INITIAL ESTIMATES OF THE POTENTIAL IMPACT OF THE US SOFTWOOD LUMBER DUTIES

REVISED

May 2, 2002

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EXECUTIVE SUMMARY

Method

A partial equilibrium model of the US and Canadian softwood lumber markets was constructed using linear supply and demand equations. These equations are functions of lumber price alone and the parameters were derived from published supply and demand elasticities and an initial calibration point. The 2001 calendar year market price and quantity are taken as the initial equilibrium calibration point. Separate supply functions were developed for the Atlantic Provinces and for the rest of Canada as the Atlantic Provinces have been excluded from the countervailing duty and thus are subject to only the anti-dumping duty. The model was run using two sets of elasticity assumptions. The first set represents short run elasticities and the response represents the impact that should occur in the first year in which the duties were imposed. The second set of elasticities represents long run elasticities, which have a more elastic supply and demand response than would occur in the short run. Simulation using the second set would represent the impact after the market fully reacted to the duties, all other factors held constant.

Simulation Results

The effects of the average 8.43% anti-dumping duty on Atlantic Canada exports and the combined 27.22% duty on the rest of Canada exports were simulated using the two sets of elasticity assumptions and the results are presented in Table 1. The results should be interpreted as the impact of the duty if it had been imposed at the start of 2001. No attempt has been made to predict the 2002 results without the duty and then simulate the impact of the duty. Nevertheless, the change in calendar year 2001 production rates and prices simulated should provide a reasonable indication of the duties' impact during the current calendar year.

Production Impact

In the short run Canadian lumber production is expected to fall by approximately 1.5 billion board feet while in the long run it may fall by 1.8 billion board feet. Note that the Atlantic Canada producers may see a small increase in production in the short run and only a small decline in the long run. This occurs because Atlantic Canada producers, who are only subject to the anti-dumping duty, may be in a position to take advantage of the higher US domestic price. This means that the production declines will largely be felt outside of Atlantic Canada.

Price Impact

In the short run $41/mbf or 54% of the duty is borne by the US consumer and $35/mbf or 46% is borne by non-Atlantic Canadian exporters. In the long run this changes to $22/mbf or 31% by the US consumers and $50/mbf or 69% by Canadian exporters. The shift in burden is shown in Figure 1.

TABLE 1
Simulation Results

	Unit	2001 Actual	2001 with Duty	Change	Percent Change
Short Run Estimates					
Total Canadian Production	mmbf	27,569	26,097	-1,472	-5.3
Atlantic Production/Exports	mmbf	2,135	2,182	46	2.2
Rest of Canada Exports to US	mmbf	16,567	14,898	-1,668	-10.1
Canadian Consumption	mmbf	6,770	6,920	150	2.2
US Production	mmbf	34,137	35,034	897	2.6
US Consumption	mmbf	52,843	52,149	-694	-1.3
US Price	US$/mbf	312	353	41	13.1
Canadian Price	US$/mbf	312	277	-35	-11.1
Long Run Estimates					
Total Canadian Production	mmbf	27,569	25,741	-1,828	-6.6
Atlantic Production/Exports	mmbf	2,135	2,118	-18	-0.8
Rest of Canada Exports to US	mmbf	16,567	14,177	-2,390	-14.4
Canadian Consumption	mmbf	6,770	7,349	580	8.6
US Production	mmbf	34,137	35,100	963	2.8
US Consumption	mmbf	52,843	51,390	-1,453	-2.8
US Price	US$/mbf	312	334	22	7.1
Canadian Price	US$/mbf	312	262	-50	-15.9

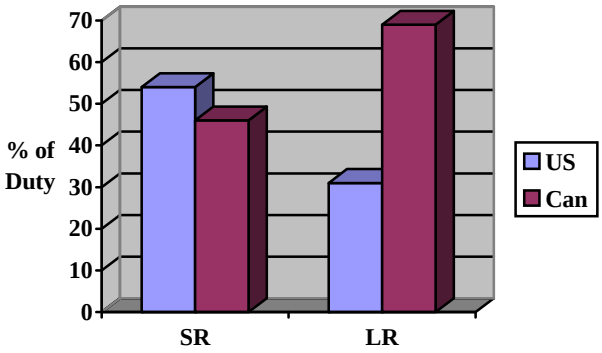

FIGURE 1
Shift in the Duty Borne by US Consumers and Canadian Producers in the Short Run and the Long Run

For Atlantic Canada lumber exporters the duty on their shipments is entirely borne by US consumers in the short run, and about $4/mbf is borne by Atlantic Canada exporters in the long run.

Sensitivity Analysis

The sensitivity of the model was tested by varying the elasticities assumptions. These tests were conducted on the short run results. Not surprisingly, changes in the elasticity of the Atlantic Provinces supply or Canadian domestic demand had little effect on the results. The other elasticities had a moderate impact, increasing or decreasing the production impact by about 25%. The impact moves in the expected direction with a greater production loss the higher the elasticity of US demand, US supply or Canadian export supply. Note however, that as the elasticity of Canadian export supply increases more of the duty's impact on price is shifted from Canadian producers to US consumers.

Employment and Other Impacts

Based on the simulation results employment, household income and other impacts were estimated. The results are summarized in Table 2.

TABLE 2
Employment and Other Impacts

Impact	**Short Run Impact**	**Long Run Impact**
Employment		
Direct	-3,544	-4,413
Indirect	-4,986	-6,209
Induced	-3,640	-4,532
Total	-12,170	-15,154
Household Income	(Cdn. $ millions)	(Cdn. $ millions)
Direct	-156	-194
Indirect	-208	-258
Induced	-118	-146
Total	-481	-599
Canadian Producer Surplus	(Cdn. $ millions)	(Cdn. $ millions)
Atlantic	+45.3	-13.2
Rest of Canada	-1,435.2	-2,042.1
Total	-1,389.9	-2,055.3
US Impacts	(US $ millions)	(US $ millions)
US Consumer Surplus	-2,152.3	-1,146.6
US Producer Surplus	1,418.0	761.6
Duty Revenue	1,185.1	1,068.2

Employment Impacts

In the short run approximately 3,500 jobs may be directly lost in the Canadian sawmilling industry, with a further 5,000 jobs lost in industries such as logging that supply goods and services to the sawmilling industry. In addition, a further 3,600 jobs would be lost in other sectors due to the lower expenditures resulting from lower household income. The total short run employment loss due to the duties may then be over 12,000 jobs. In the long run the employment loss is greater with 4,400 direct, 6,000 indirect and 4,500 induced jobs lost for a total loss of 15,000 jobs.

Note that the estimated job losses would be over and above any unemployment that had already occurred during 2001. Employment in the sawmill and wood preservation industry during 2000 was 74,145 jobs compared to 66,865 in 2001. This suggests a direct job loss of 7,280 jobs has already taken place. Using the same employment multipliers, the indirect job loss would have been a further 10,243 jobs and the induced impact a further 7,477 jobs. Thus a total of 25,000 jobs may already have been lost in 2001 before the simulated impact of the duty was run.

