SHOULD THE LOG AND WOOD PRODUCTS TRADE BE REGULATED IN THE NORTHEASTERN BORDERLANDS?*

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I. INTRODUCTION

With its periodic trade disputes over potatoes, fishery products, logs and lumber, and woods labor, the northeastern borderlands would seem to have more than its share of trade irritants with Canada. Yet none of these industries rank high on the agenda of national trade policy and consequently they are little studied except by sectoral specialists. Perhaps a discussion of the log trade issues will be of interest to a wider community of Canadian-American scholars. This paper reviews the historic background, describes and explains Canadian dependence on U.S. logs in the northeastern borderlands, illustrates some effects on U.S. timber markets, and briefly sketches the current political tensions and policy issues.

During colonial times, trans-border movements of logs, people, and lumber emerged in what later became the borderlands of Quebec, New Brunswick, and the U.S. northeast. Economic and political ten-

*A list of acronyms used in this article is provided on page 30.

sions generated by this trade today form a footnote to the story of U.S. trade relations with Canada,[1] and to the debates over log export policies which have centered on the Pacific northwest, with its log trade to Japan.[2] Log exports from the northeast to Canada are important because they represent an ongoing irritant in U.S. trade relations as well as in official state-to-province relationships. They are also of interest because of their linkages to cross-border labor movements,[3] to timber sustainability, and to local economic development policies. Nationally, imports from Canada meet about 34 percent of U.S. softwood lumber usage. As the two nations search for an alternative to the 1996 softwood lumber agreement that regulates the lumber trade, disputes about the effects of log export embargoes will figure prominently.[4]

Exports of unprocessed logs have become controversial in three other U.S. regions, so the topic of log trade is not merely of parochial interest. In the Pacific northwest, an important export trade in sawlogs and chips has been controversial for decades, and exports of logs from federal lands have been embargoed for some time. Private log and chip exports have been bitterly criticized by environmental groups, some trade unions and political leaders. In the American south, exports of hardwood chips grew rapidly in the 1980's and have been similarly controversial. Finally, from time to time, exports of high value hardwood logs from the U.S. midwest and mid-Atlantic states have become politically controversial.[5]

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Wood from northeastern U.S. forests provides a significant contribution to the fiber needs of Canadian sawmills and pulpmills near the border. There is significant cross-border ownership of both land and mills. Some individual Canadian mills depend almost entirely on U.S. wood. Some U.S. paper mills and biomass power plants depend heavily on mill residues from Canada, and some roundwood moves from Canada to the U.S. In addition, large volumes of wood move from state to state within the U.S. Landowners benefit from selling to the best markets for their wood.

Most of the timber sawn in Quebec, Maine and New Brunswick is softwood construction lumber from spruce and fir trees. Quebec is by far the largest producer (Table 1).

Table 1

1998 Softwood Lumber Production

State/Province	Million Board Feet
Quebec	7,029
New Brunswick	1,621
Maine	993
TOTAL	9,643

Source: Canadian Forestry Service; U. S. Bureau of the Census.

It is primarily the export of softwood logs that has been controversial in the northeastern states over the years, although concern over hardwood log exports arises periodically as well. The extreme complexity of the borderlands log trade involves many product forms, many mills, numerous intermediaries such as wood yards and truckers, and complex two-way relationships. An example is the flow of logs from Maine to Quebec border mills, followed by the return of chips from those mills to Maine paper mills. Another is the movement of Canadian mill by-products to U.S. bark markets and biomass electric plants.

In 1991, MIT economist Paul Krugman suggested an "economic geography" paradigm for understanding such trade flows.[6] In his view, neoclassical comparative cost models often fail to explain fully the trade conditions and trends, or to give faulty guidance to policy makers. This perspective is illustrated in a recent paper by McCallum which shows significant effects on trade attributable to the U.S. - Canadian border.[7] In another paper, Ellison and Glaeser suggest that "at least half of the geographic concentration (of industries) observed is due to natural advantages" and not to costs or other economic factors normally considered in trade theory.[8]

Timber markets are ideal illustrations of this paradigm. Due to the cost of trucking logs and their low value-to-weight ratio, the distance they can be hauled to mills is limited compared to typical hauling distances for lumber. Lumber is commonly trucked from interior British Columbia to New England, but spruce-fir sawlogs or chips can rarely be hauled more than 100 miles. The geographic factors reviewed in this paper illustrate how it is that, despite Canada's extensive forests, its mills on the U.S. border import significant volumes of logs from adjacent forests in the northeastern U.S. One consequence is that conflicts generated by the geography of timber in the borderlands often emerge in the political arena.

American sawmill owners resent the northward flow of logs because most of the lumber produced from these logs returns to the U.S. to compete with them.[9] For a time, it looked as if log movements northward were becoming generally accepted in the region's wood industry except when they became entangled in the politics of the nationwide trade actions against Canadian lumber producers. Then, in the early 1990's, a brief burst of offshore exports upset this situation. Huge log piles appeared at dockside next to busy highways in Portsmouth and Portland. Traders were faxing around inquiries for logs from China. Reporters wrote stories asking why the U.S. was exporting logs to Turkey and buying lumber from Russia. The log piles, and the brief flurry of overseas log shipments, created understandable anxieties. The logs were of low quality and in little demand by U.S. mills, but this fact figured little in the debates.[10] Then the regional flurry of exports quietly ended. Nationally, softwood log exports have also fallen dramatically since 1993,[11] but the political controversy continues.

Environmentalists have long been concerned about log exports. They see log export bans as a way to offset wood production lost to

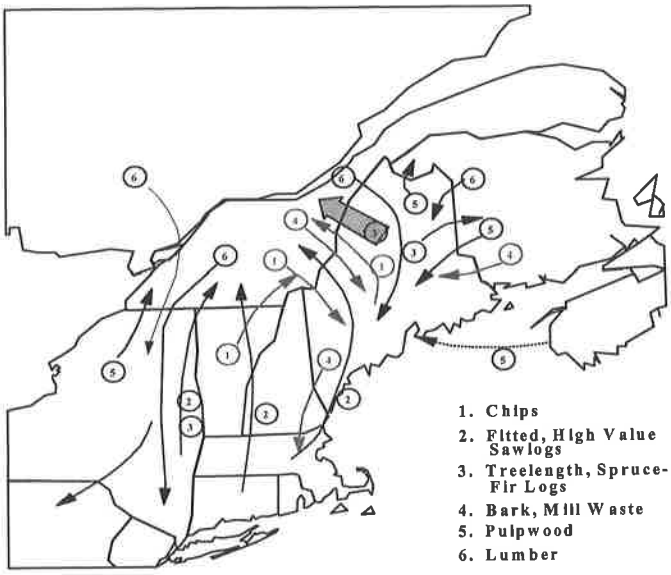
large wilderness areas.[12] Trade unions dislike log exports, believing that they cost the U.S. jobs. For politicians, therefore, criticizing log exports is always attractive. The politics of log export policy divides the region's landowner community from the wood industry. Forest landowners favor free trade as it enables them to sell their logs to best advantage. Within the industry, most independent sawmills value their ability to send chips to Quebec mills. But they bitterly oppose exports of logs which reduce supply and drive up prices. Some of the sawmills are owned by paper companies who also sell logs from their lands. Other mills are owned by Canadian companies. Because of these divided interests, the broad-based northeastern and national wood industry associations generally stay out of the "log export/ lumber import" trade controversies.[13] For the same reason, state legislatures have difficulty reaching conclusions on the issues. Instead, coalitions of interested mills have established their own group to deal with the trade actions in Washington.[14] The irritation over log exports is one factor bringing northeastern mills into national coalitions on the lumber trade actions. In contrast, in the southern U.S. there are no interests benefiting from trade in logs, chips, or pulpwood with Canada, but many sawmills believe they are being injured by imports of Canadian softwood lumber.

