

**Impact of U.S.-Canada Softwood Lumber Trade Dispute on Forest Products Companies:
A Stock Market Perspective**

by

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ABSTRACT

This paper examines the impact of a series of events related to the U.S.-Canada softwood lumber trade dispute on the stock prices of forest products firms in both countries. Our results suggest that trade actions brought substantial gains or losses in the stock prices and that, with the exception of one event, Canadian firms were impacted in the opposite direction of U.S. firms. The impact was broad based in Canada as Canadian firms relied heavily on U.S. market. In the U.S. only medium-size firms' stocks were sensitive to adverse actions. The results may explain the positions taken by forest products firms in the lumber trade dispute.

Key words: Softwood lumber trade dispute, event study methodology, seemingly unrelated regression, portfolio analysis, U.S.-Canada.

JEL Classification: G14, F13.

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INTRODUCTION

The softwood lumber trade dispute between the United States and Canada is the longest and largest trade dispute between the two countries (Cashore 1998). The modern version of the dispute started in 1982 when a group of U.S. lumber producers filed a complaint to the U.S. Department of Commerce, alleging that Canadian lumber producers which obtain most of their timber from Crown (public) lands are subsidized by provincial governments in Canada through low stumpage fees. The two countries have since experienced 5 rounds of trade dispute. The stake is high as U.S.\$6 to 7 billion worth of Canadian softwood lumber goes to the U.S. annually. The current tariff revenue alone, imposed by the U.S. in May 2002 at 27.2 percent, is worth billions of dollar each year. Some insiders call the dispute a “softwood lumber war.”

The major fighters of the “war” are a group of large U.S. and Canadian lumber producers, often on opposite sides. U.S. companies such as International Paper and Georgia-Pacific Corporation are the demanders and supporters of various trade actions and threats of trade actions initiated by the U.S. government. Canadian companies such as Canfor Corporation and Tembec oppose the trade actions and are often the reluctant recipients of trade agreements signed by the two countries. On the other hand, some U.S. firms such as Weyerhaeuser Company are “peculiarly neutral” in the dispute, and some Canadian firms (e.g., privately-held Lignum Limited) are more willing to accept some trade restriction schemes such as tariff-rated quota than other Canadian forest products companies (Zhang 1997). How much do all of these companies gain or lose due to various trade actions? More importantly, who gains, and who loses? Finally, why do companies assume different positions in the trade dispute?

This study examines the stock price reactions, for both U.S. and Canadian softwood lumber producers, to a series of trade actions related to the dispute. While this study does not cover the economic welfare of consumers in either country, it provides a more direct measure of the economic impacts of trade actions on major lumber producers in both countries. The results may explain the motivation of

trade actions demanded and supported by U.S. companies and the responses of Canadian companies and may have implications on U.S.-Canada trade policy.

Wear and Lee (1993) and Myneni et al. (1993) document the economic impacts of the 1986 U.S.-Canada Memorandum of Understanding (MOU) on softwood lumber. Zhang (2001) investigates the price and welfare impacts of the 1996 U.S.-Canada Softwood Lumber Agreement (SLA). All three studies use structural econometric models and focus primarily on U.S. side. van Kooten (2002) use game theory framework to search for the optimal strategy for the Canadian government in lumber trade negotiation, and Yin and Baek (2003) advocate for non-structural time-series model in studying the economic impacts of the trade conflict. Finally, Kinnucan and Zhang (2004) use the equilibrium displacement model to show the economic impacts of the SLA on Canada. The only study that uses stock-market returns to measure producers' welfare on U.S.-Canada lumber trade dispute is Begley et al. (1998) who look into various events led to the 1986 MOU. Other forestry related event studies include Zinkhan (1998), Zhang and Binkley (1995), Boardman et al. (1997), and Binkley and Zhang (1998). Other trade-related event studies include Brander (1991) and Thompson (1993). No event study has been conducted on trade actions/events after the 1986 MOU. The present study fills in this gap. The next section describes major events, followed by methodology, data, and results. The final section concludes.

KEY EVENTS

This study covers the following major events:¹

- Canadian withdrawal from the MOU on September 4, 1991,
- Agreement-in-principle reached for the SLA on February 16, 1996,
- Expiration of the SLA on April 1, 2001, and

¹ There may be other major events in this long trade dispute. We chose these four events based on the surprise factor (e.g., the 1991, 1996, and the 2nd event in 2001) and the significance (e.g., the 1st event in 2001) of the events. See Zhang (1997), Cashore (1998), Zhang and Laband (2004), and Random Lengths (http://www.randomlengths.com/base.asp?s1=In_Depth&s2=U.S.-Canada_Trade_Dispute) for an overview and history of the dispute.

- Imposition of a 19.67 percent preliminary countervailing duty on Canadian lumber imports by U.S. Department of Commerce on August 10, 2001.

On September 4, 1991, the Canadian government notified the U.S. government that it would withdraw from the MOU one month later, as it had met and would continue to honor all MOU commitments. While Canada could legally do so under MOU, this action backfired in Washington, DC. The political response to the withdrawal came almost immediately. For example, Sen. Max Baucus (D., Montana) seemed foreshadow a U.S. response within hours of the announcement: “The United States cannot afford to let this action by the Canadians go unanswered. The United States must take action under U.S. trade laws to let the Canadians know we won’t sit idly by the back out of the softwood lumber agreement” (Wall Street Journal, September 4, 1991, as quoted in Wear and Lee 1993). Soon, 66 U.S. Senators wrote a letter to President George Bush, urging him “either to press the Canadian Government to live up to its commitments or, if it refuses, to take immediate actions under U.S. trade laws in order to offset Canadian subsidy.” They further stated, “if these remedies are not pursued, we are prepared to find a legislative remedy to fully offset Canada’s timber subsidies.” The Bush Administration responded quickly with a self-initiated trade procedure even without the lumber industry’s formal petition, which was rare in the history of U.S. trade dispute with other countries (Zhang and Laband 2004).