Another caution on the simulated employment impacts is warranted. The estimated direct job loss is implicitly based on an average number of jobs per unit output ratio. This is acceptable if the industry has a homogenous job/output ratio. However, this is not the case and thus it is the older more labour-intensive mills that will likely shut down first. As such the simulated employment impacts may understate the potential job loss.

A further caution is required for the potential employment impacts on the remanufactured lumber and wood products sector. Not all of this sector will fall within the sawmilling industry and thus the impacts on this sector are only partially captured by the estimated employment loss. In addition, because this sector will be taxed on the value of their outputs and not on the value of their lumber inputs (i.e. their value-added is also taxed), this sector will be more vulnerable to the US duties than is the general sawmilling industry. The remanufactured sector is also characterized by a large number of small more labour-intensive firms. This suggests that the potential employment loss in the remanufactured sector may be substantially underestimated.

Household Income Impact

The resulting loss in household income due to the job losses would total $481 million in the short run and $ 599 million in the long run.

Net Revenue Loss to the Canadian Lumber Industry

The producer surplus, or net revenue, loss to the Canadian forest industry was estimated separately for the Atlantic Provinces and the Rest of Canada to account for the different duty rates. In the short run Canadian producers outside of the Atlantic region may see a net revenue loss of $1.4 billion, rising to a net loss of $2.1 billion in the long run.

In the short run Atlantic Canada producers may experience a modest net revenue gain due to the higher after-duty price they receive. But in the long run they, too, experience a net revenue loss, although a proportionately much lower loss than the non-Atlantic Canada producers.

Offsetting a part of this producer surplus loss may be reduced provincial stumpage fees from harvests from Crown land plus potentially lower stumpage fees from private timberlands. This will vary by province and depend on the responsiveness of each province's stumpage fees to changes in the lumber prices received by tenure holders and the responsiveness of private stumpage prices to lumber price changes. Nevertheless, the total revenue loss would still be felt in the Canadian economy even if it were shared between provincial Crown revenues and private timberland owners.

US Consumer and Industry Impacts

Table 2 includes estimates of the impacts on US consumers and the US lumber industry. The value lost to US consumers due to the higher lumber prices brought on by the duty is called the consumer surplus loss. Not surprisingly, the US consumer takes a substantial hit due to the duties, with a loss of about US$2.2 billion in the short run and US$1.2 billion in the long run. Thus, the biggest loser due to the duties is the US consumer.

The US lumber industry on the other hand, has a considerable net revenue gain of about US$1.4 billion in the short run, falling to US$0.8 billion in the long run. However, the US industry's revenue gain is even more substantial if the duties collected, about US$1.2 billion in the short run and US$1.1 billion in the long run, are distributed back to the US industry under the provisions of the Byrd Amendment. Thus the US industry has a substantial incentive to initiate softwood lumber trade disputes.

Caveats

There are numerous caveats that apply to the simple market model developed in this report. But the two major caveats are:

- The assumption that the selected elasticities apply at the initial calibration point can only be categorized a truly heroic. In addition, the assumption of linear demand and supply relationships will only be reasonable in the immediate neighbourhood of the calibration point. Thus, any large change from the initial equilibrium point should be viewed with caution.

- Exports to the rest of the world and US imports of non-Canadian lumber are held constant. Non-Canadian lumber imports to the US have captured a small but quickly growing share of the US market. This growth may be enhanced by any duty-induced price increase. The effect of any increase in offshore imports would be to limit US price increases meaning that more of the duty would be borne by Canadian producers and less by US consumers. From a Canadian perspective any increase in offshore exports to the US would increase the production and revenue loss estimates due to the duty. The speed with which European and other offshore suppliers, such as Chile and New Zealand, could ramp up exports of construction grade lumber is unknown but may be limited in the short run by the requirement for mills to obtain North American lumber grading certification. Nevertheless, the number of offshore mills receiving such certification has been growing. Thus, increased import substitution due to the duties should be a major concern for the Canadian lumber industry.

SECTION 1
INTRODUCTION

1.1 Background

Following the expiry of the Canada-US Softwood Lumber Agreement on March 31, 2001, the US began countervailing duty (CVD) and anti-dumping (AD) investigations of softwood lumber imports from Canada. This is the fourth trade dispute initiated by the US over Canadian lumber in the last two decades. The US Department of Commerce (DOC) issued its final determination of a 19.34% CVD and 9.67% AD *ad valorem* rates on March 21, 2002. On Friday, April 26, 2002, the DOC announced changes to its final CVD and AD rates due to ministerial errors. The final CVD rate was changed to 18.79%, down from 19.3%, while the average anti-dumping duty was lowered to 8.43% from 9.7%. Note that only the AD rate applies to Atlantic Canada lumber producers as the DOC had previously excluded them from the CVD investigation. These duties come into effect in mid-May should the US International Trade Commission also issue a final finding of injury to the US industry on May 2, 2002.

1.2 Purpose

The purpose of this study was to provide an initial estimate of the impact the imposition of the US Department of Commerce's anti-dumping and countervailing duty final determinations would have on Canadian exports of softwood lumber and on the price received by the Canadian lumber industry. In addition, the estimated impact that the drop in Canadian lumber production would have on employment and household income were estimated. Estimates of the duties' impact on Canadian lumber industry producer surplus, US consumer surplus and US industry producer surplus are also provided.

1.3 Outline

In the next section, the following elements are covered:

- the basic model is developed;
- the method used to account for the Atlantic Provinces' exclusion from the countervailing duty is described;
- the effect of changes in Canadian demand on Canadian production are incorporated;
- the results of a review of published supply and demand elasticities are presented;
- the coefficients of the model are estimated based on the selected supply and demand elasticities and the initial calibration point chosen; and,
- important caveats to the model's assumptions are presented.

In Section 3 the simulation results are presented and the sensitivity of the results to the elasticity assumptions used are tested. Section 4 describes the means of estimating the employment and household income impact due to any decline in Canadian softwood

lumber production and presents the impact estimates along with the impacts on consumer and producer surpluses.

SECTION 2
MODEL DEVELOPMENT

2.1 The Basic Model

A partial equilibrium supply and demand model is constructed for the US and Canadian lumber markets. The US market for softwood lumber is modelled with linear demand (D_u) and total supply (S_t) functions. US demand is taken as net of imports from other offshore countries and total softwood lumber imports are assumed to be an exogenously determined constant. Total supply is in turn broken down into a US domestic supply function (S_u) and a separate Canadian lumber export supply function (S_{cx}). All demand and supply functions are assumed to be solely a function of lumber price (p) measured in US dollars per thousand board feet. That is:

$$D_u = a_1 - b_1 \cdot p$$
$$S_u = a_2 + b_2 \cdot p$$
$$S_{cx} = a_3 + b_3 \cdot p$$

The market-clearing price would occur when:

$$D_u(p) = S_u(p) + S_{cx}(p) = S_t(p)$$

Figure 2-1 depicts the market clearing price and quantity under these assumptions as occurring at p_1 and q_1 respectively.

