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# INTERNATIONAL TRADE IN FOREST PRODUCTS: AN OVERVIEW

by

G. David Puttock, Marc Sabourin & Karl D. Meilke*

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*G. D. Puttock and M. Sabourin, Faculty of Forestry, University of Toronto, and K.D. Meilke, Department of Agricultural Economics and Business, University of Guelph.

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Correspondence or requests for additional copies of this paper should be addressed to:

David Puttock
Faculty of Forestry
University of Toronto
33 Willcocks St
Toronto, Ontario
CANADA M5S 3BS

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## ABSTRACT

This report provides an overview of the current status of world trade in forest products. Global production and major trade flows are presented. Domestic policies affecting trade, tariff and non-tariff barriers to trade, free trade agreements, and environmental issues and their potential implications for trade flows are also reviewed. Recent empirical approaches to modelling the spatial commodity and interregional trade in forest products are discussed. Finally, the report highlights significant gaps in our knowledge and understanding of the factors affecting trade flows and recommends areas for further research.


## INTRODUCTION

International trade in forest products was valued at approximately $76.4 billion in 1990. Given this order of magnitude, it is not surprising that trade in forest products is fundamental to the economies of many of the world's developed countries and is quickly becoming an important factor in the economic growth of a number of developing countries. Current patterns of trade have their roots in 18th century colonialism when many European nations, having cleared much of their own forest reserves for agriculture and/or to fuel the engines of industry, were forced to turn to their colonial outposts as sources for wood. Remnants of these colonial trade patterns continue to influence trade flows.

However, as those colonies with large timber reserves began to assert their own independence, they also established indigenous forest sectors to provide wood and wood products for both domestic and international consumption. This has concentrated production in a relatively limited number of forest nations and has contributed to the development of regional trade zones.

International trade in forest products, as with that for most other products, is restricted and controlled by various measures. These include tariff and non-tariff measures. Trade is also affected by domestic policies and as well as newly emerging global environmental concerns.

However, in spite of its magnitude and importance, the subject has received little attention apart from efforts to monitor trade flows. The reasons for the lack of attention to forest products trade are varied. Some forest products are generally produced in most regions of the world, wood substitutes are plentiful, and unit values are low relative to other commodities. As well, markets tend to be regional and are not well integrated internationally.

The purpose of this report is to provide an overview of international trade in forest products and to identify knowledge gaps and problems which need to be addressed in order to better understand those factors influencing trade flows.

## WORLD PRODUCTION OF FOREST PRODUCTS

A brief discussion of industrial output of forest products is in order. For convenience, these wood products are distinguished as roundwood including sawlogs, pulpwood and wood chips; primary products including lumber, panel products (plywood and composite boards), and wood pulp; and secondary products such as newsprint, and paper and paperboard. For purposes of this study, the latter includes writing paper, other fine papers and paperboard such as corrugated medium and boxboard.

Absolute comparisons of production levels across these categories is virtually impossible because of differences in the units in which output is measured and different input/output proportions across countries. However, it is possible to compare national or regional output levels within individual product categories. This information is summarized for selected forest products in Table 1.

Industrial roundwood production, which is often used as a benchmark regarding the extent of industrial forestry activity, reached 1.65 billion cubic meters in 1990. Of this, approximately 1.14 billion cubic meters or 69% was roundwood from coniferous forest species while the remaining 510 million cubic meters of roundwood came from non-coniferous (deciduous) tree species. Three countries, the U.S.A., the former Soviet Union (U.S.S.R.) and Canada accounted for nearly 62% of world coniferous roundwood production. Roundwood production from deciduous tree species is less concentrated. The top 5 producing countries, the U.S.A., Malaysia, Brazil, the U.S.S.R. and China, produced slightly less than half of the global output of non-coniferous industrial roundwood in 1990.

Approximately 62% of roundwood production in conifer species and 53% of deciduous roundwood is classified as sawlogs which are converted into lumber and panel products (FAO 1990a). The remainder is classified as pulpwood or wood chips.

World lumber production was approximately 438.3 million cubic meters in 1990. Of this, 361.4 million cubic meters or 82.5% was softwood (coniferous) lumber. The remainder, 76.9 million cubic meters, was hardwood (deciduous) lumber. Approximately 60% of softwood lumber production is concentrated in North America and the U.S.S.R. Other notable producers include Japan, China, and Sweden. Hardwood lumber production is more widely distributed. The combined output from the top 6 producing countries, the U.S.A., the U.S.S.R., Brazil, Indonesia, Malaysia and China, accounted for just over half of the world's production of hardwood lumber in 1990.

Global output of panel products, that is plywood and composite boards, was 49.7 million cubic meters in 1990. Panel production is also highly concentrated with the U.S.A., Indonesia and Japan accounting for nearly 70% of world output in these products.

The emergence of developing countries such as Indonesia, Malaysia and Brazil as important producers of solid wood products is likely to have some interesting implications for trade in these products. Lumber and plywood produced in these countries is primarily derived from tropical hardwood species. Controversy over the deforestation of the world's tropical rain forests could possibly limit the supply of tropical hardwoods for industrial use and is stimulating interest in the use of hardwoods from the northern, temperate forests (FAO 1990b).

Wood pulp is an intermediate product used to manufacture a wide range of paper and paper products. World production of wood pulp reached 154.4 million metric tonnes (mt) in 1990. Global production of wood pulp is distributed throughout the temperate forest zone in North America, Scandinavia, the U.S.S.R. and Japan.

World production of newsprint was 33.1 million mt in 1990. North American and Scandinavian producers have traditionally dominated newsprint production, however, other countries, most notably Japan and China are beginning to acquire greater shares of world newsprint output. (FAO 1990a).

In 1990, the world output of paper and paperboard was 205.2 million mt. Many of the products within this category of forest products, such as writing and printing papers, tissue and paperboard are generally regarded as products with high value added. Production of paper and paperboard is less concentrated than with market pulp and newsprint, although the U.S.A., Japan and China account for slightly more than half of the world's output of these products.

## WORLD TRADE IN FOREST PRODUCTS

The consumption of forest products is associated with various measures of economic activity and performance. The consumption of lumber and panel products is directly related to the demand for housing construction in both the domestic and export markets. On the other hand, paper and paperboard consumption is observed to be directly correlated to GNP per capita, although demand is located primarily in the developed countries (Bourke 1988).

Trade in forest products therefore, is very dependent upon macro-economic factors influencing demand in the importing regions, i.e., per capita GNP, interest rates, exchange rates, and tariff and non-tariff measures. The relative importance of the different factors will vary depending on the commodity being traded.

There is ample evidence of a significant level of dynamic inertia embodied in the pattern of the major trade flows in forest products (Nagy and Andersson 1988). This is a natural consequence of widespread long-term trading agreements, of extensive capital investment in trade-oriented facilities between partners, of risk-avoiding behaviour, and of the importance of maintaining continuity of supply and/or quality control. Long-term contracts are common in product categories such as wood pulp and newsprint, where both continuity of supply and quality are very important (Haley 1988). There is also evidence that the remnants of traditional colonial links play a significant and slowly changing role in forest products trade, thus contributing to the inertia in trade flows (Bourke 1988).