The significance of this event, from the perspective of some U.S. companies, was that Canadians “walked away” from the MOU—even with the assurance of the Canadian government to the contrary. For Canadian companies, the strong and swift political response from U.S. Congress (which made the Administration initiate trade action immediately) was not expected. With trade battles looming on the horizon and the results uncertain, it was not clear which side would benefit from the withdrawal.

The U.S. Department of Commerce imposed an interim countervailing duty of 14.48 percent in March 1992 and a final affirmative duty of 6.51 percent in May 1992. By this time, the U.S.-Canada Free Trade Agreement (FTA) had been negotiated and brought into force. Naturally Canada challenged the U.S. tariff under the FTA dispute resolution procedure in the summer of 1992. In the following two years, Canada first won under the FTA bi-national dispute panel procedure and then, on August 3, 1993, the

extraordinary challenge committee with a finding of no subsidy (and thus the countervailing duty imposed by the U.S. government was illegal). However, the Coalition for Fair Lumber Imports—a U.S. lumber producer group— filed a lawsuit in the Appellate Court of the U.S. in Washington, DC, challenging the constitutionality of the dispute resolution process in the FTA (and the North American Free Trade Agreement, or NAFTA). At this moment, seeking congressional approval for NAFTA was one of the top priorities of the Clinton Administration. The Administration did not want the court to determine the fate of NAFTA and requested the Coalition to drop the lawsuit by promising to start consultation with the Canadian government. The Coalition, which regarded consultation as negotiation, dropped the suit, and government-to-government consultation started in December 1994. On February 16, 1996, an agreement-in-principle was reached, and the SLA was formally signed in May 1996.

The SLA set up a tariff-rated quota system for 5 years, started on April 1, 1996. The four major lumber exporting provinces which accounted for more than 95 percent of Canadian lumber export to the U.S. were allowed to have a free export quota of 14.7 billion board feet. The next 650 million board feet exports were initially subject to a US\$50 per thousand board feet (mbf) export tax, and additional exports were subject to a \$100/mbf export tax. The significance of this event was that the U.S. had put a limit to Canadian lumber imports for 5 years, which would benefit U.S. firms. The responses of Canadian firms were somewhat divided. They as a group did not benefit as much as the U.S. firms. Nonetheless, Canadian firms would enjoy quota rent (van Kooten 2002). When a firm had adequate export quota, the quota rent could compensate for and even exceed the loss associated with export limits and tax (Kinnucan and Zhang 2004). Firms without much quota were likely hurt.

The SLA was set to expire on April 1, 2001. This was a relief for some Canadian firms without adequate export quota. However, the Coalition immediately filed a countervailing duty and anti-dumping case on April 2 (April 1 was a Sunday) against Canadian lumber producers to the U.S. Department of Commerce, requesting a 40% countervailing duty, with an additional 28-38% anti-dumping duty. For some U.S. firms the fear was that Canadian lumber might flood the U.S. market after the expiration of the SLA. For Canadian firms which would enjoy free trade at least for a while, the concerns were how long

the free trade period would last and if no free trade in the foreseeable future, how much tariff they would have to pay in order to access the U.S. market. The uncertainty was there for both sides, but for a period of time, free trade of lumber between the two countries took place.

On August 10, 2001, the U.S. Department of Commerce announced a 19.67% preliminary countervailing duty against Canadian lumber imports. The duty was declared retroactive to May 19, 2001 because there was evidence that imports from Canada surged more than 15% when comparing seasonally adjusted second-quarter 2001 statistics with first-quarter 2001 imports. This event made the intention of U.S. government clear and signaled that more adverse actions against Canadian lumber were coming. Indeed, the anti-dumping investigation was soon aligned with the countervailing investigation. The final determination of a 27.2 percent countervailing and anti-dumping duty was levied on May 22, 2002.

METHODOLOGY

This study uses the event-study methodology to examine the reaction of investors to major news or events associated with the softwood lumber trade dispute. The methodology is based on the assumption that capital markets are sufficiently efficient to evaluate the impact of new information (events) on expected future profits of firms. The capital asset price model (CAPM) (Sharpe 1964; Lintner 1965) is the most widely used method in event study. The CAPM specifies a linear relationship between the returns of an individual asset (R_{it}) and the returns to a value-weighted portfolio of all assets (R_{mt}). The CAPM is a simple and robust method to control for financial risk and market-wide effects, although it is not without critiques (Roll 1977; Ross 1978). CAPM states the following relationship

$$(1) \quad R_{it} = \alpha_i + \beta_i R_{mt} + \mu_{it}$$

where R_{it} = the rate of return for stock i on day t ;

R_{mt} = the rate of return on the market portfolio on day t ;

α_i, β_i = regression parameters;

μ_{it} = a random disturbance term, assumed to be normally distributed as $N(0,1)$,

independent of the explanatory variable R_{mt} .