In several northeastern states, advisory groups have argued that log exports are harmful to local industries and urge state and local policymakers to adopt remedies.[15] Such recommendations do not seem to have prompted much response. The New Hampshire Port Authority began promoting log and chip exports and was forced to abandon this policy after an industry protest.[16] Maine has a statute providing that its Bureau of Parks and Lands can restrict exports of logs cut on its lands. The Society for the Protection of New Hampshire Forests, a private conservation group, ensures that logs from its lands are not exported. Federally owned lands are minimal in this region, and their already small timber sale programs are shrinking. Legally, logs from federal lands in the northeast can be exported, though they are prohibited west of the 100th meridian.[17]

II. A REGIONAL CROSS-BORDER MARKET

There has been a long-standing trade in wood in the northeastern borderlands. Traditionally, logs were driven down the generally northerly-flowing rivers to market at sawmills on tidewater.[18] Often, these markets were in Canada. At times, this wood was exempted

Figure 1
FIBER FLOWS OF A BORDERLAND INDUSTRY



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from U.S. tariffs if it re-entered the country as sawn lumber.[19] Along portions of the St. John and St. Croix Rivers, mills on either side processed logs cut on the opposite side with little concern for formalities. River driving did not end on the St. John until the completion of Beechwood and Mactaquac Dams in the 1960's. From the 1920's to the 1960's, paper companies moved wood by rail over long distances at various times. Examples included shipping of pulpwood from central New Brunswick to Rumford, Maine, from northern New Hampshire to Deferiet, New York, and from northern Maine to

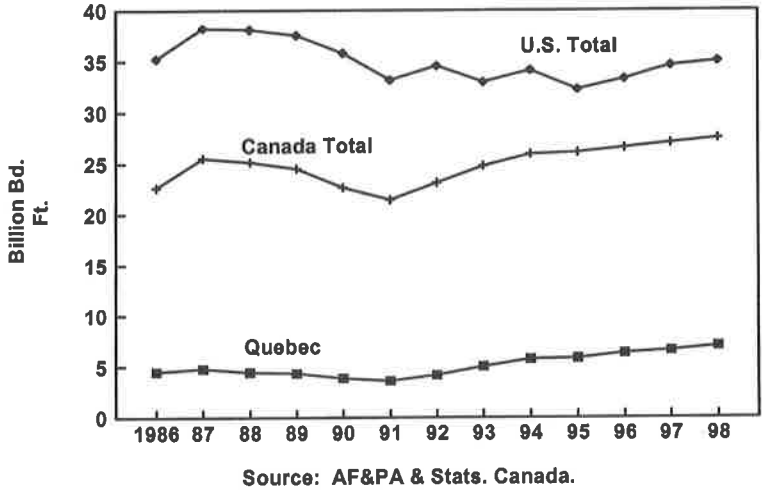
Corinth and Ticonderoga, New York. Rising transport costs and mill changes brought these long hauls to an end. The wood in time came to be hauled to Quebec sawmills instead of being driven downstream to pulpmills.

As the river driving era drew to a close, log movement switched to trucking. During this period, rail hauling was disappearing except for isolated instances. All of this revealed to mill owners what had been masked by low cost river log-driving — that most of their land was poorly located for supplying their own mills. The result was a shift from movement of logs to New Brunswick by water to movement by road to Quebec, and a secondary shift of the same kind toward New Brunswick. In Maine this was accompanied by a flurry of road-building activity whose urgency was increased by the budworm epidemic of the 1970's and 1980's.[20] This period coincided with a time when improved logging and sawmill technology promoted the use of ever-smaller logs. In addition, lumber recovery as a unit of log volume increased by 18 percent in Quebec from 1991 to 1998.[21]

A growing Quebec lumber industry (Fig. 2) imported increasing volumes of logs from the northeastern U.S.[22] Reduced timber harvests on western U.S. federal lands and a peaking of production in British Columbia collided with strong U.S. lumber demands to drive up prices during the mid-1990's. Quebec softwood lumber production responded, increasing from 3.6 Bbf (billion board feet) in 1991 to 7.0 Bbf in 1998 (one-fourth of the Canadian total), while U.S. production increased from 33.2 Bbf to 35.0 Bbf.[23] (One board foot is a piece of lumber 12" x 12" by 1" thick when sawn rough and green; a typical new house in the U.S. uses about 16,000 board feet.) Quebec lumber shipments to the U.S. rose faster than production, largely because European export markets for Quebec lumber declined after 1991. The province's paper industry also imported large volumes of chips from the U.S.

A brief overview helps put the northeastern states into a national context. U.S. exports of solid wood products have changed in the past decade (pulp and paper trade follows very different patterns and is not relevant to this paper). For hardwoods, total exports of lumber and furniture (in dollars) are far larger and have grown faster than log and chip exports (Fig. 3). For softwoods, in contrast, American exports are primarily logs (Fig. 4). Both U.S. and Canadian softwood log and lumber exports declined after 1992 due to high U.S.

Figure 2
Canadian and U. S. Production of Softwood Lumber, 1986-1998

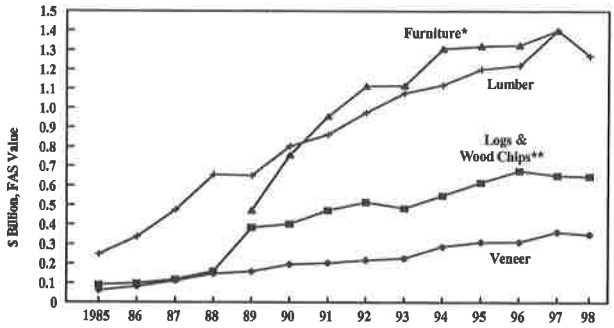


Source: AF&PA & Stats. Canada.

lumber prices and, later, to economic weakness in Asia. Log exports have often been a first step toward later establishing exports of more highly processed wood products such as dimension and parts. Foreign wood users gain familiarity with North American species by using its logs; then they buy more of its lumber, then more highly processed wood products.[24] Compared to the rest of the world, the U.S. has an astonishing abundance of wood. Wood is cheaper and accordingly it is widely used. For example, European hardwood veneer mills slice logs to far thinner sizes than do U.S. mills because of high log costs. They gain far more revenue from the same log than would a U.S. mill slicing to a thicker size, and this enables them to pay the higher costs for logs even with the freight expense. However, the U.S. furniture industry cannot use veneer so thin; as a result, European buyers are able to outbid U.S. mills for the highest quality hardwood logs.

Canada is a leading buyer not only of U.S. logs but also of lumber and veneer (Table 2). Canada's share of U.S. hardwood log exports is 72 percent, and of softwood logs 33 percent. For both hardwoods and softwoods, Canada's share of total U.S. log exports

Figure 3
Total U.S. Exports of Hardwood Products by Commodity, 1985-98

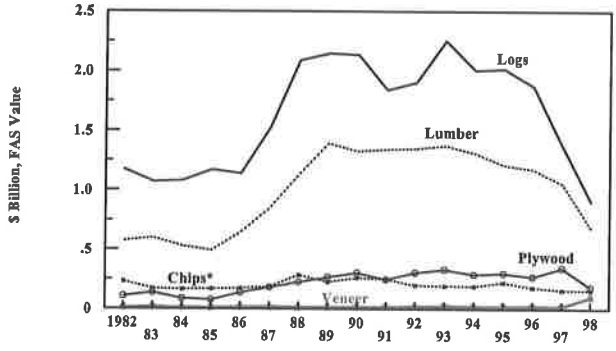


* Household furniture; 1998 not available.

** Chips data is incomplete 1985-88 due to a change in reporting styles in 1989, previously hardwood and softwood were combined as a single category.

Source: Compiled by FAS from official statistics of the U.S. Dept. of Commerce.

Figure 4
U.S. Exports of Softwood Products by Commodity, 1982-98



* Chips data is affected by a change in reporting styles in 1989, previously hardwood and softwood combined a single category.