One consequence of the inertia in trade patterns is the relative absence of supply-induced shock effects which are often associated with trade in agricultural commodities and other natural resource products.

It is difficult to assess the extent of competition in the international markets for forest products. There is general agreement that the North American softwood lumber market is perfectly competitive (Flora 1988; Haley 1988).The product is homogeneous, market information is well known to both sellers and buyers, and there are a large number of firms engaged in production and trade. A similar competitive situation exists in the West European markets for lumber, even though there are only three major exporters: Finland, Sweden and the USSR (Anderson and Ohlsson 1988).

On the other hand, wood pulp production has become highly concentrated in recent years because only large-scale production and high capacity utilization are cost efficient (Anderson and Ohlsson 1988; Flora 1988). The structural change in the pulp industry has meant not only a decrease in the number of producing units and an increase in their capacities but also a tendency to integrate with paper producers. Large producers are price leaders and exert substantial influence on the pricing process. It is no surprise therefore that wood pulp producers cooperate actively in the market (Seppala 1988).

Forest products trade flows are highly concentrated, i.e., in most products there are only a few exporters and importers, and a handful of trade flows cover some 40% to 60% of the volume and value of world trade. One reason for the degree of concentration is the bulky character of many forest products, where handling and transportation costs limit the radius of profitable trading. Consequently, concentration is more true for logs than for paper products (Nagy and Andersson 1988).

World trade in forest products can be very generally characterized as bilateral and multi-lateral trade within and across three regional trade zones - North America, that is Canada and the United States although Mexico would also be drawn in under the new North American Free Trade Agreement (NAFTA); Europe; and Japan and its Pacific Rim suppliers (Bourke 1988). A summary of trade flows for the major categories of forest products is provided in Tables 2 through 10.

## North America

As a unit, North America contains the world's largest exporter of forest products, Canada and the world's largest importer, the United States. The region is either self sufficient or a net exporter of most forest products. The main exception is for non-coniferous plywood which consists mainly of panels made from tropical hardwoods imported primarily from Indonesia. Imports account for some two-thirds of North American consumption of plywood (FAO 1990b).

The region is a net exporter of coniferous lumber, paper and paperboard, wood pulp, and roundwood. Pulpwood, wood chips and sawlogs have the Pacific Rim as the major market. Lumber and panel products have a more diversified market which includes Europe.

One of the most significant developments for the North American forest industry has been the sale of coniferous roundwood, most notably wood chips and sawlogs, to Pacific Rim countries. From small volumes in the early 1960's, the market expanded to nearly 16 million cubic meters of sawlogs and approximately 4.5 million short tons of wood chips by 1990 (FAO 1990a; Flora 1988). The origin of the sawlogs has been primarily the states of Washington and Oregon and secondarily the province of British Columbia and the state of Alaska. Japan, the Peoples Republic of China and Korea are the primary destinations. This market development has had a major effect on the roundwood markets in Washington and Oregon and has caused much controversy (FAO 1990b). The controversy arises from the fact that there are no export restrictions on roundwood harvested from private timber lands. Domestic producers must therefore compete for roundwood from these sources with foreign producers. There are export restrictions on roundwood from state and federal forest lands, however the supply of timber from these publicly owned lands is itself becoming increasingly scarce due to public pressures favouring the preservation of mature or "old growth" forests.

The U.S.A. is the world's primary importer of forest products. However, although the value and volume of U.S. imports are high, the country relies on imports for only 15% of its requirements for forest products. Thus exports to the U.S. are greatly affected by the state of its economy. Canada is the primary supplier of most of the forest products imported by the United States. An exception to the bilateral trading relationship between Canada and the United States occurs with U.S. imports of non-deciduous plywood, primarily from Indonesia.

## Europe

Imports satisfy approximately 60% of the Western European demand for forest products. Scandinavian producers are the primary suppliers of forest products to Western Europe where the U.K., Germany and France are the major importing countries. Canada, and to a lesser extent, the U.S. also supply coniferous lumber, wood pulp and newsprint to

Western Europe. However, currency valuations significantly affect the competitive position of North American suppliers of newsprint and wood pulp to Europe when compared to Scandinavia producers.

The European market for forest products can generally be characterized as mature, with growth paralleling increases in population. In a mature market, growth in market share for any one supplier must come at the expense of another supplier. The trade data suggests that there are some structural changes taking place within the group of Scandinavian countries which traditionally supply the European markets. For example, exports of newsprint from Sweden and Norway were substantially higher in 1990 compared to 1980 while exports from Finland were significantly lower in 1990 than in 1980 (FAO 1990a).

The recent political restructuring that is occurring in Eastern Europe has a number of interesting implications for forest products trade. European exports, including exports of forest products, to Eastern Europe are expected to surpass their exports to North America by the year 2000. It has also been suggested that West European producers might obtain access to East European timber supplies in order to hasten the rate of modern industrial development in Eastern Europe (Anonymous 1990).

**Japan and the Pacific Rim**

Japan is the world's primary importer of both coniferous and non-coniferous sawlogs, coniferous wood chips, non-coniferous lumber, and plywood. The U.S.A. is the primary supplier of coniferous sawlogs to Japan followed by the U.S.S.R. and New Zealand. Although Canada has extensive growing stock of coniferous tree species, it is not a significant exporter of coniferous logs. This can be directly attributed to Provincial export restrictions on timber produced from Crown lands.

Imports by Japan from the former Soviet Union had been relatively stable and were expected to be a permanent feature through the turn of the century (FAO 1990b). However with the recent political restructuring in the region, there is now some uncertainty regarding the future supply of timber from Russia. Approximately three quarters of the region's timber supply is in Siberia, most parts of which are remote and inhospitable. To gain access to this timber, heavy capital investments will be required in transport and infrastructure as well as in the forest sector itself (Ozsvald 1988). This may require foreign participation in capital projects.

Both New Zealand and Chile have large volumes of radiata pine reaching merchantable size over the next two decades with Japan being the market of preference for both countries. Market acceptance of radiata pine remains an uncertainty as does the specific products, that is, logs or processed products, that may be sold (FAO 1990a).

Japan traditionally imported little in the way of panel products. Until log export controls took effect in the Philippines and Indonesia, Japan imported tropical hardwood logs and manufactured plywood for the domestic and export markets. Tropical hardwoods are still imported from Malaysia but the domestic plywood processing industry in Japan is facing stiff competition from the newly developed plywood industry in Indonesia (FAO 1990b). Coniferous panel products and temperate hardwoods are not used to any great extent in Japan.

Although Japan is not a major importer of paper and paper products, there is reason to expect that demand for these products will increase since Japanese per-capita consumption of paper and paperboard is expected to increase.

## DOMESTIC POLICIES AND TRADE IN FOREST PRODUCTS

There is considerable historical evidence which suggests that a country's use of its forest resources progresses through a series of stages of development beginning with the unregulated exploitation of forests and proceeding through simple nonecological, economically driven regulations concerning the development and management of the resource and associated industry to a final stage of continuing development of ecologically and economically based forest resource conservation and management practices (Kimmins 1987).

At any stage in this continuum, governments can be expected to implement policies and practices which seem appropriate for the development of the resource and which may be designed to move the resource and its associated industries toward the next stage of development. However, the respective domestic policies of trading partners can also have a significant effect on the level and form of trade.

