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The Effects Of The 1996 U.S.-Canada Softwood Lumber Agreement On The Industrial Users Of Lumber: An Event Study

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THE EFFECTS OF THE 1996 U.S.-CANADA SOFTWOOD LUMBER AGREEMENT ON THE INDUSTRIAL USERS OF LUMBER: AN EVENT STUDY

NISHA MALHOTRA and SUMEET GULATI

In this article, we analyze whether the Softwood Lumber Agreement between the United States and Canada imposed significant economic costs on industries that use softwood lumber in the United States. To ascertain this impact, we use an event study. Our event study analyzes variations in the stock prices of lumber-using firms listed at the major stock markets in the United States. We find that the news of events leading to the Softwood Lumber Agreement had significant negative impacts on the stock prices of industries using softwood lumber. The average reduction of stock prices for our sample of firms was approximately 5.42% over all the events considered. (JEL F13, F23*)*

I. INTRODUCTION

Bilateral trade in softwood lumber is the subject of a long-standing and ongoing dispute between Canada and the United States of America (see Zhang, 2007, and Reed, 2001, for a detailed chronology). Since 1982, the United States has claimed, and still claims, that fees charged for harvesting softwood on public lands by certain Canadian provincial governments are artificially low. It also claims that artificially low fees set by provincial governments constitute countervailable subsidies.

In May 1996, Canada and the United States signed the Softwood Lumber Agreement (SLA). Using a tariff rate quota, the SLA voluntarily restricted U.S.-bound exports of Canadian lumber from four provinces, Alberta, British Columbia, Ontario, and Quebec. The first 14.7 billion board feet (BBF) of softwood lumber from these provinces was exported duty free. The next 650 million board feet exported was subject to a tax of $50 per thousand board feet. All further exports were subject to a tax of $100 per thousand board feet.

In this article, we investigate the impact of the SLA on industries in the United States using lumber as an input (called the downstream industry). All else being equal, restrictions on Canadian lumber exports raise lumber prices in the United States.[1] This raises profits for U.S. lumber producers, but also makes those who use lumber worse off. The National Association of Home Builders (2000) estimates that the SLA raises the cost of lumber in an average new U.S. home by 800–1,300 dollars.[2]

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1. Zhang (2001) estimates that the anticipated increase in lumber price in the United States due to the SLA was 16% for its first 4 yr.

2. This estimate was made on April 13, 2000, for a submission to the Trade Policy Staff Committee of the office of the United States Trade Representative. The submission was titled: "Regarding Softwood Lumber Practices in Canada and Softwood Lumber Trade between the United States and Canada."

ABBREVIATIONS

ACA: Average Cumulative Abnormal
ACAH: American Consumers for Affordable Homes
AMEX: American Stock Exchange
BBF: Billion Board Feet
CAPM: Capital Asset Price Model
CFLI: Coalition for Fair Lumber Imports
CRSP: Centre for Research on Security Prices
CUSFTA: Canada U.S. Free Trade Agreement
ITA: International Trade Administration
ITC: International Trade Commission
MOU: Memorandum of Understanding
NASDAQ: National Association of Securities Dealers Automated Quotation
NYSE: New York Stock Exchange
SIC: Standard Industrial Classification
SLA: Softwood Lumber Agreement
TACA: Total Cumulative Abnormal Return
WTO: World Trade Organization

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More dramatically, it also estimates that for every $50 increase in the price of 1,000 board feet of framing lumber, 300,000 potential homeowners are priced out of the housing market. However, homeowners are not the only group affected by an increase in lumber prices. When customers can no longer afford to buy homes, home builders lose business. Furthermore, as the cost of softwood lumber rises, remodeling costs rise, and subsequently, remodeling orders fall. In other words, besides homeowners, trade restrictions on lumber adversely affect other industries that use lumber as a raw material, such as home builders, manufactured-home builders, and lumber dealers.

Most previous studies of the softwood lumber dispute focused on the obvious gainers or losers: the U.S. and Canadian producers, and final U.S. consumers (see, e.g., Li and Zhang, 2006; Zhang and Hussain, 2004; Zhang, 2001; Van Kooten, 2002; and Begley et al., 1998). To our knowledge, the industrial users of softwood lumber are usually ignored. We believe that it is important to include this industry for two reasons. First, as lumber is primarily used as a raw material,[3] the effects of the SLA on the industrial users of lumber are likely to be significant. Secondly, this group is an important political player in the softwood lumber dispute. The American Consumers for Affordable Homes (ACAH; see http://www.acah.org) is a special interest group largely comprising the industrial users of lumber and has been an active participant of this dispute for several years. Because of the literature's omission of this group, potentially large costs borne by this group have so far been ignored.

The antidumping and countervailing duty legislation in the United States also ignores the impact of any proposed duty on the users of the imported good. Currently, U.S. law requires that the International Trade Commission (ITC) and the International Trade Administration (ITA)[4] only consider the effects of trade on the import competing industry and ignore the impact of imposing any countervailing or antidumping duties on consumers of the imported good (see Destler, 2005). We believe that it becomes particularly important to consider the users of the imported good when restricting trade could potentially deny some a basic necessity of life—housing.