Source: Compiled by FAS from official statistics

far exceeds its share of lumber exports. In view of the cost of hauling logs compared to lumber, and the fact that the Canadian lumber market is 10 percent as large as the American, this is understandable. U.S. trade with Canada is affected by the exchange rate on the Canadian dollar (Fig. 5), which has generally weakened since the late 1980's. When it falls, it encourages shipment of Canadian softwood lumber into the U.S.[25] This is so significant that the annual reports of Canadian wood products companies always include illustrations of the impact on their profits of a one-cent change in the exchange rate.

Yet, other factors are also involved. The upswing in softwood lumber prices in the mid-1990's made Canadian lumber less competitive in foreign markets. A requirement that all softwood imports into Europe must be kiln-dried halted most lumber shipments from eastern Canada. In addition, the troubles of the Japanese economy have reduced purchases by Canada's largest offshore customer. These factors have increased the importance of the U.S. market to Canadian mills. In 1993, Quebec mills shipped 47 percent of their softwood lumber to the U.S.; in 1998 they shipped 58 percent and much of the increase was sent to the southern states.[26]

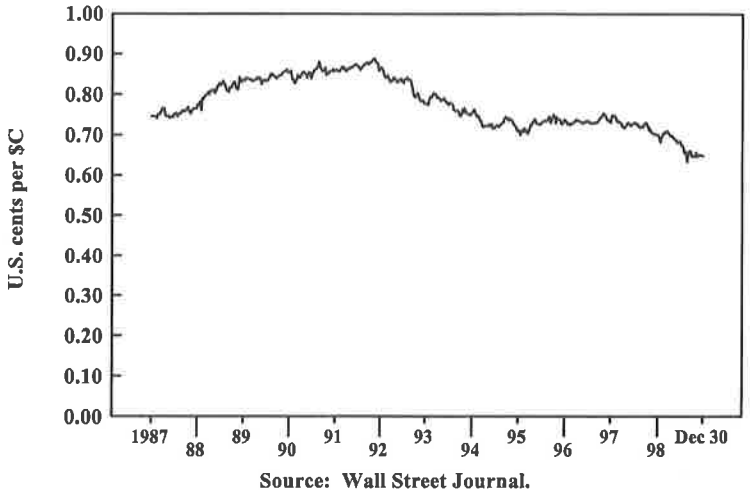
Table 2
United States Exports, 1998

Item	Unit	Total	Canada	Canada Percent	Canada Rank
Hardwood Logs	MMcm	1,502	1,083	72%	1
Hardwood Lumber	MMcm	2,502	816	33%	1
Softwood Logs	MMcm	7,457	2,444	33%	2
Softwood Lumber	MMcm	7,665	544	20%	2
Hardwood Veneer	$MM	340	83	24%	1
Hardwood Plywood	$MM	61	31	51%	1

Source: USDA, FAS. Wood products: International Trade and Foreign market. Ann. Stat. Trade Edition, April 1999, Circ. Ser. WP2-99.

Canada is a nation of vast forest resources[27] with a population one-tenth the size of the U.S. Canada's eastern forests are closer to eastern U.S. markets than the forests of Washington and Oregon. Hence it is natural that Canadian lumber, newsprint, and pulp would serve U.S. markets. So, it might seem strange, then, that Canadian mills along the U.S. border are such active *buyers* of U.S. logs. The

Figure 5
Canadian Exchange Rate
Weekly, January, 1987 to December, 1998



Source: Wall Street Journal.

economic geography paradigm reveals how the details of location, resources, and costs affect trade. It does not treat nations and commodities as abstractions as does trade theory. These details help explain why log movements in the borderlands are so important.

Quebec and New Brunswick account for a large share of all of Canada's log and chip imports (Table 3). In Quebec below the St. Lawrence, a pattern of private ownership along with farmland clearing and heavy cutting have left behind only modest supplies of softwood timber. Consequently, dependence on New England and New York wood is extreme, especially along the Maine-Quebec line. In at least one instance the edge of a sawmill's woodyard is on the international border, adjacent to the lands of a prime log supplier. A stand of spruce along the Maine border might be a 5-10 mile truck haul from one of these border mills, but a 100 mile or longer haul to the nearest Maine mill. Quebec operators have become masters of logistics. Logs are commonly hauled back to Quebec on the same trucks that haul the lumber south. In some areas, trucks are rigged to be able to haul logs, lumber, or chips, as the day's need may dictate. The northeast is dotted with literally hundreds of small woodyards

where logs are gathered by local buyers. Further, as noted below, part of what Canadian firms haul across the border is their own wood. These factors affect the bidding potential for stumpage (standing timber) by U.S. and Quebec mills. The share of Quebec lumber production in these borderlands is declining (Fig. 6) as harvests rise on provincially-owned Crown lands north of the St. Lawrence.

Table 3
Canadian Imports of Forest Products by Commodity Group and Province, 1995

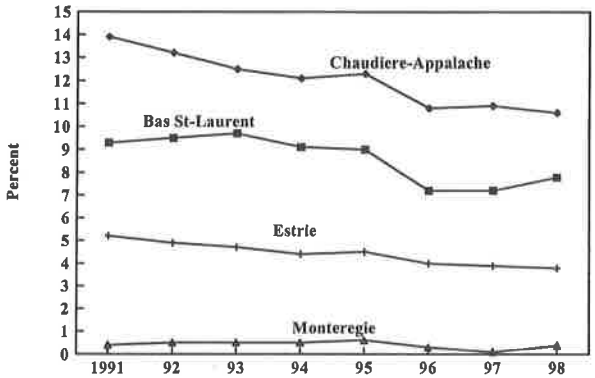
Item	Unit	NB	Que	All Canada	NB & Que as % of All Canada
Logs, Bolts, Total	1000 m3	136	2,194	3,722	62.6%
Softwood	1000 m3	41	1,408	2,639	54.9%
Pulpwood, Total	1000 m3	287	2,018	2,740	84.1%
Softwood	1000 m3	246	1,842	2,384	87.6%
Wood Chips	100 tonnes	38	66	875	11.9%

Source: CFS, Selected Forestry Statistics Canada, 1996. Table II-11A.

New Brunswick's overall dependence on imports of pine and spruce-fir logs is minimal. The bulk of the log flow to New Brunswick must be accounted for by Maine lands owned by two Canadian companies, Fraser, Inc. and by J.D. Irving, Ltd. Dependence on imports of specialty items, cedar and hardwood, is high, however. New Brunswick is facing a situation of overcutting on its freehold (privately-owned) lands that will continue to strain its supply situation.[28] On the New Brunswick border, both logs and chips flow in both directions, though New Brunswick officials note that their ability to track exports of fiber is limited. A northern Maine veneer mill is often the best market for certain species from New Brunswick.

Because of the key role of Quebec, further information on its log trade may be useful. This is made possible by a detailed database maintained by the Quebec Ministry of Natural Resources.[29] All Quebec primary wood users must report their wood usage, by source, annually. Quebec imports actively from the U.S. — more than 1.1 billion bd. ft. of all species in 1997 — but also from adjacent Canadian provinces (Fig.7). Imports from the U.S. have increasingly shifted toward hardwoods (Fig. 8). While imports from Maine have

Figure 6
Percent of Quebec Lumber Production, Softwood & Hardwood by Administrative Area



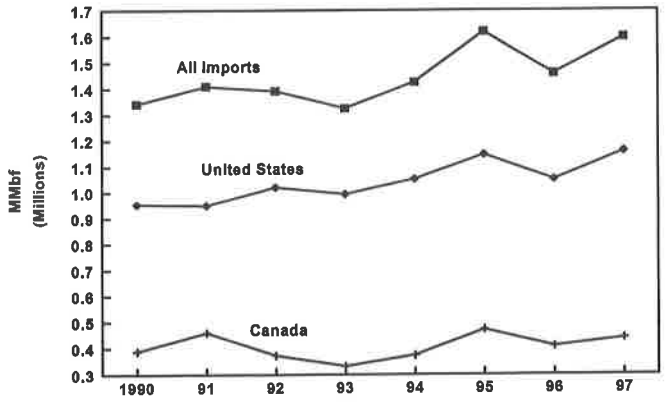
Source: QLMA.