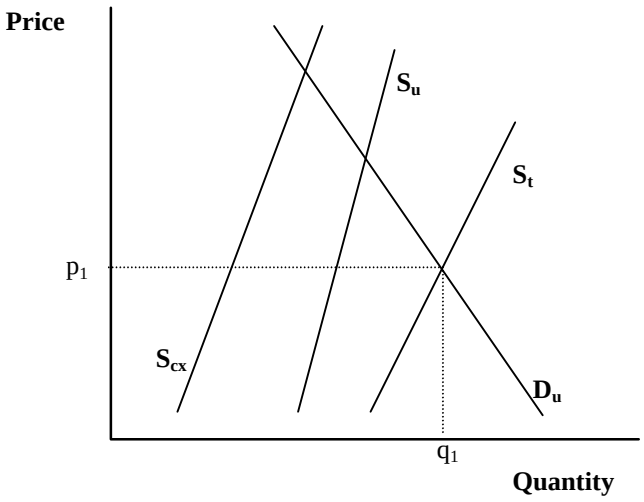

FIGURE 2-1
Market Clearing Lumber Price and Quantity

The Supply of Canadian Export Lumber

The available supply of Canadian exports is the Canadian lumber supply (S_c) less Canadian domestic demand (D_c) or:

$$S_{cx}(p) = S_c(p \cdot exch) - D_c(p \cdot exch)$$

Thus the supply of Canadian exports takes into account changes in Canadian domestic demand as the North American price of lumber changes.

It is assumed in the remainder of this report that the exchange rate remains constant and thus can be suppressed in the Canadian demand and supply functions. As with the US demand function the Canadian domestic demand is taken as net of softwood imports from other countries which are held constant at an exogenously determined quantity.

A Linear Model

The intercept term in each demand and supply equation is assumed to account for all other factors affecting demand and supply at the market equilibrium point at which the model is initialized. The values for the coefficients are then derived using demand and supply elasticities and values for D_u, S_u and S_{cx} at the point at which the model is to be initialized.

At the initialization point it is assumed that the market is in equilibrium. Let Q_o be the market clearing quantity demanded and supplied, S_{uo} and S_{cxo} the quantity supplied to the US market by the US and Canadian lumber industries respectively, and p_o the market clearing price. To show how the model is calibrated for the demand equation, first remember the definition of the elasticity of demand as:

$$\eta = \frac{\partial Q}{\partial p} \cdot \frac{p}{Q}$$

We then assume that the value selected for the elasticity of demand applies at the point at which the demand curve is initialized. Using the values for Q_o and p_o the value for b_1 can be estimated as:

$$b_1 = \frac{\partial Q}{\partial p} = \eta \cdot \frac{Q_o}{p_o}$$

The intercept term can then be specified as:

$$a_1 = Q_o - b_1 \cdot p_o$$

This process is then repeated for the supply equations, with S_{uo} and S_{cxo} replacing Q_o and the appropriate supply elasticity replacing the demand elasticity in the calculation of the coefficients.

Effect of the Duty

With the linear model coefficients specified, the introduction of the duty is incorporated into the model by changing the supply of Canadian export lumber to:

$$S_{cx}(p) = a_3 + b_3 \cdot p/(1+t)$$

where t is the duty rate expressed as a decimal. This causes S_{cx} and S_t to pivot upwards as shown in Figure 2-2, resulting in the US price of lumber rising from p_1 to p_2 and the market clearing quantity of lumber falling from q_1 to q_2. Canadian exports in turn fall from q_3 to q_4. Canadian producers would now receive a price equal to $p_2 \cdot (1 - t)$.

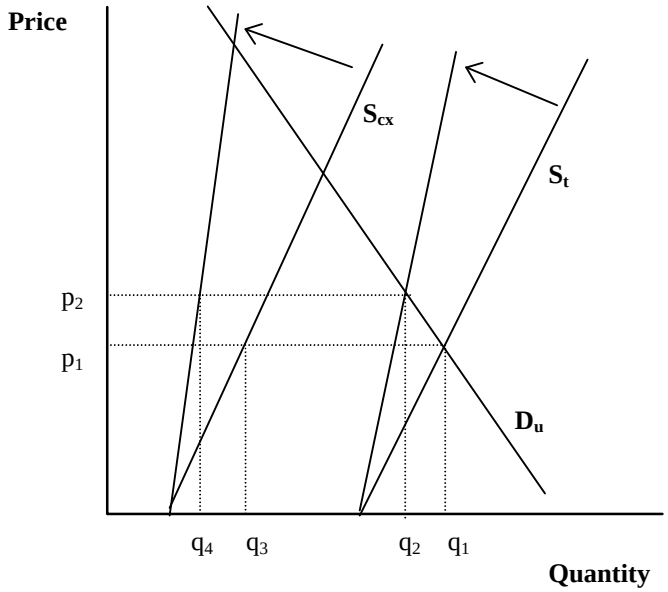

FIGURE 2-2
Effect of the US Lumber Duty

2.2 Accounting for the Atlantic Provinces' CVD Exclusion

The Atlantic Provinces were excluded from the countervailing duty by the US Department of Commerce. However these provinces will be subject to the average anti-dumping duty of 8.43% if affirmed by the US International Trade Commission in early May 2002. Given the substantial difference in the duty

applied to Atlantic Canada lumber shipments, it is important to separate Atlantic production from the remainder of Canadian lumber production and treat the Atlantic area as a separate production region.

With the implementation of the AD and CVD, the Canadian domestic price of lumber will fall relative to the US price. Atlantic Canada producers will have a significant pricing advantage and can be expected to ship their output to the US rather than the Canadian domestic market. Local Atlantic Canada domestic demand would then be filled by lumber from other Canadian regions. This was the case during the 1996-2001 Canada/US Softwood Lumber Agreement when Atlantic Canada was exempted from quota restrictions and a similar divergence in Canadian and US domestic prices took place. If this logic holds then the Canadian domestic price should be lower than the US domestic price by the full amount of the AD and CVD duties.

To model this shifting of trade flows we deduct all Atlantic Canada lumber production from total Canadian lumber exports and initialize the Canadian lumber export supply curve at this reduced value. An Atlantic Canada export supply curve is then initialized at its total production level using its elasticity of total supply rather than the elasticity of export supply. The Atlantic lumber supply curve is specified as:

$$S_{ac}(p) = a_4 + b_4 \cdot p/(1+t-0.1879)$$

2.3 Total Canadian Production

Total Canadian production will be the sum of domestic demand, Atlantic Canada exports to the US, the rest of Canada exports to the US, plus Canadian exports to the rest of the world (XW), or:

$$S_{ct}(p) = D_c(p/(1+t)) + S_{ac}(p) + S_{cx}(p) + XW$$

Lower Canadian exports due to the duty will, all other factors held constant, be partially offset by higher domestic demand. As noted earlier XW is assumed to be an exogenously determined constant that is unaffected by changing North American lumber prices.