There are two general approaches to event studies. The older, more common, *residual-analysis* method is mainly applied to company specific events. This method assumes that there are no firm-to-firm correlations among the impacts of the event. This assumption clearly is questionable for the kind of regulatory change (trade actions) considered in this study, and can have serious practical consequences if the underlying assumptions—equal variances across firms and no contemporaneous covariance among firms—are invalid (Collins and Dent 1984; Binder 1985, 1998). These shortcomings of residual analysis can be overcome by using a one-step *multiple regression analysis* method which simultaneously estimates an asset pricing model and the effect of the event. This study employs the latter method.

A multiple regression analysis begins by parameterizing the abnormal return γ_i due to the event in an asset-pricing model using the dummy variable D_t that takes the value of 0 prior to the beginning of the event, and 1 afterwards:

$$(2) \quad R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \mu_{it}$$

where γ_i is a regression parameter for stock i . When the explanatory variables in the return-generating process are the same for each of the N firms, the multiple equations below can be estimated jointly as a seemingly unrelated regression equation (SURE) model (Zellner 1962; Theil 1971):

$$(3) \quad \begin{aligned} R_{1t} &= \alpha_1 + \beta_1 R_{mt} + \gamma_1 D_t + \mu_{1t} \\ R_{2t} &= \alpha_2 + \beta_2 R_{mt} + \gamma_2 D_t + \mu_{2t} \\ &\vdots \\ R_{Nt} &= \alpha_N + \beta_N R_{mt} + \gamma_N D_t + \mu_{Nt} \end{aligned}$$

This approach allows individual abnormal returns and residual variances to differ across firms. It also incorporates the cases where the contemporaneous covariance of the disturbances across equations $E(\mu_{it}, \mu_{jt})$ are non-zero, whereas the non-contemporaneous covariance $E(\mu_{it}, \mu_{j,t-k})$ all equal zero. Note that estimating (3) as a system gains no efficiency in either the coefficients or the residual variances, and produces estimates which are identical to those obtained from OLS estimation of the individual equations (Theil 1971, Chapter 7). The advantage of this approach over residual analysis comes in testing the joint

hypotheses since the heteroscedasticity across equations and contemporaneous dependence of the disturbances are explicitly incorporated in the statistical tests (Binder 1985; Collins and Dent 1984).

The null hypothesis of no contemporaneous correlation ($H_0: \sigma_{ij}=0$, for $i \neq j$) can be tested by the Breusch and Pagan test statistic (λ), given as

$$\lambda = T \sum_{i=2}^N \sum_{j=1}^{N-1} r_{ij}^2$$

which is asymptotically distributed as chi-squared (χ^2) with $N(N-1)/2$ degrees of freedom, and r_{ij} is the correlation coefficient of residuals estimated by using the OLS. Given that the stock market data used in this study was time series, serial correlation across observations on each security might exist. We tested the null hypothesis of no autocorrelation, and in some cases, the null hypothesis was rejected. Therefore, we used a formulation of SURE allowing for autocorrelation of order one, $\mu_{it} = \rho_i \mu_{i,t-1} + \varepsilon_{it}$, where ρ_i is the autocorrelation coefficient.

Three null hypotheses are of interest. The first (H_1) is that the *sum* of the abnormal returns (called the *aggregate abnormal return* below) across the N equations equals zero (i.e., $\sum \gamma_i = 0$). This test measures the impact on Canadian or U.S. forest products companies as a whole. The second (H_2) is that *some* of the abnormal returns equal zero (i.e., $\gamma_i = 0$, for some i), with the impact being systematically related to the characteristics of individual firms. Tests of H_2 are more informative than tests of H_1 if an event affects the sample firms but the effects differ in sign and magnitude. A rejection of H_2 would mean that shareholders of some Canadian and/or U.S. firms suffered or gained from the trade actions. The third hypothesis (H_3) is that the abnormal returns—whether significant or not—are equal across equations ($\gamma_i = \gamma_j$ for $i \neq j$).² This hypothesis builds on the previous ones and relates to inter-company differential impacts. Its rejection would mean that abnormal returns are not uniform across firms.

² Note that while estimating the equation system (3) involves the use of Zellner generalized least squares, the constrained system as implied by hypotheses 1 and 3 necessitates the use of maximum likelihood method. See Greene (2003) for details.

DATA

The Canadian and U.S. forest products companies included in this study are listed in Table 1. These companies were selected because they are large softwood lumber producers in each country and their stocks are publicly traded. Collectively they accounted for 32 to 47 percent of softwood lumber production in each country in 1991, 1996, and 2001. To avoid double counting, forest products companies operating in both countries were assigned to one or the other country group based on the headquarter of the company. For instance, Domtar Inc. was in the group of Canadian companies. Similarly, Weyerhaeuser was in the group of U.S. companies though it has sizeable operations in Canada and trade actions impact their operation in both countries in different direction. We could not, however, consistently maintain the same number of companies in the analysis of all four events because of corporate merge and acquisition in the study period. For example, Weldwood of Canada, Champion International, Donohue, Macmillan Bloedel, Union Camp, and Willamette Industries were all acquired by, or merged with, other firms between 1991 and 2001.

Data for U.S. firms included in this study are from CSI (<http://www.csi.com> for stock prices) and EDGAR (<http://www.sec.gov/edgar.shtml>, for no. of common stock shares outstanding). Data for Canadian firms are from the Toronto Stock Exchange (for stock prices) and SEDAR (<http://www.sedar.com> for no. of common stock shares outstanding). The S&P 500 index and TSE 300 index were used as market return index for U.S. and Canada firms, respectively.

