

Tariff Liberalization, Wood Trade Flows, and Global Forests

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ABSTRACT

This paper examines the question of the likely effects on global forests of a further reduction in wood products tariffs including both solid wood products and pulp and paper, as has been proposed to the World Trade Organization (WTO) by the Asia Pacific Economic Community (APEC). The tariff reductions would be an extension of the tariff reductions associated with the Uruguay Round (*Federal Register* 1999). The questions include both how international trade is likely to change in response to further tariff reduction and also the implications for timber harvests and forests generally of such trade liberalization in the various forest regions. The paper finds that the evidence suggests further reductions in tariffs on forest products are likely to generate only very modest increases in worldwide trade and production, and the increased harvest pressures on forests due to tariff reduction should be quite modest. The major countries likely to experience export and production increases are found largely in the northern hemisphere and are likely to be able to facilitate additional harvests with minimal effects on the forests due to the modest nature of the impact, new forest practices laws, new forest set-asides, and movement toward improved practices designed to achieve multifaceted sustainable forestry. Furthermore, there is little reason to expect that tariff reductions will significantly increase harvests from tropical forests. Earlier tariff reductions appear to have had minimal impacts on tropical harvests or exports. Nevertheless, tropical forests will remain under deforestation pressure due to land conversion objectives, commonly to provide additional agricultural lands.

Key Words: international trade, tariffs, forest, forest products, World Trade Organization
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1. BACKGROUND

The accelerated tariff liberalization proposal in forest products covers chapters 44,46,47,48,49 on the Harmonized Tariff Schedule (HTS). Roughly, the proposal is to accelerate the existing Uruguay Round agreement to decrease tariffs to the point where there would be the total removal of tariffs in chapters 47,48 and 49 of the HTS (pulp, paper and paperboard, and printed materials). For solid-wood, chapters 44,46, the objective would be a continuation of the process of lowering tariffs that was begun in the Uruguay Round. Table 1 presents an average of forest products tariffs for selected countries.

In addition to tariffs, however, nontariff trade barriers exist in forest products. The most important nontariff barriers probably apply to log exports (many countries prohibit log exports) and lumber exports (some countries apply export taxes). These issues are being looked at separately, but as part of the overall assessment. This paper addresses some of these issues as they relate to the effects of the tariff reductions.

Forest products trade runs the spectrum from raw wood materials, such as logs and wood chips, to highly processed products such as furniture and fine papers. Within the wood products sector some countries specialize in the production of raw wood, others specialize in various facets of processing, while still others produce both raw wood and processed goods. Thus, the value of wood products appears to be only a crude proxy of the amount of raw wood harvested, both domestic and

Table 1: Tariffs*, Selected Countries

Country	Tariff % MFN average
Australia	2.88
Canada	3.88
Chile	11
China	20.86
Taiwan	3.22
Hong Kong, China	0
Indonesia	9.7
Japan	1.14
Korea	4.98
Malaysia	12.26
Mexico	11.32
New Zealand	6.06
Singapore	0
Thailand	20.04
USA	1.4
EU	5.26

Source: FAOSTAT Website, 1998

Table 2. World Industrial Roundwood Production, 1996

Country	Volume (cu. M)	Percent Total
USA	406,595	27.30
Canada	183,113	12.29
Europe, excluding Nordic	266,853	17.92
Nordic	102,798	6.90
Brazil	84,711	5.69
Russian Federation	67,000	4.50
Japan	22,897	1.54
Indonesia/Malaysia	83,016	5.57
China/India	133,707	8.98
Other	138,843	9.32
Total World	1,489,533	100.00

Source: FAO Forest Products Yearbook, 1996

imported. Nevertheless, since there are often advantages in processing near the source of the raw material, most of the countries with large dollar values of production and exports also have large harvests. Table 2 presents the volume of timber harvest by major region in a recent year while table 3 provides information on the value of exports, imports and net forest product trade in a similar year. The high harvest countries are almost all major forest product exporters, although some, most notably the US, are net importers by virtue of very high import levels. Thus, while we focus on the value of net forest products exports, this figure is also a good proxy for harvests.

Global Forest Production Trends

The past two decades of global wood production can probably be best characterized by two phenomena. The first is the stagnation of global wood production and consumption. Global industrial harvest levels were essentially the same in 1997 as they were in 1984. The second is the increasing role of industrial forest plantations in meeting global industrial wood demand. Both of these trends could be permanent.

In recent years global production of raw industrial wood has stagnated. Production in 1997 of 1.523 billion cubic meters was almost identical to that of 1984, which was 1.527 billion cubic meters. Although this trend reflects some special short term circumstances (the all-time high was 1.72 billion cubic meters in 1990), it may also reflect more fundamental long term trends. The demise of the centrally planned system of the Soviet Union resulted in a precipitous decline in production from the countries that made up the former Soviet Union, particularly Russia. Industrial wood production in Russia has fallen dramatically, to only 20 percent of the production levels reported in the late 1980s, as the system of heavy transport subsidies has been eliminated, making long distance hauls of wood uneconomical. There is little likelihood that wood production, even in a revitalized Russian market economy, will soon approach the harvest levels experienced under the highly subsidized Socialist system. The economics of transport appear to preclude the types of massive timber harvests that characterized the Soviet system.