In allocating Canadian production to different regions, it should be assumed that Atlantic production would be fully exported to the US and no domestic demand or exports to the rest of the world would be assigned to it. Production in the other regions would then be the sum of total domestic consumption, US exports from non-Atlantic Canada and exports to the rest of the world.

2.4 Elasticity Estimates

Demand and supply elasticities are not directly estimated in this report. Instead the literature was reviewed for elasticity estimates. Table 2-1 presents some of the recent published results. Note there are no published elasticity estimates for the Atlantic Provinces elasticity of supply. In its place estimates for eastern Canada, defined as either

the provinces east of BC or east of the prairies, are reported in the table for Atlantic Canada. The table also indicates if the estimated elasticities represent a short run or long run estimate. It would be typical to find that both demand and supply would be more responsive, or elastic, to price changes in the long run than would occur in the short run.

TABLE 2-1
Published Elasticity Estimates

Elasticity	Estimate	LR/SR	Source
US Demand - η	-0.075	LR	Adams (1977)
	-0.350	LR	Waggener et al. (1978)
	-0.173	LR	McKillop et al. (1980)
	-0.91	LR	Rockel and Buongiorno (1982)
	-0.111	SR	Spelter (1985)
	-0.390	LR	Spelter (1985)
	-0.174	LR	Adams et al. (1986)
	-0.380	LR	Sharma (1986)
	-0.380	LR	Gellner et al. (1991)
	-0.600	LR	Seldon and Hyde (1991)
	-0.130	SR	Adams et al. (1992)
	-0.550	LR	Adams et al. (1992)
	-0.070	SR	Adams and Haynes (1996)
US Supply - δ	0.430*	LR	Adams and Haynes (1980)
	0.193*	LR	Haynes and Adams (1985)
	0.419*	LR	Adams et al. (1986)
	0.808	LR	Sharma (1986)
	0.309	LR	Chen et al. (1988)
	0.035*	SR	Lewandrowski (1989)
	0.340	LR	Seldon and Hyde (1991)
	1.435*	SR	Lewandrowski et al. (1992)
	0.729*	LR	Adams and Haynes (1996)
Canadian Export Supply - λ	0.890	LR	Adams and Haynes (1980)
	0.917	LR	Adams et al. (1986)
	0.122	SR	Lewandrowski (1989)
	1.063	SR	Lewandrowski et al. (1992)
Atlantic Provinces Supply** - γ	0.492	SR	Adams and Haynes (1996)
	0.650	LR	Latta and Adams (2000)
Canadian Demand - π	-0.23	LR	Sharma (1986)
	-0.54	LR	Gellner et al. (1991)

* Indicates a production-weighted average of the reported regional supply elasticities.
** Elasticities reported for Atlantic Provinces are the estimates reported for eastern Canada or east of BC.

2.4 Coefficient Estimation

Table 2-2 lists the values for the initialization point and the demand and supply elasticities that are assumed to hold at the initialization point. Both a long run and short run elasticity is reported for each demand and supply category. The selection of elasticity values is admittedly arbitrary and subjective. Nevertheless, the values selected tend to represent an average of the most recent estimates. Table 2-3 reports the estimated coefficients based on the assumptions contained in Table 2-2.

The point of initialization represents the annual values for the 2001 calendar year. Using the previous year would be inappropriate, as the values would reflect the effects of the quota restrictions under the Softwood Lumber Agreement. Using 2001 is also not ideal as the first quarter of the year would have also been affected by the Softwood Lumber Agreement and the second half of the year would be affected by the preliminary CVD and AD rates and the subsequent bonding requirements. Using the 2001 calendar year values may then mean that some of the potential effects of the final duties may already be incorporated into these values. Nevertheless, a suitable alternative initialization point is not obvious and the 2001 values are employed.

TABLE 2-2
Values Used in Initializing the Linear Supply and Demand Model

Variable	Unit	Value
Price - P_o	US$/mbf	312
US Demand[a] - Q_o	mmbf	52,843
US Supply[b] - S_u	mmbf	34,137
Rest of Canada Export Supply - S_{cx}	mmbf	16,567
Atlantic Provinces Production - S_{ac}	mmbf	2,135
Canadian Demand[c] - Q_{co}	mmbf	6,770
Can. Exports to Rest of World -XW	mmbf	2,097

Elasticity	Long Run or Short Run	Estimate
US Demand - η	Long Run	-0.39
	Short Run	-0.10
US Supply - δ	Long Run	0.40
	Short Run	0.20
Rest of Canada Export Supply - λ	Long Run	0.91
	Short Run	0.91
Atlantic Provinces Supply - γ	Long Run	0.65
	Short Run	0.50
Canadian Demand - π	Long Run	-0.54
	Short run	-0.20

a. net of US offshore imports
b. net of US exports
c. net of Canadian imports

TABLE 2-3
Derivation of Coefficients from the Initial Values and Elasticities

	Coefficient Calculation	
Equation	**b**	**a**
Short Run		
US Demand	$\eta \cdot Q_o/P_o = -16.937$	$Q_o - b \cdot P_o = 58{,}127$
US Supply	$\delta \cdot S_u/P_o = 21.883$	$S_u - b \cdot P_o = 27{,}310$
Supply of Can. Exports	$\lambda \cdot (S_{cx}-S_{ap})/P_o = 48.319$	$(S_{cx}-S_{ap}) - b \cdot P_o = 1491$
Atlantic Provinces Supply	$\gamma \cdot S_{ap}/P_o = 3.422$	$S_{ap} - b \cdot P_o = 1068$
Canadian Demand	$\pi \cdot Q_{co}/P_o = -4.34$	$Q_{co} - b \cdot P_o = 8124$
Long Run		
US Demand	$\eta \cdot Q_o/P_o = -66.054$	$Q_o - b \cdot P_o = 73{,}452$
US Supply	$\delta \cdot S_u/P_o = 43.765$	$S_u - b \cdot P_o = 20{,}282$
Supply of Can. Exports	$\lambda \cdot (S_{cx}-S_{ap})/P_o = 48.319$	$(S_{cx}-S_{ap}) - b \cdot P_o = 1{,}491$
Atlantic Provinces Supply	$\gamma \cdot S_{ap}/P_o = 4.449$	$S_{ap} - b \cdot P_o = 747$
Canadian Demand	$\pi \cdot Q_{co}/P_o = -11.717$	$Q_{co} - b \cdot P_o = 10{,}425$

2.5 Caveats

The caveats to this modelling approach are numerous:

- The assumption that the selected elasticities apply at the initial calibration point can only be categorized a truly heroic.

- The assumption of linear demand and supply relationships will only be reasonable in the immediate neighbourhood of the calibration point. Thus, any large change from the initial equilibrium point must be viewed with caution.

