity markets beyond steel. In the early 1980s, China consumed about 5% of the world's base metals (copper, lead, zinc, nickel), while this share has increased to some 30% in present years. Consequently its demand for these materials is a key driver in base metal markets and often a key determinant of price on terminal markets such as the London Metal Exchange. Given the continuing urbanization of the Chinese population and the growing global and domestic demand for consumables, China's economic growth will be a key factor in commodity markets for decades to come.

The other members of the BRIC quartet, Brazil, the Russian Federation (Russia) and India, because of their large domestic consumer markets, also have the potential to

provide long-term buoyancy in commodity prices in this century. In these instances, growing urbanization is helping drive consumer demand – and the attendant electricity demand, development of infrastructure and manufacturing capacity, and growth in the middle-class. The result is a need for the underlying raw materials that support these new demands: potash for fertilisers, uranium for nuclear power, base metals for construction and manufacturing and even diamonds and gold to serve the desires of a growing middle class.

While the long-term outlook from a demand perspective looks positive, there are many challenges on the supply side that could bring uncertainty to global commodity markets. The factors affecting the supply side response to market price signals have also grown more complex over the last three decades, further contributing to market uncertainty. In mining, as in other capital intensive sectors, uncertainty detracts from capital availability and investment flow.

The high price period of the first decade of this century has not resulted in the typical industry response of project development, over-shooting of supply and subsequent depression of price. The reasons for this are many and include the following:

- Regulatory requirements facing new projects in both developed and developing countries have generally become more time-consuming, complex and subject to overlaps, as public values regarding environmental degradation and the need for post mining reclamation have captured certain externalities and turned them into development costs while also driving environmental assessment processes to be more inclusive of social issues.

- Assessments of new projects are also confronting a more complex web of human and indigenous rights which must be considered and accommodated. In the case of human rights assessments, there is not a commonly accepted template which provides consistent guidance to the private sector in this area. The emergence of the World Bank—International Finance Corporation (IFC standards and the over 70 private sector banks and credit agencies adhering to the Equator Principles (essentially the IFC standards) in their loan policies, has meant that most major mining projects are subject to a level of scrutiny and assessment before development and permitting that has stretched out development times significantly.

- The high price signals in the market place for commodities have served to drive the exploration and development community to the remotest corners of the globe in the search for base and precious metals and rare earths. Many of these remote areas lack power and transportation infrastructure; this also becomes part of the development process and stretches out timeliness.

- Related to political risk and taxation, periods of price buoyancy can lead to governments re-examining their tax policies in respect of obtaining their ‘fair share’ of rents. Even more stable countries with a long history in mining and a deep understanding of the cyclical nature of the business have not been immune from this political reality. Given the large capital requirements for investment and the long life of operations, the need for fairly stable taxation regimes is critical to the ability of the industry to make long term capital investment decisions.

Export barriers, as discussed below, can also frustrate industry’s ability to move materials to market in the most advantageous value-added form. Export restrictions can disrupt market forces and distort investment decisions. When markets are disrupted, the potential short-term and longer-term damage from trade distortions becomes higher. Price

volatility associated with export restrictions create an insecure environment and investment by the mining industry, in particular, can be negatively affected by this instability since it requires large capital and thus is sensitive to risks. Trade liberalisation is an important element in the suite of economic policies needed to create a more resilient economic structure for all countries.

Declining reserves in some traditional countries

It should be noted that levels of proven and probable mineral reserves in some traditional mining countries have declined in recent decades. Such declines serve to reinforce the importance of finding new reserves, either in these countries or in emerging or riskier countries. Table 6.2 shows the example of Canada, where reserves of base metals and some precious metals have generally declined by over half during the past quarter-century.

Table.6. 2. Canadian reserves of selected metals, 1980 – 2007

Year	Copper (000 t)	Nickel (000 t)	Lead (000 t)	Zinc (000 t)	Molybdenum (000 t)	Silver (t)	Gold (t)
1980	16 714	8 348	9 637	27 742	551	33 804	826
1985	14 201	7 041	8 503	24 553	331	29 442	1 373
1990	11 261	5 776	5 643	17 847	198	20 102	1 542
1995	9 250	5 832	3 660	14 712	129	19 073	1 540
2000	7 419	4 782	1 315	8 876	97	13 919	1 142
2003	6 037	4 303	749	6 251	78	9 245	1 009
2004	5 546	3 846	667	5 299	80	6 568	801
2005	6 589	3 960	552	5 063	95	6 684	965
2006	6 923	3 940	737	6 055	101	6 873	1 032
2007	7 565	3 778	682	5 984	213	6 588	987

Source: Mining Association of Canada.