The estimation period and event window varies by country and event.³ The estimation period for the 1991 event started on February 1, 1991 to avoid the January effect. The estimation period for the 1996 event is a bit longer, started on February 1, 1996, shortly after both countries had started their

³ There is little agreement in the literature regarding when the estimation period and event window should start and for how long it should last. Therefore a trial-and-error method is often used to choose the starting date. Desai and Stover (1985) start the window at -20 (20 days before event); Dann and James (1982) start at -10. Zinkhan (1988) and Boardman et al. (1992) use -5 as the starting day. In addition to those reported in next section, equation (3) was estimated by using day -5, -3, and -1, as the starting date and date +3, +7, +11 +15 as the ending date. The results did not significantly differ from those reported here.

consultation and negotiations. The estimation period for the first 2001 event started on August 1, 2000 to avoid the technology stock prices decline in April 2000 which dragged down S&P 500 index. The event period for the second 2001 event started on April 20, 2001, when the impact of the first event in 2001 was largely absorbed in the market.

EMPIRICAL RESULTS

Tables 2 to 5 presents the results based on joint estimation of parameter estimates of equation (3) using seemingly unrelated regression. For each SURE model corresponding to the 1991, 1996, and two 2001 events, the hypothesis of zero contemporaneous covariance was rejected according to the Breusch-Pagan test statistics, suggesting that SURE framework is appropriate. In addition, using SURE with AR(1) allowing for autocorrelation of order one resulted in improved estimates.

Based on Wald test, H_1 was rejected in all 4 events in the case of Canada, suggesting that all these events had statistical significant aggregate impacts on Canadian firms as a whole. In the case of U.S., results were mixed; H_1 was rejected in the two 2001 events but not in other events. However, the hypothesis of no abnormal returns for some companies (H_2) was rejected for all events for both U.S. and Canadian forest products firm groups. Lastly, H_3 was rejected twice in the case of Canada (for the 1996 and August 10, 2001 events) and once in the case of U.S. (August 10, 2001), suggesting that impacts were not uniform in these events. Firm characteristics such as firm size and diversification may explain the difference in company-specific impacts.

Termination of the MOU: September 8, 1991

This is the only event to which the stock prices of both Canadian and U.S. firms reacted negatively. While the initial reaction of most U.S. companies to the withdrawal was largely negative, only two firms' stocks—Bowater and Willamette—had significant abnormal returns (Table 2). On the other hand, Canadian expectations for no adverse U.S. trade action evaporated quickly when U.S. political responses to the withdrawal came almost immediately after the announcement and especially when the Bush Administration indicated that it would self-initiate a CVD case against Canadian lumber. The

adverse impacts were broader for Canadian firms, and four of which—Canfor, West Fraser Timber, Weldwood, and Slocan— experienced significant negative abnormal returns (Table 2).

An agreement-in-principle for SLA reached: February 16, 1996

The SLA resulted in the redistribution of benefits among various stakeholders, including U.S. and Canadian treasuries, consumers and lumber industry in each country. Based on the results presented in Table 3, Canadian companies including Canfor, Donohue, Doman, and Ainsworth experienced a significant decline in stock prices over the event window. In contrast, four of the U.S. companies— Georgia Pacific, Champion International, Union Camp, and Willamette—were better off (Table 3). It seems that Canadian investors did not see the SLA and the 5-year peace brought by it as a positive event even though the SLA was the result of negotiations of all parties—governments of, and various forest products firms in, both countries. On the other hand, investors see it as beneficial to U.S. forest products companies.

Expiration of the SLA: April 1, 2001

The expiration of the SLA on April 1, 2001 was perceived as a positive event by Canadian investors in six companies—Canfor, West Fraser Timber, Slocan, International Forest Products, Domtar, and Tembec (Table 4). They had positive returns despite that the Coalition filed cases against Canadian lumber producers, demanding for a huge (as high as 78 percent) duty. Mirroring the opposite response, U.S. firms including Louisiana Pacific, Bowater and Simpson Timber had significant negative returns over the event window (Table 4). This suggests that Canadian investors probably thought that the chance of a preventative duty being eventually imposed was low. Furthermore, even if any duty is imposed, it will not be in the immediate future. Given the large inventory of Canadian lumber accumulated during the late 1990s and 2000 for lack of export quota to the U.S., free trade—even for a period of time—was welcomed to the investors of Canadian forest products companies.

Announcement for a 19.67% preliminary countervailing duty: August 10, 2001

Indeed, the U.S. Department of Commerce announced a countervailing duty of 19.67 percent, much lower than the 40 percent (only for the countervailing duty part) requested by the Coalition.

Nonetheless, this event seemed to have surprised them as six Canadian companies—Canfor, Slocan, Doman, Riverside, Tembec, and Ainsworth—had negative abnormal returns over the event window (Table 5). As expected, the impacts were positive and broad based on the U.S. side; six companies including Georgia Pacific, Louisiana Pacific, Boise Cascades, Plum Creek, Bowater, and Simpson Timber experienced positive abnormal returns. Only Pope and Talbot which had operations in Canada had negative abnormal returns (Table 5).