To investigate the impact of the SLA, we use an *event study*.[5] We calculate the changes in stock prices of firms that use lumber as an input attributed to the news release of three important events leading to the SLA.[6] Our results indicate that the news of these events had significant negative impacts on the stock prices of industries using softwood lumber. Cumulating the losses over the events considered, we find that the average reduction in stock prices for the firms in our sample was 5.42% indicating that the SLA imposed significant economic costs on the users of lumber. We also disaggregate this impact among the users of lumber. Using four-digit Standard Industrial Classification (SIC) codes, we find that retailers and wholesalers of lumber and other building materials (SIC 5211) had the largest depreciation in their market value. As one would expect, industries that could not easily substitute away from softwood lumber to other inputs (like SIC 5211 and 1521) bore the largest losses from the agreement.[7]

The main contribution of this article is to draw attention to the industrial users of lumber from the protracted softwood lumber dispute between Canada and the United States. We wish to convince the reader that the impact of SLA on the industrial users of lumber is large and significant and hope to persuade researchers and policy makers to interpret results from earlier studies in light of this important player. We also believe that this study is timely given the new deal on softwood lumber between the United States and Canada. The new SLA (SLA, 2006) came into force on October 12, 2006, and uses a combination of export taxes and quotas to

3. In 1993, 83% of the U.S. consumption of softwood lumber was in construction (USITC, 1995). This included new residential, repair and remodeling, and nonresidential construction.

4. The ITC and the ITA are U.S. government agencies deciding antidumping and countervailing duty cases.

5. An *event study* is an empirical study of the price of an asset just before and after an event (e.g., an announcement, merger, or dividend).

6. We consider the following events. The first event date we consider is February 2, 1996. On this day, the Coalition for Fair Lumber Imports (CFLI—a coalition representing U.S. lumber interests) announced its intention to file a petition for a countervailing duty if an agreement between United States and Canada was not reached by February 15, 1996. The second event date is February 15, 1996; on this day an agreement between the two countries was reached in principle. The final event date we consider is April 3, 1996, on which day Canada finalized the agreement and announced its details.

7. There is no quantitative measure of the substitutability, but the industry reports prepared by Gale Group in the *Encyclopedia of American Industries* highlights the relative substitutability for these industries (relative across these industries).

regulate Canadian softwood exports.[8] A similar framework of analysis can be used to estimate expected losses from the new deal on the users of lumber in the United States.

There is a significant literature related to this paper. We discuss a few selected and relevant examples below. Hartigan et al. (1986) use an event study to look at the stock market response to two U.S. government agencies' (the ITC and ITA) decisions in antidumping investigations. Ries (1993) examines the effect of voluntary export restraint agreements on profits in the Japanese automobile industry. Begley et al. (1998) used an event study to assess the impact of export taxes during the Memorandum of Understanding (MOU) on the producers of Canadian lumber. More recently, Zhang and Hussain (2004) used an event study to assess the impact of events related to the MOU, the SLA, and the recent countervailing duty by U.S. authorities in 2001 on producers of lumber. Rucker et al. (2005) use a modified event study to estimate, among other events, the effect of the news of administrative and judicial decisions of the U.S.-Canada lumber dispute on lumber futures prices. While none of the articles studying the U.S.-Canada lumber dispute estimate the effect of the dispute on the industrial users of lumber, there are a few articles estimating the effect of a trade restriction on the downstream industry. Hughes et al. (1997) look at the stock market response to the 1986 U.S./Japan Semiconductor Trade Accord. They find that investors expected both U.S. producers and consumers (the downstream industry) to benefit from this agreement. Liebman and Tomlin (2007) study the effect of Steel Safeguards on the stock prices of U.S. steel firms and downstream consumers (like producers of transportation and electrical equipment). They find that while U.S. firms gained from the Steel Safeguards, downstream consumers suffered significant negative losses from the imposition of the safeguards.

We structure this paper as follows. In Section II, we put the SLA in context of the U.S.-Canadian softwood lumber dispute. In Section III, we describe the event study. In Section A, we discuss the data and the various sources and methods used to find firms that used softwood lumber. In Section IV, we present results and a sensitivity analysis of our results. We conclude in Section V.

II. EVENTS LEADING UP TO THE U.S.-CANADA SLA OF 1996

In Table 1, we list the main countervailing duty investigations involving softwood lumber and their outcomes. For a complete and detailed history of the U.S.-Canada softwood lumber dispute, please read Zhang (2007), Reed (2001), and Van Kooten (2002).

In May 1992, the ITA issued a final determination that set the countervailing duty at 6.51%. Subsequently, Canada appealed the ruling at the dispute settlement body of the Canada-U.S. Free Trade Agreement (CUSFTA). A prolonged period of litigation under the CUSFTA followed. The duty imposed was disallowed by CUSFTA, and finally revoked by the U.S. government in 1994.

Following this revocation came a phase of euphoria in bilateral relations between the United States and Canada. When President Clinton visited Ottawa (February 1995) after the North American Free Trade Agreement, both the United States and Canada were considered to be in a phase of increasing integration (as reported by Leo Ryan in a news report for the *Journal of Commerce* on February 23, 1995). This period can be considered a period of truce in the dispute with no significant developments and a period of relatively free trade. The period of truce is useful for our study as it provides a pre-event estimation period for the event study free of any significant developments related to the dispute.