In the longer term, the growth of wood production and consumption are affected by both demand and supply side considerations. Consumption appears to be declining, in part, due to what is being

**Table 3. Major Global Exporters and Importers of Forest Products, 1996**

Country	Exports (1,000 US\$)	Imports (1,000 US\$)	Net (1,000 US\$)
Canada	25,333,157	2,622,203	22,710,954
Sweden	10,996,199	1,323,936	9,672,263
Finland	10,301,017	699,632	9,601,385
Indonesia	5,206,522	865,424	4,341,098
Malaysia	4,161,279	881,539	3,279,740
Austria	4,149,678	1,988,878	2,160,800
Brazil	3,233,476	1,154,971	2,078,505
Russian Federation	2,995,568	115,030	2,880,538
Norway	2,059,960	1,402,551	657,409
Switzerland	1,797,767	2,501,957	-704,190
France	4,193,914	5,356,351	-1,162,437
Belgium-Luxembourg	2,180,694	3,544,574	-1,363,880
Hong Kong	1,872,717	3,488,083	-1,615,366
Spain	1,523,810	3,552,249	-2,028,439
Netherlands	2,406,430	4,489,773	-2,083,343
China (incl. Taiwan)	1,490,413	3,858,254	-2,367,841
Germany	9,438,751	11,926,822	-2,488,071
Korea	1,258,793	4,425,527	-3,166,734
Italy	2,486,782	6,148,593	-3,661,811
USA	16,939,897	22,558,536	-5,618,639
United Kingdom	1,957,907	8,476,689	-6,518,782
Japan	1,781,177	18,890,397	-17,109,220
World	134,656,439	138,652,187	-3,995,748

Source: FAO Forest Products Yearbook, 1996

called the “dematerialization” of the economy. Materials are seen as playing a decreasing role as economies move toward services and the information age. The question of a long-term trend toward dematerialization is more problematic. It is clear that the growth of industrial wood consumption worldwide has been declining for several decades (Sedjo and Lyon 1990). The experience of the past decade shows no change in that declining trend. In fact, given the robustness of the overall global economy through 1997, the stagnation of world wood production and consumption is rather remarkable, despite the events in the former Soviet Union. Furthermore, when that data are out we will most likely see that the latter part of the 1990s also had a moderation of demand for industrial wood, if only because of the difficult economic conditions being experienced in much of Asia beginning in 1998.

Even as industrial wood demand has tended to stagnate, however, investments continue to be made in industrial forest plantations. While this activity appears to suffer from “fits and starts,” overall tree planting has continued at high levels globally since the 1970s. One of the driving forces for plantation establishment appears to be the increasing pressure and success of the environmental movement in limiting and prohibiting harvests from native forests (Sedjo 1999a). Examples can be found in the dramatic decline in harvests over the past decades from the U.S. National Forest Sys-

Table 4. Inaccessible Forest

Region	Area of Forest Unavailable for Timber Supply (million ha)
Africa	233
Asia	177
Oceania	61
Europe	20
Russia	166
North America	238
Central America	49
South America	709
Total	1,653

Source: FAO Global Fibre Supply Model (1998)

tem and increases in restrictions and costs associated with harvests in British Columbia. As environmental groups continue to achieve success in regulating practices and limiting harvests from native forests, costs are being driven up and planted forests appear increasingly attractive economically. Although reliable representative wood price data are difficult to obtain, there is anecdotal evidence that prices for wood from old growth forests are rising, leading to a continuing shift to second growth and plantation forests. Also, globally, prices in the U.S. appear to be rising more than those in other regions, especially Europe. This appears due, in part, to North American set-asides, e.g., reductions in harvests from the national forest system, and trade prohibitions on wood from Canada, including both Canadian log prohibitions and export taxes on certain Canadian softwood lumber exports to the U.S.

Protection of the World's Forest Through Inaccessibility

The world's forest area is estimated at roughly 3.2 billion hectares (ha). However, according to the FAO, about one-half of that area is economically inaccessible and therefore unavailable for timber harvests under normal circumstances (table 4). This includes huge forest areas in all regions of the world.

Such a situation affords a large measure of protection from commercial harvest or development for these forests. Wood products tariff reductions and other types of trade liberalization policies are unlikely to have any affect on harvest these lands. Additionally, the inaccessibility of these lands tends to protect them from many types of development. However, these areas may still be susceptible to pressures from local peoples to convert the land to other uses, especially agricultural.