Industry-wide impacts

After controlling for firm specific risk and movement in market index we estimated the impacts of these events on shareholders' wealth of individual companies and of the whole softwood lumber industry in both countries. The industry-wide impacts were calculated as the total impacts for all firms included in the study divided by their softwood lumber production/capacity share in each country. For the U.S. side, the industry-wide impacts were U.S.\$-5.6 and 7.4 billion for the two 2001 events. These results are similar to Zhang (2001) who found that the SLA had brought the U.S. lumber producers \$7.7 billions in the first four years. The industry-wide impacts for the U.S. were much smaller for the 1991 and 1996 events. On the other hand, industry-wide impacts were pretty even, ranged from CND\$ -720 million to -1.2 billion in the three negative events and 1.2 billion in the first 2001 event (Table 6).

CONCLUSIONS

The findings of this study suggest that event specific impacts associated with the U.S-Canada softwood lumber trade dispute have been large enough to be noticeable in stock prices of forest products firms. In three events (1991, 1996, and August 2001), Canadian forest products firms as a whole were hit hard, but they had substantial gains when free trade returned. Negotiation for the SLA and imposition of countervailing duty by U.S. government hurt the shareholders of Canadian firms. This may explain why some Canadian forest products firms—represented by the Free Trade Lumber Council—favor the litigation (to fight the U.S. case in WTO and NAFTA) route rather than negotiation.

Surprisingly it was several Canadian forest products firms that urged and pressured the Canadian government to withdraw from the MOU. Canadian forest products firms as a whole have suffered for a

long period of the time since. Thus, misperception and miscalculation about what the U.S. would react to the withdrawal and what the NAFTA procedure can help their case by these firms have been costly to all Canadian forest products companies.

Firm specific impacts vary among firms in both countries. Given the relatively higher reliance of Canadian forest products companies on the U.S. market—some 90 percent of all Canadian softwood lumber export going to the U.S.—both medium and large Canadian firms were adversely impacted by restrictive trade actions. In the case of U.S. adverse impacts were confined only to the medium forest products companies such as Bowater, Willamette, and Louisiana Pacific (whose market capitalizations were usually less than U.S.\$3 billion in the study period) while the positive impacts included large companies such as Georgia Pacific Corporation and International Paper (whose market capitalizations were more than U.S.\$10 billion). This suggests that company size and possibly diversification might have helped large U.S. firms, but did not insulate large Canadian companies from specific events.

The last three events had opposite impacts on the stock prices of U.S. and Canadian firms. Given that the impacts are in hundreds of millions and even several billions for softwood lumber producers on both sides of the border, it is not surprising that the trade dispute can be a “war”. As the U.S. companies are currently the winners of the “war”, there is little incentive for them to give up what they have got and there is much incentive for Canadian firms to fight back. Perhaps this explains why the trade dispute has been for so long and why several rounds of negotiation since 2001 have failed to generate an agreement acceptable for companies in both countries. As long as this kind of financial incentives exist, we may see the dispute to go on for a while unless one side has a clear victory in WTO and NAFTA and the losing side live up to the WTO and NAFTA rulings.

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Table 1. List of Canadian and U.S. companies and their share of softwood lumber production/ capacity in each country

	1991*	1996*	2001†
Canadian firms	Share of Canadian softwood lumber production (%)		
Canfor Corporation	6.40	5.20	7.31
West Fraser Timber Co. Ltd.	4.98	5.08	5.66
Weldwood of Canada Ltd.	4.58		
Fletcher Challenge Canada Ltd.	4.00	0.82	
Macmillan Bloedel Ltd.	3.27	3.72	
International Forest Products Ltd.	3.15	2.71	2.36
Domtar Inc.	2.91	2.77	3.54
Slocan Forest Products Ltd.	2.84	4.31	4.01
Doman Industries Ltd.	2.56	2.11	3.07
Donohue Inc.	2.35	4.41	
Avenor Inc. (Can. Pacific For. Prod., Inc.)	1.83	0.96	
Crestbrook Forest Industries Ltd.	1.45	1.44	
Tembec Inc.	1.40	1.56	3.54
Riverside Forest Products Ltd.		1.81	1.77
Ainsworth Lumber Co. Ltd.		0.83	
Primex Forest Products Ltd.		0.75	0.71
Timberwest Forest Ltd.		1.05	
Accumulative share (%)	35.31	36.70	31.97
U.S. Firms	Share of U.S. softwood lumber production (%)		
Weyerhaeuser Co.	8.10	11.46	12.26
Georgia Pacific Corp.	7.32	7.50	6.28
Louisiana-Pacific Corp.	5.49	3.73	2.99
International Paper Co.	2.66	5.58	8.55
Champion International Corp.	2.47	4.22	
Boise Cascade Corp.	2.45	2.19	1.13
Simpson Timber Co.	1.73	2.79	1.75
Pope & Talbot Inc.	1.50	1.70	1.55
Temple-Inland Forest Products Corp.	1.48	1.90	1.65
Plum Creek Manufacturing	1.26	1.28	0.82
Union Camp Corp.	1.25	1.48	
Potlatch Corp.	0.99	1.33	1.55
Willamette Industries Inc.	0.95	1.67	1.96
Bowater Inc.	0.63	0.59	
Accumulative share (%)	38.28	47.42	40.49

*Based on softwood lumber production. Data source: Lumber & Panel North American Fact book 1992-1993, 1998 by Miller Freeman Inc., 600 Harrison Street, San Francisco, CA 94107.

† Based on softwood lumber production capacity. Data source: Paul Jannke, Resource Information Systems, Inc., 4 Alfred Circle, Bedford, MA 01730.

Table 2. SURE parameter estimates for the Sep 4, 1991 event (t-statistics in parentheses).