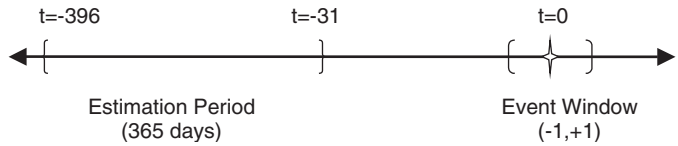
In late 1995, there was renewed pressure on the U.S. government to limit softwood imports from Canada. Given that the Canadian softwood lumber industry had incurred large litigation costs to win Softwood Lumber III, they were willing to look for a negotiated bilateral solution. Despite ongoing negotiations, on February 2, 1996, the U.S. coalition for fair lumber imports

8. On April 27, 2006, the Canadian Prime Minister announced that Canada and the United States had agreed on a 7-yr deal to end the softwood lumber dispute (with the option of renewal for additional 2 yr). While the intended effect of the new SLA is the same as the SLA in 1996, the structure is substantially different from the 1996 SLA. The export measures required by SLA 2006 depend on the prevailing monthly price of softwood lumber. The agreement calls for a increasing export tax combined with a decreasing volume restraint (defined as a proportion of exports to expected monthly consumption in the United States) as lumber prices in the United States fall. Further details of the agreement are available at the Government of Canada's Foreign Affairs and International Trade Web site: http://www.dfait-maeci.gc.ca/eicb/softwood/SLA-main-en.asp.

TABLE 1
History of the Softwood Lumber Agreement

Countervailing Duty Investigations	Outcome
Softwood Lumber I: 1982	U.S. authorities decided no subsidy
Softwood Lumber II: 1986	15% Provisional duty
	replaced by 15% export tax in MOU
Softwood Lumber III: 1991	after Canada unilaterally terminates MOU
	Countervailing case filed: Interim bonding requirement
	Canada wins appeal against countervailing duty in CUSTA (1993 and 1994)
	United States revokes duties against Canadian lumber (August 1994)
	Bilateral consultation process for softwood established
Threat of a Countervailing Duty Investigation: 1996	Softwood Lumber Agreement is signed: The first 650 million board feet over 14.7 BBF was subject to a tax of $50 per thousand board feet, and any further exports were subject to a tax of $100 per thousand board feet

FIGURE 1
The Estimation Period



announced its intentions to petition if no pact was reached by February 15. On April 3, 1996, the 5-yr SLA (from April 1, 1996, to March 31, 2001) was accepted by both sides.

III. THE EVENT STUDY

We will use an *event study* to estimate *abnormal* returns to the value of a firm's stock attributed to the event considered. We assume that capital markets are efficient, and they evaluate the impact of the event on a firm's expected future profit. This implies that *abnormal* changes in the stock price of the firm can be interpreted as the present discounted value of future gains or losses expected due to the event.

In order to calculate *abnormal* returns, we first calculate the relationship between a firm's stock price and the stock market in the absence of the event considered (in our case the SLA). We use the standard estimation period of 365 d that begins 396 d before the event and ends 31 d before the first event considered (as shown in Figure 1).[9] This estimation period is chosen so as to calculate as current a relationship as possible without letting the event affect the estimated relationship. This relationship generates predicted returns in the absence of the SLA. A comparison of these predicted returns with the actual returns on the event dates specific to the SLA gives us *abnormal* returns attributed to the SLA.

More formally, our event study is based on the capital asset price model (CAPM; also commonly termed the market model—Sharpe, 1964, Lintner, 1965), relating the return of an individual firm's stock to the return of a market index and a firm-specific constant,

$$R_{it} = a_i + B_i R_{mt} + e_{it}, \tag{1}$$

where R_{it} is firm i's return at date t; R_{mt} is the return of the value-weighted stock price index at date t; a_i and B_i are the parameters to be estimated; and e_{it} is a serially uncorrelated error term with mean 0 and constant variance σ_i^2 for stock i.[10]

9. For our study, the estimation period starts from January 2, 1995, and ends on January 2, 1996.

10. For a critique of the CAPM, please see Ross (1978).

We use an extended version of the traditional market model to include separate dummy variables for each event date. Thus, an event window of N days requires N dummy variables. The modified estimation equation has the following form:

$$(2)\quad R_{it} = a_i + B_i R_{mt} + \sum_{n=t+1}^{T+N} \mathrm{EW}_{nt} A_{in} + e_{it},$$
$$(t = 1, 2, T, T+1, \ldots, T+N);$$
$$(i = 1, 2, \ldots, I),$$

where EW_{nt} is a dummy variable that takes the value 1 for the nth day of the event window and 0 otherwise, and the A_{in} are additional parameters to be estimated. Equation (3) is estimated using ordinary least squares.

The coefficient of the dummy variable (EW) is the abnormal return (A).

$$\widehat{A}_{it} = R_{it} - (\hat{a}_i + \hat{B}_i R_{mt})$$
$$t = T+1, \ldots, T+N,$$

where a hat on top of a variable indicates its predicted value. There are I sets of equations, one for each firm, with $(T+N)$ observations for each i. In the above model, the estimation period for the slope and the intercept is $(t = 1, \ldots, T)$.[11] There are N days in the event window. The A_{in} coefficients for these N observations are nothing but the prediction errors or the abnormal returns. The dummy variables are aggregated over the event window (N) to obtain cumulative daily abnormal returns for firm i (CA_i):

$$(3)\qquad \mathrm{CA}_i = \sum_{t=T+1}^{T+N} \widehat{A}_{it}.$$

The average cumulative abnormal return across I firms is defined as:

$$(4)\qquad \mathrm{ACA} = \frac{1}{I} \sum_{i=1}^{I} \mathrm{CA}_i.$$

A test statistic introduced by Boehmer, Musumeci, and Poulsen (1991) is used to test for statistical significance of cumulated abnormal returns.[12] We also use the generalized sign test, the null hypothesis for which is that the fraction of positive returns in the event period is the same as in the estimation period.

