Effects of global trade liberalization on U.S. forest products industries and trade: A computable general equilibrium analysis

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Abstract

This study assesses the effects of tariff reductions represented by the North American Free Trade Agreement (NAFTA), the Uruguay Round (UR) of the General Agreement on Tariffs and Trade (GATT), and the World Trade Organization (WTO) negotiations on U.S. forest products industries using a computable general equilibrium model. Our results indicate that the NAFTA would have very limited impacts on U.S. forest products industries and trade. Global trade liberalization under the GATT/WTO would not significantly change the output, consumption, and price of forest products, but would stimulate international trade and U.S. exports of forest products. Through altering global forest products trade patterns, trade liberalization beyond the UR would create both opportunities and challenges for U.S. forest products industries in increasingly open and competitive world markets.

Recent decades have witnessed unprecedented global trade liberalization and regional economic integration/cooperation. Among the regional and global trade agreements are the North American Free Trade Agreement (NAFTA), the General Agreement on Tariffs and Trade (GATT), and the World Trade Organization (WTO) negotiations. One of the common objectives of these trade agreements is to curtail tariff and non-tariff trade barriers among member countries. Tariff reductions will change terms of trade, affecting international competitiveness of a country's industries. Due to their extensive interactions with global markets, U.S. forest products industries are likely to be affected by trade liberalization and regional economic integration. To what extent do the existing tariffs/subsidies distort forest products trade? How will trade liberalization affect production, consumption, and price of forest products and the international competitiveness of U.S. forest products industries? Answers to these questions are of great interest to producers, consumers, policy-makers, and researchers.

Most existing studies have focused on the impacts of tariff reductions in forest products sectors on forest products trade. These studies have covered softwood lumber trade between the United States and Canada (Boyd et al. 1993, Boyd and Krutilla 1987), the NAFTA (Prestemon and Buongiorno 1996, Wisdom 1995, Buongiorno and Gilles 1993), and global trade agreements (Zhu et al. 2001; Barbier 1999, 1995; Olechowski 1987). These forestry sectoral studies, though providing useful insights into the trade policy impacts on selected forest products, did not incorporate the interactions between forest products industries and other economic sectors. These interactions could be significant. First, forest products industries extensively interact with other sectors in production and consumption. Second, distortions (tariffs or subsidies) in forest products trade are relatively small compared to those in other industries, particularly agriculture and food sectors. According to the Global Trade Analysis Project (GTAP) database, the world's average import tariff rate in 1993, the year prior to the NAFTA, was above 35 percent in agriculture and food sectors, 10 percent in manufactures, about 5 percent in both lumber and wood products and pulp and paper sectors, and 2 percent in forestry. In addition, agricultural and food products exports have enjoyed considerable subsidies in many countries, while ordinary subsidies to forest

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products exports are fairly small or barely exist. Hence, trade liberalization in other sectors as well as in forest products sectors is likely to affect forest products industries and trade. Because the NAFTA, GATT, and WTO all deal with economy-wide trade liberalization, it is reasonable to consider the impact of trade liberalization within and outside forest products industries.

An effective approach to assessing the effects of economy-wide trade liberalization is the computable general equilibrium (CGE) analysis. A CGE model can take into account interactions throughout an economy in a consistent manner (Borges 1986). It has increasingly been applied to analyzing trade policy impacts due to the availability of large and complicated datasets and increased modeling capacity (Brown et al. 1992, Cox and Harris 1992). Recently, CGE applications have been extended to forestry, including the impact assessments of trade policy (Gan and Ganguli 2003, Boyd 1987), taxes (Boyd and Newman 1991), and subsidies (Boyd 1998).

In this study, we develop a CGE model and use it to evaluate the impacts of trade liberalization represented by the NAFTA and GATT/WTO on U.S. forest products industries and global forest products trade. The impacts of tariff reductions on the output, consumption, price, and trade pattern of forest products are examined. In the remainder of this paper, the model and tariff reduction scenarios are described, followed by the results and conclusions.