Regional Production and Trade Flows

International trade flows have exhibited a great deal of stability in recent decades. Most of the trade occurs in the northern hemisphere between industrial countries. In addition, there are growing flows from the plantations countries of the southern hemisphere including Australia, New Zealand, South Africa, Chile, and Uruguay. About 75 percent of industrial wood comes from temperate forests. Tropical timbers are produced and consumed largely in the tropical world, with modest international exports from Africa and South America. The Asia-Pacific region is the only large



regional exporter of tropical wood, with large levels of wood exports flowing from Malaysia and Indonesia, largely to the Pacific Basin, but also worldwide.

Industrial wood is produced throughout the northern hemisphere. As noted, until recently the Soviet Union was a major producer of industrial wood, primarily for its own consumption. Nevertheless, Russia continues to be an exporter of industrial wood to parts of Europe, (pulpwood to Finland), and Asia, (logs to Japan). Also, wood flows from Russia to the former centrally-planned economies of Europe have decreased as these countries have been using more of their domestic wood resources directly and also exporting some of their wood into central and western Europe.

North America continues to be the world's major producer and exporter of industrial wood, with over one-third of the world's production. This situation has not changed substantially from the 1970s (Sedjo and Radcliffe 1980). The U.S. continues to be the world's major consumer market for industrial wood and wood products, with supplies provided from various wood producing regions within the U.S., supplemented by major exports from Canada.

Europe is also a huge market. Most of the total wood consumed in Europe is produced within Europe, including the Nordic countries. There is a great deal of forest products trading within the broad European setting, with France, Germany, Austria, and Poland being the primary wood producing continental countries. The Nordic countries, especially Sweden and Finland, are large producers and exporters of forest products, with most of the exports going to other countries within Europe, in the form of pulp and paper and some wood products. Overall, however, Europe is a wood deficit region with the wood deficits provided from a variety of suppliers including North America and Russia. Africa and Asia tend to supply largely tropical wood, while South America supplies pulp, primarily to Europe, produced by plantations, and also some tropical woods.

Finally, in Asia, Japan has been the dominant consuming country. In fact, Japan is the world's largest net importer of forest products. Japan draws the vast majority of its wood resources and products from a host of producing countries in the Pacific Basin. These include Canada and the U.S. in North America, Chile in South America, New Zealand and Australia in Oceania, Malaysia and Indonesia in the Asia-Pacific, southeast Asian countries, and the Russian Far East.

2. SOME EXISTING LITERATURE

In general, forest product tariffs tend to be low (Bourke and Leitch 1998, Brown 1997). Barbier (1999) estimated the effects of the Uruguay Round's tariff reduction of 33 percent on most forest products to increase total forest products world trade by US \$460–\$593 million. This is an increase of only 0.4–0.5 per cent of 1993's global forest products trade of US \$85.6 billion. Modest levels of change in trade suggest only modest levels of change in production. In the specific markets analyzed, which included products with relatively modest amounts of processing valued added (logs, sawnwood, veneer, particleboard, fiberboard, plywood, wood pulp, and newsprint), the trade increases constitute an increase of 1.6-2.0 percent, with the largest trade increase of 5 percent being for plywood, a product where tariffs have tended to be relatively high in the 10-15 percent range. Barbier's lowest trade effect was 1 percent export increase for wood pulp, which is a product that in most countries has little or no tariff. His study also found that the trade effects of tariff reductions would generally increase the exports of developed countries while reducing the exports of developing countries. This is consistent with the simple trade model approach used below.

One of the issues raised with forest products trade has to do with the likely impacts on timber harvests. It should be noted that the overwhelming evidence indicates that commercial timber harvesting is not a major source of deforestation. The temperate forest, which provides the vast major-

ity, in excess of 75 percent of the world's industrial wood, has been expanding in recent decades (Sedjo 1992). Commercial harvesting typically does not generate deforestation since it is almost always associated with reforestation, either natural or artificial. This is generally true in the tropics also. Numerous studies have found that most tropical deforestation is caused by forest land conversion, usually to agriculture (e.g., see Amelund 1991, FAO 1997).

3. A SIMPLE CONCEPTUAL MODEL

As seen in figure 1, in a stylized 2-country world of prohibited tariffs, no international trade would exist. The price in country A would be P_A and the price in country B a lower P_B . The tariff level is represented by the distance $P_A - P_B$. As tariff rates were gradually reduced, international trade flows (exports) of goods would be expected to begin to flow gradually from countries which have a comparative cost advantage to countries with a cost disadvantage with the lower priced good in B being exported to the high priced country A. The cheaper exports of the low cost countries would begin to displace the domestic production of the high cost countries. In unrestricted trade a common price would emerge, P_T , with the exports of B equaling the imports of A. The effect of trade would be to increase production of the good with the cost advantage, from Q_B to Q_{PB} in country B, as that country tended to specialize in producing the export good. Conversely, the country that was importing would find the low-priced foreign goods displacing its domestic production, declining from Q_A to Q_{PA} , as domestic production of the imported good would tend to decline. Overall, the country with the comparative cost advantage would find both its production and its exports increasing, while the country with the cost disadvantage would find its production decreasing as imports displaced domestic production. This general result of the 2-country model can be generalized to a world with many countries.