A. Data

Industrial Users of Softwood Lumber in Our Sample. In the United States, softwood lumber is largely used for constructing new homes and remodeling existing structures. It is also used for building manufactured homes. Accordingly, we shortlist firms from the ACAH that belong to the following four-digit SIC: SIC 1521 (Single-family Housing Construction), SIC 1531 (Operative Builders), 2451(Mobile Homes), and 2452 (Prefabricated Wood Buildings). Besides direct users of lumber, we also include lumber suppliers; these are largely wholesale lumber dealers, SIC 5211 (Lumber and Other Building Materials).[13]

Our sample of lumber-using industry (also referred to as *downstream* industry) draws from two sources, the membership of the ACAH and the *Encyclopedia of American Industries* prepared by Gale Group. The ACAH claims that it represents approximately 95% of softwood lumber use in the United States.[14] Depending on the availability of stock price data, we shortened the list further. Our data for stock price data come from the Centre for Research on Security Prices (CRSP) database, which includes firms that are listed either on the American Stock exchange (AMEX), the New York Stock Exchange (NYSE), or the National Association of Securities Dealers Automated Quotation System (NASDAQ). We also require the availability

11. For more details on this regression equation and its estimation, see Karafiath (1988).

12. It is an extension of the standardized abnormal return test (also known as the Patell test) and corrects for both serial correlation and contemporaneous correlation found in our analysis. Please see the Appendix for more detail on the test statistic used. For further information on the robustness of the results, specification, and power of the test, please see Boehmer et al. (1991).

13. We have tried to be very careful in choosing our sample for industrial users of lumber, because not all members of ACAH are direct consumers or users of softwood lumber. To ensure that we only choose firms that do directly use softwood lumber either as an input or otherwise, we individually investigated each member firm (either by looking up their Web sites or by using characteristics given in the COMPUSTAT database).

14. The members of ACAH include CHEP USA, Citizens for a Sound Economy, Consumers for World Trade, Free Trade Lumber Council, The Home Depot, International Mass Retail Association, International Sleep Products Association, Leggett and Platt Inc., Manufactured Housing Association for Regulatory Reform, Manufactured Housing Institute, National Association of Home Builders, National Black Chamber of Commerce, National Lumber and Building Material Dealers Association, National Retail Federation, and the United States Hispanic Contractors Association (source: the Web site for ACAH).

TABLE 2
Names of Firms Used in the Analysis and Their Classifications

Names	Four-Digit SIC	Ranking* for 1521	Ranking* for 1531
B M C West Corp	5211		
BEAZER HOMES USA	1531		7
CALPROP CORP	1521		
CAPITAL PACIFIC H	1521		
CAVALIER HOMES IN	1531		
CENTEX CORP	1531	2	1
CHAMPION ENTERPRI	2451		
CLAYTON HOMES INC	2451		
D R HORTON INC	1521	4	
DYNAMIC HOMES INC	2451		
ENGLE HOMES INC	1531		6
FLEETWOOD ENTERPR	2451		
GROSSMANS INC	5211		
HOME DEPOT INC	5211		
HOVNANIAN ENTER A	1531		8
KAUFMAN & BROAD H	1521	3	
LENNAR CORP	1531	6	
LIBERTY HOMES I B	2452		
LOWES COMPANIES I	5211		
M D C HOLDINGS IN	1531		
M I SCHOTTENSTEIN	1531		
MANUFACTURED HOME	1521		
N V R INC	1531		
NOBILITY HOMES IN	2451		
OAKWOOD HOMES COR	2451		
PULTE CORP	1521	1	2
RYLAND GROUP INC	1531	7	3
SKYLINE CORP	2451		
SOUTHERN ENERGY H	2452		
STANDARD PACIFIC	1531		
STARRETT HOUSING	1521		
TOLL BROTHERS INC	1531		
U S HOME CORP	1521	8	4
UNITED MOBILE HOM	2451		
WEITZER HOMEBUI A	1521		
WICKES LUMBER CO	5211		
WOLOHAN LUMBER CO	5211		

*This ranks firms in terms of revenues earned in the industry subgroup.
Source: *Encyclopedia of American Industries*, 3rd edition, Gale Group, 2001.

of stock price data during the entire time period relevant for the SLA. The relevant time period begins a year before the first news report regarding possible export restrictions in 1995 and ends 40 d after the last news report regarding the SLA. This process of elimination leaves us with data for 37 firms.

In Table 2, we list the 37 firms used in this analysis. The last two columns include their ranking in terms of revenue in the domestic industry (revenue share data drawn from Gale Group, 2001a, 2001b, 2001c). A few large firms can be classified into both Single-family Housing and Operative Builders. We sorted these firms into a single classification depending on their ranking and their primary SIC listing in the COMPUSTAT database.[15] We find that many industry revenue leaders are included in

15. For example, Centex Corporation (refer to Table 2), which ranked 1 under SIC 1531 and 2 in SIC 1521, was placed under SIC 1521. In case the ranking was not available

our sample. This gives us the hope that our sample represents a significant share of the overall market.