- Given that the model is a partial equilibrium model, the results do not include the effect the estimated change in lumber price and production would have on the general economy and how the effect on the general economy would then feedback onto the demand and supply for lumber.

- Exports to the rest of the world and US imports of non-Canadian lumber are held constant. Non-Canadian lumber exports to the US have captured a small but quickly growing share of the US market. This growth may be enhanced by any duty-induced price increase. The effect of any increase in offshore imports would be to limit US price increases meaning that more of the duty would be borne by Canadian producers and less by US consumers. From a Canadian perspective any increase in offshore exports to the US would increase the production and revenue loss estimates due to the duty. The speed with which European and other offshore suppliers, such as Chile and New Zealand, could ramp up exports of construction

grade lumber is unknown but may be limited in the short run by the requirement for mills to obtain North American lumber grading certification. Nevertheless, the number of offshore mills receiving such certification has been growing. Thus, import substitution should be a major concern for the Canadian lumber industry.

- During the latter half of 2001, lumber exporters had to post bonds on the value of preliminary anti-dumping and countervailing duty rates. This bonding requirement may have affected production rates and prices. If so, then some of the potential impact of the duty may already be built into the 2001 calendar year results. If true then this may cause the model to overstate the duty impact.

- The assumption that Atlantic Canada producers would immediately shift all production to the US market may overstate the speed at which such a transition could take place and thus may understate the short run impacts. Nevertheless, Atlantic Canada producers are expected to quickly take advantage of any duty induced price differential that is available.

- A sustained increase in the price of lumber may also result in greater substitution for other building products such as engineered wood products, steel studs, plastics, etc. The potential of substitution is not assessed in this report.

SECTION 3
Simulation Results

3.1 Results

The effect of the duty was simulated using the both the short run and long run elasticities. Summary results are presented in Table 3-1. The short run results can be interpreted as the result if the duty had been imposed at the start of the year. The long run results can be interpreted as the results if all other demand and supply determinants had been held constant while the Canadian and US markets adjusted to the long term consequences of the duty. As in the long run both the demand and supply functions tend to be more elastic, we should expect to see a more muted price effect and a larger Canadian supply reduction. And this is indeed what is observed in the simulations.

TABLE 3-1
Simulation Results

	Unit	2001 Actual	2001 with Duty	Change	Percent Change
Short Run Estimates					
Total Canadian Production	mmbf	27,569	26,097	-1,472	-5.3
Atlantic Production/Exports	mmbf	2,135	2,182	46	2.2
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Atlantic Production/Exports	mmbf	2,135	2,118	-18	-0.8
Rest of Canada Exports to US	mmbf	16,567	14,177	-2,390	-14.4
Canadian Consumption	mmbf	6,770	7,349	580	8.6
US Production	mmbf	34,137	35,100	963	2.8
US Consumption	mmbf	52,843	51,390	-1,453	-2.8
US Price	US$/mbf	312	334	22	7.1
Canadian Price	US$/mbf	312	262	-50	-15.9

Figure 3-1 shows the change in the Canadian export supply function (from S_{cx1} to S_{cx2}) due to the duty and the resulting shift in the total supply curve (from S_{t1} to S_{t2}). Figure 3-2 shows the change in the Atlantic Provinces supply curve, the rest of Canada export supply curve, Canadian Domestic demand, and their summation, which is the total Canadian supply curve. Note the prices shown are the US price and the effect of the duty

is shown by the large inward shift of the rest of Canada export supply curve and the small inward shift in the Atlantic Provinces supply curve and the outward shift in the Canadian domestic demand curve.

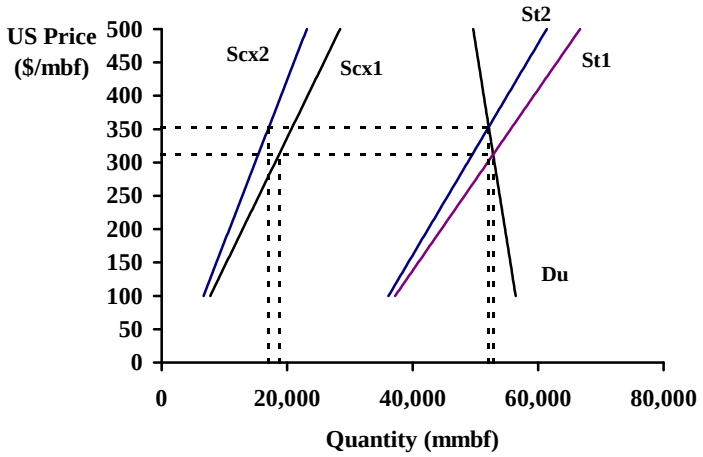

FIGURE 3-1
Effect of the Duty on the US Market

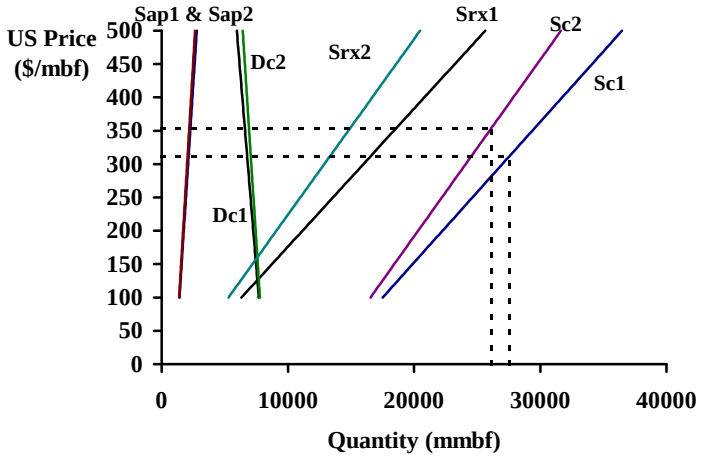

FIGURE 3-2
Effect of the Duty on the Canadian Market

In the short run $41/mbf or 54% of the duty is borne by the US consumer and $35/mbf or 46% is borne by non-Atlantic Canadian exporters. In the long run this changes to $22/mbf or 31% borne by the US consumers and $50/mbf or 69% by Canadian exporters. The shift in burden is shown in Figure 3-3.

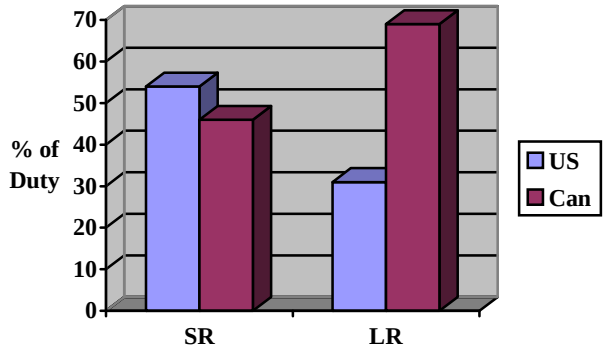

FIGURE 3-3
Shift in the Duty Borne by US Consumers and Canadian Producers in the Short Run and the Long Run

For Atlantic Canada exporters the duty on their shipments is entirely borne by US consumers in the short run and about $3/mbf is borne by Atlantic Canada exporters in the long run.