It should be noted that the opening of trade would tend to increase the price of that good in the exporting country, while the price of that good would decrease in the importing country. Overall, the opening of trade due to tariff reduction, which operates in the same manner, would be likely to increase total production and trade and therefore is likely to result in overall increases in the world's timber harvests.

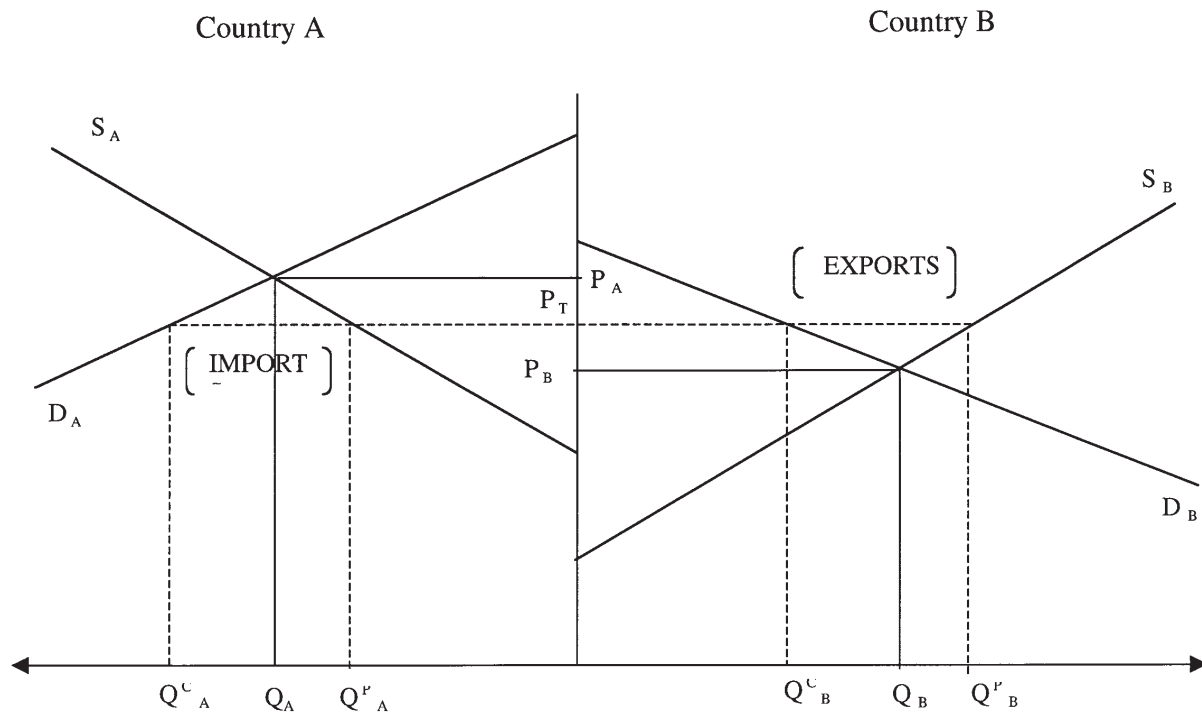
The harvest increases would be expected to be associated with the countries with a comparative advantage in wood exports, and hence countries that are net exporters, as with country B. Countries with a comparative disadvantage, as country A, are likely to experience harvest declines as domestic production is replaced by imports. (Note: It could be that a country is a net exporter of wood products but undertakes no harvesting. Such a situation could occur if a country imports minimally processed wood and provides value-added processing, after which it exports the more highly processed product. This situation is discussed further below.)

Dynamic Considerations

In the short run the ability of the economy to respond to changing market signals, such as those provided by changes in tariffs, is relatively limited. Existing forests can be harvested more extensively and the utilization of existing mills can be increased, but usually only at an increasing cost. However, over the longer period additional adjustments can be made. Historically, increases in effective demand in the forest products industry were met with increased harvests through deeper incursions into the native forest, together with investments in new mills to service the new logging sites. In more recent decades, however, more of the increased raw wood production has come from planted forests as forestry has followed the earlier path of agriculture in which foraging, hunting



Figure 1. Trade model



and gathering, were gradually replaced by herding and cropping. In the past 50 years a similar phenomenon has taken place in forestry as the portion of industrial wood provided by native forests has been declining and replaced by wood from planted forests (Sedjo 1999b). This trend has been accelerated by the advent of technology that allows for intensive management, short rotations and high yields (Sedjo 1999a).

For a country or region, the long term transition to plantation forests may involve the gradual shifting of the basis of comparative advantage in the production of industrial wood from large stands of natural forest to an advantage based on the productivity of a site, its accessibility, and its location vis-à-vis markets (Sedjo and Lyon 1983). The U.S., for example, has seen a shift of forest production from the west to the south beginning as early as the late 1970s. Similarly, over time, the comparative advantage in industrial wood production is shifting away from countries which have huge natural forests, like Canada, to countries that have land areas particularly suitable for tree growing, like New Zealand and Chile.