Now we describe our sample from each SIC group separately. We first consider SIC 1521: Single-family Housing Construction industry. Single-family Housing Construction is highly fragmented and dispersed. The industry consists of contractors that are primarily engaged in building, remodeling, and repairing houses. Some large contractors in the industry are also listed as operative builders (SIC 1531). However, around 75% of the establishments engage solely in the construction of single-family housing. In 1997, the five largest contractors accounted for 14% of the revenue in the industry, their total revenue being $11.3 billion.[16] The industry revenue leader, Pulte Corporation, accounted for 2.3% of the housing starts (included in our sample). Other large single-family home contractors include Centex Corporation, Kaufman and Broad Home Corporation, D. R. Horton, and Lennar Corporation (also included in our sample).

Now consider SIC 1531: Operative Builders. Operative builders account for a smaller percentage of construction overall. Operative builders also undertake site development, real estate management activities, land acquisition, land sales, and other miscellaneous operations. Unlike general contractors, operative builders own the structures they erect and act as their own general contractors. The largest operative builder in 1999, with sales of $5.2 billion, was Centex Corporation, followed by Pulte Corporation, Ryland Group, Toll Brothers, and Beazer Homes (all included in our sample).

Next consider SIC 2451: Mobile Homes, and SIC 2452: Prefabricated Wood Buildings together. According to Lindsey et al. (2000), in 1997 23.8% of single-family housing starts and 30.5% of new single-family homes sold were manufactured homes.[17] Thus, these industry groups are also important for our analysis. This industry is relatively more concentrated. There are only 88 manufactured home corporations in the United States, and in 1998, the top 10 manufactured home producers accounted for 78% of total industry shipments. The industry leader was Champion Enterprises, followed by Fleetwood Enterprises, Oakwood Home Corporation, Clayton Homes, and Cavalier Homes (all included in our sample).

Finally, consider SIC 5211: Lumber and Other Building Materials. Several establishments fall into the Retail Lumber and Building Materials category. The largest categories, by far, are Lumber Yards, Home Centers, and Warehouse Home Centers. In these the industry leaders are Home Depot, Lowe's (both included in our sample), Menard Incorporated (a private firm not listed on any stock exchange and thus not in our sample), and the 84 Lumber Company (also a private firm not in our sample).

Event Dates. To find the dates for public media announcements related to the SLA, we use two databases: the Lexis Nexis Academic Database and the Business and Company Resource Center of Gale Group Database. In Table 3, we list what we consider the three most important announcements or events related to the SLA. The second column of the table contains the headline for the news report and the third column lists the news source in which the report was published.

The first event date considered is February 2, 1996. On this date, the Coalition for Fair Lumber Imports (CFLI—a coalition representing U.S. lumber interests) announced its intent to file a petition for a countervailing duty if an agreement between the United States and Canada was not reached by February 15, 1996. This announcement was probably prompted by the lack of progress made in the negotiations between the U.S. and Canadian governments. The second event date considered is February 15, 1996. On this day, under pressure from the CFLI announcement, an agreement between the United States and Canada was reached and announced in principle. The final event date we consider is April 3, 1996. On this day, Canada finalized the SLA and announced its details.

IV. RESULTS

We expect the SLA to have a negative impact on the users of lumber and find results consistent with that hypothesis. Protection for the domestic lumber industry in the form of the Softwood

we placed them under their primary SIC, as specified in the COMPUSTAT database.

16. Much of this descriptive information about this industry and that below is drawn from Gale Group (2001a, 2001b, 2001c).

17. According to Lindsey et al. (2000), this figure was calculated at the request of the National Association of Home Builders by the Bureau of the Census. The calculation was based on Census Bureau analysis described in Howard A. Savage, "Who Could Afford to Buy a House in 1995," *Current Housing Reports*, H121/99-1, August 1999.

TABLE 3
Chronology of Events

Important Events	Headlines	Article
Event 1: February 2, 1996 (Warning by U.S. Producers)	Trade Reprisals Loom for Canada; U.S. Group Sets February 15th Deadline for Lumber Pact	*Journal of Commerce*
Event 2: February 15, 1996 (Agreement Reached in Principle)	U.S. Lumber Industry Welcomes Agreement in Principle over Subsidized Canadian Imports	*PR Newswire Association*
Event 3: April 3, 1996 (Canada Finalizes the Agreement)	Canada Agrees to Tax Softwood Exports to U.S. Ottowa-Washington Deal Averts Another Trade War over Lumber	*Journal of Commerce*

Notes: Search Engine: LexisNexis Academic.

TABLE 4
Stock Price Response to SLA; Event Window (−1, +1)

Event	News	Number of Firms	ACA (%)	Z STAT	Positive:Negative	Z STAT
Event 1	Warning by U.S. Producers	37	−1.50	−2.61**	13:24	−1.42*
Event 2	Agreement Reached in Principle	37	−1.45	−2.63**	11:26	−2.08**
Event 3	Canada Finalizes the Agreement	37	−2.47	−3.18***	9:28	−2.74***

*Significant at 10% confidence interval level;
**significant at 5% confidence interval level;
***significant at 1% confidence interval level.

Lumber Industry had a significantly negative impact on the market value of firms that use lumber as an input. In Table 4, we report the stock price response for the users of lumber to the three events listed above. The average cumulative abnormal returns (ACA) for the event window (−1, +1) (cumulating the average return of firms from 1 d before the news release to 1 d after the news release) is reported in the table. The ACA is significant and negative for all three events.