3.2 Sensitivity Analysis

Varying the coefficients for each demand and supply equation using a range of elastiticities tested the sensitivity of the model to the elasticity assumptions. The ranges tested are shown in Table 3-2. Each elasticity was varied holding all other elasticities constant at their base value. Only the short-run results were examined. Figures 3-4 to 3-12 graph the sensitivity of total Canadian production and lumber price to changes in each elasticity. Table 3-3 summarizes the range of the impacts on total Canadian production.

TABLE 3-2
Elasticity Scenario's Tested

Scenario	US Demand	US Supply	Cdn Export Supply	AC Supply	Cdn Demand
Base	-0.10	0.20	0.91	0.50	-0.20
1	-0.05	0.05	0.50	0.10	-0.05
2	-0.10	0.10	0.60	0.20	-0.10
3	-0.15	0.15	0.70	0.30	-0.15
4	-0.20	0.20	0.80	0.40	-0.20
5	-0.25	0.25	0.91	0.50	-0.25
6	-0.30	0.30	1.00	0.60	-0.30
7	-0.35	0.35	1.10	0.70	-0.35
8	-0.40	0.40	1.20	0.80	-0.40
9	-0.45	0.45	1.30	0.90	-0.45
10	-0.50	0.50	1.40	1.00	-0.50

Table 3-3 suggests, not surprisingly, that changes in the elasticity of the Atlantic Provinces supply or Canadian domestic demand have little effect on the results. The other elasticities have a moderate impact, increasing or decreasing the production impact (of –1,472 MMBF from Table 3-1) by about 25% on average. The impact moves in the expected direction with a greater production loss the higher the elasticity of US demand, US supply or Canadian export supply. Note in Figure 3-9 however, that as the elasticity of Canadian export supply increases more of the duty's impact on price is shifted from Canadian producers to US consumers.

TABLE 3-3
Summary of the Sensitivity Results
on Short-Run Total Canadian Production

	Elasticity Assumption	
Equation Tested	**Low**	**High**
US Demand	-1,284	-2,189
US Supply	-1,057	-1,925
Rest of Cdn Export Supply	-947	-1,847
Atlantic Supply	-1,474	-1,426
Cdn Demand	-1,585	-1,247

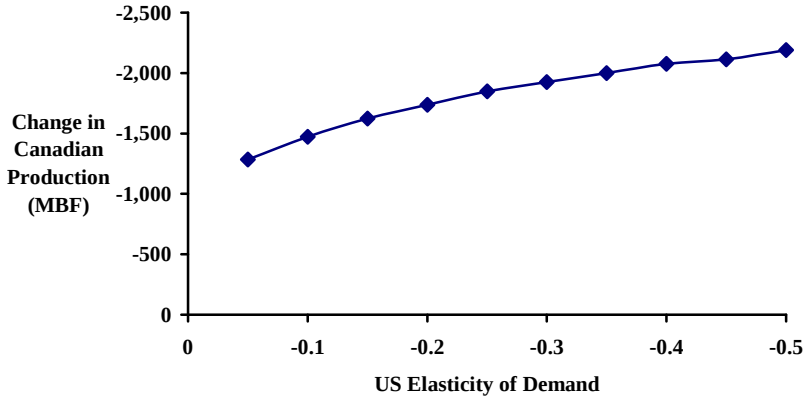

FIGURE 3-4
Sensitivity of Total Canadian Output to Changes in US Elasticity of Demand

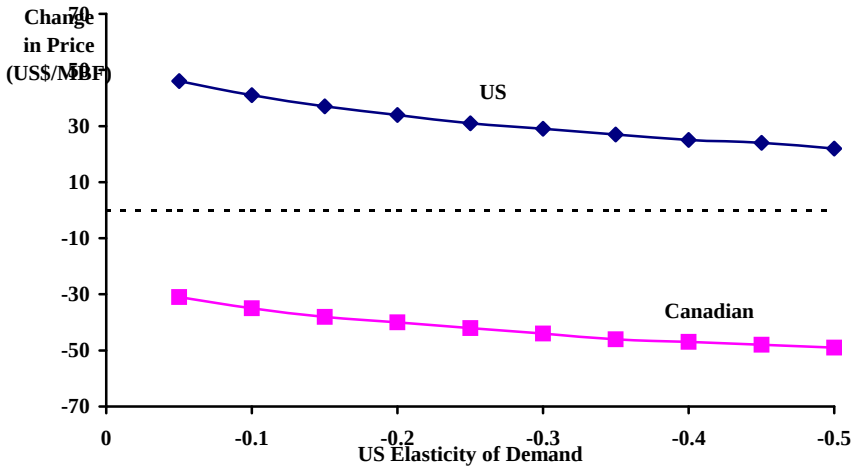

FIGURE 3-5
Sensitivity of US and Canadian Lumber Price to Changes in US Elasticity of Demand

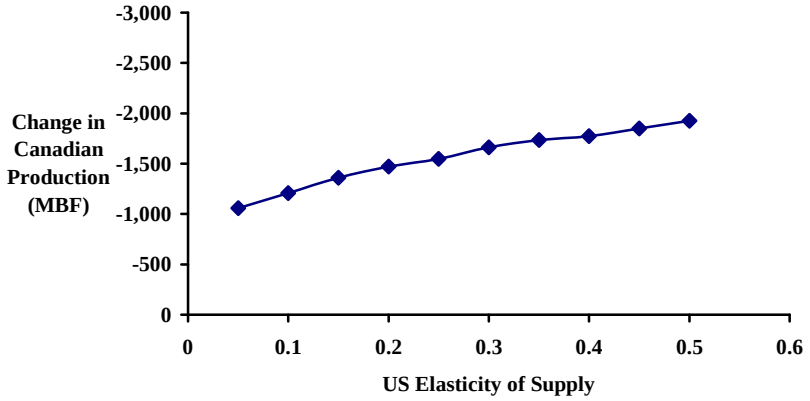

FIGURE 3-6
Sensitivity of Total Canadian Output to Changes in US Elasticity of Supply