These declines reflect some cuts in exploration spending in response to weak metals prices during the 1990s. However, in recent years Canada has received the largest share of world exploration spending (almost one-fifth of the total). Exploration expenditures for gold have been robust during the past decade, with the industry spending historically high amounts. Despite this, there is a concern that the exploration success rate is declining.

In copper, the recent buoyant period of demand has been met primarily through expansions of existing copper mines as opposed to new large greenfield developments. Antamina in Peru was the last large copper project to be brought on stream while other discoveries such as Oyu Tolgoi in Mongolia have awaited government agreements and permits for development for several years and are slowly moving toward the development stage. The copper price remains higher than would be expected, arguably because of the supply-side considerations discussed in this section. The declining trend of reserves emphasizes the importance of investment in providing a stable supply of basic metals and minerals.

Export barriers affecting raw material supply

In the context of what has, until recently, been strong global growth, the dramatic economic transformation in emerging market economies has created what seems to be an insatiable demand for raw materials to produce products either for export or domestic consumption. This expanded demand has provided the driver for the governments of several of these countries to impose significant restrictions on raw material exports. To the extent that an emerging market economy both produces these critical raw materials and consumes them in its downstream manufacturing processes, there is a temptation to provide advantage to those manufacturing operations via restrictions on the export of raw material inputs.

These restrictions can take a number of forms — export quotas, export taxes and export licensing requirements, among others. The focus of such restrictions seems to be on minerals and metals. In the minerals and metals area, China is usually identified as the most active practitioner of such restrictions, although the governments of a number of other emerging market economies (India, Ukraine, Russia, Vietnam and Colombia) have also imposed restrictions. The issue of export barriers has been raised from an informal dispute to a formal trade action with the recent decision by the United States and the European Union to challenge China's export taxes and quotas on raw materials at the WTO. While China is the most important of the BRIC economies, it is also expected that future economic growth will be high in competing countries such as Brazil, Russia, and India. Thus, it is unlikely that a strategy of locking up raw materials for domestic use is going to go away anytime soon.

This section aims to examine in further detail the issue of export restrictions on raw materials in the mineral and metals sector. The analysis briefly covers the logic and implications of such restrictions, the type of restrictions and evidence on the scope of such practices.

Logic and implications behind export barriers

Export restrictions on critical raw materials can come in a number of forms (quotas, export taxes, licensing arrangements, etc.) although the rationale for their imposition and their consequences are broadly similar.

Recently, social objectives have been invoked as motivations for export restrictions of metals and minerals. The high price of metals and minerals encouraged the mining and production of raw materials and consequently increased government concerns regarding the by-products of this economic activity; namely resources depletion and pollution.

However, without corresponding measures to restrain domestic consumption, export restrictions by themselves would be ineffective in dealing with the issue. The policy concerns of depletion and pollution arise in the production stage regardless of the domestic or international destination of the products. However, export restrictions could affect only foreign demand without reducing domestic demand.

Chile's experience provides an alternative policy option by applying a mining tax on the operating income of mine operators (OECD, 2010). Ruiz-Dana (2007) shows that Chile's copper revenue management was also effective in lessening its vulnerability to commodity shocks and increasing its development capacity without trade distortions.

Promoting downstream processing industries is a major motivation in many cases. By restricting the export of a critical raw material, a government increases the supply of that material available to its domestic processing industry and lowers its cost. This, in turn, provides a competitive advantage to the domestic processors relative to their foreign counterparts. This advantage may continue along the value chain if domestic manufacturers of products use the output of the advantaged industry as an input (*e.g.* steel in vehicles and appliances).