Note: Chaudiere-Appalache is an area including St. George and L'islet; Bas St.-Laurent includes Riviere-du-Loup and Rimouski; Estrie is the "Eastern Townships," around Sherbrooke; and Monteregie is south of Montreal to the Vermont line.

barely increased over the period, other states, including New Hampshire and even Massachusetts, have increasingly been drawn into the far-flung logistical network of Quebec mills (Fig. 9). For Quebec there is essentially no flow of logs southward; only lumber, chips and mill residues. For Quebec sawmills, log imports from the U.S. are roughly equal to the cut from freehold lands (Fig. 10). Unfortunately, the state of the data on these log movements is weak.[30]

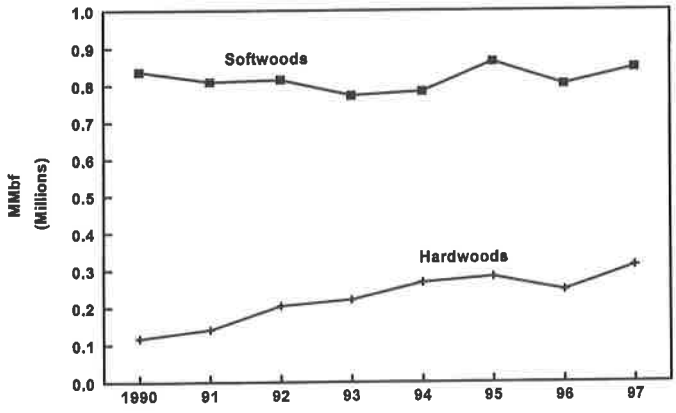
Cross-border land ownership is an important aspect of the northeastern borderlands. In the 1960's, a heavy U.S. stake in Canada's pulp and paper industry was a political issue and a factor motivating Foreign Investment Review Act (FIRA) restrictions on foreign investment in Canada. Since then, U.S. firms have reduced their investments in Canadian mills and lands as manufacturing investments in the south became more attractive and Canadian companies arose to buy out U.S. interests. Also, Canadian firms have invested heavily in the U.S. In the northeast, significant Canadian holdings are found in northern New York and in northern Maine. In Maine, for example, three of the top 15 forest landowners in 1993,

Figure 7
Quebec Log Imports, 1990-1997
All Sources, U.S. and Canada



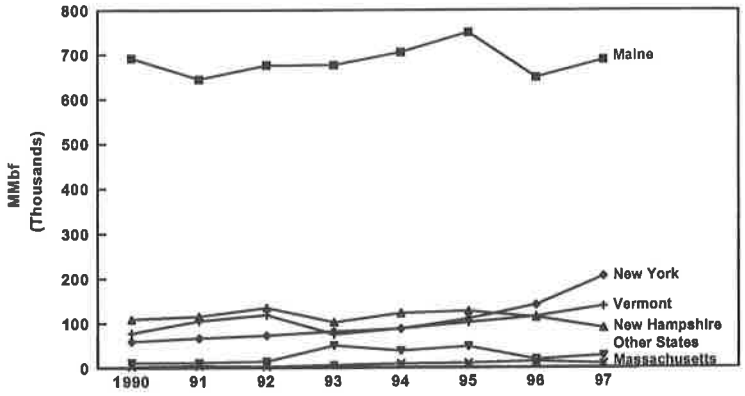
Source: Quebec Ministry of Natural Resources.

Figure 8
Quebec Log Imports from U.S.,
by Softwoods and Hardwoods, 1990-1997



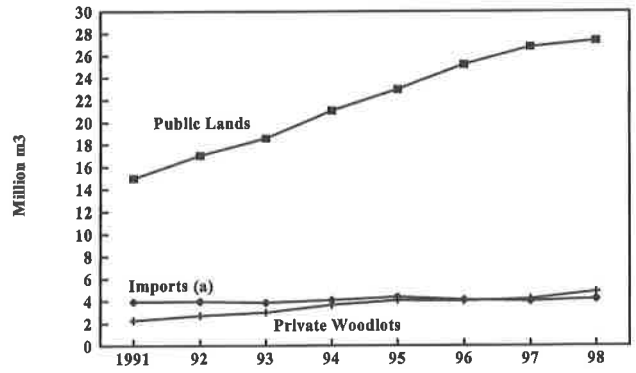
Source: Quebec Ministry of Natural Resources.

Figure 9
Quebec Log Imports from U.S., by State, 1990-1997



Source: Quebec Ministry of Natural Resources.

Figure 10
Origin of Timber Supply



Source: QLMA from QMNR estimates.

(a) = Estimated by the Ministry of Natural Resources
Imports include U.S. and other provinces.

were Canadian (Fraser, J. D. Irving, Ltd., and Kruger), with a total of about 1.1 million acres of land. In 1999, Irving increased its ownership in northern Maine by an additional million acres, making it the state's largest private landowner. Also, in 1999, a joint venture led by a Quebec lumber firm purchased 245,000 acres of International Paper Company lands, bringing Canadian ownership to some 2.5 million acres, more than 10 percent of the state. Another Canadian venture acquired mills and lands of former Great Northern Paper Company.[31] Significant log movements into eastern Canada, then, reflect landowners moving their own wood to their own mills.

In the other direction, there is relatively little American ownership in Quebec and the Maritimes. There is little freehold (private) land in Quebec, and in New Brunswick it is in strong hands. Scott Maritimes was sold in the 1990's. Georgia-Pacific owned about 300,000 acres in southwestern New Brunswick which supplied its mills in Woodland, Maine, until sold to the Crown in 1999.

While the globalization of markets has recently become a cliché, in the northeast it has been a reality for some time. One example is the chip trade. During the 1980's and 1990's potential chip exports were periodically considered in the northeast.[32] Before the proposed port facility at Sears Island on the Maine coast was canceled, analysts suggested the feasibility of chip exports of some 600,000 tons per year.[33] The cancellation of the Maine terminal and the crisis in Japan's economy have made the issue of waterborne chip exports moot for the moment. A few chip shipments to Asia have been made from Nova Scotia, and the Port Authority of New Hampshire has explored chip exports. The American share of Japanese chip, log, and lumber imports has been declining.[34] As the Japanese and other Asian economies recover from their current economic difficulties, wood fiber flows are likely to change. If demand revives, northeastern chip exports, which seem unlikely today, could be considered once again.

As another example, in winter 1993-94 a freighter from Russia offloaded a shipment of softwood lumber at Searsport, Maine. Arriving just when log exports were controversial, this shipment drew a good deal of attention. It was trucked to several Maine mills for grading, re-sawing, and sale through retailers elsewhere in the country. But sources close to the transaction doubt that such a shipment will occur again any time soon, even though it illustrates the global scope of the lumber market.

III. EFFECTS OF LOG EXPORTS ON NORTHEASTERN U.S. TIMBER MARKETS

To understand the economic impacts of log trade on northeastern U.S. timber markets, we will assess the importance of log movements relative to production, examine overall timber supply balances, and review price data to look for impacts of trade on stumpage markets. A more detailed discussion is presented for trade impacts on Maine and Vermont.

For New York and the northern New England states, exports to all locations are a significant portion of their 1997 timber harvest (Table 4) – Maine, 16.6 percent; New Hampshire, 36.5 percent; Vermont, 43.4 percent; and New York, 16.3 percent. In this table, an estimated "woodflow" balance is shown indicating logs cut and logs used within a state, logs imported, and logs exported. This enables a calculation of net export or net import dependence for each state.[35] These amounts are clearly enough to affect the resource and to have economic significance. The export volumes cover all destinations, but Canada is clearly the dominant one. The estimates include sawlogs and veneer logs, pulpwood, fuelwood, and biomass cut from roundwood. Some of these logs may be re-exported offshore, as is also common for hardwood lumber.