Methods

The model and data

The CGE model used in this study is based on the GTAP model constructed to analyze the economic effect of global trade by the Center for Global Trade Analysis at Purdue University in cooperation with researchers around the world. The standard GTAP model consists of many sectors and regions in the world. It assumes constant returns to scale in all production sectors and perfect competition in all markets. Products are differentiated by country of origin. For each region in the model, its total expenditures include those by private households and government and savings. The demand by the private households for goods and services is derived by maximizing their utility given the budget constraint. Firms produce goods and services to maximize their profit. The government finances its expenditures by imposing taxes on the private households, firms, imports, and exports. The private households, firms, and governments in different regions interact through trade.

Also included in the model are global transportation and banking. The global transportation sector redeems its service with the difference between the f.o.b. (free on board) and c.i.f. (cost, insurance, and freight) values for a particular commodity shipped along a specific route. The global bank allocates investments to different sectors in all regions according to savings and rate of returns to capital.

The GTAP database version 3 is used in this study with a base year of 1993. Version 3 is used instead of the latest one because it contains pre-NAFTA information, making it appropriate as a benchmark for analyzing the NAFTA impacts. Year 1993 was also the transition time from the GATT to the WTO. The database contains 45 regions and 50 sectors including 3 forest products sectors. The GTAP model and its database, which was derived primarily from the regional input-output models around the world, have been validated by the Center for Global Trade Analysis at Purdue University. They have been widely used in global trade and environmental policy analysis. Hertel (1997) provided detailed explanations about the structure, development, validity, and applications of the GTAP model and database.

For the purposes of this study, the regions/countries in the GTAP model are further aggregated into ten regions: Australia and New Zealand, Japan, the rest of Asia, Canada, the United States, Mexico, Latin America, the European Union (EU), the former Soviet Union, and the rest of the world (ROW). The separation of regions is based on underlying trade agreements; importance in production, consumption, and trade of forest products; economic development status; and geographic locations. Each region's economy is divided into nine sectors: agriculture, forestry, mining, food and tobacco, manufactures, lumber and wood products, pulp and paper, construction, and services. The sector classification reflects our emphasis on forest products industries and related sectors. These sectors are aggregated according to the Standard Industrial Classification (SIC) codes. The forestry sector includes forestry services, timber tracts, logging, and forest nurseries and gathering of forest products. The lumber and wood products sector covers lumber, wood panels, wood containers, wood furniture, wood buildings and mobile homes, and other processed wood products (flooring, doors/windows, moulding, etc.). And the pulp and paper sector contains pulp, paper, and allied products.

Firms use land, labor, and capital to produce goods and services. Land supply is fixed in the model. Labor is allowed to move across sectors in each region, but not across regions. Capital can be transferred across sectors and regions.

Tariff reduction scenarios

The simulations involve the partial and complete removals of *ad valorem* import and export taxes/subsidies between NAFTA and GATT/WTO members. The NAFTA and GATT/WTO negotiations are complicated multilateral trade agreements. There are different tariff reduction rates for different goods/services and trade partners at different time frames. To consider all tariff reduction situations is impossible and unnecessary. For simplicity and without losing generality, we consider five scenarios of tariff reductions ranging from the NAFTA to the Uruguay Round (UR) and to the complete elimination of all tariffs/subsidies as follows:

- elimination of all tariffs and subsidies among NAFTA members (the NAFTA scenario);
- 36 percent across-the-board cut of tariffs and subsidies for developed countries and 24 percent for developing countries (the UR scenario);
- combination of the NAFTA and UR (the NAFTA and UR scenario);
- 50 percent across-the-board cut of all the existing tariffs and subsidies;
- elimination of all tariffs and subsidies.

The NAFTA scenario represents its full implementation. The tariff reduction under the UR is derived according to a standard treatment of the UR liberalization (Blake et al. 1999). Because WTO negotiations are still in process, it is unrealistic to anticipate the resulting trade

Table 1.— Percentage changes in U.S. output and consumption of forest products under NAFTA and GATT/WTO (base year: 1993).