	α	β	γ
Canadian firms [Window: -1, +15]			
Canfor Corporation	0.0005 (0.37)	0.9196** (3.73)	-0.0079* (1.77)
West Fraser Timber	0.0007 (0.65)	0.1897 (0.86)	-0.0050 [†] (1.39)
Weldwood of Canada Ltd.	-0.0010 (1.06)	0.3175 (1.46)	-0.0048 [†] (1.38)
Donohue Inc.	0.0002 (0.18)	0.6607** (3.15)	-0.0031 (0.92)
Fletcher Challenge Canada Ltd.	0.0004 (0.32)	0.5910** (2.47)	-0.0027 (0.75)
Macmillan Bloedel	-0.0003 (0.30)	0.9595** (5.35)	-0.0014 (0.47)
Int'l Forest Products	0.0003 (0.20)	0.8264** (2.25)	-0.0040 (0.73)
Domtar Inc.	-0.0001 (0.13)	0.6546** (2.12)	-0.0090* (1.82)
Slocan Forest Products	0.0017 (0.83)	0.3154 (0.73)	-0.0072 (1.09)
Doman Industries Ltd.	0.0001 (0.08)	1.6331** (4.28)	-0.0040 (0.73)
Avenor	0.0005 (0.40)	0.4429* (1.84)	-0.0040 (1.02)
Crestbrook Forest Industries	-0.0008 (0.46)	1.4255** (3.70)	-0.0058 (1.01)
Tembec	-0.0001 (0.18)	0.3231* (1.88)	0.0008 (0.33)
No. of observation	167		
Wald Test (for H ₁) (df=1)	7.64**		
Wald Test (for H ₃) (df=12)	6.17		
Breusch-Pagan test (λ_{LM}) (df=78)	188.42		
U.S. Firms [Window: 0, +7]			
Weyerhaeuser Co.	-0.0002 (0.16)	1.1997** (8.74)	0.0057 (0.88)
Georgia Pacific	0.0014 (0.72)	1.0037** (6.35)	0.0012 (0.14)
Louisiana Pacific Corporation	0.0022 (1.12)	0.7839** (4.67)	-0.0054 (0.63)
International Paper	0.0004 (0.36)	0.9920** (9.42)	0.0024 (0.47)
Champion Int'l Corporation	-0.001 (0.69)	0.9896** (7.21)	-0.0029 (0.44)
Boise Cascades	-0.0004 (0.28)	0.8238** (6.04)	-0.0006 (0.11)
Pope and Talbot	-0.0005 (0.28)	0.5548** (3.32)	-0.0056 (0.71)
Temple Inland	0.0012 (0.95)	1.0908** (7.25)	-0.0005 (0.09)
Plum Creek Manufacturing	0.0055** (2.46)	0.6645** (2.68)	-0.0045 (0.44)
Union Camp Corporation	0.0002 (0.18)	1.0244** (9.24)	0.0016 (0.33)
Potlatch	0.0013 (0.73)	0.7085** (3.73)	-0.0027 (0.34)
Willamette Industries Inc.	0.0018 (1.17)	0.6669** (4.26)	-0.0116* (1.66)
Bowater	0.0004 (0.21)	0.9247** (5.84)	-0.0106 [†] (1.31)
No. of observation	167		
Wald Test (for H ₁) (df=1)	0.70		
Wald Test (for H ₃) (df=12)	8.60		
Breusch-Pagan test (λ_{LM}) (df=78)	405.54		

** Significant at 5 percent; * Significant at 10 percent; [†] Significant at 20 percent. Estimation period: Feb 1, 1991- Sep 30, 1991.

Table 3. SURE parameter estimates for the Feb. 16, 1996 event (t-statistics in parentheses).

	α	β	γ
Canadian firms [Window: -1, +11]			
Canfor Corporation	-0.0008 (0.78)	0.8454** (4.21)	-0.0146** (2.92)
West Fraser Timber	-0.0012 (0.54)	0.5098 (0.97)	-0.0054 (0.51)
Donohue Inc.	-0.0003 (0.28)	1.2065 (5.77)	-0.0070 [†] (1.40)
Slocan Forest Products	-0.0001 (0.09)	0.0891 (0.73)	-0.0008 (0.28)
Macmillan Bloedel	-0.0010 [†] (1.38)	1.5584** (12.01)	0.0023 (0.70)
Int'l Forest Products	-0.0001 (0.13)	0.8298** (4.58)	-0.0019 (0.41)
Domtar Inc.	-0.0016 (1.28)	2.0137** (8.50)	0.0006 (0.10)
Doman Industries Ltd.	-0.0009 (0.88)	1.0013** (4.46)	-0.0094** (1.91)
Riverside Forest Products	-0.0014 (1.31)	0.6000** (2.98)	0.0011 (0.22)
Tembec	-0.0022** (2.23)	1.1000** (5.70)	-0.0025 (0.54)
Crestbrook Forest Industries	-0.0026** (2.38)	1.1210* (5.18)	0.0012 (0.24)
Ainsworth Forest Products	-0.0010 (0.65)	0.5733* (1.72)	-0.0120* (1.65)
Primex Forest Products	-0.0006 (0.38)	0.1909 (0.62)	-0.0025 (0.36)
No. of observation	294		
Wald Test (for H ₁) (df=1)	2.36 [†]		
Wald Test (for H ₃) (df=12)	18.03 [†]		
Breusch-Pagan test (λ_{LM}) (df=78)	207.35		
U.S. Firms [Window: -1, +15]			
Weyerhaeuser Co.	-0.0006 (0.78)	1.1657** (8.17)	0.0032 (0.94)
Georgia Pacific	-0.0012 (1.22)	0.9983** (6.89)	0.0053 [†] (1.29)
Louisiana Pacific Corporation	-0.0022* (1.78)	1.6465** (8.00)	0.0042 (0.81)
International Paper	-0.0006 (0.74)	0.8549** (6.44)	0.0027 (0.82)
Champion Int'l Corporation	-0.0008 (0.71)	0.8818** (4.87)	0.0063 [†] (1.33)
Boise Cascades	-0.0001 (0.12)	1.2734** (6.50)	0.0052 (1.01)
Pope and Talbot	-0.0007 (0.71)	0.4744** (4.87)	0.0004 (0.11)
Temple Inland	-0.0010 (1.16)	0.9055** (7.23)	0.0036 (1.05)
Plum Creek Manufacturing	0.0006 (0.88)	0.6755** (5.39)	-0.0014 (0.49)
Union Camp Corporation	-0.0013* (1.65)	0.9270** (7.77)	0.0053* (1.70)
Potlatch	-0.0003 (0.57)	0.7596** (8.09)	0.0019 (0.88)
Willamette Industries Inc.	-0.0010 (0.87)	1.1808** (6.68)	0.0063 [†] (1.30)
Bowater	-0.0001 (0.04)	0.9815** (4.75)	0.0034 (0.52)
No. of observation	294		
Wald Test (for H ₁) (df=1)	1.56		
Wald Test (for H ₃) (df=12)	5.16		
Breusch-Pagan test (λ_{LM}) (df=78)	327.88		