Table 4
Wood Fiber Trade Account, New York, Maine, New Hampshire and Vermont (All Species)

Composition of Cut by State -- All Species

	NY		VT		NH		ME	
	Cords	Percent	Cords	Percent	Cords	Percent	Cords	Percent
Sawlogs	1,276	40.3%	524	37.1%	904	42.5%	2,928	39.9%
Veneer/ Spec.	134	4.2%	74	5.2%	18	0.8%	56	0.8%
Pulp	813	25.7%	461	32.6%	555	26.1%	3,470	47.3%
Fuel (R)	800	25.3%	300	21.2%	280	13.2%	350	4.8%
Fuel (B)	140	4.4%	55	3.9%	369	17.3%	538	7.3%
Total	3,163	100.0%	1,414	100.0%	2,126	100.0%	7,342	100.0%

Fiber Balance by State -- All Species

	NY		VT		NH		ME	
	Cords	Percent	Cords	Percent	Cords	Percent	Cords	Percent
Harvested	3,163	100.0%	1,414	100.0%	2,126	100.0%	7,342	100.0%
Consumed	2,845	89.9%	1,053	74.5%	1,877	88.3%	7,715	105.1%
Exported	515	16.3%	613	43.4%	776	36.5%	1,222	16.6%
Imported	197	6.2%	252	17.8%	527	24.8%	1,595	21.7%

Source: The Irland Group, 1999, p. 29.

Every northeastern state depends heavily on fiber imported from outside its boundaries (Table 5). Fully 22 percent of all wood cut in the four states crosses a stateline or boundary before being milled. Total wood fiber imports are equivalent to the following portion of their log exports: Maine, 129 percent; New Hampshire, 68 percent; Vermont, 41 percent; New York, 38 percent. These ratios indicate the complexity and mutual dependence of the wood trade between these states.[36]

Table 5
Participants in and Impacts of Log Trade in Northeastern Borderlands, and Imact of Embargo, Assuming no Retaliation

Group	Impact of Existing Trade	Impact of U.S. Embargo on Log Exports
U. S. small landowners	+	-
U. S. large integrated landowners	+	-
Canadian owners of U.S. timberland	+	-
Canadian landowners	-	+
U. S. papermills	Uncertain	Uncertain
Independent sawmills	-	+
Canadian papermills	Uncertain	Uncertain
U. S. logging and trucking contractors	+	-
Canadian logging and trucking contractors	+	Uncertain
U. S. buyers of Canadian	+	-
U. S. workers	Uncertain	Uncertain
Canadian Workers	+	-

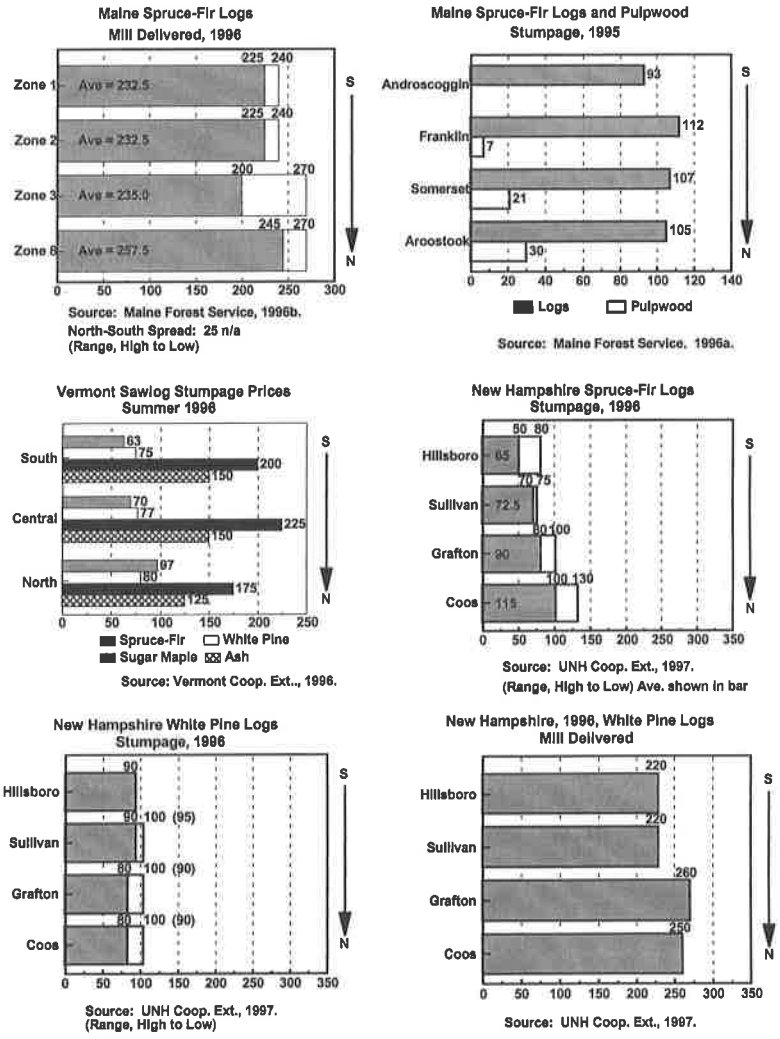
Fundamental supply/demand balances for timber are changing in the northeastern borderlands, and market responses to the log trade need to be considered in this light. In Maine, the spruce-fir timber inventory has declined markedly since the late 1970's due to the spruce budworm epidemic and heavy cutting rates.[37] This in turn has precipitated a significant decline in Maine's spruce-fir harvest since the late 1980's. A complex supply forecasting exercise, using 1995 inventory data, was recently completed in Maine,[38] and the study forcasts a continued, slow reduction in spruce-fir inventory, assuming the 1996 harvest level is not exceeded. In New Hampshire, spruce-fir and pine growth/cut balances remain favorable in New Hampshire but are very close to the margin. There is concern that when availability is considered for these species, the balance is negative.[39] New inventory data for Vermont and New Hampshire show volume increases.[40] Supply-demand balances for both hardwoods and softwoods are favorable in New York and in southern New England, where limited local markets result in significant volumes of high-grade logs flowing north.

Comparing stumpage and delivered log prices on a gradient from north to south offers a way to look for market impacts. The effect of the Quebec log market is shown by higher prices in more northerly areas because of the importance of trucking costs. For this reason, one would expect stumpage prices to decline with distance from principal Quebec consumption centers. In Maine, with its well-developed and dispersed sawmill industry and surrounded by Canadian sawmills in all directions, only a limited effect is detected. Yet it is consistent with expectations. Limited effects are also seen in New York and Vermont (Fig. 11).[41]

In New Hampshire fairly strong price effects of the Quebec market are evident with stumpage prices $50 higher in northern Coos County than in southerly Hillsboro County.

The higher spruce-fir stumpage prices in northerly areas reflect not only transportation cost differences but also higher chip prices north of the border and tighter utilization in Quebec mills. In Northern Maine the pulpwood product class has vanished. Woods-run spruce-fir, to 5" butt and 2.5" tops, is hauled to the sawmills. Pulpmills use the chips and the boiler uses the sawdust and shavings. Hence a log that would go for pulp in southern Maine or New Hampshire goes to a sawmill in northwestern Maine. In the pine and hardwood markets, by contrast, the trucks on the interstate highways

Figure 11



These charts were compiled from state reports on prices. Stumpage is the price paid to a landowner for standing trees. Delivered prices are the amounts paid at millyards for delivered wood; that is, they include stumpage plus the cost of harvesting and hauling. The geographic price relationships vary from state to state and product to product. The strongest north-south differentials are for pulpwood in Maine, and spruce-fir logs in New Hampshire. In contrast, the differences for New Hampshire white pine are not as large, probably because the state has a large lumber industry using white pine.

carry large, straight, high-grade logs that can bear the hauling costs. Do these higher prices reflect subsidies enjoyed by Canadian mills? Despite all the litigation, rancor, and debate on this contentious issue, the evidence is less than compelling. Repeated studies during the various trade investigations failed to produce evidence of significant cost-reducing subsidies to sawmills.[42] In summary, it is clear that the amounts of log exported to Canada are significant and that market evidence is consistent with a strong effect of log exports on prices. A brief look at two contrasting situations — Maine and Vermont — will amplify the picture.