It is often difficult to distinguish national or local policies of resource management and industrial development from policies which are specifically designed to affect trade in forest products. Thus there is considerable confusion and debate regarding which policies are legitimate to a country's development of its forest resources and which are used as either barriers or enhancements to trade. The various policies and mechanisms that have been developed to achieve these objectives are numerous and have been well documented. In the case of trade in forest products, those domestic policies which affect trade generally fall into one of the following categories: timber pricing policies, health and environmental policies and standards, regional development and taxation policies, export restrictions (particularly on roundwood), and product standards.

Health standards which are established to prevent the introduction, by way of imports, of forest pests and diseases are generally acknowledged as legitimate domestic concerns and have been implemented by most countries. Export restrictions and product standards are typically classified as non-tariff barriers to trade (Bourke 1988). The others are more

difficult to classify and are often the source of major trade disputes. What follows are examples of some of the more prominent domestic policies which fall into the latter category.

**Pricing Policy for Canadian Timber and the Subsidy Issue**

The definition of a subsidy is one of the most difficult problems faced in international trade relations. Such is the case regarding the timber pricing policies of Provincial governments in Canada. U.S. softwood lumber producers have charged that timber harvested from Crown lands in Canada is priced below competitive levels, and, therefore producers were being subsidized by the Provincial governments that own the timber. U.S. prices for timber harvested on public lands are established by competitive bids, whereas Canadian prices are typically administratively determined (Fox 1991).

Following investigations between 1984 and 1986, the U.S. Department of Commerce ("Commerce") established a 15% countervailing duty on Canadian softwood lumber exports. However, in December 1986, before the countervail was implemented, negotiations between the two countries resulted in a Memorandum of Understanding whereby Canada would impose an export tax of 15% on softwood lumber destined for the U.S. This tax could be replaced by increased stumpage fees imposed by individual provinces (Fox 1991).

In October, 1991 The Government of Canada stopped collecting the softwood lumber tax, prompting Commerce to initiate an immediate investigation into alleged dumping and in March 1992, in a preliminary determination, Commerce found that there was an estimated subsidy of 14.8%. This has subsequently been reduced and importers of softwood lumber from some Canadian provinces are now required to post a cash deposit of 6.1% of the value of the shipments. A review of the findings has been requested under the Canada-U.S. Free Trade Agreement (Price Waterhouse 1992).

This situation is a major irritant between the two countries. Although it can be argued that the stumpage fee policy in Canada is not a subsidy, if the issue is not resolved, other Canadian forest industries could ultimately face a number of trade actions by the U.S. in the form of countervailing duties on a variety of forest products. In order to avoid such actions, Provincial governments in Canada may have to reconsider the way in which stumpage prices are established (Fox 1991).

**Stumpage and Roundwood Pricing Policies in Sweden**

Most of the industrial timber harvested in Sweden comes from private lands and stumpage prices are set on a free and competitive market. Once the harvested timber has been converted into sawlogs and pulpwood, log prices are determined by negotiations between cartelized buyers and sellers. In these negotiations, the country is divided into

five different pricing regions and the established prices remain in effect for most the harvesting season. (Anderson and Ohlsson 1988).

**Sales Associations in Finland**

Finland's forest industry is mostly privately owned, but companies work in close cooperation in the marketing of exports. Pulp and paper products are sold mainly through joint sales associations. These voluntary joint marketing organizations, which have their origins as early as 1892, are unique in the world's forest industry (Seppala 1988). However, perhaps because the sales associations have been so successful, major pulp producers within the EEC and North America are accusing Finnish producers of forming cartels to obtain market power and influence pulp prices (Nagy and Andersson 1988).

## BORDER MEASURES AND TRADE IN FOREST PRODUCTS

Trade barriers affect trade by placing impediments on the free flow of goods. The barriers reduce volumes below levels that would otherwise occur, and influence patterns of trade. Bourke (1988) defines trade barriers as being any government law, policy or practice which has a restrictive effect on trade. "Natural" barriers such as distance from market (important in the trade of bulky forest products), transportation advantages or limitations, natural resources endowments, government monetary and fiscal practices (Sweden's devaluation of the Krona in 1983), and restrictions imposed to protect public health or safety are not regarded as trade barriers.

The impact of trade barriers on international trade and their effect on industrial development is underscored by Uhler et al. (1991). when discussing the development of the Canadian newsprint industry. Following the removal by the U.S., of duties on newsprint and wood pulp in 1913, Canada developed into a major producer and exporter of these commodities achieving important economies of scale. The conditions enabling Canada to produce wood pulp and newsprint at competitive rates should also have existed for other types of paper. However, examination of the trade flows reveals that Canada is not a major international trader in these commodities, or at least not at the levels of exports achieved with wood pulp and newsprint. This has been attributed to the existence, until the negotiation of the Canada-U.S. Free Trade Agreement (FTA), of tariffs on printing and other paper products limiting the market opportunities and the possibility of achieving economies of scale.

## Tariffs

Tariff measures are put in place for a variety of reasons such as protecting domestic producers of identical or similar products, encouraging the development of a domestic industry, raising revenues, gaining self-sufficiency for strategic reasons, encouraging trade links with certain trade partners and restricting the entry of undesirable products.

Tariffs on forest products are generally low. Table 11 gives average tariff rates facing forest products trade between developed countries. In general, developing countries face slightly lower duties due to the range of special preferences they are eligible for, especially special rates under the Generalized System of Preferences (GSP). However, the duties assessed in Japan on imports of primary and secondary forest products from the developing countries are marginally greater than those on competing products from developed countries. This can be attributed to differences in product characteristics such as the species involved.

A situation of free trade already exists on many forest products. Still, significant tariffs exists on plywood, some types of lumber, manufactured wood articles and some paper products. As with agricultural products tariff escalation is common in the international trade of forest products. Tariffs are the lowest on unprocessed products and tend to rise with increased processing, that is, roundwood, primary products, and secondary products (Olechowski, 1987). The Tokyo Round of GATT negotiations reduced the extent of escalation, but tariffs on primary products remain on average 235% higher than those on roundwood (Olechowski, 1987).

Tariffs are expected to be reduced even further as a result of the Uruguay Round of the GATT, although there is no separate negotiating group within the Uruguay Round for forest products. Olechowski (1987) has investigated the extent to which complete removal of the post-Tokyo round tariffs would affect the magnitude of world trade. Under this hypothetical scenario, shipments of forest products to the developed countries would increase by over US $950 million, or approximately 6% of the 1980 trade base. Austria, Canada, New Zealand and Switzerland would experience import increases ranging from 30% to 72%. In the EEC, the overall increase is estimated to be much smaller since some of the developed country suppliers to this market would experience large trade losses due to the erosion of preferential margins currently enjoyed by the European Free Trade Association (EFTA) countries. Developing countries could be expected to experience important increases in exports to their largest markets, the EEC, the U.S., and Japan.