** Significant at 5 percent; * Significant at 10 percent; [†] Significant at 20 percent. Estimation period: Feb 1, 1995-Mar 29, 1996.

Table 4. SURE parameter estimates for the April 2, 2001 event (t-statistics in parentheses).

	α	β	γ
Canadian firms [Window: -2, +2]			
Canfor Corporation	0.0007 (0.40)	0.9821** (91.69)	0.0179* (1.67)
West Fraser Timber	0.0016 (0.80)	0.9741 (76.37)	0.0160**(2.04)
Slocan Forest Products	0.0031 [†] (1.57)	0.9770** (80.68)	0.0230* (1.90)
Int'l Forest Products	0.0025 [†] (1.38)	0.9793** (90.42)	0.0207* (1.91)
Domtar Inc.	0.0019 (1.18)	0.9853** (102.14)	0.0147 [†] (1.52)
Doman Industries Ltd.	-0.0019 (0.38)	1.0155** (33.22)	-0.0155 (0.51)
Riverside Forest Products	-0.0012* (0.47)	0.9842 (65.84)	0.0158 (1.06)
Tembec	0.0005 (0.29)	0.9762** (88.16)	0.0238** (2.15)
Ainsworth Forest Products	-0.0010 (0.37)	0.9957** (59.40)	0.0043 (0.25)
Timberwest Forest Ltd.	0.0028** (2.52)	0.9975** (144.35)	0.0025 (0.36)
No. of observation	182		
Wald Test (for H ₁) (df=1)	5.44**		
Wald Test (for H ₃) (df=9)	7.46		
Breusch-Pagan test (λ_{LM}) (df=45)	132.34		
U.S. Firms [Window: -2, +2]			
Weyerhaeuser Co.	0.0013 (0.79)	0.6088** (4.82)	-0.0057 (0.56)
Georgia Pacific	0.0012 (0.43)	-0.1569 (1.03)	-0.0125 (0.93)
Louisiana Pacific Corporation	-0.0008 (0.30)	-0.3243* (1.66)	-0.0217 [†] (1.31)
International Paper	-0.0002 (0.08)	-0.1823 (1.19)	-0.0042 (0.34)
Boise Cascades	0.0009 (0.48)	-0.1458 (1.06)	-0.0110 (0.93)
Pope and Talbot	-0.0016 (0.84)	0.8705** (6.41)	-0.0055 (0.49)
Temple Inland	0.0012 (0.83)	0.6582** (6.06)	-0.0034 (0.40)
Plum Creek Manufacturing	-0.0008 (0.54)	-0.1335 (1.25)	-0.0023 (0.37)
Potlatch	-0.0007 (0.60)	-0.1194 [†] (1.31)	-0.0016 (0.19)
Bowater	-0.0001 (0.10)	-0.0871 (0.74)	-0.0152 [†] (1.62)
Simpson Timber Co.	0.0002 (0.23)	-0.0388 (0.53)	-0.0081 [†] (1.30)
No. of observation	177		
Wald Test (for H ₁) (df=1)	2.23 [†]		
Wald Test (for H ₃) (df=10)	7.41		
Breusch-Pagan test (λ_{LM}) (df=55)	787.11		

** Significant at 5 percent; * Significant at 10 percent; [†] Significant at 20 percent. Estimation period: August 1, 2000-April 4, 2001.

Table 5. SURE parameter estimates for the August 10, 2001 event (t-statistics in parentheses).