For the first event, that is, the warning by the CFLI (or U.S. producers), the ACA is significantly negative at the 5% level. The second event, the day the agreement was announced in principle, had a relatively smaller, but still statistically significant, effect on the stock prices. There are two possible reasons for this smaller impact, the first being that the market anticipated this announcement. If the threat by CFLI was seen as credible, the market would have anticipated the announcement of the agreement on the second event date (the earlier threat included this event date as a deadline). The second reason could be that the market did not consider the agreement announced as being credible. Until a few hours before the agreement was announced, several Canadian provincial representatives disagreed over the details of the SLA.[18] The disagreement between provinces was widely known and is likely to have reduced the market's expectation about whether the SLA would be finalized. Consistent with the second possible reason above, the final signing of the SLA caused significant depreciation in the market value of our sample of lumber-using firms. We find a negative 2.38% abnormal return during this event, significant at the 1% level.[19]

18. There are details regarding this disagreement in the news report of the announcement of this agreement (see Table 3 for a reference).

19. Zhang and Hussain (2004) also test the impact of our second event (the SLA being announced in principle) on the stocks of several U.S. and Canadian lumber manufacturing companies. They find that a small number of Canadian companies (4 out of 13) experienced a significant decline in stock prices over the event window, and an even smaller number of U.S. companies (3 out of 13) were better off over the same event window. All other companies considered in their sample found no statistically significant impact on their stock prices due to the news of this event. They also

TABLE 5
Stock Price Response, Cumulated over All Events,[a] by Four-Digit SIC, Event Window (−1, +1)

SIC Four-Digit	Industries	Event Window	Number of Firms	TACA (%)	*Z* STAT
1521	Single-Family Housing Construction and Residential Construction, Nec	(−1, +1)	9	−6.19	−2.90***
1531	Operative Builders	(−1, +1)	11	−4.22	−0.88
2451 and 2452	Mobile Homes and Prefabricated Wood Buildings	(−1, +1)	11	−1.88	0.04
5211	Lumber and Other Building Materials[b]	(−1, +1)	6	−12.99	−2.08**
ALL	ALL	(−1, +1)	37	−5.42	−1.84**

[a]This table includes TACA for all three events. Event 1: U.S. producers warn they will petition if no pact by February 15th; Event 2: Agreement in principle reached; Event 3: Canada finalizes the SLA agreement.

[b]"Other" consists of four-digit SICs: 2515-Mattresses and Bedsprings; 5031-Lumber, Plywood, and Millwork; 5271-Mobile Home Dealers.

*Significant at 10% confidence interval level;
**significant at 5% confidence interval level;
***significant at 1% confidence interval level.

In the sixth column of Table 4, we report the number of firms with positive and negative average abnormal returns for the event window. For all three events, firms with negative returns outnumber the firms with positive returns. For the final event, when Canada finalized the agreement, the number of firms that lost market value are more than three times those that gained value. In the last column of Table 4, we report the test statistic for the generalized sign test. This tests whether the fraction of positive returns for the event window is the same as in those during the estimation period. For each of the events, the null hypothesis that the number of positive returns is the same as those during the event window is rejected. In other words, the decrease in the number of firms losing value during each event is statistically significant. For the final event, when Canada finalized the agreement, 28 of the 37 firms reported negative abnormal returns, and this is significantly different from similar ratios during the estimation period at the 1% level.

We add the cumulative abnormal returns for all three events to obtain the total cumulative abnormal return (TACA). In Table 5, we present the TACA for each of the four-digit SIC industries considered (1521, 1531, 2451 and 2452, 5211, and all others). The results suggest that the response to SLA varied across industries. Firms belonging to SIC 5211 (Lumber and Other Building Materials) had the largest depreciation in their market value. Their TACA was −12.99% and is significant at the 1% level. The next largest impact occurred in Single-family Housing Construction. Their TACA was −6.19% and was significant at the 1% level. Although TACA for SICs 1531 and 2451 and 2452 are negative, they are not statistically significant. This is probably because the consumption of softwood lumber in Mobile Homes and Prefabricated Wood Buildings is relatively small. Also, firms belonging to Operative Builders (SIC 1531) are involved in many other activities like site development work, real estate management activities, land acquisition, and land sales. The impact on these firms is thus likely to be less than for firms belonging to Single-family Housing Construction, where 75% of establishments engage in the same single activity. In the last row of Table 5, we present results cumulated for all three events, for all firms in our sample. We find that the market

find that the overall effect (or ACA) for Canadian firms is negative and significant only at 20%. The overall effect (the ACA) of this event on U.S. firms is not statistically significant. As this is the only event they consider for the SLA we cannot compare their results with ours for the other events; however, their lack of significance probably derives from the same reasons discussed above: the announcement of the agreement in principle was not credible and was not surprising given the earlier warning given by the CFLI.

TABLE 6
Stock Price Response for All the Events[a]; Various Event Windows

Event Window	Number of Firms	TACA (%)	*Z* STAT
(−1, +1)	37	-5.42	-1.84**
(−2, +2)	37	-5.11	-2.03**
(−3, +3)	37	-3.55	-2.27**
(−5, +5)	37	-5.10	-2.19**

[a]Event 1: U.S. producers warn they will petition if no pact by February 15th; Event 2: Agreement in principle reached; Event 3: Canada finalizes the SLA agreement.
*Significant at 10% confidence interval level;
**significant at 5% confidence interval level;
***significant at 1% confidence interval level.

value of all firms in our sample depreciated by 5.42%, and this is significant at the 5% level.