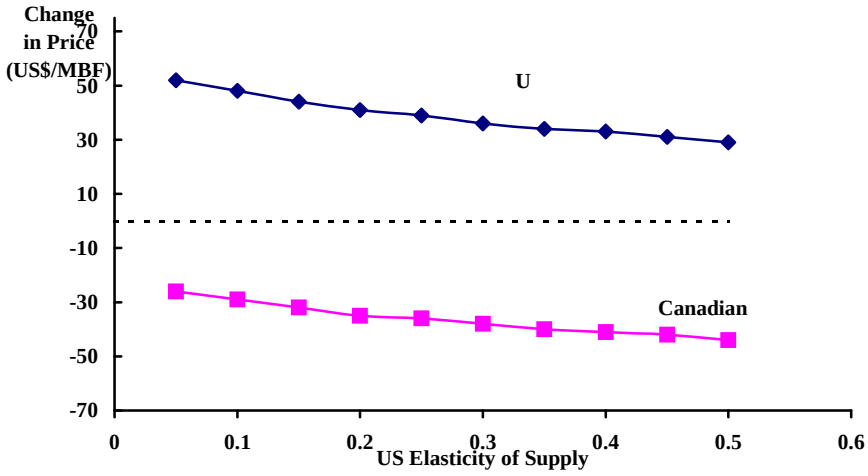

FIGURE 3-7
Sensitivity of US and Canadian Lumber Price to Changes in US Elasticity of Supply

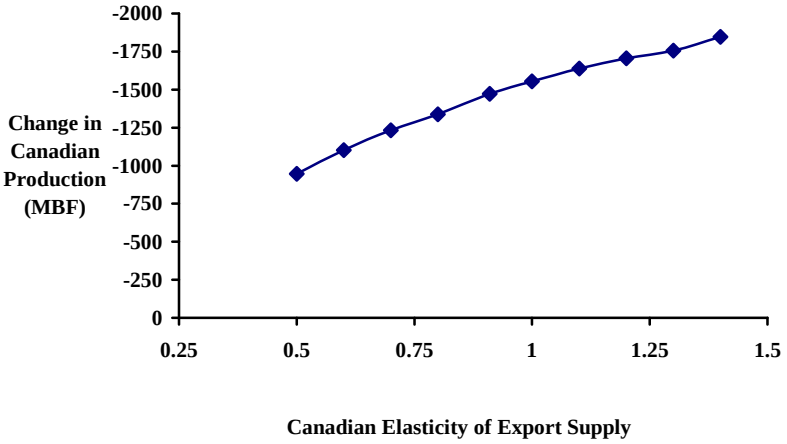

FIGURE 3-8
Sensitivity of Total Canadian Output to Changes in Canadian Elasticity of Export Supply

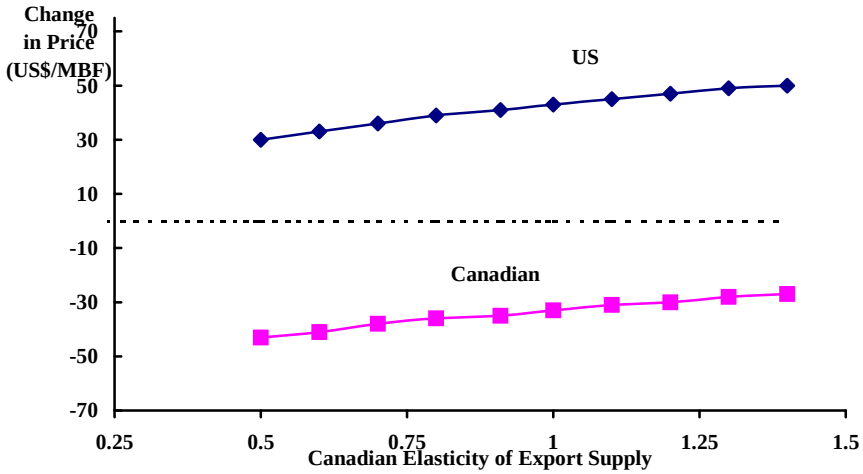

FIGURE 3-9
Sensitivity of US and Canadian Lumber Price to Changes in Canadian Elasticity of Export Supply

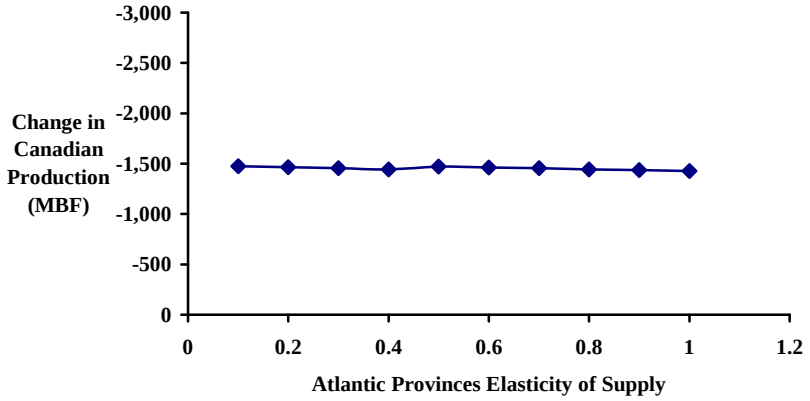

FIGURE 3-10
Sensitivity of Total Canadian Output to Changes in Atlantic Provinces Elasticity of Supply

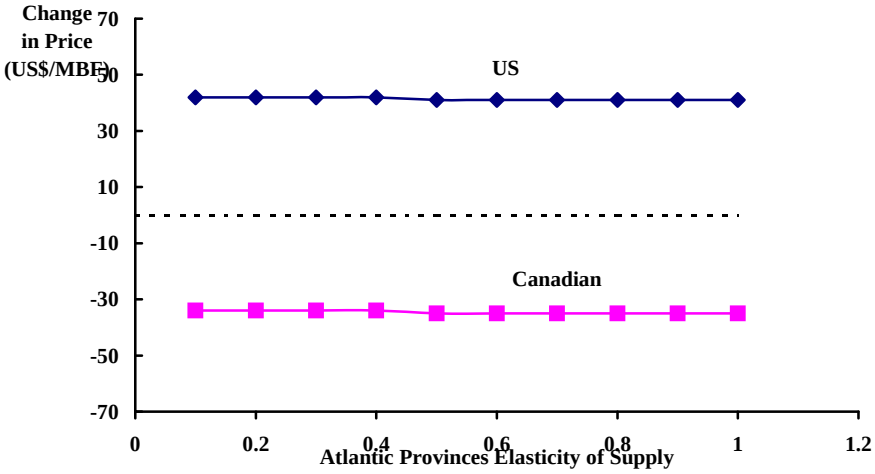

FIGURE 3-11
Sensitivity of US and Canadian Lumber Price to Changes in Atlantic Provinces Elasticity of Supply

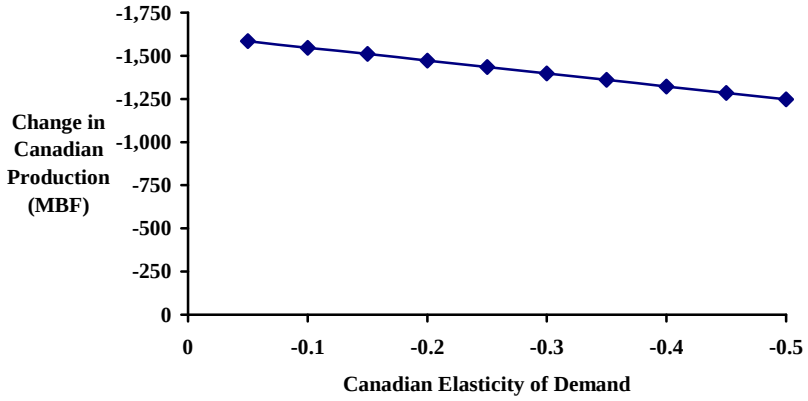

FIGURE 3-12
Sensitivity of Total Canadian Output to Changes in Canadian Elasticity of Demand

SECTION 4
Employment, Household Income and Other Impacts

4.1 Impact Estimation Methodology

Jacques (1996) provides estimates of Canadian employment and household income attributable to the production of major forest product categories, including softwood lumber. Also included are estimates of the indirect impacts to the industries that supply goods and services to the sawmilling industry. For example, the logging industry is a prime supplier to the sawmilling industry. In addition, Jacques also reports the induced impacts due to the spending of household income generated directly and indirectly by the sawmilling industry. Jacques derived these results using Statistics Canada's input-output model for the Canadian economy.