## Non-tariffs barriers

As tariffs on forest products have been reduced through multilateral negotiations such as the GATT and through regional free trade agreements, non-tariff measures have become increasingly used to achieve domestic objectives. Unlike tariffs, non-tariff measures are diverse, difficult to identify and even more difficult to quantify (Bourke 1988; Olechowski, 1987). Unfortunately, their lower visibility and greater flexibility make their use even more appealing.

Table 12 describes selected non-tariff barriers used by specified countries for forest products. Non-tariff barriers are concentrated in primary forest products trade. Roundwood is generally free from any non-tariff controls except in those countries which have imposed export restrictions on sawlogs and other roundwood. Secondary products face only a few barriers. As much as 30% of primary wood product imports are subject to non-tariff controls, considerably increasing the overall impact on developing countries since these countries are more likely to produce primary rather than secondary wood products (Olechowski, 1987).

Export restrictions on roundwood, although classified as a non-tariff barrier to trade, might also be viewed as an important management policy designed to prevent the practice of hi-grading (removing only the most valuable trees), and for maintaining forest resources which are both productive and biologically diverse.

The origin of sawlogs shipped to Japan, the Peoples Republic of China and Korea has been primarily the West Coast regions of Canada and the United States.
There are no restrictions on exports of logs from private lands in either the U.S.A. or Canada, although the amount of privately owned forest land in Canada is relatively small. Exports from Federal lands are banned in the Western United States and legislation is pending to limit log exports from State lands. British Columbia has an export restriction that limits the volume of log exports from Crown lands. A number of other Canadian provinces also restrict or prohibit exports of roundwood from Crown lands.

Similar controls are now in effect in Indonesia and have contributed to the development of a strong plywood manufacturing sector. Indonesia now accounts for 52% of world plywood exports.

Although it is difficult to identify individual non-tariff barriers, a number of trends in the use of these measures are observed. First, most quantitative import restrictions have been in place for 15 years or less. Their use is most common in the EEC and a number of developing countries. Second, the use of official complaint procedures resulting in formal anti-dumping or countervailing duties is increasing, particularly in the USA and the EEC.

Third, the desire to control exports prices or volume has greatly increased in the past 10 years.

## TRADE AGREEMENTS

The form of trade agreements and their impacts on international trade vary greatly. There are currently four important regional trade agreements which bear upon the world markets and trade in forest products.

### Canada-U.S. Free Trade Agreement (FTA)

The free trade agreement between Canada and the United States has had a limited impact on the forest sector. Most forest products were already being traded duty free (Fox 1991). The trade agreement has some impact on plywood and manufactured wood products and paper products other than newsprint. This can be attributed to the fact that tariffs on these products were substantially higher than those on other products, including newsprint for which free trade has existed for several years. The FTA does not affect non-tariff barriers such as safeguard, anti-dumping, and countervailing duty provisions of the respective countries but trade decisions can be appealed through a bi-national panel.

### North American Free Trade Agreement (NAFTA)

The NAFTA builds upon the Canada-U.S. FTA in that the provisions within the FTA with respect to forest products continue to apply as related to trade between Canada and the U.S. NAFTA will cut tariffs on primary paper products, including printing and writing papers, linerboard, and bleached pulp five years after coming into effect. Mexico is the second largest foreign market for U.S. paper, paperboard, and converted products, and Mexican tariffs on nearly all paper products are now at 10%, except for newsprint, which is at 15%. Reductions in these tariffs are expected to boost the level of exports of paper products from both the U.S. and Canada to Mexico (Roberts 1991b).

### New Zealand-Australia Free Trade Agreement

The New Zealand-Australia FTA requires Australia's pulp importers to obtain 75% of their supply from New Zealand or face a 15% duty on imports from other sources (Ferguson and Batten 1988).

### EEC and the European Free Trade Association (EFTA)

The establishment of the EEC has resulted in reduced barriers between member states, but increased barriers on many products for non-member states. For example, the free trade agreements negotiated between the EEC and the members of the EFTA (currently Norway, Finland, Sweden, Portugal and Austria), have resulted in the EFTA countries receiving duty free status on exports of all paper and paper board products to the EEC. Other suppliers continue to face tariff levels ranging from 6% to 15% which puts them at a competitive disadvantage (Bourke 1988).

### Implications of a Single European Market

Recent initiatives to establish a single European market would have interesting implications for forest products trade, particularly for those European countries not included in the EFTA and those outside the region proposed under "Europe 1992".

The objectives of Europe 1992 are to establish a common free trade zone within the European Community. As a result, competition within the EC is expected to intensify and European producers of forest products are expected to have a competitive advantage over foreign firms. On the other hand, North American producers could find the European market easier and less costly to access than under current conditions (Anonymous 1990).

European health standards which relate to forest products imports and product standards and codes are also expected to change within a single European market. North American producers are concerned that these changes could further restrict access to European markets in favour of Scandinavian producers.

## "TREMS" AND GREEN CONSUMERISM

Over the past several years, trade related environmental measures (TREMS) have become increasingly prevalent. TREMS may be defined as tariff and non-tariff barriers which are ostensibly designed to meet environmental objectives (Roberts 1992).

Environmental issues can be roughly divided into two categories; (i) those with links to the management of the forest resource, such as the concern surrounding global deforestation and, (ii) those related to the transformation and use of that resource, including chlorine bleaching in pulp and paper and mandatory recycling programs for newsprint.

Roberts (1992) suggests that one of the primary reasons for the increased use of TREMS is related to the effectiveness of the GATT in reducing trade barriers. If the Uruguay Round of the GATT succeeds, TREMS will be one of the few barriers to forest products trade available to protectionists.

Higher inner-conscious consumers appear to becoming an increasingly potent force in Europe and North America. These consumers are purchasing not only on the traditional basis of price and quality of a product but also on its "environmental friendliness".

**Global Deforestation**

The alarming rate of deforestation particularly in the tropical forest regions is at the forefront of global environmental concerns. Very few tropical forests are managed on a sustainable basis (Cross 1988) thus adding to the concerns that continued uncontrolled deforestation will soon lead to a deterioration of the economic and ecological health of the regions involved and perhaps on an even greater geographical level (Ryan 1992).

A number of developed countries are reacting to public pressure and are moving toward a boycott of tropical timber. European countries are also examining the possibility of applying a levy on tropical wood upon its entry. The monies thus collected could be reinvested toward sustainable development of the resource.

The implications of this proposal are currently being considered by the International Tropical Timber Organisation (ITTO) which represents a group of exporting and importing countries of tropical woods. Some producing tropical countries see such a surcharge as a tax which discriminates in favour of timber from the northern developed countries. This assumes added importance in light of the fact that almost all of the products made from tropical timber could be replaced by other timber or non-timber material. Tropical wood is chosen solely because of its low price relative to the price of non-tropical wood (Cross 1988).

Conversion of forest to cropland and grazing land is by far the leading cause of deforestation in the tropics, particularly in South America. In Africa, however, population pressures have transformed fuelwood collection into an unsustainable practice and fuelwood collection is thus an agent of forest destruction, primarily in the arid woodlands of Africa (Postel and Heise 1988). It is noteworthy therefore, that although the proposed penalties would be applied to forest products, the factors contributing to the penalties are related to land uses other than for industrial timber production. In fact, it has been suggested that a market for tropical timber would assure a value to the resource and act as an incentive to its management (Cross 1988).