This competitive advantage is enhanced to the extent that the country applying such measures is itself a major producer of the critical raw material. By imposing the restriction on the export of the raw material, the government can not only reduce costs for its domestic manufacturers but also increase costs for the counterpart foreign manufactures via its impact on the global market price of the raw material. Thus foreign manufacturers complain that they are forced to pay more for raw materials than they otherwise would, thereby increasing their cost of doing business. To the extent that these higher costs are passed on, consumers also are adversely impacted by the restrictions on raw materials exports.

Assessing the impact of export restrictions is an empirical issue. The size of that impact will depend on several factors including the following.

- The degree to which the country imposing the restriction is a major producer of the critical raw material and can thus influence the world price;
- The relative importance of the manufacturing industry which uses the raw material in the emerging market economy;
- The contribution of that raw material to the total costs of manufacturing of the processed product;
- The ease of substitution of other materials or inputs in the manufacturing process for the material in question.

Evidence on export restrictions[2]

Several organizations have amassed evidence on the various forms of raw materials export restrictions in the minerals area. The emphasis seems to be on steel making and certain inputs (e.g. ferrous scrap) integral to that process, although this may simply reflect that steel is the product most intensively examined. The remainder of this section summarizes and synthesises the evidence of these various surveys.

Export quotas

China appears to be the country that most readily imposes quotas on the export of strategic raw materials. As of late 2008, the Chinese Government chiefly through the Ministry of Commerce has imposed export quotas on coke, antimony, bauxite, magnesium carbonate, molybdenum, silicon carbide, tin and tungsten. Exports of silica sands are banned. There also appears to be the option for a contract-specific quota on zinc which the Ministry of Commerce may impose as a precondition for receiving an export licence. The quotas appear to be established on an annual basis although that for molybdenum is semi-annual.

The export quotas appear to be increasingly restrictive over time. Relative to 2006, the 2008 quota for coke was 14% lower, that for antimony 8% lower and for tin 37% lower. For the latter, the 2009 quota was a further 30% lower than the 2008 quota.

Several of the quotas — bauxite and magnesium carbonate — are accompanied by a bidding system in which qualified exporters buy the right to export a limited amount of the commodity pursuant to the quota. The qualifications include a minimum level of registered capital and previous compliance with environmental and safety laws.

The Chinese quota for coke, an essential input for the production of steel in integrated facilities, has been examined by the government more closely than the others. The coke quota was imposed in 2004, at which time it was 14.3 million MT annually. By 2008, it was reduced to 12 million MT. To put these numbers in perspective, China's annual production of coke is about 200 million MT which represents about 40% of global production and the export quota represents less than 5% of its production (Rudyka and Malina, 2008).

Other countries do not appear to use the export quota approach as aggressively as China. One interesting variant of the approach, however, is the domestic quota. The Russian government is considering mandating the amount of coke which its producers must supply to the domestic market. The contemplated amount is 50 million MT which represents about 93% of the country's 2007 production. The imposition of this domestic quota would have a similar effect as export restrictions and severely limit the export of coke.

Export taxes

Export taxes appear to be the principal vehicle through which many governments control the exports of mineral raw materials in order to support their manufacturing industries. Table 6.3 provides a survey of the principal taxed minerals in China, Russia, India and Vietnam. These are not the only countries to impose export taxes, Egypt and Argentina tax ferrous scrap and Ghana imposes a duty on manganese exports, but they are generally the most important in terms of raw material production and trade. In examining the table, it is worthwhile to note that India (1995) and China (2001) have been WTO members for some time. Vietnam acceded to WTO membership in 2007 and the Ukraine in 2008. Discussions concerning Russian membership are ongoing. Thus the data provided for Vietnam and Ukraine reflect a transition from their current rates to their committed reductions after a five to six-year transition period.

Several observations can be made from the information in Table 6.3.

- Of the five countries, India uses export taxes the least. The only identified export taxes are on iron ore and scrap. As will be noted later, it seems that India uses other devices such as State Trading Enterprises (STEs) and licensing arrangements to control exports. Taxes and other levies are imposed at the provincial level.
- It is clear that, in Ukraine, Russia and Vietnam, scrap material is of greater interest than raw ore or compounds. Scrap of all kinds is typically export taxed at around 40% in Vietnam versus 10-15% on ore and compounds. In Ukraine, the export tax regime is almost totally focussed on scrap. In Russia the typical rate is fairly low (6.5%) but scrap of certain strategic minerals — aluminium, nickel and titanium — is taxed at high rates.