Wood Product Trade and Harvests Under Tariff Liberalization

In a world where there is an across-the-board reduction in tariffs, certain changes are highly predictable. Countries with comparative advantages in the production of certain goods, as noted, would be expected to expand both their production and export of these goods. Countries with a comparative disadvantage would be expected to reduce their production of these goods while increasing imports. Presumably, for wood products, countries that expand production and exports would tend to increase their harvest levels, while countries that reduce production would tend to reduce their harvest levels. This relationship need not always necessarily hold when looking at the values of exports and imports since countries may increase (decrease) export values by producing higher

(lower) value outputs, without increasing (decreasing) harvests. However, for this study we will assume that values and volumes generally move together.

Tables 2 and 3 show forest raw wood (roundwood) production and forest products exports and imports by country. Countries comparative advantage in wood production is reflected in their net exports. The countries with the largest net exports include Canada, the Nordic countries (Sweden, Finland, and Norway), Austria and Russia in the temperate forests and Indonesia, Malaysia, and Brazil in the tropics. Countries that have a comparative disadvantage, as shown in their net imports include Japan, the UK, the U.S., Italy, Korea, Germany, China (including Taiwan), the Netherlands, Spain, Hong Kong.

Production and exports alone are not sufficient to determine comparative advantage. The US is the dominant producer of forest products; however, it is also the major consumer. On balance, the U.S. is the third highest net importer. Most U.S. forest products imports originate in Canada, which is the globe's dominant exporter and net exporter, reflecting its huge production relative to consumption. Overall, North America is the dominant global timber producer, with much of the production being traded both within and external to North America.

In general, wood exporting countries and countries with large net forest products exports are found among the industrial countries of the northern hemisphere. However, New Zealand, South Africa and Australia are important southern hemisphere wood producers and wood exporters, based importantly on plantation forests. Additionally, the tropical countries of Indonesia, Malaysia and Brazil are large tropical developing countries with substantial forest exports.

Countries with large net imports tend to be industrial countries. From this information alone one would expect most harvest increases to be primarily in the northern hemisphere countries, with some possible exceptions including some tropical forested countries and some southern countries with industrial plantation wood production.

4. How Large an Impact on Trade is Likely From the Tariff Reduction?

Some idea of the probable range of impact of a tariff reduction can be obtained by examining earlier estimates. For example, Barbier (1999) estimated that the effect of the Uruguay Round tariff reductions on selected forest product exports would increase by an overall average of 1.6-2.0 percent. In a continuation of the tariff reduction, the elimination of the quite small remaining tariff on pulp and paper and the continued reduction of other export tariffs is likely to increase exports by no more, and probably somewhat less than, the earlier estimate of Barbier, since the absolute amount of the proposed new reduction is smaller.

In addition, most forest product production is not exported. Thus, forest product production is considerably larger than exports. Assuming that production exceeds exports by a factor of four, Barbier's estimate of the absolute increase in exports would be a larger percentage of exports than of overall production. Thus, for example, a ten percent increase on an export base of 25 units would be only a 2.5 percent increase on the corresponding production base of 100, production being 4 times exports. In Barbier's example, a 1.6-2.0 percent increase in exports would only be a production increase of one-four, or about 0.4-0.5 percent. If translated into additional harvest, this would be a very modest increase of 6 to 10 million cubic meters annually, on global harvests of 1.5 billion cubic meters, due to tariff reductions.

Some Specifics of Major Wood Exporting Countries

In the following section we examine the major players in greater detail to determine if there are country-specific conditions that might cause the impacts to be different from the general types of impacts postulated.

The simple trading model indicates that net exporting countries are likely to increase their wood exports. This, in turn, suggests increasing harvests. Let us examine this situation for some of the major countries. By far the largest net forest products exporters in the world are the northern hemisphere industrial countries of Canada, Sweden and Finland.

Canada: Canada is the world's major net exporter. Our model suggests that, other things being equal, Canada would increase its forest products exports if wood product tariffs were reduced across the globe. However, this impact is likely to be reduced somewhat due to the specific nature of Canadian exports and her trading partners. Much of Canadian wood exports are to its major trading partner—the U.S. Tariffs do not exist on several major wood exports into the U.S. (softwood lumber and newsprint), so the elimination of tariffs globally would do relatively little to affect this trade. One exception is the unlikely case that tariff reductions elsewhere would open up huge new markets to Canada that would draw exports away from the U.S.. Other nontariff barriers do exist, however. For example, Canada has an overall log export ban and a lumber export tax on softwood lumber exports to the U.S. This export ban is lifted under certain circumstances. The lumber export tax is in effect only if softwood lumber exports exceed a certain allowed maximum from selected provinces. These are the provinces from which most of the softwood lumber exports have historically originated and the tax typically is in effect toward the end of every calendar year. Thus, due to the export tax, tariff liberalization in itself would likely have little effect on softwood lumber trade to the U.S.