Using Jacques' results, indirect and induced multipliers for employment and household income were developed. However, to use these multipliers the direct employment and household income impacts of the sawmilling industry must first be estimated. The direct impact was estimated by assuming that the 2001 employment level and household income were reduced by the same percentage as the decline in total Canadian softwood lumber production due to the duties. The multipliers were then applied to the direct impact estimate to derive the indirect and induced impacts.

Other impacts, including changes to Canadian lumber industry producer surplus, US consumer surplus, US lumber industry producer surplus and the total duty revenue are also presented.

4.2 Results

<u>Employment</u>

The Survey of Employment, Payrolls and Hours (SEPH) reports 66,865 employees in the sawmill and wood preservation industry during 2001 (Statistics Canada, 2001). If sawmill production falls in the short run by 5.3 percent due to the duty, then, assuming a linear relationship between employment and production, there would be 3,544 jobs directly lost in the sawmill industry. Using the employment multipliers listed in Table 4-1, the indirect impact on the logging and other sectors supplying the sawmill industry would be 4,986. The induced impact, due to the decline in household income, would be a further 3,640 jobs for a total short run impact of 12,170. Using the same methods for the estimated 6.6% decline in production for the long run indicates a total job loss of 15,154.

TABLE 4-1
Employment Impact

Impact	Employment Multiplier	Short Run Employment Loss	Long Run Employment Loss
Direct	1.000	3,544	4,413
Indirect	1.407	4,986	6,209
Induced	1.027	3,640	4,532
Total	3.434	12,170	15,154

Note that these job losses would be over and above any unemployment that had already occurred during 2001. Employment in the sawmill and wood preservation industry during 2000 was 74,145 jobs compared to 66,865 in 2001. This suggests a direct job loss of 7,280 jobs had already taken place. Using the same employment multipliers, the indirect job loss would have been a further 10,243 jobs and the induced impact a further 7,477 jobs. Thus a total of 25,000 jobs may already have been lost in 2001 before the simulated impact of the duty was run.

Another caution on the simulated employment impacts is warranted. The estimated direct job loss is implicitly based on an average number of jobs per unit output ratio. This is acceptable if the industry has a homogenous job/output ratio. However, this is not the case and it is the older, more labour-intensive mills that will likely shut down first. As such the simulated employment impacts may understate the potential job losses.

A further caution is required for the potential employment impacts on the remanufactured lumber and wood products sector. Not all of this sector will fall within the sawmilling industry and thus the impacts on this sector are only partially captured by the estimated employment loss. In addition, because this sector will be taxed on the value of their outputs and not on the value of their lumber inputs (i.e., their value-added is also taxed), this sector will be more vulnerable to the US duties than is the general sawmilling industry. The remanufactured sector is also characterized by a large number of small more labour-intensive firms. This suggests that the potential employment loss in the remanufactured sector may be substantially underestimated.

Household Income

From SEPH, the average salary in the sawmill sector was $43,958 during 2001. The salary multiplied by the number of workers yields a total income for the sector of $2.939 billion. Again assuming a direct relationship between employment and production loss yields an estimated short run household income loss of $156 million and a long run loss of $194 million. Using the income multipliers listed in Table 4-2 the indirect and induced income losses were calculated. This yielded a total household income loss in the short run of $481 million and a long run loss of $599 million.

TABLE 4-2
Household Impact

Impact	Income Multiplier	Short Run Income Loss	Long Run Income Loss
		(Cdn. $ millions)	(Cdn. $ millions)
Direct	1.000	156	194
Indirect	1.333	208	258
Induced	0.755	118	146
Total	3.088	481	599

4.3 Other Impacts

Three other potential welfare impacts due to the duties are now examined; the producer surplus loss to the Canadian lumber industry, the consumer surplus loss to US consumers, and the producer surplus gain to the US lumber industry. An estimate of the total revenue that would be generated by the duties for the US government is also included.

Canadian Industry Revenue Loss

The producer surplus loss to the Canadian lumber industry would be equal to the Canadian price change multiplied by the new production level plus one-half of the price change multiplied by the change in production. However, this procedure must be done separately for the Atlantic Provinces and the Rest of Canada to account for the different duty rates. This procedure was followed for the short and long run production impacts and separated for the Atlantic Provinces and the rest of Canada. The results are given in Table 4-4

TABLE 4-4
Canadian Lumber Industry Producer Surplus Impact

Impact	Short Run	Long Run	Short Run	Long Run
	(Cdn. $ millions)	(Cdn. $ millions)	(US $ millions)	(US $ millions)
Atlantic	+45.3	-13.2	+29.3	-8.5
Rest of Canada	-1,435.2	-2,042.1	-926.5	-1,318.4
Total	-1,389.9	-2,055.3	-897.3	-1,326.9

Offsetting a part of this producer surplus loss may be reduced provincial stumpage fees from harvests from Crown land. This will vary by province and depend on the responsiveness of each province's stumpage fees to changes in the lumber prices received by tenure holders.

US Consumer Surplus Loss and US Lumber Industry Producer Surplus Gain

The consumer surplus loss to the US consumer is the area under the US demand curve between the old and new US price. The producer surplus gain to the US lumber industry is the area above the US domestic supply curve between the old and new US price levels. The results are listed in Table 4-5. The estimated duty revenue is also included in the table. Not surprisingly, the US consumer takes a substantial hit, with a loss of about $2.1 billion in the short run while the US industry has a considerable net revenue gain of about $1.4 billion. The US industry's net revenue gain is even more substantial if the duties collected, about $1.2 billion, are distributed back to the US industry under the Byrd Amendment.

TABLE 4-5
US Consumer Surplus Loss and US Industry Producer Surplus Gain

Impact	**Consumer Surplus Loss**	**US Industry Surplus Gain**	**Duty Revenue**
	(US $ millions)	(US $ millions)	(US $ millions)
Short Run	2,152.3	1,418.0	1,185.1
Long Run	1,146.6	761.6	1,068.2

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