Table 6.3. Export taxes on minerals, selected countries

Mineral	Tax rates % unless otherwise indicated				
	China	Russia	India	Ukraine[2]	Vietnam[3]
Aluminium					
-cpds					5-10
-waste/scrap	15	6.5		30/15	40/22
Antimony					
-ore/cpds[1]	5-10				5-10
-waste/scrap		6.5			
Bauxite	15				
Calcium		6.5			
Coke	40	6.5			10
Copper					
-ore/cpds	15			30/15	
-waste/scrap				30/15	40/22
Ferrous					
-ore/cpds	10	15	15[4]		5-10
-waste/scrap			15	EUR 25/EUR 10 per tonne	33/17
Magnesium Carbonate	5-10				
Manganese	20				
Molybdenum	15-20	6.5			5-10
Nickel					
-ore/cpds					5-10
-waste/scrap		30		30/15	40/22
Silicon [5]	10-20				
Tin					
-ore/cpds	10-20				
-waste/scrap		6.5		30/15	40/22
Titanium					
-ore/cpds					5-10
-waste/scrap		30			
Tungsten					
-ore/cpds					5-10
-waste/scrap		6.5			
Yellow Phosphorous	120				
Zinc					
-ore/cpds	5-15				
-waste/scrap				30/15	40/22

General: many export duties, particularly those in Russia and the Ukraine, are expressed as the greater of a percent or a flat rate (typically in euros) per unit. For simplicity, the flat rate levies are not shown.

1. Compounds (cpds) refer to various media in which the mineral is incorporated. For example, magnesium carbonate includes natural magnesium carbonate and light-burned magnesia which attract a 5% tax and sintered magnesia, fused magnesia and unwrought magnesium which attract a 10% tax.

2. The two Ukraine numbers represent, respectively, the current export duty as pledged by the Government of the Ukraine on accession to the WTO and the duty pledged 5-6 years after the accession.

3. The two numbers for Vietnam indicate the current tax and the tax pledged by the government 5 years after accession to the WTO. The tax rate reductions are to be phased in over this period.

4. Iron fines face an 8% export tax.

5. Except silica sands which are banned from export.

Source: Price *et al*. (2008)

- In China, almost the same minerals/products that were subject to quotas are subject to an export tax suggesting that the Chinese government is using both instruments in tandem to restrict exports rather than employing the tax as a revenue raising device. With respect to coke markets, the relatively tight and declining quota coupled with a 40% export tax (and possibly higher licensing fees) have both increased the Chinese export price of coke and artificially reduced the domestic price to coke-consuming industries. The resulting price gap is very large. It is estimated that as of September 2008, the Chinese coke export price was about 56% higher than the domestic price (about USD 619 per tonne for exports *versus* USD 397 per tonne for domestic sales).

- The elaborate Chinese system of quotas and taxes does raise the question of whether these are consistent with its WTO obligations. Quantitative export restrictions are generally banned under Article XI of the GATT with some exemptions for conservation and security reasons allowed in Article XX. In joining the WTO, China committed to eliminate (and not reintroduce) export tax measures that could not be justified under the provisions of the WTO. It did, however, reserve the right to impose export taxes up to certain maximum permissible rates of 20 to 50% on a number of products. This "bound" list includes most of the minerals listed in Table 6.3 on which China currently levies an export tax. Whether China's export taxes and quotas on coke and various minerals are consistent with WTO treaty rules is the subject of the joint US–EU complaint to the WTO.

Removal of VAT rebates

One variant on the export tax is the removal of rebate from value-added tax (VAT) or other sales tax on exports of a designated raw material. Many countries do not charge sales tax on exports so that domestic producers are not rendered less competitive when exporting to other jurisdictions. For example, exports from Canada are not required to pay the Goods and Services Tax. China abolished its VAT rebate in 2005-06 on exports of aluminium and aluminium alloys, steel sold in certain export zones, various forms of primary iron, fluorspar, magnesia, molybdenum concentrates and various rare earth products and finished steel. Assuming the rebate was for the full amount of the tax, the implications of its removal could be significant given a VAT rate of 17%. It is not known which of these rebate eliminations are still in effect.