Developed countries could also face similar penalties in light of public perceptions, at home and abroad, that their forest resources are also being mismanaged. Recent concerns

over the loss of the "old growth" forest habitats of the Northern Spotted Owl in the Western U.S. and Canada is just one example of the kinds of environmental issues facing the North American forest products sector.

The practice of clearcutting, i.e., harvesting all the merchantable timber in a forest stand in a single cut, in North America has also received considerable attention and media exposure in Germany and other Western European countries. Although clearcutting has long been regarded as an appropriate forestry practice in temperate forest regions, it is increasingly perceived as being ecologically unacceptable for a number of reasons. European consumers are being urged to boycott forest products harvested in this manner.

**Chlorine Bleaching**

The environmental issues associated with wood transformation processes and recycling are more numerous and primarily affect the pulp and paper industry. The industry has to adapt to both domestic pollution controls (biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), adsorbable organic halogen (AOX), dioxin , furan, and other compounds), and the international demand for chlorine-free products.

Most producing countries have established new environmental regulations for their pulp and paper mills (Roberts 1991a). Although the standards vary they are within a reasonable range and they are easily exceeded in newly constructed facilities. However, older mills often require heavy investments to meet these standards thus reducing their abilities to compete on world markets.

The demand for total chlorine-free (TCF) paper products is concentrated in western Europe. It has been estimated that by 1995, European demand for TCF wood pulp will be around 2 million mt, but that global pulp capacity will be in excess of 5 million mt. This potential output could more than double if British Columbia and Ontario, in Canada, convert their pulp production to TCF as planned. Given the excess supply, it is clear that this product will not command a premium on European markets. However, it remains unclear as to whether TCF status will be required in order to export to the European market.

**Wastepaper Recycling**

As of August 1992, twelve U.S. states have imposed mandatory recycling programs for newsprint and ten others have signed voluntary agreements with their newsprint publishers. The legislation has established targets of from 20% to 50% recycled fibre content by the year 2000. For a country like Canada which exports over 73% of its newsprint production to the U.S., there will be the added cost of transporting old newspapers back to Canada from the U.S. and the capital expenditure for de-inking

facilities. A number of Canadian newsprint producers are likely to find these costs prohibitive and will not invest in the required recycling technology. This could be a significant factor in determining the potential growth of the Canadian newsprint industry.

The U.S. Congress is also considering national recycling regulations which would extend the requirements for recycled fibre to a number of paper and paperboard products. Proposed penalties for non-compliance are a fine of $50 per ton for each ton below the annual utilized requirement, and a prominent label on the violator's products declaring that the company failed to meet federal recycling requirements (Roberts 1992).

Far greater efforts towards mandatory recycling are under way in Germany with the introduction of the German Waste Packaging Law. By July 1995, 80% of paper must be recycled. It is expected that North American shipments of paperboard to Germany will decline as a result. Companies outside of Germany are complaining that the German regulations discriminate against them. Some sixty major international firms have joined together in a formal complaint to the European Commission. It is likely that other countries like France, the Netherlands and Austria will harmonize their systems with Germany's (Roberts 1992).

## EMPIRICAL STUDIES OF FOREST PRODUCTS TRADE

Interest in international trade in forest products as a field of economic research dates back to the mid-1930's. However, it was not until the mid-1970's that available methods of analysis were applied to econometric studies of trade patterns in the forestry sector. Waggener (1989) provides a useful review of the early efforts to focus economics research on international trade in forest products.

Initial attempts to project world-wide equilibrium trade flows in timber products were frustrated by the lack of appropriate trade statistics and were thus based largely on judgement rather than an explicit, quantified model. These judgements had within them, however, assumptions about excess supply, excess demand, and other components of a framework for analysis of trade (Darr 1983).

Some of the earliest efforts to model bilateral trade patterns focused on the North American softwood lumber trade. In particular, the models accounted for U.S. imports of softwood lumber from Canada as a component of an overall model of U.S. markets for softwood lumber and softwood stumpage. For example see Adams and Blackwell (1973), Mills and Manthy (1974), Robinson (1974) and Buongiorno et al (1979).

The development of models representing multilateral trade in forest products has been more limited. McKillop (1973) and Gallagher (1980) have estimated models of U.S.-Japanese-Canadian trade in logs and lumber.

In Western Europe, market analysis has initially concentrated on demand or consumption only (Aberg 1968, Sundelin 1970), although there are studies that also deal with supply analysis (FAO 1977) but not simultaneously. It may be tempting to treat Western Europe as a single market for purposes of analyzing global trade patterns. However social, cultural and economic differences among the various countries complicate any analysis (Uutela 1983). Analysis is further complicated by the prominence of both bilateral and multilateral trade within Western Europe. The U.K., Germany and France are large net importers while the Nordic countries and Austria are major net exporters (McKillop 1983). Furthermore, imports from North America must also be considered.

More recently, a wide variety of "trade issue" studies have been undertaken. Economic analysis has often provided the primary analytical framework for such research. Issues studied have included analysis of log exports and trade restrictions (Josephson 1975), trade barriers (Bourke 1988), exchange rates (Adams et al. 1986) and transportation and distribution channels (Wisdom 1987).

Research on the modelling of spatial commodity and interregional trade has progressed dramatically during the past two decades. Prominent examples include the International Institute for Applied Systems Analysis' Global Trade Model (IIASA GTM) which is currently installed at the University of Washington (CINTRAFOR) for evaluation and testing in a North American context, the Timber Assessment Market Model (TAMM) which has the capability to analyze regional markets within the North American forest products sector, and PAPYRUS and other models representing global trade in paper products. A more complete description of these and other forest sector models can be found in Row (1989).

Important market model development has also taken place in Sweden (Nilsson 1983; Lonstedt 1986), Finland (Seppala and Seppala 1987) and Japan (Nomura 1983). Several private sector consulting firms have also developed supply-demand models. Examples of the industrial models include Resource Information Systems Inc. (formerly Data Resources Inc.) of the U.S. and Jaakko Poyry International of Finland (Young 1987 and Veltkamp et al. 1983).

Spatial modelling in the forest sector draws heavily on developments in agriculture and general economics. Thompson (1981) provides an excellent review of spatial modelling in agricultural markets. Previous reviews of applications in the forest sector include Gallagher (1983) and Row and Roberts (1984) and Adams and Haynes (1987).

Thompson (1981) identified five broad classes of trade models:
(1) Two region, non-spatial models.
(2) Multiregion, nonspatial price equilibrium models.
(3) Spatial equilibrium models.
(4) Trade flow and market share models.
(5) Transportation models.

Adams and Haynes (1987) provide an excellent review of the construction, advantages and limitations of each of these classes of models. In this paper, we pay particular attention to the class of spatial equilibrium models since this is the form used in the IIASA GTM, PAPYRUS and other multiregion models of the forest sector.

Spatial equilibrium models differ from all other classes of models in that demand and supply quantities, prices, and bilateral trade flows are determined endogenously in the model solution process (Adams and Haynes, 1987). These models, such as the IIASA GTM, also give explicit consideration to the costs of transportation and handling along each shipment route included in the market area. Solution of spatial equilibrium models involves the use of direct optimization or iterative processes to find a set of demands, supplies, prices, and trade flows that satisfies the conditions for market equilibrium for the particular market structure (either competitive or noncompetitive) under investigation (Adams and Haynes 1987).

