Empirical Evaluations of Heterogeneous Firm Models: An Event Study Approach*

Holger Breinlich†

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Abstract

This paper presents novel empirical evidence on key predictions of heterogeneous firm models by examining stock market reactions to the Canada-United States Free Trade Agreement of 1989. Using the uncertainty surrounding the agreement's ratification, I show that the pattern of abnormal returns of Canadian manufacturing firms was broadly consistent with the predictions of a class of models based on Melitz (2003). Increases in the likelihood of ratification led to stock market gains of exporting firms relative to non-exporters. Moreover, gains were higher in sectors with larger cuts in U.S. import tariffs. Decreases in the likelihood of ratification led to opposite stock market reactions. Results for the impact of Canadian tariff reductions are less conclusive but most specifications suggest that exporters also gained relative to non-exporters in response to such reductions.

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†University of Essex, CEP and CEPR. Address: Wivenhoe Park, Colchester CO4 3SQ, United Kingdom. Tel.: +44 (0)1206 87 2768. E-mail: hbrein@essex.ac.uk.

1 Introduction

The last decade has seen a revolution in the theoretical analysis of trade liberalization episodes. Since the seminal contribution by Melitz (2003), models with heterogeneous firms have all but replaced traditional modelling approaches with homogeneous firms. The key innovation of Melitz and subsequent extensions was to show how trade liberalization leads to aggregate productivity gains through intra-industry reallocation.[1] The mechanism underlying this reallocation is the differential impact of trade liberalization on exporting and non-exporting firms. While exporters benefit from increased access to foreign markets, non-exporters suffer lower profits due to increased product and factor market competition. Together with the assumption that exporters are more productive than non-exporters, the ensuing reallocation of market shares towards exporting firms raises aggregate productivity.

Many features of heterogeneous firm models are consistent with stylized facts which have emerged from a large empirical literature over the years. For example, Bernard and Jensen (1999) provide evidence that more productive firms self-select into export markets. Tybout (2003) summarizes several studies which show that market share reallocations were an important part of trade liberalization episodes. A smaller literature also provides more direct evidence on the impact of lower trade costs on the reallocation of market shares between exporters and non-exporters (*e.g.*, Bernard, Jensen and Schott, 2006; Trefler, 2004).

A common feature of all empirical studies to date is their ex-post character. That is, they track the firm-level variables of interest for a number of years and try to isolate the impact of trade policy changes from a large number of confounding factors. Depending on the specific setting of the liberalization episode, this can pose consirable econometric challenges (see, for example, Trefler, 2004).

In this paper, I take a different approach to providing evidence for the differential impact of trade liberalization on exporters and non-exporters. I do so by using stock market reactions surrounding the implementation of the Canada-United States Free Trade Agreement of 1989 (henceforth, CUSFTA). Under the assumption of efficient stock markets, share price reactions to unanticipated changes in the likelihood of CUSFTA's implementation will reflect changes to future profit opportunities of firms. One advantage of such an approach over traditional ex-post evaluations is that the number of confounding factors is much more limited. Essentially, only factors about which expectations change during my one- to seven-day event windows will have the potential to contaminate the estimates.[2]

CUSFTA is particularly well suited for providing event study evidence on heterogeneous firm models. In particular, the agreement was the main election issue in the Canadian general election of November 1988. Both the election itself as well as a number of events in its run-up provide unanticipated changes in the likelihood of CUSFTA's implementation which can be usefully exploited for event study evidence. Secondly, CUSFTA was a reciprocal agreement and

[1] See, for example, Melitz and Ottaviano (2008) and Chaney (2008). An alternative approach developed by Eaton and Kortum (2002) and Bernard et al. (2003) yields very similar predictions about the effects of trade liberalization.

[2] This advantage comes at the well known cost that event studies are joint tests of the theory in question and the efficient markets hypothesis (see Campbell et al., 1997). My approach is thus best understood as complementing the traditional ex-post evaluations of trade liberalizations.

is as such suitable for analyzing the differential impact of domestic and foreign tariffs. This distinction is a key element of many of the more recent heterogeneous firm models such as Melitz and Ottaviano (2008) or Chaney (2008). Finally, the large variation of tariff cuts across sectors allows the implementation of a differences-in-differences estimation strategy within the event study framework.

My findings are broadly supportive of the predictions of heterogeneous firm models. The election victory of the ruling Progressive Conservatives (a strong supporter of CUSFTA) led to significant stock market gains of exporting firms relative to non-exporting firms. In contrast, opinion polls in the run-up to the election showing a substantial lead for the oppositional Liberal Party (who were opposed to CUSFTA) resulted in negative abnormal returns of exporters compared to non-exporters.

In order to address the possibility that a Conservative election victory may have affected these two groups of firms differently through channels other than CUSFTA, I compare return differences between exporters and non-exporters across industries with different extents of tariff cuts. Consistent with theoretical predictions, I find that the relative gains and losses of exporters were indeed significantly higher in sectors with larger U.S. tariff cuts.

As a further check on my results, I also examine stock market reactions to two earlier events which were directly related to CUSFTA but not the election itself: the reaching of an agreement on CUSFTA after difficult negotiations between the U.S. and Canada in October 1987; and the refusal of the Canadian Senate to ratify the agreement in July 1988. I again find that stock prices of exporters increased relative to those of non-exporters in reaction to the first event, and decreased in response to the second event. As before, reactions were stronger in sectors with higher future U.S. tariff cuts.

My results are less conclusive with respect to the effects of Canadian tariff cuts. The majority of results suggests that exporting firms also gained relative to non-exporting firms in response to such tariff reductions. However, the corresponding coefficient estimates are generally small and have the wrong sign for some specifications and events.