Export licensing requirements

Several countries have created elaborate export licensing requirements. It is argued that these arrangements are designed primarily to restrict exports of what are considered to be strategic raw materials. The details vary, but two common themes are lack of transparency in the licensing process and the degree of discretion provided to officials.

The Chinese government imposes controls on the export of molybdenum, silicon carbide, zinc, antinomy and coke through extensive export licensing requirements administered by the Ministry of Commerce. Contracts are for no longer than six months. There are a number of financial and other requirements in order to be placed on the approved list of exporters.

The export licensing for coke has a long history. In 2004 the EU complained that the licensing arrangement created significant imbalances in the global market and demanded its elimination. The Chinese government committed to supplying an agreed-upon minimum quantity of coke to the EU. At the same time, the Chinese government, through

the Ministry of Commerce sought to maintain the licensing system and to enforce it more vigorously on other foreign customers in part through the reduced overall quota noted earlier. The stated rationale for this policy was "to preserve coke for its booming domestic steel industry" (Wong, 2004).

Ukraine also has a system of registration requirements particularly for the export of scrap metals. Exporters must be properly registered with the Ministry of the Economy which issues the export license. It is alleged that the charges for issuance of such licences demonstrate that they are set up primarily as a deterrent to trade — the charges being apparently five times higher than the ordinary customs fee. Perhaps more importantly, Ukraine reserves the right to apply minimum export prices to a variety of goods including ferrosilicon, heavy sheet rolled metal and ferro-concrete reinforcements.

In India, the government requires that the trade in raw materials pass through State Trading Enterprises (STEs). Under Indian policy, STEs have the exclusive right to import and export certain minerals such as iron ore, manganese ore and chrome ore. In the case of ores containing 65% or more iron, the entire transaction must be channelled through the state-controlled Minerals and Metals Trading Corporation (MMTC). Having the bulk of exports channelled through a few state-owned enterprises does allow government considerable control over price and supply. This control would appear to be enhanced in the case of iron ore. The state-owned National Mineral Development Corporation (NMDC) is India's largest iron miner and is the major supplier of iron ore for export to MMTC which is the clearing house for all exports of high grade ore.

Compared with other forms of export restrictions, export licensing has drawn relatively less attention, partly because it is difficult to acquire information on this measure. Enhancing transparency on export licensing was proposed during the WTO Doha Round negotiations. The proposal was composed of three pillars. Each country has to notify its measures and, upon request by any WTO member, is also required to provide all relevant information. Finally, the WTO would review regularly the implementation and operation of this procedure.

Impacts of export restrictions

Export restrictions can have a negative impact on supply capacity, which will increase market uncertainties. Price volatility caused by export restrictions creates an insecure environment and companies can consequently be unwilling to invest in long-term projects, thereby negatively affecting global capacity. As has been shown in the recent price hike of raw materials, delayed supply-side investments serve to exacerbate price volatility and supply instability.

Similar problems can be seen on the demand side. Input price differences between domestic and foreign processors provide an uneven playing field, while frequent revision of export tax rates or export quotas without prior notification raises the level of unpredictability faced by importers. Broad discretion in export licensing regimes has comparable impacts.

Complementary barriers and actions regarding foreign direct investment

While this paper focuses primarily on the export barrier component of this issue, it is worth noting that actions and barriers in the area of direct investment can also play significant roles. UNCTAD (2008) identifies that foreign direct investment (FDI) in the extractive industries is aimed mainly at gaining control over mineral resources. Several

perspectives could be found regarding the relevance and interaction between export restrictions and FDI policy.

As components of a country's industrial policy, it is conceivable that export restrictions could be utilized to help lure FDI in processing industries. Export restrictions favour the downstream processing industries in exporting countries by providing cheap raw materials while raising prices faced by processors in competing countries. The degree of price differences between exporting and importing countries depends on the market power of the exporting country. This price difference can act as an incentive to attract FDI in processing industries — where access to raw inputs would be weighed against other investment drivers.