Applications of the spatial equilibrium model differ by the means used to attain the equilibrium conditions. So called, optimization or "programming approaches" seek to establish a formal equivalence between the equilibrium problem and an optimization problem. Takayama and Judge (1971) have demonstrated the applicability of quadratic programming to solving the spatial equilibrium problem. This approach has been widely applied in the study of agricultural markets and was used by Buongiorno and Gilless (1984) in an analysis of the North American newsprint industry.

Haynes (1975) described an early application of a linear programming spatial equilibrium approach to an analysis of the US softwood forest products sector. The linearized demand representation of Duloy and Norton (1975) was employed together with an activity analysis representation of manufacturing activities, as described by Takayama and Judge (1971), subject to resource availability and capacity constraints (Adams and Haynes, 1987). The IIASA GTM is a further application of this modelling approach.

A second major category of solution methods for spatial equilibrium problems is variously termed "recursive" or "reactive" programming. These methods have a long history in the analysis of agricultural markets. In reactive programming, an iterative systems of computations is employed, which adjusts quantities produced, consumed, and transported among regions until the equilibrium conditions are satisfied.

Adams and Haynes (1980) have applied reactive programming in a model of the North American softwood lumber and plywood industries. Boyd and Krutilla (1984) employed reactive programming to examine the effects of US intercostal shipping regulations on the North American lumber market and the impacts of a tariff on Canadian softwood lumber imports to the US.

One of the major weaknesses in the reactive programming approach has been the inability of existing algorithms to handle more than one market level in the same equilibrium

solution process. This could present problems in forest sector applications, particularly when considering regional trade flows in primary products such as roundwood and wood pulp, both of which have a number of end uses.

One of the principal advantages of spatial equilibrium models for some applications is the endogenous determination of spatial flows. Adams and Haynes (1987) have noted, however, that the models commonly fail to explain "minor" bilateral flows and may error substantially in predicting the size of larger flows. Also, the pattern of flows can be quite sensitive to shifts in transportation costs or the parameters of supply and demand relations. This behaviour is in sharp contrast to the usual observation that interregional flow patterns for forest products exhibit inertia and are relatively slow to change.

Plausible explanations for errors in flow predictions and volatility of flow patterns in spatial equilibrium models are numerous and often relate to one or more failures in the underlying model assumptions. For example, spatial equilibrium models ignore the heterogeneity of goods within a given commodity class, and time delays associated with maintaining bilateral trade links. Both of these factors are particularly relevant to forest products trade.

Spatial equilibrium models also assume perfect certainty and hence abstract from the policies of some importers of diversifying sources so as to limit the impacts of trade disruptions.

Spatial equilibrium methods have been modified in some applications to recognize these limitations. The IIASA GTM and the pulp and paper model of Buongiorno and Gilless (1984) include explicit "inertia" constraints on specific bilateral flows to insure that a flow is included in the solution and to retard the speed of adjustment (Adams and Haynes 1987).

## KNOWLEDGE GAPS AND RESEARCH QUESTIONS

Notwithstanding recent efforts to apply more rigorous analyses to the question of international trade in forest products, knowledge gaps remain and the subject appears to be ripe for further research. Waggener (1989) has identified a number of strategic directions for future research. These include, developing an improved understanding of wood and fibre supplies and consumption patterns in a worldwide context and an understanding of the technical and economic conditions important to comparative advantages in wood product production.

Although many researchers have investigated the levels of protection provided to domestic industries by trade barriers on agricultural and other products, very little has been done relating to forest products. The implications of trade liberalization associated

with the Uruguay Round of the GATT are not fully understood. Nor is there an thorough understanding of the effects of non-tariff measures.

It is highly probable that the recent free trade agreements in North America and Europe will have a significant impact on forest products trade between nations both within and outside these agreements. These affects are expected to be particularly severe on developing countries which rely on exports to developed countries operating within the jurisdictions of the trade agreements. Detailed case studies could be carried out for those developing countries which are most likely to be affected.

Finally, the immediate and long-term effects associated with the use of trade related environmental measures are unknown. The use of these measures as a means of restricting trade is itself a subject for concern since it appears that the sustainability of the very resources which the measures are designed to protect, depends upon the existence of an economically viable forest products sector. Research is required to investigate whether these trade restrictions will lead to the desired environmental benefits. An associated issue relates to the potential conflict between timber production and forest-based or "eco" tourism. It will be necessary to develop a better understanding of forest-based international tourism and its implications for forest products trade.

## CONCLUSIONS

International trade in forest products can be characterized as bilateral and multi-lateral trade within and across three regional trade zones - North America, Europe and Japan and its Pacific Rim suppliers. There is a significant level of inertia embodied in the pattern of trade flows resulting from the remnants of colonialism, long-term contracts and trade agreements, and extensive capital investment in trade-oriented facilities.

International trade in forest products, as with that for most other products, is restricted and controlled by various means. These include tariff and non-tariff measures. A situation of free trade already exists on many forest products. Still, significant tariffs exist on plywood, some types of lumber, manufactured wood articles and some paper products. Tariff escalation is common in the international trade of forest products. The Tokyo Round of GATT negotiations reduced the extent of escalation, but tariffs on primary products remain substantially above those on roundwood. Tariffs are expected to be reduced even further as a result of the Uruguay Round of the GATT. As tariffs are reduced, it is anticipated that the use of non-tariff measures will increase.

Trade is also affected by domestic policies, particularly those which affect the pricing and distribution of forest products. Regional trade agreements are also expected to impact on the magnitude and flow of forest products trade. Finally, global concerns for the loss of forest cover and other environmental issues are becomingly important factors in international trade of wood and wood products.

Research on the modelling of spatial commodity and interregional trade in forest products trade is a relatively recent phenomena. Prominent applications include the Global Trade Model, the Timber Assessment Market Model and PAPYRUS. These models fall within the class of spatial equilibrium models.

A number of strategic directions for future research in forest products trade have been identified. These include, developing an improved understanding of wood and fibre supplies and consumption patterns in a worldwide context and understanding of the technical and economic conditions important to comparative advantages in wood product production.

Finally, research is required to determine the immediate and long-term effects associated with the use of trade related environmental measures and forest-based eco-tourism on forest products trade.