	Forestry		Lumber and wood products		Pulp and paper	
Scenario	Output	Consumption	Output	Consumption	Output	Consumption
NAFTA	0.04	0.12	0.25	-0.07	-0.05	-0.02
Uruguay Round	0.59	0.29	0.14	-0.14	0.11	0.03
NAFTA and the Uruguay Round	0.62	0.37	0.31	-0.18	0.07	0.01
50% cut of all existing tariffs/ subsidies	1.35	0.68	0.42	-0.06	0.21	0.05
Elimination of all tariffs/subsidies	2.44	1.14	0.59	-0.35	0.39	0.11

liberalization. Instead, we consider a 50 percent across-the-board cut of all the existing tariffs and subsidies as one scenario and elimination of all import tariffs and export subsidies as the completely free trade scenario.

Results and discussion

This section presents the simulation results of the trade liberalization. The impacts of tariff reductions on output, consumption, prices, imports, exports, and trade patterns are analyzed. All impacts are derived against the 1993 benchmark.

Output and consumption

Table 1 shows the effects of the NAFTA and GATT/WTO on U.S. output and consumption of forest products. Trade liberalization, in general, would affect output more than consumption. Global trade liberalization would make U.S. forest products more competitive overseas, stimulating U.S. exports and production. Given the relatively low U.S. import tariffs, their further reductions would have very minor impacts on U.S. market prices, resulting in fairly small changes in the consumption. Among the three forest products sectors, the forestry sector would be affected most in terms of percentage changes. In general, global trade liberalization under the UR and beyond would have more significant impacts than the NAFTA. However, all the impacts would be relatively small. In most cases, the resulting changes in U.S. output and consumption would be less than 1 percent of the benchmark levels.

The NAFTA would enhance the output of the U.S. lumber and wood products sector by only a quarter percent. Its impact on the output of U.S. forestry and pulp and paper sectors would be even smaller. The small production increase in the U.S. lumber and wood products sector would be mainly driven by the increased U.S. exports to Mexico. However, the magnitude of the increased Mexican imports would not be big enough to significantly boost the U.S. production. The Canadian forestry and lumber and wood products sectors would suffer a minor output decline with the NAFTA liberalization, while its paper and pulp sector's output would gain slightly. Because the pre-NAFTA tariffs for forest products traded between the United States and Canada were negligible, the NAFTA would not help much in expanding Canadian exports. Unlike the United States, Canadian exports to Mexico would not increase much either. This may be partially due to the stronger traditional market presence of U.S. forest products in Mexico. Canadian domestic demand would largely determine the output changes. Mexico would experience significant declines in the output of its forestry and lumber and wood products sectors due to its increased imports from the United States.

The UR would slightly enhance the production of all three U.S. forest products sectors. Unlike the NAFTA, the UR would result in an output increase in the pulp and paper sector. The access of U.S. forest products industries to a large domestic and global market base probably accounts for the U.S. positive performance under the UR.

The effects of the NAFTA and UR on the output of U.S. forest products sectors seem to be independent. This indicates that U.S. forest products are competitive both in North America and global markets. Penetration into the established North American forest products markets by producers in other regions seems to be difficult. Seeking global trade liberalization as well as the NAFTA is apparently beneficial to U.S. forest products industries. The NAFTA and UR together would increase the output of all the forest products sectors in the United States. The complete elimination of all the existing tariffs and subsidies in all sectors and countries would further boost the output of U.S. forest products industries, particularly the forestry sector. The increased U.S. exports to Japan, other Asian countries, and ROW would account for most of the output expansion. Global trade liberalization would make U.S. forest products more competitive in these markets. To expand U.S. exports to Japan and other emerging markets through the opportunities created by trade liberalization is extremely important to the future growth of U.S. forest products industries.

The impact of the trade liberalization on U.S consumption of forest products shares a similar pattern to that on output, but the magnitude of the impacts on consumption would be smaller. In most cases, the resulting changes (positive or negative) in consumption would be less than 0.5 percent of the 1993 benchmark levels. Part of the reason for the small consumption changes is the existing relatively low tariffs for U.S. imports. In addition, demand for forest products has traditionally been more sensitive to general economic conditions than other factors. This may have undermined the effect of tariffs on the consumption.