Countries applying export restrictions may also choose to limit FDI in mining and other primary industries. There may be several reasons for this, including:

- A strategy to ensure that value-added activity based on domestic raw materials would take place in the host country (and a suspicion that this may be less likely to happen if multinationals own and control the extraction and processing of such materials);

- A desire to keep FDI away from sectors that may have above-normal profits in periods of high commodity prices;

- Concern that foreign-owned entities could move materials to their subsidiaries in other countries where profits might be more lightly taxed.

China allows only state enterprises to explore in several types of minerals — including in the exploration and mining of antimony, molybdenum, tungsten, tin and other minerals (Price *et al.*, 2008). In addition only state-owned enterprises (SOEs) are permitted to refine and process tungsten and tin. Further, China restricts the ability of foreigners to conduct survey and mapping activities and to access resulting data. There is a perceived lack of transparency in auctioning and bidding for exploration licenses. It has also been noted that there are generally additional hurdles for foreign companies attempting to secure an exploration license. It has been suggested that approval processes "suffer from a lack of transparency and from undue discretionary power by local government authorities" (Price *et al.*, 2008). Other countries, including Russia, Ukraine and India also have formal or informal measures in place which negatively impact the ability of foreign businesses to invest in raw materials exploration and development.

Controls on direct FDI within the host country are often just one side of a strategy to develop greater influence over world markets for strategic raw materials. Several of the countries which have export restrictions on their own raw materials are also aggressively pursuing direct investments in other countries. This is not a particularly surprising development – private companies often pursue vertical integration between mining and processing sectors in order to protect themselves from price or volume volatility (Antkiewicz and Whalley, 2006). Recent examples of vertical integration include China's state aluminium company Chinalco acquiring Peru Copper in 2007 and thereby obtaining development rights to the Toromocho mining projects in Peru. This aims at securing the supply of copper ore to Chinalco's smelters, underpinning the company's vertical integration strategy.

Investment in natural resources by several sovereign wealth funds (SWFs) could reflect investment diversification strategies. Singapore's Temasek Holdings, for instance,

invested in Inmet Minings and Platmin, both Canadian mining firms, with operations worldwide. China Investment Corporation (CIC) invested in Teck Resources, another Canadian mining firm, as well as similar firms in Mongolia. Teck Resources perceived the CIC as a strategic investor, as China is the largest consumer of Teck's coking coal.[3]

Currently, it is premature to predict the impact of these investments on global trade. In several cases, the investment was made in a new mining project which will take several years to start actual production. The motivations driving the FDI, vertical integration or portfolio investment, can also have a significant impact on eventual trade flows of the raw materials. While the lack of reciprocity in treatment of FDI is of concern, many trade analysts and policymakers are also troubled by the use of state-owned or controlled enterprises and sovereign wealth funds as the vehicles for these investments. Antkiewicz and Whalley (2006) raised the question of whether SOEs may be provided with favourable funding terms.[4] It is argued that government financing and support for acquisition and investment activities by these entities provides an unfair advantage over private-sector competitors. The advantages include subsidies such as low interest bank loans to SOEs investing overseas (Price *et al*. 2008)[5].

The breadth of FDI related policies adopted by several countries causes some concern for the future. It is worrisome that China's policies, while somewhat more comprehensive in scope, are being followed by other countries that have export restrictions as well. Russian FDI is at a comparable level as China — around USD 50 billion in 2008 (UNCTAD, 2010). Russian companies have become some of the world's most aggressive investors. Metallurgy and energy corporations — Norilsk Nickel, Rusal, Lukoil, Gazprom — all have close relations with government and are at the forefront of investment activity that achieves vertical integration. It should be noted that while the Russian government obviously provides a great deal of policy and diplomatic support to such foreign investments, there is little hard evidence of specific subsidization of such activities.

The overall conclusion to be drawn from this section is that export restrictions on raw materials can often be reinforced by policies that restrict inward FDI. Taken together, these two policy instruments result in a growing concentration of domestic ownership of many critical raw materials. The impact of these restrictions on concentration is further exacerbated when the host country itself embarks on an aggressive campaign of outward investments in these same materials — a campaign which can be partly or predominately financed with the support of the host government.

Areas of future study

Several studies have made the case that a recent trend to erect barriers to the export of raw materials, in particular minerals, is potentially a significant impediment to international trade. The joint US–EU decision in June 2009 to request WTO dispute resolution against China for its export restraints on several mineral raw materials has ensured that export barriers will gain greater prominence as a global economic issue.