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TABLE 1: Contribution to total world production of selected forest products by major producing countries (%).

| COMMODITY | TOTAL WORLD PRODUCTION | USA | USSR | CANADA | CHINA | BRAZIL | GERMANY | SWEDEN | MALAYSIA | JAPAN | OTHER MAJOR PRODUCERS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INDUSTRIAL ROUNDWOOD | 1654181 (1000 CUM) | 25.1 | 17.2 | 9.0 | 5.5 | 4.4 | 4.2 | 3.1 | 2.6 | 1.8 | FINLAND 2.3% | 75.1 |
| CONIFEROUS SAWLOGS | 707215 (1000 CUM) | 31.2 | 17.7 | 13.4 | 4.1 | 3.0 | 6.9 | 3.2 | 0.0 | 2.3 | FINLAND 2.3% | 84.1 |
| NON-CONIFEROUS SAWLOGS | 272550 (1000 CUM) | 12.8 | 7.6 | 2.1 | 6.2 | 7.0 | 1.8 | 0.2 | 15.0 | 0.8 | INDONESIA 9.9% | 63.3 |
| CONIFEROUS LUMBER | 361385 (1000 CUM) | 23.9 | 22.3 | 14.2 | 4.1 | 2.3 | 2.9 | 3.2 | 0 | 7.3 | FINLAND 2.1% | 82.3 |
| NON-CONIFEROUS LUMBER | 121621 (1000 CUM) | 14.2 | 9.3 | 1 | 6.6 | 8.1 | 1.5 | 0.2 | 6.7 | 2.7 | INDONESIA 7.4% | 57.7 |
| WOOD-BASED PANELS | 124939 (1000 CUM) | 25.7 | 9.7 | 5.0 | 2.7 | 2.3 | 6.8 | 1.0 | 1.3 | 6.9 | INDONESIA 7.7% | 69.1 |
| WOOD PULP | 154421 (1000 MT) | 37.1 | 7.7 | 14.8 | 1.1 | 2.8 | 1.5 | 6.2 | 0 | 7.3 | FINLAND 5.6% | 84.1 |
| NEWSPRINT | 33075 (1000 MT) | 18.1 | 5.2 | 27.4 | 2.3 | 0.7 | 3.4 | 6.9 | 0 | 10.5 | FINLAND 4.3% | 78.8 |
| OTHER PAPER AND PAPERBOARD | 205163 (1000 MT) | 32.2 | 4.4 | 3.6 | 7.5 | 2.2 | 5.2 | 3.0 | 0.1 | 12.0 | FINLAND 3.6% | 73.8 |

Table 2: Summary of 1990 trade flows in coniferous sawlogs (1000 CUM).

| | MAJOR EXPORTERS | | | USA | USSR | N. ZEALAND | CANADA | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS 1990 | | | 18091 | 6200 | 2860 | 1020 | |
| | % WORLD EXPORTS | | | 52 | 18 | 8 | 3 | 81 |
| | VALUE OF EXPORTS (1000 US$) | | | 2136678 | 509000 | 170400 | 100784 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| JAPAN | 16682 | 47 | 2768620 | 11720 | 4073 | 1391 | 759 | |
| CHINA | 5004 | 14 | 529352 | 1804 | 1265 | 219 | 5 | |
| KOREA | 4569 | 13 | 526166 | 2739 | 3 | 1250 | 15 | |
| CANADA | 2300 | 6 | 94000 | 1466 | 0 | 0 | 0 | |
| AUSTRIA | 1925 | 5 | 135000 | 0 | 0 | 0 | 0 | |
| ITALY | 1333 | 4 | 159000 | 18 | 0 | 0 | 51 | |
| TOTAL | | 90 | | | | | | |

Table 3: Summary of 1990 trade flows in non-coniferous sawlogs (1000 CUM).

| | MAJOR EXPORTERS | | | MALAYSIA | FRANCE | P. N. GUINEA | USA | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 20355 | 1679 | 1349 | 994 | |
| | % WORLD EXPORTS | | | 64 | 5 | 4 | 3 | 76 |
| | VALUE OF EXPORTS (1000 US$) | | | 1494169 | 276572 | 100000 | 252200 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| JAPAN | 10320 | 33 | 1534363 | 10439 | 0 | 921 | 177 | |
| KOREA | 3727 | 12 | 464308 | 3118 | 0 | 368 | 66 | |
| CHINA | 3570 | 11 | 393101 | 3691 | 0 | 7 | 64 | |
| ITALY | 2519 | 8 | 410600 | 0 | 606 | 0 | 64 | |
| THAILAND | 2180 | 7 | 220725 | 765 | 0 | 6 | 1 | |
| INDIA | 895 | 3 | 88000 | 1297 | 0 | 0 | 1 | |
| TOTAL | 74 | | | | | | | |

Table 4: Summary of 1990 trade flows in chips and particles (1000 CUM).

| | MAJOR EXPORTERS | | | USA | AUSTRALIA | CHILE | CANADA | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 8100 | 7066 | 3298 | 1581 | |
| | % WORLD EXPORTS | | | 32 | 28 | 13 | 6 | 78 |
| | VALUE OF EXPORTS (1000 US$) | | | 412018 | 298183 | 109280 | 120334 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| JAPAN | 19783 | 77 | 1440391 | 7078 | 5193 | 3014 | 926 | |
| USA | 1241 | 5 | 24096 | 0 | 0 | 0 | 655 | |
| CHINA | 1168 | 5 | 63157 | 414 | 159 | 0 | 0 | |
| SWEDEN | 1142 | 4 | 57388 | 0 | 0 | 81 | 0 | |
| TOTAL | | 91 | | | | | | |

Table 5: Summary of 1990 trade flows in coniferous lumber (1000 CUM).

| | MAJOR EXPORTERS | | | CANADA | USA | SWEDEN | USSR | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 37466 | 6970 | 6234 | 6200 | |
| | % WORLD EXPORTS | | | 51 | 9 | 8 | 8 | 77 |
| | VALUE OF EXPORTS (1000 US$) | | | 4635957 | 1338903 | 1860451 | 1036000 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| USA | 30384 | 39 | 2777395 | 28231 | 0 | 0 | 0 | |
| UK | 8367 | 11 | 1838892 | 2767 | 146 | 1242 | 1200 | |
| JAPAN | 7369 | 10 | 2018780 | 3967 | 2718 | 0 | 265 | |
| ITALY | 4422 | 6 | 1171348 | 145 | 288 | 245 | 434 | |
| GERMANY FR | 4246 | 6 | 1184175 | 151 | 115 | 1217 | 623 | |
| NETHERLANDS | 2515 | 3 | 639015 | 82 | 311 | 641 | 386 | |
| TOTAL | | 74 | | | | | | |

Table 6: Summary of 1990 trade flows in non-coniferous lumber (1000 CUM).

| | MAJOR EXPORTERS | | | MALAYSIA | USA | SINGAPORE | FRANCE | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 5283 | 1930 | 1000 | 731 | |
| | % WORLD EXPORTS | | | 36 | 13 | 7 | 5 | 62 |
| | VALUE OF EXPORTS (1000 US$) | | | 1135389 | 805952 | 245759 | 264788 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| USA | 1930 | 11 | 156331 | 16 | 0 | 20 | 0 | |
| JAPAN | 1669 | 10 | 833493 | 533 | 296 | 42 | 1 | |
| ITALY | 1569 | 9 | 640374 | 80 | 118 | 6 | 111 | |
| THAILAND | 1485 | 9 | 316667 | 1197 | 7 | 0 | 0 | |
| SINGAPORE | 1184 | 7 | 159576 | 1001 | 13 | 0 | 0 | |
| NETHERLANDS | 871 | 5 | 416970 | 480 | 43 | 45 | 50 | |
| TOTAL | | 51 | | | | | | |

Table 7: Summary of 1990 trade flow in plywood (1000 CUM).