Prices

Tariff changes affect market prices in many different ways. First, tariff reductions in forest products will directly reduce their market prices. Second, disproportional tariff reductions across countries/regions will alter the regional relative prices of forest products, shifting imports and exports and affecting the market prices. Third, trade liberal-

Table 2.— Percentage changes in U.S. and world market prices of forest products under the NAFTA and GATT/WTO (base year: 1993).

Scenario	Forestry		Lumber and wood products		Pulp and paper	
	U.S.	World	U.S.	World	U.S.	World
NAFTA	0.33	0.10	0.33	0.09	0.33	0.08
Uruguay round	-0.53	-0.50	-0.57	-0.15	-0.54	-0.09
NAFTA and the Uruguay round	-0.32	-0.43	-0.53	-0.09	-0.37	-0.04
50% reduction of all existing tariffs/subsidies	-0.88	-0.44	-0.94	0.17	-0.89	0.08
Elimination of all tariffs/subsidies	-1.13	-0.37	-1.30	0.57	-1.19	0.42

ization in non-forest products sectors will affect their demand for forest products, leading to changes in the prices of forest products. Finally, trade liberalization will affect household income, resulting in demand shifts and price changes. The ultimate market equilibrium price after trade liberalization is the combined effect of these interactions. Both the NAFTA and GATT/WTO would have relatively small impacts on U.S. domestic prices of forest products. The NAFTA would slightly increase U.S. market prices of forest products. Removal of the existing near-zero tariffs would have a negligible impact on U.S. domestic prices of forest products. The resulting price rise would be mainly due to increased exports (to Mexico) and domestic demand caused by trade liberalization in other sectors. Contrary to the NAFTA, global trade liberalization under and beyond the UR would cause the prices to fall. With the complete elimination of all the existing tariffs, the U.S. domestic prices of forest products would decrease by more than 1 percent, with the largest price drop of 1.3 percent in the lumber and wood products sector (**Table 2**). In these cases, the price decrease caused directly by the tariff reductions seems to outweigh other effects. Despite the low tariffs between the United States and Canada, the United States still imposes assorted tariffs for forest products imported from other countries. The reductions of these tariffs under global trade liberalization would cause the prices to drop. Given the small output changes resulting from the tariff reductions, the price decline would benefit U.S. consumers, but reduce the producers' profit margin.

The impacts of the NAFTA and GATT/WTO on world prices of forest products would also be insignificant (**Table 2**). Because it is a regional agreement, the NAFTA would have a much smaller price effect on world markets than on U.S. markets. The UR and the combination of the NAFTA and UR would have a negative impact on world prices. However, additional trade liberalization beyond the UR would have mixed effects. The world prices of forestry products and services would decline, while those of lumber and wood products and pulp and paper products would rise. The different effects of global trade liberalization beyond the UR on the world prices of forest products imply different global demand and supply situations in these forest products sectors. With global trade liberalization, advanced and more cost-effective technology in forestry would diffuse and cause global forestry productivity improvements. Countries with comparative advantages in technology and forest management like the United States and Canada would significantly increase their exports (**Table 3**). As a result, the world supply in forestry sector would outgrow its demand, leading to a decline in the world prices of forestry products and services. On the other hand, worldwide tariff reductions would increase global demand for lumber and wood products and pulp and paper products, particularly in developing countries where high import tariffs are still imposed. The demand growth would outpace their supply increase in these two sectors, raising their world market prices. **Table 2** also indicates that U.S. domestic prices would decline relative to world prices with increased global trade liberalization. Therefore, it would be more profitable for U.S. forest products industries to export than to sell in domestic markets under global trade liberalization.

Overall, the effects of the NAFTA and GATT/WTO on U.S. output, consumption, and prices of forest products would be relatively small. In most case, these effects would be less than 1 percent of the benchmark. Insignificant impacts of the NAFTA on U.S. forest products industries were also predicted by other studies (Prestemon and Buongiorno 1996, Wisdom 1995). The impacts of the UR on forest products industries were estimated to be modest (Barbier 1999). Our results are parallel to these previous findings. The relatively small impacts of the tariff reductions represented by these trade agreements are attributable to the existing low tariffs of forest products. The reduction or elimination of these small distortions would not result in a significant direct impact on the quantity and price of forest products. In addition, due to the unique features of wood products and consumers' general preferences for wood products to man-made materials or other substitutes, these trade agreements would not cause significant resource shifts from or to forest products industries. As a result, the overall impacts of the NAFTA and GATT/WTO on the output, consumptions, and prices of forest products, although significant in some cases, would not be vast.