It is also reasonably clear from this and similar papers that, while it is possible to generate lists of raw materials trade barriers and make inferences about their purpose and impact, there is a lack of hard analytical evidence as to their economic consequences. Furthermore, the determination that a raw material is critical seems to be retrospective rather than prospective — i.e. it happens after a barrier has been erected. It would be helpful for public policy if there were a means of identifying critical raw materials (and therefore the potential for restrictions on export) in advance.

This analysis could provide the basis for negotiations to develop a framework to discipline measures that negatively affect international raw materials trade. It is with these objectives in mind that three future studies related to export barriers have been proposed below, in particular a registry of raw materials export constraints, an economic analysis of the impacts of current and proposed export constraints on raw materials, and the development of a methodology to identify the "criticality" of raw materials.

Registry of raw materials export restrictions

Although Price *et al*. (2008) and ITS Global (2007) have compiled information on quotas, export taxes and related barriers, the material captures a snapshot in time and will become dated. There is a need to update and systematize the information on a regular basis. Arguably, as well, the current information is too China-centric and it may be useful to expand the geographic scope of the registry to include other emerging market economies and even developed countries.

It is noteworthy that in advancing this study, judgement will be required to determine whether a particular quota, tax or licensing arrangement or other measures falls within the definition of export restrictions. Depending on the subject commodities or industries, expertise of the relevant sectors would be critical in identifying existence and impact of export restrictions. In this regard, collaboration with business community would be advised.

Economic analysis of current export barriers

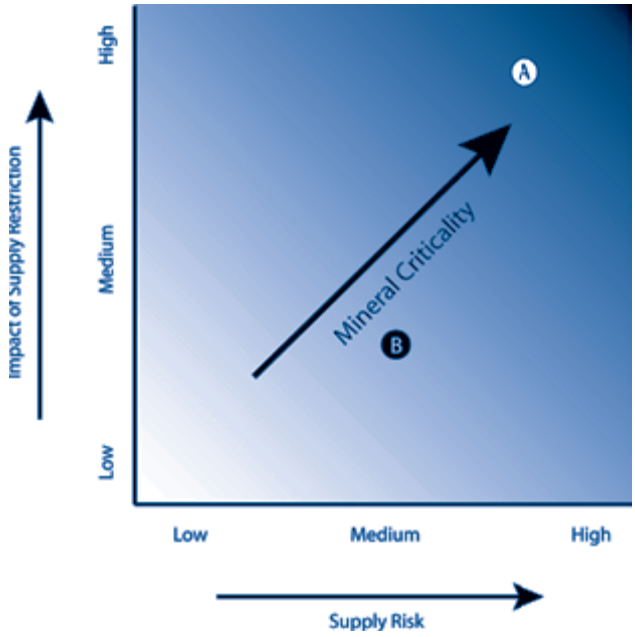
What is not sufficiently addressed in any definitive way in the current literature is the economic impact of the export constraints. How significant is their impact on the export prices of raw materials? In the countries facing these constraints, how significant are the cost increases for manufacturing and, to the extent that they render such manufacturing less competitive, what are the implications for GDP and employment? On the exporter side, how important are the benefits (in terms of export performance, value-chain, GDP and employment) for which the government of the emerging market economy presumably imposed the constraints?

Responding to quantitative questions of this nature would require a well-developed economic modelling capacity and the ability to draw comparisons between jurisdictions and scenarios. In some instances, it may be necessary to combine certain constraints or scenarios so as to make the analysis more meaningful or practical. Again, a business perspective could contribute to this analysis.

Assessing the criticality of particular raw materials

The identification of barriers to the export of important minerals is typically a retrospective exercise; the mineral in question is found to be critical only after the barriers have been applied. It would be helpful for security policy, trade policy and also for research and development policy to have an approach which could identify the "criticality" of a mineral or other raw material in advance. This methodology could also be used to provide an initial sense of the factors responsible for the criticality of a particular mineral. Is the mineral critical because of supply side factors (geology, production concentration, etc.) or because of demand factors such as new applications for the mineral or limited substitution options?