Exports to Canada , roughly 900,000 cords or 461 million board feet, accounted for roughly 31 percent of all Maine's estimated 1997 sawlog harvest.[43] Official data are not available for Maine offshore exports, but the total for 1993 was probably not larger than 50-60 million board feet, including volumes moving out via Portsmouth. This is equivalent to the usage of one large sawmill, or perhaps 10 percent of the state's softwood log usage. But that does not mean that a mill would be built to use this wood if it could not be exported. This wood was drawn from all corners of the state and consisted of a mix of species. Offshore shipments have declined to virtually nil since 1993.

Maine is a net importer of wood fiber on a volume basis (Table 4 above). Since these figures do not include imported market pulp and chips, they understated Maine's true dependence on imported fiber. Maine paper mills depended on net imports for 18 percent of their wood pulp requirements in 1989 (more recent data is not available). Since then, the state's mills have become major buyers of recycled paper from nearby states. Maine is a net exporter of high value fiber (spruce-fir logs), while it is a net importer of low value fiber. In particular locations, large mills depend heavily on logs, chips, and mill residues brought in from adjacent states and provinces. Also, for certain valuable species, landowners (including the state's Bureau of Parks and Lands) depend on selling to out-of-state mills to obtain good prices. Consequently, many Maine mills, communities, landowners, and workers depend on a free movement of logs and fiber across state lines.

The 1995 forest inventory shows a significant decline in Maine's softwood timber inventories.[44] Several major landowners have reduced their cut levels. For landowners and loggers, it will be increasingly important to be able to sell wood to the markets yielding

the best prices, whether in Maine, Vermont, Quebec, or Japan. New policies are needed to ensure that an upper limit can be placed on the harvest level. Private landowners in Maine, who own 95 percent of the forest, and state government face a severe challenge on this question in coming years. The unregulated market cannot fully address this problem, yet there are no known public policies that can master it. As tempting as it would be to force the entire burden of adjustment onto our neighbors and trading partners, it would not be wise. While forest sustainability is clearly a concern in Maine as well as in Quebec and New Brunswick, trying to control the harvest level will be an extremely complex and costly undertaking.

Vermont is a small state. It is not uncommon for mills to purchase wood from 100 to 150 miles away. Vermont is a net importer of hardwood — its mills import more hardwood logs than the state exports (Table 6). The state's 1996 sawlog net exports were equal to only 12 percent of the state's production (Table 7), which indicates that Vermont mills used the equivalent of 88 percent of the state's log harvest. Also, state surveys show that for hardwood logs, Canada accounts for a smaller share than do nearby states.[45] In 1997, the balance switched to net imports. Vermont has no markets for pulpwood or sawmill chips. Vermont's forests yield more than 400,000 cords of pulpwood annually. Being able to export pulpwood to mills in New Hampshire and New York is a major benefit to landowners and creates jobs in Vermont. Even if this wood is worth only $5.00 a cord on the stump, it represents an annual flow of stumpage income exceeding $2 million to the state's landowners. Significant volumes of Vermont sawmill chips go to Quebec pulpmills, and wholetree chips and lower-grade mill residuals move to users in New York and New Hampshire. The state's modest net export position is not worrisome from the viewpoint of the resource or the state's economy.

From lands managed by the Maine Department of Conservation, yellow birch veneer logs from western Maine have been shipped to a Vermont mill. Had Maine embargoed that wood, it would have 1) led to the underutilization of the logs (they would have been sawn into lumber instead of made into veneer), 2) created few, if any jobs in Maine, and 3) cost jobs in Vermont.

Table 6
Vermont Sawlog and Veneer Balance, 1997

	Export	Import	Net Import
Hardwood	19.8	43.4	+23.6
Softwood	56.2	32.9	-13.3
Total	76.0	86.3	-10.3

Source: Vermont Dept. of Forests, Parks & Recreation, 1998.

Table 7
Vermont Sawlog Trade Balance (Hard and Soft), 1996 and 1997

	MMbf		% of Harvest	
	1996	1997	1996	1997
Exports	103.4	76.0	35%	26%
Imports	68.8	86.3	23%	29%
Net Exports/Imports	34.6	10.3	12%	4%
Sawlog Harvest	293.8	293.5	100%	100%
Vermont Mill Usage	259.3	296.7	88%	101%

Source: Vermont Dept. of Forests, Parks & Recreation, 1998.

IV. SHOULD THE LOG TRADE IN THE NORTHEASTERN BORDERLANDS BE REGULATED?

Landowners, sawmills, and papermills in this region participate in a complex log, chip, and lumber trade. This trade has many implications for the location of economic activity. The trade is a complex web of transborder ownership and interdependencies, and the flow of benefits is not one-sided. Clearly, the borderlands log trade has created groups in the U.S. that perceive themselves to be losers. They vigorously advocate change, most commonly by embargoing log exports. It is not unreasonable to sympathize with the concerns of these groups.[46]

The ability to sell to the best markets is critical to landowners. Given the geography of the region's wood-using industries, it often occurs that a mill in a distant state or nation can offer a higher price for stumpage than a nearby one (the example of veneer logs is cited above). Small landowners may harvest wood infrequently. In between harvests, they pay taxes that are often very high, inflated by potential development values of the land. Larger landowners rely heavily on regular timber income, and apparently modest differences in prices can affect their net returns because they deal in large volumes. Integrated landowners rarely are able to use all the species occurring on their lands. A paper company, for example, may use only pulpwood grades of certain species in its mill. Its managers seek the best markets for sawlogs and veneer logs to maximize returns to land and best utilize the forest's yield. In all of these instances, landowners need to be able to send wood to the best-paying markets available. In addition, they need the benefit of having many different buyers competing for their timber. It is well recognized that the greater the degree of competition for stumpage, the higher the prices.

It is often argued that log exports prevent the establishment of "value-added" industries like furniture and cabinets. But proximity to quantities of lumber production is not a key location factor for value-added processing. If it were, the world's leading furniture, cabinet, and millwork producers would be countries like Russia, Indonesia, and Brazil.[47] Instead, the leading centers in these fields are virtually all found in countries and U.S. regions that lack significant timber resources. Examples in the U.S. include the significant door and window industries in Iowa, Illinois, and Indiana, and the large furniture industry in southern California.

The U.S. depends on imports for about one-third of its annual furniture consumption.[48] While increased exports of specialty furniture items are likely, it is not clear that Asian nations would import more U.S. furniture if they stopped shipping them logs. Yet there is evidence that log exporting has opened doors for expanded business in lumber and in cut-up parts and components.[49] This has occurred in the northeast. As to Canada, cross-border trade in these value-added wood items is extensive in both directions.[50]

The species and forms of wood being exported now would not support significant value-added employment in the northeast beyond primary processing. Eastern spruce-fir and hemlock lumber is generally used directly in construction and a few other markets and

not for processing into other products. High grade hardwood and pine logs that are shipped to Canadian mills are often exported as lumber and not used in furniture, door, or window plants. If they remained in the U.S., these species could theoretically support value-added processing. As a practical matter, though, if local log exports could be embargoed (without retaliation by others), there would probably be little impact on value-added employment. The lumber would still be shipped to the same markets now buying it. Also, future worldwide markets for labor-intensive, value-added items are going to be dominated by subtropical and tropical nations that have more abundant wood supplies and far lower labor costs than the U.S. Economic development experts are generally skeptical that log embargoes succeed in creating value-added employment.[51]

An overview of participants in and impacts of the log trade is shown in Table 5 (p. 18). This analysis suggests how a U.S. log embargo would affect those groups, assuming that no retaliation occurs. To develop a factual analysis of all relevant effects for the northeast would entail a large research effort. Further, to assess the impacts if retaliation is considered would require many assumptions; judgments expressed in Table 5 rely on a number of them. Each row of the table could be debated by those preferring different economic assumptions. But the larger point of the table is to show how many interests are affected. It suggests how difficult it would be to design a policy that would make all U.S. participants better off while avoiding negative side effects. Certainly it is clear that outright embargoes on export of U.S. logs would create significant mill closings and unemployment in Quebec and New Brunswick border towns.