U.S. imports and exports

Although the tariff reductions under the NAFTA and GATT/WTO would have relatively small impacts on output, consumption, and prices, their impacts on U.S. imports and exports of forest products would be significant in most cases (**Table 3**). They would affect U.S. exports more than imports, and global trade liberalization would have more significant impacts than the NAFTA. Of the three forest products sectors, the pulp and paper sector would be least affected. The U.S. imports of pulp, paper, and allied products would almost be unaffected by the tariff changes. However,

Table 3. — Percentage changes in the values of forest products trade under the NAFTA and GATT/WTO (base year: 1993).[a]

Country	Trade	NAFTA	UR	UR and NAFTA	50% cut of all tariffs	Elimination of all tariffs
Forestry						
U.S.	Import	-0.2	0.8	0.6	1.2	3.2
	Export	-0.6	3.8	3.5	8.6	17.1
Canada	Import	-0.4	-1.5	-1.8	-2.1	-4.1
	Export	0.8	5.1	5.7	10.4	22.1
Mexico	Import	38.6	8.1	33.7	10.5	22.8
	Export	-10.7	-1.6	-9.1	-2.1	-4.5
World	Import	-0.1	3.5	3.4	8.2	17.5
Lumber and wood products						
U.S.	Import	1.1	1.0	1.7	1.0	2.9
	Export	5.5	3.9	7.5	6.9	13.6
Canada	Import	3.1	0.0	1.9	-0.2	0.4
	Export	0.5	2.1	2.5	4.3	8.9
Mexico	Import	36.6	8.3	32.6	11.4	25.0
	Export	6.9	4.5	8.7	7.5	15.7
World	Import	0.9	2.7	3.2	6.2	14.0
Pulp and paper						
U.S.	Import	0.7	0.1	0.6	0.0	0.8
	Export	-0.1	0.8	0.7	1.8	3.4
Canada	Import	-0.1	-1.0	-1.0	-1.5	-2.2
	Export	0.2	1.1	1.2	1.8	3.9
Mexico	Import	3.1	-1.0	0.9	-1.9	-3.7
	Export	6.9	3.2	7.5	4.6	9.8
World	Import	0.1	0.9	1.0	3.0	6.9

[a] Imports are valued at c.i.f. and exports at f.o.b.

both the NAFTA and global trade liberalization would increase U.S. exports of lumber and wood products. Global trade liberalization, not the NAFTA, would also boost U.S. exports of forestry products and services. The impacts of trade liberalization would be intensified with increased tariff reductions.

The NAFTA would stimulate U.S. exports to Mexico in the forestry sector. But it would have little impact on U.S. pulp and paper trade. This may be attributed to the low trade distortions in the pulp and paper sector among NAFTA countries, and the price irresponsiveness of Mexican demand for imported pulp and paper products (Prestemon and Buongiorno 1996). Probably, the most significant impact of the NAFTA would be on the lumber and wood products sector. The NAFTA would increase U.S. exports of lumber and wood products by 5.5 percent. Although U.S. imports would also increase (1.1%), the export increase would exceed the import rise. The rise in U.S. lumber and wood products exports would be mainly due to increased Mexican imports caused by its tariff reductions. Interestingly, the NAFTA would not significantly increase U.S. imports of lumber and wood products from Canada. This is due to the low pre-NAFTA import tariffs on Canadian lumber and wood products. Non-tariff barriers such as log export restraints and the softwood lumber dispute are not incorporated in this study.

The most significant impacts of the UR would be on U.S. exports of forestry products/services and lumber and wood products. Under the UR, U.S. exports of forestry products and services would increase by 3.8 percent, driven by increased imports by Japan and other Asian countries. For the lumber and wood products sector, the UR would increase U.S. exports to all regions/countries except Canada. The UR would also slightly improve U.S. trade balance in the pulp and paper sector due to the increased exports to Japan and other Asian countries.