	α	β	γ
Canadian firms [Window: -2, +1]			
Canfor Corporation	0.0018 (0.77)	0.1567 (0.50)	-0.0432** (3.72)
West Fraser Timber	0.0008 (0.40)	0.0437 (0.17)	-0.0050 (0.52)
Slocan Forest Products	-0.0006 (0.21)	0.6614* (1.86)	-0.0226 [†] (1.58)
Int'l Forest Products	-0.0010 (0.34)	0.2487 (0.81)	-0.0129 (0.99)
Domtar Inc.	-0.0003 (0.15)	0.5896** (2.46)	0.0066 (0.68)
Doman Industries Ltd.	-0.0036 (0.63)	1.7766** (2.34)	0.0406 [†] (1.45)
Riverside Forest Products	0.0005 (0.20)	0.273 (0.92)	-0.0233** (2.15)
Tembec	-0.0007 (0.26)	0.6089** (2.21)	-0.0165 [†] (1.36)
Ainsworth Forest Products	0.0045 (1.15)	0.2119 (0.42)	-0.0341* (1.79)
No. of observation	91		
Wald Test (for H ₁) (df=1)	4.17**		
Wald Test (for H ₃) (df=8)	24.97**		
Breusch-Pagan test (λ_{LM}) (df=36)	55.25		
U.S. Firms [Window: -2, +2]			
Weyerhaeuser Co.	0.0014 (1.01)	0.8555** (6.70)	0.0021 (0.38)
Georgia Pacific	0.0022** (2.18)	0.7171** (6.04)	0.0070 [†] (1.61)
Louisiana Pacific Corporation	-0.0022 (1.30)	0.7250** (3.96)	0.0200** (2.80)
International Paper	0.0016 (1.11)	0.8963** (6.31)	0.0037 (0.62)
Boise Cascades	0.0012 (1.04)	0.6070** (5.20)	0.0065 [†] (1.41)
Pope and Talbot	0.0006 (0.28)	0.2474 (1.21)	-0.0136 [†] (1.59)
Temple Inland	0.0024** (2.16)	0.8151** (6.85)	0.0041 (0.88)
Plum Creek Manufacturing	0.0018* (1.72)	0.4095** (3.56)	0.0115** (2.59)
Potlatch	0.0001 (0.06)	0.6515** (5.01)	0.0044 (0.90)
Bowater	0.0002 (0.14)	0.6791** (5.70)	0.0070 [†] (1.38)
Simpson Timber Co.	0.0003 (0.14)	0.0241 (0.17)	0.0180** (2.16)
No. of observation	86		
Wald Test (for H ₁) (df=1)	3.84**		
Wald Test (for H ₃) (df=10)	14.60 [†]		
Breusch-Pagan test (λ_{LM}) (df=55)	817.99		

** Significant at 5 percent; * Significant at 10 percent; [†] Significant at 20 percent. Estimation period: April 20, 2001-August 15, 2001.

Table 6. Impacts[†] of U.S.-Canada softwood lumber trade controversy (in US\$1,000)

	Sep. 4, 1991	Feb.16, 1996	Apr. 2, 2001	Aug. 10, 2001
Canadian Firms				
Avenor	NSND	na	na	na
Ainsworth	na	-19,937	-584,763	-2,929
Crestbrook Forest Industries	-69,979	-15,146	Na	na
Canfor Corporation	-24,867	-147,319	74,970	-107,623
Doman	-2,019	-51,697	-3,256	703,200
Domtar, Inc	-105,127	14,472	27,329	-117,435
Donahue	-18,679	-65,125	na	na
Fletcher Challenge Canada	NSND	na	na	na
Int'l Forest Products	-17,944	-916	23,805	-9,716
Primex Forest Products	na	-908,160	na	na
Riverside Forest Products	na	-902	443,233	-20,490
Slocan Forest Products	-4,353	-21,431	38,824	-39,339
Tembec	3,930	-16,290	89,882	20,588
TimberWest	na	na	-2,813	NSPD
Weldwood of Canada	-52,919	na	na	na
West Fraser Timber	-123	27,649	129,031	51,936
Macmillan Bloedel	-137,532	-6,705	na	na
TOTAL	-429,615	-304,254	377,630	-224,304
Industry-wide impact	-1,216,696	-829,030	1,208,031	-717,544
U.S. Firms				
Weyerhaeuser	41,137	71,706	-1,538	602,281
Georgia Pacific	-3,895	363	-150,461	526,090
Louisiana Pacific	-44,111	7,023	-99,469	156,682
International Paper	-20,249	-253,376	-1,719,885	918,475
Champion International	-101	195,478	na	na
Boise Cascades	15,437	41,134	-12,780	113,236
Pope and Talbot	-2,584	-9,964	-6,831	-12,027
Temple Inland	6,551	58,680	-3,303	213,944
Plum Creek Manufacturing	-252	13,694	-36,716	360,566
Union Camp	43,155	89,456	na	na
Potlatch	-23,141	25,061	-56,354	44,035
Willamette	-55,520	199,043	na	na
Bowater	-6,435	46,981	-162,764	103,355
Simpson Timber Co.	na	na	-30,548	-14,016
TOTAL	-50,009	485,277	-2,280,650	3,012,621
Industry-wide impact	-130,640	1,023,359	-5,632,625	7,440,408

NSND: No number of common share data; na: Not applicable; NSPD: No share price data.

[†]Calculated as $n_i(P_i^1 - \hat{P}_i)$ where n_i is the number of common stock shares for firm i ,

$\hat{P}_i = P_i^0 \exp(\alpha_i + \beta_i \ln(\text{INDEX}^1 / \text{INDEX}^0))$, where P_i^0 is a 10-day average share price, 10 days prior to the test window, P_i^1 and INDEX^1 are respectively i th stock price and market index (S&P 500 or TSE 300) on the last day of the test window (post event).