Canada also exports wood products widely beyond the U.S. Thus, many of its other markets would be stimulated by the proposed reduction in wood tariffs. For example, tariff reduction could increase its exports of certain products to Japan and Asia. Japan has been a major Canadian market for decades. Since 1990, however, it has been weak due to Japan's slow economy. More recently, other Asian markets have suffered from a similar economic slowdown. Although the tariff reduction does not guarantee economic recovery, a tariff reduction and economic recovery in Asia should increase Canadian wood exports. Europe is also a substantial Canadian market for wood products that could be stimulated by tariff reductions. However, many of Canada's major potential exports are not seriously limited by tariffs. They either are largely restriction free, or they are constrained by some type of nontariff barrier. One product, however, where tariff reductions might have a substantial impact on Canadian exports could be plywood, which has a fairly large tariff in much of the world.

On the harvesting side, however, a factor inhibiting increased Canadian production and exports could be found in new forest practices codes, which have increased harvesting costs, such as those now in place in British Columbia. In addition, Canada is now considering moving to sustainable and certified timber production, which makes special provisions for ecological and biodiversity concerns. These more severe standards are likely to raise costs and inhibit production and exports, despite the stimulus of a tariff reduction. In response to Canada's higher costs and increasing logging restrictions, especially in the west, there has been a shift to greater production from eastern Canada, where environmental problems and concerns tend to be less severe. This trend might be expected to continue with much of any increases in harvests occurring in the less environmentally sensitive east.

Nordic: The Nordic countries, particularly Sweden and Finland, have historically been major producers and exporters of forest products, particularly to continental Europe and the UK, but also outside of Europe. This has been accomplished through a policy of major reforestation subsequent to harvest, both through natural regeneration and artificial planting. Major tariff reductions ought to allow the Nordic countries to further exploit their comparative advantage in wood products and increase their production and exports, most of the value of which is in pulp and paper products. In

recent years Nordic wood products exports are increasingly finding their way to non-European markets.

The Nordic countries have recently undertaken new policies to insure sustainability of production and of biodiversity. These new policies will increase the costs of production (Sedjo et al. 1998). While new environmental concerns are somewhat reducing the harvest capacity of the Nordic countries, their capacity to expand their wood base seems secure, in part because they have added to their timber base. To offset this, the Nordics are obtaining large portions of their raw wood from Russia, and more recently Estonia and Latvia. In the cases of Estonia and Latvia, many of these resources are the result of farm abandonment that resulted from the collectivization of the Soviet era, and almost surely offer few serious threats to native biodiversity.

Russia: Until the demise of the Soviet Union, the area of Russia was the world's second leading producer of industrial wood, trailing only the U.S. In recent years, however, wood harvests have fallen to a reported 20 percent of their previous levels. The harvests of the Soviet era were at high levels largely due to the focus of the central plan on physical production and huge de facto transport subsidies. However, under a market system the very high cost of harvests and transport in many of the inaccessible regions of Russia make much of their earlier wood production uneconomical. It appears unlikely that harvests will return to the levels of the Soviet era in the foreseeable future, even if the Russian economy fully recovers. However, political stability should generate increased investments in wood processing, largely for domestic markets, which would require more raw wood input and harvests. At this time, Russia remains a large exporter of raw wood, much of which comes from second-growth, previously logged-over forests in western Russia. To some extent the forests that are now inaccessible are largely primary forests. In the west, wood is exported to Finland and in the east to Japan. Tariffs do not apply to raw wood in most, if any, of Russia's major markets and tariff reductions are unlikely to directly affect exports significantly. However, to the extent that a reduction in tariffs serves to increase overall wood product exports and production, the effect could be to increase the demand for Russian raw wood exports. Overall, however, the pressure on Russian harvests from trade liberalization is unlikely to increase harvests to anywhere near the levels of the Soviet era.

The Tropics

The above analysis suggests that the pressures on northern forests are unlikely to change substantially as a result of tariff reductions. This section examines the situation in some major tropical wood producing and exporting countries.

Indonesia and Malaysia: Indonesia is the world's major producer of tropical hardwood followed closely by Malaysia. Most Indonesian hardwood exports utilize native timbers that are converted to tropical hardwood plywood, which are directed primarily, but not exclusively, at the Japanese market. Malaysia exports a wider array of products including raw logs, largely for the Asian market, again with a large percentage going to Japan. In addition, Indonesia is aggressively developing a pulp and paper industry based on wood from forest plantations. In the recent period, production has been stagnant reflecting limits in the resources and the economic problems of Asia.