| | MAJOR EXPORTERS | | | INDONESIA | USA | MALAYSIA | SINGAPORE | TOTAL |
|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 8433 | 1840 | 1017 | 755 | |
| | % WORLD EXPORTS | | | 52 | 11 | 6 | 5 | 74 |
| | VALUE OF EXPORTS (1000 US$) | | | 2724931 | 360708 | 319050 | 176737 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | |
| JAPAN | 2941 | 21 | 1032603 | 2800 | 17 | 17 | 1 | |
| USA | 1540 | 11 | 631706 | 990 | 0 | 3 | 10 | |
| UK | 1215 | 8 | 572994 | 225 | 324 | 69 | 61 | |
| CHINA | 1118 | 8 | 372295 | 1503 | 1 | 0 | 0 | |
| KOREA | 1070 | 7 | 256164 | 1050 | 90 | 1 | 0 | |
| SINGAPORE | 735 | 5 | 144539 | 642 | 0 | 350 | 0 | |
| TOTAL | 60 | | | | | | | |

Table 8: Summary of 1990 trade flows in wood pulp (1000 MT)

| | MAJOR EXPORTERS | | | CANADA | USA | SWEDEN | FINLAND | BRAZIL | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 7883 | 5346 | 2768 | 1461 | 975 | |
| | % WORLD EXPORTS | | | 31 | 21 | 11 | 6 | 4 | 74 |
| | VALUE OF EXPORTS (1000 US$) | | | 5233660 | 3146372 | 1921401 | 996713 | 610078 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | | |
| USA | 4267 | 17 | 2889652 | 3835 | 0 | 31 | 8 | 286 | |
| GERMANY | 3489 | 14 | 2694638 | 814 | 598 | 922 | 394 | 110 | |
| JAPAN | 2869 | 11 | 1904354 | 941 | 1048 | 83 | 31 | 220 | |
| ITALY | 2099 | 8 | 1459501 | 432 | 426 | 287 | 117 | 42 | |
| UK | 1928 | 8 | 1385510 | 299 | 194 | 241 | 279 | 61 | |
| FRANCE | 1905 | 8 | 1372400 | 288 | 326 | 259 | 144 | 72 | |
| TOTAL | | 65 | | | | | | | |

Table 9: Summary of 1990 trade flows in newsprint (1000 MT)

| | MAJOR EXPORTERS | | | CANADA | SWEDEN | FINLAND | NORWAY | USA | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 8722 | 1772 | 1203 | 822 | 527 | |
| | % WORLD EXPORTS | | | 57 | 12 | 8 | 5 | 3 | 85 |
| | VALUE OF EXPORTS (1000 US$) | | | 5043800 | 1169075 | 764414 | 471044 | 317598 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | | |
| USA | 7529 | 48 | 4459338 | 7337 | 75 | 23 | 34 | 0 | |
| UK | 1308 | 8 | 890000 | 273 | 445 | 263 | 182 | 32 | |
| GERMANY | 1217 | 8 | 852899 | 134 | 444 | 248 | 146 | 1 | |
| FRANCE | 498 | 3 | 277000 | 64 | 1110 | 101 | 52 | 0 | |
| JAPAN | 435 | 3 | 302532 | 130 | 13 | 10 | 0 | 257 | |
| TOTAL | 71 | | | | | | | | |

Table 10: Summary of 1990 trade flows in paper and paperboard (1000 MT).

| | MAJOR EXPORTERS | | | FINLAND | USA | SWEDEN | GERMANY | CANADA | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | TOTAL EXPORTS | | | 6431 | 4862 | 4564 | 3671 | 3152 | |
| | % WORLD EXPORTS | | | 16 | 12 | 11 | 9 | 8 | 57 |
| | VALUE OF EXPORTS (1000 US$) | | | 6568421 | 3509644 | 5125151 | 4530880 | 7197401 | |
| MAJOR IMPORTERS | TOTAL IMPORTS | % WORLD IMPORTS | VALUE (1000 US$) | | | | | 1990 | |
| GERMANY | 5563 | 14 | 6028844 | 981 | 205 | 924 | 0 | 55 | |
| UK | 4434 | 11 | 5230000 | 1121 | 289 | 935 | 451 | 108 | |
| USA | 4156 | 11 | 7821890 | 433 | 0 | 148 | 161 | 2360 | |
| FRANCE | 3294 | 8 | 3138000 | 551 | 37 | 544 | 798 | 6 | |
| ITALY | 2080 | 5 | 2261819 | 209 | 169 | 385 | 298 | 9 | |
| NETHERLANDS | 2026 | 5 | 2479666 | 439 | 104 | 256 | 459 | 20 | |
| HONG KONG | 1467 | 4 | 1259500 | 61 | 13 | 27 | 10 | 50 | |
| TOTAL | | 59 | | | | | | | |

Table 11: Average tariff rates facing forest products in selected coutry markets A, roundwood; B, primary wood products; C, secondary wood products.

| Imports from developed countries | | | | | |
|---|---|---|---|---|---|
| | Pre-Tokyo Round | Post-Tokyo Round | | Pre- Tokyo Round | Post-Tokyo Round |
| Canada | | | EEC | | |
| A | .4% | 0.1% | A | 0.1% | 0.0% |
| B | 4.6% | 2.5% | B | 1.0% | 0.8% |
| C | 17.7% | 12.6% | C | 2.2% | 1.7% |
| USA | | | JAPAN | | |
| A | 0.0% | 0.0% | A | 0.0% | 0.0% |
| B | 0.8% | 0.4% | B | 0.3% | 0.2% |
| C | 4.7% | 2.4% | C | 9.6% | 4.3% |

Source: UNCTAD Data Base on Trade measures in Olechowski, 1987

Table 12: Description of selected non-tariff barriers used by specified countries for forest products.

| | Product | Applies to: | Year initiated | Changes since introduction | Comments |
|---|---|---|---|---|---|
| **EEC** | | | | | |
| Tariff quotas | Newsprint | All imports | 1969 | Modified 1985 (Quota reduced) | EFTA countries exempt from quota since 1984 (Additional quantities added to basic quota throughout quota period) |
| | Paper & paperboard | All imports | 1973 | | |
| | Plywood | All imports | 1977 | Unchanged | Separate scheme for hardwood and softwood (little growth in quota level) |
| Product standards | Log and lumber | All imports | 1981 | Requirements increased | Involved oak wilt disease. USA disagreement on W. Germany standards of preservation. Ireland's requirement of kiln-dried softwood lumber from North America. |
| | All products? | All imports? | 1992? | | Development of common EEC standards (Europe 1992). |
| Price investigation | Pulp | 36 named countries | 1981 | Ruling 1985 | Charge of price-fixing over period 1973-81. |
| **USA** | | | | | |
| Anti-dumping investigation | Plywood | Japan | 1975 | 1976 | Duties applied. |
| Countervailing investigation | Softwood lumber | Canada | 1982 | 1992 | Export tariff 6.1% |
| **Japan** | | | | | |
| Product standards | Plywood | All imports | | | Disagreement with USA over standards. |
| | *Pinus radiata* lumber | All *P. radiata* imports | | Revised 1981 | New-Zealand disagreement over treatment of *P. radiata* in standards. |

Source: Bourke, 1988.

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