If something must be done about log exports, only a limited number of options exist:[52]

- embargo logs from public lands;
- apply an export tax;
- revoke state use-value property tax provisions for exported logs;
- embargo all log exports from whatever source;
- develop a system of state or federally-administered export permits that would permit exports on the basis of some economic and market impact criteria.

Some of these options have actually been advocated in one state or another, or have been attempted in other countries.

Those proposing export controls should bear the burden of proof that they will work and will not cause unintended side effects. Log export controls could have many unexpected effects on an existing market, will affect private commerce and property rights, place burdens on international commerce, have significant political impacts, and raise important federalism issues. It is not unreasonable to expect advocates of change to respond fully and in detail to these concerns. Anyone proposing log export regulations or bans should respond fully to the following questions:

- Are the proposed measures administratively feasible?
- Are they constitutionally or legally permissible and enforceable?
- Can it be shown that such measures will actually achieve their intended objectives?
- Are all contingencies for responses by injured parties (litigation, retaliation) understood and accounted for?
- Could winners from such an embargo compensate the losers?

So far as is known, there has been no effort to date that begins to meet such a burden of proof. A National Wildlife Federation report advocates a package of measures but contains no analysis addressing these issues. There is no convincing evidence that proposed log export controls would work as planned, or that they would be free of adverse side effects.

The impact of log exports on timber markets and local mills would depend on the locality within the state, the species and grade of wood being considered, and the policy assumptions being made. For some species such as hemlock, there is little or no U.S. market. In other instances, logs being exported could technically be processed in U.S. mills. There are probably areas where U.S. mills would process logs now being exported if those exports were not occurring. In other situations, it is doubtful that U.S. mills would be built or expanded to process the wood. As we saw above, however, if U.S. export bans were followed by retaliatory restrictions, many U.S. workers could lose their jobs. After all factors are considered, there is simply no evidence that Maine sawmill employment would be larger if Maine could successfully embargo all exports of logs *and if its neighbors were able to adopt similar policies*. This applies to the other states as well.

There is essentially no relevant econometric research for the borderlands region that would be capable of assessing the impacts of

export restrictions. Developing such models is complex and would require overcoming many data gaps and analytical obstacles. An indication of the difficulty can be obtained from the literature on this issue in the Pacific northwest,[53] and those results are not transferable to the northeast.

Under the U.S. Constitution states have little or no role in the regulation of foreign trade.[54] Yet, Congress has authorized legislatures for several western states to limit exports of logs from state lands, and it has been suggested that Congress authorize other states to ban log exports. Probably state-level controls would simply move the source of log shipments from one state to another unless all states acted fully in concert, which would be very difficult to arrange. Also, it is not clear that overburdened state agencies could administer effective export control programs.

In complex market situations, simple solutions often fail to work or they generate unintended side effects.[55] Ideologies are not helpful. Free trade proponents would say that no barriers should stand in the way of trade. Impeding the flow of trade always imposes long-term costs, they would say. The classic economics of free trade and an analysis of the effects of trade policies can be found in any intermediate microeconomics text.[56] But trade is already heavily managed by the U.S. and its trading partners. As Laarman and Sedjo observe, "In a world of highly diverse trading partners, no single theoretical framework is sufficient to encompass all of the arguments for and against free trade."[57] As a sample from a vast literature, other evidence on the costs of trade barriers is reviewed by Feenstra.[58]

Log export restrictions have an enduring appeal because they promise what appear to be cost-free benefits. They would enable states to shift the costs of unpleasant decisions onto others— export customers — who are not represented in local legislatures. Imposing costs on residents of other jurisdictions takes little political courage. Claims that export bans would benefit a state usually involve the hidden assumption that it can ban exports of its own wood and still avoid retaliation by others. By themselves, log exports may not foster better forest management or more stable land ownership. Nor will the policy promote better management to bar forest landowners from selling their wood to the markets that yield them the best return.

There is concern over exporting logs, but not over exporting lumber. The basis for this distinction is unclear. Lumber is also a raw material for other manufacturers. Furniture manufacturers might

well appeal to Congress, arguing that sawmills should not be permitted to "export" jobs by exporting lumber. Further, critics of log exports have not been able to offer a principled basis for distinguishing between exports to other states and exports to Canada.

Canadian log export embargoes from Crown (provincial) lands are an irritant in the trade relationship often raised by U.S. sawmill owners. This raises the issue of *reciprocity*, which would seem to be a reasonable concern. Yet, on the Quebec border south of the St. Lawrence there is little Crown land where timber would be accessible to U.S. mills, and little indication of sawlogs from Quebec freehold land coming to Maine mills. In New Brunswick, it appears that Crown wood embargoes do have an effect at least for logs of some species, and some means of dealing with legitimate reciprocity concerns would be desirable.

Canadian industry and government officials claim that, for lumber at least, "the playing field is level," and hence Canadian log imports are not based on any subsidies received by the industry.[59] Yet these same officials persist in defending embargoes on the export of Crown logs which are a significant irritant in the trade relationship. If the "playing field" were truly level, provinces would have no need to control log exports. Further, despite improvements under NAFTA, U.S. truckers continue to claim that the field is not level for them to operate in Canada.

V. CONCLUSION

From a disciplinary perspective, the log and lumber trade in the northeastern borderlands illustrates the potential of the "economic geography" paradigm for understanding the location of economic activity. By examining the details of landownership, mill locations, transport costs, and markets, we can see why the timber-rich province of Quebec imports wood from the timber-scarce state of Maine. The volumes of wood involved in cross-border trade are substantial relative to U.S. harvest levels and to mill usage in adjacent parts of Quebec and New Brunswick. Limited evidence suggests significant effects on U.S. stumpage prices for some species in some areas.

Fundamental wood supply-demand balances in the northeastern states are tightening, especially in Maine and New Brunswick. In Maine, it is uncertain whether current softwood harvest levels are sustainable. Should it be found that future harvest levels need to be restrained, surely attention will first be drawn to log exports. Fur-

thermore, demands are rising for large allocations of land to non-timber uses. An example is the proposed Maine Woods National Park, a preserve which would occupy 3.2 million acres, about one-fifth of Maine's commercial forest area. Another is the proposal under consideration for expanded "protected areas" in New Brunswick. Regulated reductions in log or chip exports seem to offer a politically painless way to offset the wood supply effects of such land allocations. Also, industry concerns over log exports are linked to the ongoing conflict over Canadian softwood lumber imports. That issue is not likely to end soon, with Canadian lumber holding a 34 percent share in the U.S. market. Industry groups and other interests are divided on log export policies. This ensures that log exports will be politically controversial in the northeastern borderlands for a long time to come.

No evidence has been produced to show that suggested regulations to restrict log exports would work as proposed, would have acceptable side effects, and would be consistent with other policy objectives. The burden of proof that log export restrictions could meet reasonable criteria of acceptability and effectiveness lies on the proponents, and that burden has not been met. The fact that a state could enact a policy into law does not amount to showing that it would work as intended. One need not believe that the free market always knows best to remain unconvinced that log embargoes are in the overall public interest for either Canada or the U.S. The first principle of policymaking ought to be: "Do no harm." A due regard for this principle would be of great assistance in screening out unsound policy ideas.

The state, provincial, and federal governments should improve their monitoring of trade in state and regional wood production and trade flows.[60] They should attempt to understand any favorable or unfavorable effects of this trade on landowners, mills, communities, and the environment. They should begin the difficult process of designing policies to ensure that the total harvest level does not exceed long-run sustainable levels. Rhetoric about log trade is not an adequate substitute for serious deliberation on these fundamental challenges.