While raw logs generally do not face tariffs, plywood imports into Japan have traditionally experienced a tariff of 15 percent and some lumber products face tariffs also. This tariff has been lowered as a result of the Uruguay Round and further reductions are expected as a result of the proposed additional reductions. Normally, such a reduction of tariffs would be expected to promote production, exports and perhaps generate increased harvests for Indonesia and Malaysia. However, the experience of the two countries is significantly different over the past several years with

Malaysia's harvest declining while Indonesia's continues to rise. Their collective harvests, however, have remained relatively constant. These countries are dominant suppliers of low-price tropical timbers and plywood in Asia, and to the important Japanese market. They appear to have been able to exert market power by limiting the growth of tropical timber harvests in the face of tariff reduction and thereby capture some of the financial surplus. Their harvests of tropical sawlogs and veneer logs has been relatively stable in recent years, as have been their production and exports of plywood and lumber. However, Indonesia particularly has experienced a substantial increase in the total volume of harvest with essentially all of the increase being pulpwood, much of which is due to planted forests that are now coming into production.

Thus the data indicate that harvests of tropical timbers and the production and exports of sawnwood and plywood have been constant, or perhaps declined slightly, in the last several years during which the early tariff reductions went into effect. Some of this stability, of course, is the result of some fall-off in demand due to weak Asian markets. In addition, these countries face pressures from the global environmental community to restrain their harvests in tropical forests, which may contribute to this stability. In any event there is little reason to believe, on the basis of recent performance, that additional modest tariff reductions will have much effect on overall harvests of tropical timbers and/or exports.

Although concerns have been raised over the levels of harvests of primary tropical forests, harvesting in heterogeneous tropical forests tends to be on a selective basis, rather than the clearcutting we are familiar with in much of the temperate forest. Such an approach limits harvests to large older trees of certain species; in the Asia-Pacific region these are largely species from the *dipterocarp* genus. Much of the forest is left in place. If the harvested area is not converted to other uses, as with planned conversion to agriculture or migrating cultivators, forest regeneration is common and the native forest is renewed. Nevertheless, legitimate concerns persist that appropriate management practices are followed and the native forest not be excessively exploited.

On the forest plantation side, reduced tariffs should enhance the inherent competitive advantage generally believed to be associated with Indonesian pulp and paper operations. These activities, which are to be fed largely by plantation forests, will likely induce more investment in planted forests over the long term.

Brazil: Over a period of a few decades Brazil has become one of the major forest products exporters worldwide. The primary source of this change is not Brazil's native tropical forest, but rather Brazil's forest plantations that were established in the 1970s and 80s and have matured and are now providing large volumes of pulpwood, which is being processed into pulp and widely exported. Additionally, Brazil's native forest is a source of tropical timbers, most of which are consumed domestically, but substantial volumes of which are exported, largely to Europe. However, the forests of the Brazilian Amazon are highly heterogeneous with only a very few merchantable trees per hectare. Thus, in general, large-scale commercial logging in natural forests is not as financially attractive as in the Asia-Pacific region, since timber volumes per hectare in Brazil are generally very modest, 5-10 cubic meters per ha, as compared with 40-60 cubic meters often found in the Asia-Pacific region. (By contrast, clearcut harvests in temperate areas typically run to several hundred cubic meters per ha.) There is pressure on Brazil's forests that is contributing to widespread deforestation. However, this is coming largely from land conversion activities, many of which are associated with broad development objectives for the Amazon region.

Brazil will also certainly continue to increase its production and exports into the future and worldwide tariff reductions would facilitate further increases. However, much of the expansion of the Brazilian forest products industry will be the result of its early and continuing investments in

planted forests, which rarely displace native forest since they typically are established on marginal agricultural lands. Liberalized trade will surely promote this expansion. The pressure on native forests in Brazil, however, will almost certainly continue. But it will be principally the result of forest land conversions to other uses, primarily agricultural, and minimally the effect of tariff reductions.

Some Considerations of Major Wood Importing Countries

Japan, the UK, the U.S., Italy, Korea, Germany, China (including Taiwan), the Netherlands, Spain, and Hong Kong are the world's major net importing wood product countries. With the exception of the U.S. and Germany, these countries are only modest producers of raw industrial wood.

Japan: The world's major wood importing country, both in gross and net terms is Japan. Historically, Japan has been a country where wood is used extensively for housing, structures, and a variety of other uses. Japan had traditionally produced most of its timber domestically. However, in the early post-WW II period Japan found that its timber stock had been depleted by the war, and that it could import wood cheaply. Subsequently, it became highly dependent upon wood imports and today imports are the source of about 80 percent of Japan's wood consumption. Much of the locally produced wood is highly customized to the unique tastes of Japan. For example, some native species are modified during growth to provide special characteristics such as wood grain or pole form. These unique features result in a limited ability to import certain products.

Initially in the post-WW II period, Japan stressed the importation of unprocessed logs, which were obtained largely from the Asia-Pacific region and the U.S. This practice was promoted by placing tariffs on processed wood and thereby providing an additional incentive to import raw wood and process it domestically. In addition, this practice was also the result of sizes and standards unique to Japan that persist until today. The raw wood was then processed in Japan into various products. For example, logs from North America were processed into high value, often custom-cut lumber, while the wastes and residuals were utilized in the production of wood pulp for Japan's paper industry. In recent years raw logs have been more difficult to import and Japan has increased its imports of processed wood products.