The combination of the NAFTA and UR is probably the scenario that can best represent the current trade environment. Their combined effects would be moderate except for U.S. exports of forestry products/services and lumber and wood products. The most noticeable impact would be the increase in U.S. exports of forestry products and services to Japan, the rest of Asia, and Mexico, and lumber and wood products to Japan, the rest of Asia, Mexico, and ROW. For the pulp and paper sector, the export increase resulting from the UR would largely be offset by the import increase caused by the NAFTA, resulting in only small changes in the sector's trade balance.

Further global trade liberalization beyond the UR would have even more significant impacts on U.S. exports and imports. Under the completely free trade situation, U.S. exports of forestry products and services to Japan and the rest of Asia would increase by 16.1 and 33.5 percent, respectively. This indicates that U.S. exports of forestry products and services to Japan and other Asian countries would have a great potential if all tariff barriers are removed. With the removal of all tariffs/subsidies, U.S. lumber and wood products exports to Japan, the rest of Asia, and ROW would increase by 16.3, 51.2, and 64.5 percent, respectively. These countries would count for the majority of the U.S. export increase. On the other hand, the U.S. would increase its imports from Canada and the EU. Global trade liberalization beyond the UR would also moderately enhance U.S. exports of pulp, paper, and allied products.

The significant increases in U.S. exports of forest products under global trade liberalization suggest the strong international competitiveness of U.S. forest products industries. Most of the increased U.S. exports would be shipped to Japan, other Asian countries, and ROW. The existing tariffs for forest products in these countries are still relatively high. Liberalization of their markets would stimulate U.S. exports. Continuing economic growth in the emerging markets would present even greater opportunities for U.S. forest products industries.

Global trade patterns

The NAFTA and GATT/WTO impacts on global forest products trade patterns vary across sectors and coun-

tries/regions. The NAFTA would have few impacts on the flows and values of global forest products trade. Its impacts would be confined within North America, particularly the lumber and wood products sector. One of the noticeable impacts would be to expand U.S. and Canadian exports of lumber and wood products to Mexico. Even though our results show a 3.1 percent increase in Canadian imports of lumber and wood products under the NAFTA, which is greater than the percentage increase in its exports (0.5%), the total trade balance of the Canadian lumber and wood products sector would basically be unchanged. This is because the total values of exports were much greater than that of imports in the sector.

The UR impacts on global forest products trade would be moderate. The UR appears to have more significant impacts on the forestry and lumber and wood products sectors than the pulp and paper sector. The total values of global trade under the UR would increase by 3.5 percent in the forestry sector, 2.7 percent in the lumber and wood products sector, and 0.9 percent in the pulp and paper sector (**Table 3**). These results are in general very close to those from previous analysis (Barbier 1999), which estimated that the UR would increase the total world imports of all forest products by 1.6 to 2.0 percent with 0.4 percent for logs, 1.0 percent for pulp, and 3.3 to 5.1 percent for plywood. The UR would enhance forestry products trade (imports and exports) in the rest of Asia, Latin America, and ROW; increase exports from Canada and the United States; and boost imports by Japan and the former Soviet Union. It would promote lumber and wood products trade across almost all regions. Under the UR, Japan and the rest of Asia would significantly increase their lumber and wood products imports, supplied mainly by the United States, Canada, the EU, and the rest of Asia itself. The EU would shift its lumber and wood products imports from the former Soviet Union to ROW. The UR would also slightly enhance pulp and paper exports from Canada, the U.S., and the EU. Major designations for the increased exports would be Japan, the rest of Asia, Australia and New Zealand, ROW, and the former Soviet Union.