A. Sensitivity to the Definition of Event Windows

We test the sensitivity of these results to the definition of the event window by expanding our event window. In Table 6, we report TACA for various event windows. Irrespective of the definition of an event window, the TACA is negative and significant at the 5% level, and point estimates are similar across windows. We also carried out similar analysis for an event window of 5 d, (−2, +2) (see Tables 7 and 8). As with the 3-d event window, the last event (Canada's finalizing of the agreement) had the biggest impact, and again this is significant at the 1% level. The other events also reduced market value, but the reduction was not statistically significant for the first event. Even at the industry level, results do not vary much across event windows.[20]

V. CONCLUSION

In this article, we evaluate whether the SLA had a significant economic impact on the industrial users of lumber. To ascertain the impact of the SLA on users of lumber, we study stock price variations of lumber-using firms. We find that information of the events leading to the SLA brought about large and statistically significant reductions in the stock values of the firms in our sample. Nevertheless, a few caveats are due. We only include firms listed in the major stock exchanges in the United States. While we believe that our sample covers a significant share of the relevant industries, it is important to remember that the sample is not comprehensive. If we could include all firms that used softwood lumber, the cumulative negative effect is likely to be larger still.[21]

If we assume that the stock market processes information efficiently, this reduction in stock value can be interpreted as the economic loss expected from the SLA. Use of an event study is not restricted to only SLA. We can use an event study to analyze any policy measure that impacts firms listed in the stock exchange. The benefit of using an event study is that it can measure the impact of the policy the instant it is adopted.

This article illustrates the importance of studying the industrial users of lumber while analyzing the softwood lumber dispute between Canada and the United States. Industrial use makes up a majority of the first wave of U.S. consumption of lumber. The costs of any trade restriction on lumber are going to be shared by the industrial users and final consumers. Through this article, we present an estimate of the cost borne by the industrial users of lumber. While analyzing the impact of trade-restricting policies, the government only

TABLE 7
Stock Price Response to SLA; Event Window (−2, +2)

Event	News	Number of Firms	ACA (%)	*Z* STAT	Positive:Negative	*Z* Stat
Event 1	Warning by U.S. Producers	37	−1.14	−1.94*	14:23	−1.09
Event 2	Agreement Reached in Principle	37	−1.01	−2.13*	10:27	−2.41***
Event 3	Canada Finalizes the Agreement	37	−2.96	−3.52***	12:25	−1.75**

*Significant at 10% confidence interval level;
**significant at 5% confidence interval level;
***significant at 1% confidence interval level.

20. We also find that changing the estimation period did not impact the results either. These results and tables can be obtained from the authors.

21. It is important to note that the average loss to all firms might increase or decrease with the inclusion of more firms.

TABLE 8
Stock Price Response for All the Events[a] at Four-Digit SIC; Event Window (−2, +2)

SIC Four-Digit	Industries	Event Window	Number of Firms	TACA (%)	*Z* STAT
1521	Single-family Housing Construction and Residential Construction, Nec	(−2, +2)	9	−5.98	−2.74***
1531	Operative Builders	(−2, +2)	11	−7.20	−0.92
2451 and 2452	Mobile Homes and Prefabricated Wood Buildings	(−2, +2)	11	−0.84	0.01
5211	Lumber and Other Building Materials[b]	(−2, +2)	6	−7.79	−1.76**
ALL	ALL	(−2, +2)	37	−5.11	−2.03**

[a]Event 1: U.S. producers warn they will petition if no pact by February 15th; Event 2: Agreement in principle reached; Event 3: Canada finalizes the SLA agreement.
[b]"Other" consists of four-digit SICs: 2515-Mattresses and Bedsprings; 5031-Lumber, Plywood, and Millwork; 5271-Mobile Home Dealers.
*Significant at 10% confidence interval level;
**significant at 5% confidence interval level;
***significant at 1% confidence interval level.

considers the import-competing industries. As with the case for antidumping and countervailing duties,[22] there needs to be a mechanism under which the losses to the downstream industry and the consumers are also considered.

APPENDIX ON THE METHODOLOGY USED IN EVENT STUDY

Estimates

For each firm, we have an equation,

$$\boldsymbol{R} = \boldsymbol{XZ} + \boldsymbol{e},$$

where $\boldsymbol{R}$ is a $[(T+N)*1]$ vector; $\boldsymbol{X}$ is $[(T+N)*(2+N)]$ matrix; $\boldsymbol{Z}$ is a $[(2+N)*1]$ vector of coefficients; and $\boldsymbol{e}$ is a $[(T+N)*1]$ vector. The partitioned $\boldsymbol{X}$ matrix can be written as:

$$\boldsymbol{X} = \begin{bmatrix} \boldsymbol{X}_T & 0 \\ \boldsymbol{X}_N & \boldsymbol{I} \end{bmatrix},$$

where $\boldsymbol{X}_T$ is a $[T*2]$ matrix and $\boldsymbol{X}_N$ is a $[N*2]$ matrix. The upper right-hand corner is a $[T*N]$ matrix of zeros, and the lower right-hand corner is a $[N*N]$ identity matrix. The estimated coefficient matrix is:

$$\widehat{\boldsymbol{Z}} = [\boldsymbol{X}'\boldsymbol{X}]^{-1}[\boldsymbol{X}'\boldsymbol{Y}].$$