With the advent of reduced wood tariffs, Japan may find itself importing more processed wood, although its unique standards and sizes will reduce the extent of such a shift. Lower wood prices on processed wood, as a result of reduced tariffs, should promote the trend to importing more processed wood. This should perhaps reduce even further the fraction of raw wood provided by Japan and reduce pressures on native Japanese forests.

The UK: The United Kingdom relies extensively upon imported wood products. To some extent the UK has tried to offset this high import dependence by establishing domestic forest plantations. However, the potential of these plantations appears limited both economically and biologically and they are probably operational for industrial wood production only with substantial subsidies. Reduced tariffs with non-EU countries will mostly likely make imported wood financially more attractive especially from countries in the western hemisphere. Pressure on UK forests due to reduced tariffs is likely to be minimal.

The U.S: The United States is both the world's largest wood-producing and wood-consuming country. On balance, however, it is a very large net importer, with a large portion of these imports coming from Canada. Initially, the U.S. obtained most of its industrial wood from largely undisturbed native and old-growth forests. However, in the current century growing portions of the wood supply have come from second-growth forests throughout the US. Over the past decade, most of the

remaining old-growth forests have been protected or otherwise set aside from logging; however, large timber harvests continue from the second-growth and increasingly planted forests in the south, the Great Lake states, New England, and also the Pacific Northwest. The U.S. has low tariff rates and would not expect much change in its imports from a general wood tariff reduction. However, low tariffs elsewhere could encourage exports and some increased pressure on U.S. forests. Most of this pressure would probably take the form of encouraging additional investments in plantations in the south.

Italy: Like the UK, Italy is an industrial country with limited industrial wood capacity. Reduced tariffs would probably increase Italy's wood imports and decrease high-cost domestic wood operations.

Korea: South Korea is an industrializing country with little forest or raw industrial wood potential. Like the UK and Italy, it meets its industrial wood needs through imports. Reduced tariffs would almost surely increase imports without influencing domestic wood production.

Germany: Germany, like the U.S. is a large producer and exporter of wood products, but an even larger importer. With a modest tariff structure within the EU, Germany could be expected to be only modestly affected by a general wood products tariff reduction.

China (including Taiwan): China is a significant producer of wood, mostly for domestic consumption. Domestic production is supplemented with significant imports, with an even more modest outflow of wood exports. China has embarked on a major plantation forest effort, that should in the longer term allow for greater domestic raw wood production. In the near term however, reduced tariffs would relieve the pressure on China's native domestic forests allowing a greater portion of its wood requirements to be met by foreign producers.

5. CONCLUSIONS

The evidence suggests that further reductions in tariffs on forest products are likely to generate only very modest increases in worldwide trade and production, and thus the increased harvest pressures on forests due to tariff reduction should be quite modest. The trade effects of the Uruguay Round were estimated to increase total wood exports about 0.5 percent and to increase commonly traded forest products about 1.6-2.0 percent.

The remaining forest products tariffs are quite modest and the trade effects for the proposed new tariff reduction are likely to be even smaller than estimated for the Uruguay Round, since the absolute value of the reductions is generally smaller than the reductions of the Uruguay Round.

The overall pressures on the world's forests from increased wood harvests associated with the tariff reductions are likely to be small and manageable. We estimate the effects to generate an increase in harvest of 6-10 million cubic meters per year or about a 0.4-0.7 percent increase in the global industrial wood harvest. The major countries likely to experience export and production increases are found largely in the northern hemisphere and are likely to be able to facilitate additional harvests with minimal effects on the forests due to the modest nature of the impact, new forest practices laws, new forest set-asides, and movement toward improved practices designed to achieve multifaceted sustainable forestry. Some forests, e.g., the Russian forest, have experienced substantial decreased pressure from harvesting, and trade considerations are not likely to change this significantly.

There is little reason to expect that tariff reductions will significantly increase harvests from tropical forests. Earlier tariff reductions appear to have had minimal impacts on tropical harvests or

exports. Tropical forests, however, will remain under deforestation pressure due to land conversion objectives, commonly to provide additional agricultural lands.

Total demand for industrial wood has been stagnant in recent years and is unlikely to increase dramatically in the near term due to increases in secular demand. Any increases in the effective demand due to tariff changes will be small and probably will not be exacerbated by substantial increases in secular demand.

Forest product tariff reduction is taking place in the context of major efforts to increase forest set-asides worldwide and movement toward more sustainable management regimes. These corrective changes will almost surely have a much larger influence on forests than the modest impact of tariff reductions.

In the longer run, tariff reductions, together with rising costs of wood from native forests, are likely to facilitate the trend to raw wood being provided by plantation forest. These forests, established largely on former agricultural lands, will bear the brunt of future increases in timber production, whether these increases are due to tariff reductions or to increases in long-term secular demand.



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