ACRONYMS

Bbf	billlion board feet
CFS	Canadian Forestry Service
FAS	Foreign Agriculture Svce, U.S. Dept. of Agriculture
FIRA	Foreign Investment Review Act
MMbf	million board feet
MMcm	million cubic metres
NAFTA	North American Free Trade Agreement
QLMA	Quebec Lumber Manufacturers' Association
QMNR	Quebec Ministry of Natural Resources
USDA	U.S. Department of Agriculture

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NOTES

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[1] U.S. Senate, 1982; Morton, 1997; Wonnacott, 1987; Waggener, 1990; Cashore, 1998. In 1998, Canada accounted for 21% of the total of all U.S. imports and export, and was the largest U.S. trading partner (U.S. Council of Economic Advisors, 2000, p. 205). An excellent overview of trade issues is Schott and Smith (1998).

[2] Hines, 1987; Lane, 1998.

[3] Pan Atlantic Consultants and The Irland Group, 1999.

[4] American Forest and Paper Association, 2000. On the current Agreement, see Irland, 1996. Despite significant bilateral trade liberalization under the 1986 Trade Agreement (Little, 1988) and later under NAFTA, the grievances of the resource industries persist. For details on NAFTA, see USITC, 1998, ch. 3 and subsequent reports. For a Canadian view of the 1996 Agreement, see Widman, 1998; and R. Taylor, 2000. For a recent U.S. view, see Singleton, 1999.

[5] Jones, et al., 1994

[6] Krugman, 1991.

[7] McCallum, 1995

[8] Ellison and Glaeser, 1999; Evans, 2000; see also Wall, 1999; Helliwell, 1998; Anderson and Smith, 1999a and 1999b.

[9] Outran, 1985 in Anon, 1985; Lumbert, 1996.

[10] Samples of press coverage include Passell, 1992; Platt, 1993; Canton, 1993; Sanders, Aldrich, and Ober, 1994; and Bradbury, 1994.

[11] In 1993, U.S. Softwood log exports (FAS basis) were worth $2.2 billion; by 1999 this amount fell to only $898 million. Hardwood log exports rose from $245 million to $330 million in the same period (USDA, 2000, p. 28).

[12] Kellett, 1989; Palola, 1997, National Wildlife Federation, 1995; and Bradbury, 1994.

[13] For an exception, see Barford, 1994.

[14] Currently known as the Coalition for Fair Softwood Lumber Agreement.

[15] A recent example is Anon., 1999, which extensively discusses the log export issue but stops short of recommending export controls. A recent Vermont report (VT Dept. of Forest, Parks, and Recreation, n.d.) uses the amount of logs exported as an indicator of the industry's health. See, for New York, Governor's Task Force on Forest Industry (1989), esp. pp. 5, 26, and 29-30; and Yellow Wood Associates (1991), pp. 5, 37, and 38-41.

[16] Sanders, Aldrich, and Ober, 1994.

[17] Hines, 1987; Lane, 1998.

[18] Irland, 1999, pp. 80-83.

[19] Smith, 1972; Judd, 1989.

[20] See, generally, Irland, 1987; and Irland, 1996.

[21] Quebec Lumber Manufacturer's Association, 1999; see also Huber, 1999; and Cote, 1995.

[22] See, generally, Aley, 1981; Jones, et al., 1994; and citations in note 8 *supra*; Frederic, 1983; and Field, 1986 in Konrad, Morin, and Erb, 1986, p. 287-310.

[23] Taylor, 2000.

[24] In a recent trade journal article, log exporter Mark Carroll is quoted: *"A lot of my overseas customers that we have been exporting logs to have begun asking for Hardwood lumber," Carroll said. "By being able to furnish them with Hardwood lumber, I am able to take my business to the next step and diversify, which I think will give us the longevity that I want for my company."* (Miller, 2000, p. 41). Despite rising U.S. hardwood log exports, the Wood Components Manufacturers Association reports that in 1987, 40 percent of its members were exporting value-added products, while in 1997, 64 percent were exporting such products (Henness, 1998). For a useful global perspective, see Laarman and Sedjo (1992, ch. 5).

[25] Waggener, 1990.

[26] Quebec Lumber Manufacturers Association, 1999.

[27] Natural Resources Canada, 1999.

[28] MacFarlane, 1997, pp. 9-11.

[29] I owe this dataset to the assistance of Mr. Nsimba Kinuani of the Quebec Lumber Manufacturer's Association.

[30] Forest Service research suggests that the hardwood log and lumber export data are unreliable (Hansen, 1998); many believe that softwood log shipments are understated. Census analysts acknowledge that undercounting of exports is widespread (U.S. Bureau of the Census, 1998). See also U.S. General Accounting Office, 1989. Chip shipments from Canada to the U.S. are probably undercounted. For more detailed comment, see Irland Group (1999a). In these reports, the Customs district of departure from the U.S. is not necessarily the district of origin of the wood. Also, this database does not distinguish between different destinations within Canada. So these figures should only be used with a keen appreciation of their limitations. A useful comparison is Maranda (1986) in Konrad, Morin, and Erb, 1986, pp. 345-355. New Brunswick officials acknowledge that past tracking of log movements has not been complete.

[31] Irland Group, 1999b; and Irland, 1996, p. 45.

[32] Field and Forster, 1989.

[33] Vanasse Hangen Brustlin, 1995.

[34] Taylor, 1000; Cohen, 1998.

[35] See Irland Group, 1999a.

[36] Source: Irland, 1999, p.29.

[37] Irland and McWilliams, 1997; Irland, 1998a.

[38] Maine Forest Service, 1998.

[39] New Hampshire Forest Inventory Project, 1995.

[40] Irland, McWilliams, and Widman, 2000.

[41] There are questions as to the accuracy and precision of the published price reports, expecially for local areas. Most reports urge users to use them as a guide only, and disclaim any pretensions to precision, in view of the countless factors that can affect stumpage prices. For the modest claims being made here, we are not uncomfortable using this information.

[42] For an older review, see Irland, 1987b; key documents include U.S.-Canada FTA, 1993; U.S. ITC, 1992; U.S. ITC, 1998.

[43] Annual wood flow reports, Maine Forest Service; see also Irland Group, 1999a.

[44] Griffith and Alerich, 1996.

[45] Vermont Dept. of Forests, Parks and Recreation, 1999.

[46] See, e.g., Jim Outram, paper in Anon. 1985; and Lumbert, 1996.

[47] Irland, 1998b.

[48] Emanuel and Rhodes, 2000, p. 20.

[49] As an example, Japan, traditionally a log and chip importer, now imports more prefab buildings and laminated products from North American suppliers. China is another example. In 1988, the value of China's solid wood imports from the U.S. was almost entirely in softwood logs. Higher U.S. log prices and Chinese policy changes,

virtually ended those imports by the mid 1990's. While still very small, China's imports of softwood lumber, moldings, veneer, and plywood are rising. Yet, there is no indication that China's cessation of log imports has actually prompted their replacement by an equivalent volume of U.S. value-added products (USDA-FAS, 2000).

[50] Irland Group, 1999a.

[51] See, e.g., Hirsch, 2000, pp. 5, 6.

[52] See, e.g., National Wildlife Federation, 1995, pp. 60-72; Phillips, 1993.

[53] Wiseman and Sedjo, 1981; Shinn, 1993; Flora and McGinnis, 1992; Darr, Haynes, and Adams, 1980.

[54] Gorte and Thomas, 1993.

[55] Irland 1997a; Irland, 1997b; Howard, n.d.; West, 1993; Jones, et al., 1994.

[56] Pindyck and Rubinfield, 1989, ch. 9; and Carlton and Perloff, 2000, ch. 18 are good examples. Also, U.S. Congressional Budget Office, 1986.

[57] Laarman and Sedjo, 1992, p. 196. A readable overview of the case for free trade is U.S. Council of Economic Advisers (2000), chapter 6.

[58] Feenstra, 1992. A good analysis from Canada's perspective is provided in Wonnacott, 1987, ch. 2.

[59] Canadian Embassy, n.d.; G. Saucier, 1985 in Anon. 1985; D.D. Lockhart, 1986; and J. Maranda, 1986; both in Konrad, Morin, and Erb, 1986.

[60] More details available in Irland Group, 1999a, pp 31-34.

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