Inverting the above $\boldsymbol{X}$ matrix and solving for $\widehat{\boldsymbol{Z}}$,

$$[\boldsymbol{X}'\boldsymbol{X}]^{-1} = \begin{bmatrix} (\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1} & -(\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1}\boldsymbol{X}_N' \\ -\boldsymbol{X}_N(\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1} & \boldsymbol{I} + \boldsymbol{X}_N(\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1}\boldsymbol{X}_N' \end{bmatrix}$$

$$[\boldsymbol{X}'\boldsymbol{X}]^{-1}\boldsymbol{X}'\boldsymbol{R} = \begin{bmatrix} (\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1}\boldsymbol{X}_T'\boldsymbol{R}_T \\ -\boldsymbol{X}_N(\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1}(\boldsymbol{X}_T'\boldsymbol{R}_T) + \boldsymbol{R}N \end{bmatrix} = \begin{bmatrix} \widehat{\boldsymbol{Z}}_T \\ \widehat{\boldsymbol{Z}}_N \end{bmatrix}.$$

Because there is a dummy variable for each day in the event window that takes the value 1 on the nth day and 0 otherwise, only the first T observations without the dummies are used to estimate the slope and the parameters $\widehat{\boldsymbol{Z}}_T' = \hat{a}_i, \hat{B}$, as in the traditional market model. $\widehat{A}$ are the abnormal returns that are estimated using the estimates of $\hat{a}_i$, $\hat{B}$ from the first T observations and is reduced to $\boldsymbol{R}_N - \boldsymbol{X}_N\widehat{\boldsymbol{Z}}_T$.

Covariance

In order to design a statistic to test the significance of the ACA, the characteristics of the abnormal returns need to be studied in a little more detail. Abnormal return by design exhibit sampling error, abnormal return, $\widehat{A}_i$, has an expected mean of zero and the covariance matrix is given by:

$$\boldsymbol{V}_i = \sigma_i^2[\boldsymbol{I} + \boldsymbol{X}_N(\boldsymbol{X}_T'\boldsymbol{X}_T)^{-1}\boldsymbol{X}_N'];$$

T = estimation period; N = event window,

where $\boldsymbol{X}_T$ is the matrix of explanatory variables over the estimation period and $\boldsymbol{X}_N$ is the matrix of explanatory variables over the event window. The covariance matrix, $\boldsymbol{V}(\widehat{A}_i)$, has two parts. The first term in the covariance matrix is the variance due to random disturbances and the second

22. For more information, please read the World Trade Organization (WTO) reports on the *measure of injury* in the injury decision for the Antidumping Legislation (available at http://www.wto.org). Also see Destler (2005).

term is the additional variance due to the sampling error (due to prediction outside the estimation period). The maximum likelihood estimate of the variance $\text{cov}(A_{ip}, A_{is})$, for $p = s$ (the variance of the abnormal return) is

$$S^2(\widehat{A}_i) = s_i^2 \left[1 + \frac{1}{T} + \frac{(R_{mt} - \overline{R}_m)^2}{\sum_{t=1}^{T} (R_{mt} - \overline{R}_m)^2} \right],$$

where $\overline{R}_m = \frac{1}{T} \sum_{t=1}^{T} R_{mt}$.

Testing for the statistical significance of CA (aggregated abnormal returns over the event window) is complicated by serial correlation of the abnormal returns.[23] Abnormal returns are serially correlated despite the fact that the true disturbances, e_{it}, are independent through time. The variance of the cumulative abnormal return, given serial correlation in the series of abnormal return, is equal to the sum of the variances of the individual abnormal returns plus twice the sum of their covariances,

$$V(\text{CA}_i) = \sigma_i^2 \boldsymbol{i}' [\boldsymbol{I} + \boldsymbol{X}_N (\boldsymbol{X}'_T \boldsymbol{X}_T)^{-1} \boldsymbol{X}'_N] \boldsymbol{i},$$

where $\boldsymbol{i}$ is a $(N* 1)$ unit vector. This implies that for an event window that extends from $t = 1 - N$, the estimate of covariance is:

$$S^2(\text{CA}_i) = (N+1)\sigma_i^2 \times \left[\left(1 + \frac{N+1}{T} + \frac{(\sum_{t=p}^{s} R_{mt} - 2\overline{R}_m)^2}{\sum_{t=1}^{T} (R_{mt} - \overline{R}_m)^2} \right) \right].$$

Test Statistic

The standardized cumulative abnormal return for firm i is

$$Z(\text{CA}_i) = \frac{\text{CA}_i}{S^2(\text{CA}_i)}.$$

The following Z statistic is used to test for the statistical significance of cumulated average abnormal return for an event:

$$Z(\text{ACA}) = \frac{\sum_{i=1}^{\boldsymbol{I}} Z(\text{CA}_i)}{\boldsymbol{I}^{1/2} \left[\frac{1}{\boldsymbol{I}-1} \sum_{i=1}^{\boldsymbol{I}} \left(Z(\text{CA}_i) - \frac{1}{\boldsymbol{I}} \sum_{i=1}^{\boldsymbol{I}} Z(CA_i) \right) \right]}.$$

The following Z statistic is used to test for the statistical significance of the total cumulated average abnormal return for all the events considered:

$$Z(\text{TACA}) = \frac{\sum_{e=1}^{E} \sum \text{ACA}_e / [V(\text{ACA}_e)]^{1/2}}{N^{1/2}}.$$

23. For a firm, all the abnormal returns estimates use the same intercept and slope parameters.

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