The combined effects of the NAFTA and UR would virtually be the sum of their individual effects. Further global trade liberalization beyond the UR would have more significant impacts on global forest products trade. With the complete elimination of all tariffs/subsidies, the values of global forest products trade would increase by 17.5 percent in the forestry sector, 14 percent in the lumber and wood products sector, and almost 7 percent in the pulp and paper sector. In the forestry sector, the United States, Canada, and ROW would expand their exports to Japan and the rest of Asia. The EU would reduce its exports while increasing its imports from ROW. In the lumber and wood products sector, the traditional major exporters including Canada, the United States, and the EU would significantly increase their exports mainly to Japan, the rest of Asia, and ROW. Canada, the United States, and the EU would also remain as major players in global pulp and paper markets. The United States would increase its exports to the rest of Asia and ROW. The EU would become a pulp and paper net exporter largely due to its increased exports to the rest of Asia and ROW. The former Soviet Union's current limited engagement in global forest products trade would not be improved. Its exports of lumber and wood products as well as pulp and paper products would decrease, continuing to lose its competitiveness in global markets to developed countries as well as other emerging forest products exporting regions like the rest of Asia and Latin America.

Three major changes in global forest products trade under global trade liberalization beyond the UR are worthy to point out. First, global trade liberalization beyond the UR would significantly increase U.S. and Canadian exports in all three forest products sectors. Under the completely free trade scenario, U.S. exports would rise by 17.1 percent in the forestry sector, 13.6 percent in the lumber and wood products sector, and 3.4 percent in the pulp and paper sector. Similarly, Canadian exports would go up by 22.1, 8.9, and 3.9 percent in the corresponding sectors, respectively. This indicates the strong international competitiveness of U.S. and Canadian forest products industries. Second, global trade liberalization beyond the UR would stimulate the engagement of developing countries in forest products trade. It would result in huge jumps in both imports and exports of forest products in developing countries including the rest of Asia, Latin America, and ROW. Their imports and exports would grow at double-digit rates in all three forest products sectors. While developed countries would continue to dominate global forest products markets, increased global trade liberalization would stimulate forest products trade among developing countries, particularly within and among the rest of Asia, Latin America, and ROW. This would intensify competition in global forest products markets, particularly the emerging markets. Third, Japanese imports of all forest products would significantly increase with further global trade liberalization. This would create additional export opportunities for U.S. and Canadian forest products industries. However, Japanese exports of lumber and wood products would also increase considerably with increased trade liberalization, which may also enhance competition in the sector in Japanese, Asian, and other markets.

Conclusions

This study assessed the impacts of the NAFTA and GATT/WTO on U.S. forest products industries using a computable general equilibrium model. This approach allows us to assess the impacts of economy-wide trade liberalization on forest products industries. Our results indicate that trade liberalization would affect the production of forest products more than consumption in the United States. Of the three forest products sectors, the forestry sector would be affected most, followed by the lumber and wood products and pulp and paper sectors. The NAFTA and UR would have fairly small impacts on the output, consumption, and prices of forest products. However, global trade liberalization, particularly further liberalization beyond the UR, would have tremendous impacts on U.S. and global forest products trade flows and values. It would significantly enhance U.S. and Canadian exports of forest products and stimulate forest products trade by developing countries where considerable trade barriers still exist. The increased engagement of developing countries in global forest products trade would provide both opportunities and challenges to U.S. forest products industries. It would alter the existing global forest products trade pat-

terns even without substantially changing total output and consumption. Our study also showed the strong international competitiveness of U.S. forest products industries, particularly under global trade liberalization. Given their competitiveness in world markets, global trade liberalization seems to be more beneficial to U.S. forest products industries than the NAFTA. As Asia, Latin America, and ROW are increasingly engaged in global forest products trade, to expand exports to these emerging markets would be feasible and vitally important for U.S. forest products industries to maintain and strengthen their competitiveness in the increasingly open and competitive world markets.

Our results reflect only the potential impacts of tariff reductions. Besides tariffs, other factors like non-tariff trade barriers and general economic conditions also affect the production, consumption, price, and trade of forest products. Historical data show that the Mexican peso devaluation and the Asian financial crisis have had some impacts on U.S. forest products exports (USDA Foreign Agricultural Service 2001). The impacts of general economic conditions on forest products industries are also evident (Gan and Kolison 1997). The softwood lumber dispute between the U.S. and Canada is another example of trade distortions caused by non-tariff barriers. These factors, along with the underlying assumptions of the CGE model, should be considered when making applications and implications of our results. Hopefully, by considering economy-wide trade liberalization, this study has provided more comprehensive insights into the NAFTA and GATT/WTO impacts on the aggregate forest products sectors.

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