A committee of experts organized by the US National Academies[6] has developed such an initial framework to determine mineral criticality. The central innovation of their 2007 report, *Minerals, Critical Minerals and the U.S. Economy*, is a "criticality matrix". This matrix (see below) posits that a mineral is critical if it is important in use (the impact of a supply restriction or vertical axis) and if it is subject to potential supply restrictions (supply risk or horizontal axis). In the diagram, mineral A is more critical than mineral B both because of a greater supply risk and because the imposition of a restriction would have a more severe impact.



One attraction of the criticality matrix approach is that it organizes the factors leading to a mineral being critical into demand and supply categories. The demand category, represented by the impact of supply restriction vertical axis encompasses factors such as existing and new applications for the mineral and the technical and economic possibilities for substitution in the event of a supply shortage. Demand criticality could include considerations such as military technology applications and use in key energy technologies. The supply risk category covers five factors: geology (existence and availability of reserves), technical (ease of extraction/processing), environmental/social, political (the capacity of governments of supplying countries to influence supply) and economic (unit operating and capital costs for extraction). This categorization not only helps organize thinking but also suggests to policy makers what data, information and research is needed to mitigate potential restrictions in the supply of that mineral for existing or future uses.

In its study, the National Academy team applied the matrix to a selection of mineral/mineral groups, namely copper, gallium, indium, lithium, manganese, platinum metals, rare earth elements, tantalum, titanium and vanadium. As the study notes, "this list should not be construed as a comprehensive list of potentially critical minerals; but rather those determined by the committee to demonstrate the range of factors over which the matrix methodology could be tested, and which could be reviewed within the time constraints of the study".

Some of the conclusions of the study are fairly obvious. Rare earths, for example, are critical for the United States largely because it is totally dependent on foreign suppliers and that 76% supply is concentrated in one country, China. On the other hand, the categorization highlights that platinum (and some rare earth elements) is critical primarily because it is fundamental to the construction and function of automobile catalytic converters and, at present, there are no viable substitutes for platinum in this application. It is proposed that this methodology be adapted as necessary and applied to a broader range of minerals.[7]

Notes

1. Gordon Peeling, the Mining Association of Canada and Paul Stothart, Mining Association of Canada. Bill Toms and Neil Mcllveen, ENTRANS Policy Research Group.
2. Much of the information in this part relies on Price *et al*. (2008) and ITS Global (2007).
3. Yazad Darasha, *Sovereign funds flirt with commodities*, *www.gulfnews.com* (21 May 2010)
4. Antkiewicz (2006) explains that the State and Reform Commission (SDRC) and the China Import and Export Bank notified in 2004 that low interest loans would be available if the overseas activity of companies involves, among others, resource exploration, acquiring foreign advanced technology, developing global competitiveness of the company and global competitiveness of the company and expanding its markets.
5. Chinalco, the China National Offshore Oil Company and the CIC have been highly active investors in Africa, Australia and many other regions in recent years.
6. The National Academies is an umbrella organization for the National Academy of Sciences, the Nation Academy of Engineering, the Institute of Medicine and the National Research Council
7. It is noteworthy that the EU also defined critical raw materials from its perspective (EU, 2010). In this study, raw material is labelled “critical” when the risks of supply shortage and their impacts on the economy are higher compared with most of the other raw materials. The report analyses a selection of 41 minerals and metals and finds that 14 raw materials of them are critical.

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The Economic Impact of Export Restrictions on Raw Materials

Export restrictions on raw materials are applied to achieve a number of policy objectives. However, they can have a significant and negative impact on the efficient allocation of resources, international trade, and the competitiveness and development of industries in both exporting and importing countries.

By diverting exports to domestic markets, export restrictions raise prices for foreign consumers and importers. At the same time, by reducing domestic prices in the applying countries and increasing global uncertainty concerning future prices, export restrictions negatively affect investment, thus potentially reducing the overall supply of raw materials in the long term. In view of existing alternative policy tools that have a different impact on trade, the effectiveness of export restrictions to achieve stated policy objectives should be carefully reviewed.

This publication presents a selection of papers discussed at the OECD Workshop on Raw Materials, held in Paris in October 2009. This workshop was organised in response to the growing concern on the use of export restrictions on raw materials, particularly by emerging economies.

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