A small group of papers also employs stock market event studies to test theories of international trade. Grossman and Levinsohn (1989) provide evidence in favor of the specific-factor model of trade, and Thompson (1994) for hypotheses based on comparative advantage and economies of scale. Hartigan et al. (1986) and Ries (1993) analyze stock market reactions to trade policy announcements such as VERs and temporary protection of specific industries. Aguiar et al. (2003) use an event study approach to explore the extent to which foreign ownership increases the profitability of firms in emerging markets. Brander (1991) and Thompson (1993) also evaluate stock market reactions to CUSFTA although they do not directly test theories of international trade. None of these papers provides evidence on the newer theories of heterogeneous firms. In contrast to past papers linking trade liberalization with stock market reactions, the present paper also has the added advantage of being able to rely on sectoral variation in tariff cuts, which substantially increases the potential for convincing econometric identification.

The rest of this paper is structured as follows. Section 2 derives theoretical predictions of heterogeneous firm models with respect to stock prices. Section 3 describes CUSFTA and the

specific events I study in more detail. Section 4 discusses the event study methodology and describes the data sources used. Sections 5 and 6 present the empirical results and section 7 concludes.

2 Theoretical Predictions

To theoretically demonstrate the link between models of heterogeneous firms and stock market reactions to expected changes in trade costs, I take a two-step approach. I first show how stock market prices are linked to firm-level profits. I then discuss the predictions of heterogeneous firm models with respect to how profits change in response to reductions in domestic and foreign tariffs.

2.1 Linking stock prices to expected profits

The standard approach to linking stock market prices to expected profits is the dividend discount model (see, for example, Brealey and Myers, 2000). The dividend discount model states that the price of firm i's shares at time t equals the net present value of its future stream of dividends per share:

$$p_{it} = \sum\nolimits_{s=1}^{\infty} \frac{E(DIV_i|I_t)}{(1+r_i)^s} = \frac{E(DIV_i|I_t)}{r_i}$$

where $E(DIV_i|I_t)$ is the expected value of future per-period dividends per share of firm i, given information available on date t (I_t), and r_i is the expected return on securities in the same risk class as firm i. Assuming that firms disburse all profits as dividends, or that profits are reinvested at an internal rate of return equal to r_i, share prices are simply the net present value of expected future profits per share:[3]

$$p_{it} = \sum\nolimits_{s=1}^{\infty} \frac{E(\pi_i|I_t)}{(1+r_i)^s} = \frac{E(\pi_i|I_t)}{r_i}$$

The key to link share prices to predictions of heterogeneous firm models is thus through changes in expected future profits.

Now consider two groups of firms, exporters (X) and non-exporters (NX). Relative stock market returns between these two groups upon the arrival of new information will be (assuming r_i stays constant for both groups):

$$\frac{r_X}{r_{NX}} = \frac{E(\pi_X|I_{t+\varepsilon})/E(\pi_X|I_t)}{E(\pi_{NX}|I_{t+\varepsilon})/E(\pi_{NX}|I_t)}$$

What matters for relative stock market returns is thus the change in profits of exporters relative to non-exporters after the arrival of new information (regarding the likelihood of CUSFTA's implementation in the present case).

[3] Note that it is straightforward to allow for growth in expected dividends or positive net present value projects (see Brealey and Myers, 2000). Since this would not add any new insights for the purpose of this paper, I abstract from such complications.

2.2 Firm-Level Profits and Trade Liberalization

I now turn to a discussion of how profit changes after trade liberalization vary across exporters and non-exporters in models with heterogeneous firms. A common feature of all heterogeneous firm models is the assumption of segmented markets and constant marginal costs. This allows total profits of firm i to be split into a part derived from domestic sales and one derived from export sales:

$$\pi_{it}\left(\tau_d, \tau_f; Z\right) = \pi_{idt}\left(\tau_d, \tau_f; Z\right) + \pi_{ixt}\left(\tau_d, \tau_f; Z\right)$$

where τ_d denotes domestic tariffs, τ_f foreign (here: U.S.) tariffs and Z all other factors influencing profits. As I am interested in predictions with respect to τ_d and τ_f only, I disregard Z in the following. Totally differentiating the above expression with respect to the two tariffs yields:

$$d\pi_{it} = \left(\frac{\partial \pi_{idt}}{\partial \tau_d} + \frac{\partial \pi_{ixt}}{\partial \tau_d}\right) d\tau_d + \left(\frac{\partial \pi_{idt}}{\partial \tau_f} + \frac{\partial \pi_{ixt}}{\partial \tau_f}\right) d\tau_f \tag{1}$$

Equation (1) provides the background for the following discussion of the predictions of heterogeneous firm models. I focus my attention on Melitz's original contribution as well as on two influential extensions: Melitz and Ottaviano (2008) and Chaney (2008). The latter two papers have the advantage of explicitly modelling asymmetric domestic and foreign tariffs which are a key feature of CUSFTA. I derive formal analytic expressions for the elements of (1) for these two models in appendix A. Here, I discuss the underlying intuition.

In Melitz (2003) reallocation after trade liberalization is triggered by increased export opportunities. While tariffs (or more generally, variable trade costs) are assumed to be symmetric in his model, the general intuition is clear. Lower foreign tariffs lead exporters to expand and also induce more entry of domestic firms responding to increased profits from exporting. This in turn puts upward pressure on domestic wages. Non-exporters thus face higher input costs but do not benefit from increased access to foreign markets. In the present context, U.S. tariff cuts are thus expected to increase the profits of exporters relative to non-exporters.

Chaney (2008) presents a short-run version of Melitz (2003) in which wages rates are exogeneously given and potential entrants observe their productivity before entry. In his model, lower U.S. tariffs imply increased exporting opportunities and thus higher profits for exporters while non-exporters are not affected. In contrast, lower Canadian tariffs will raise increase competition in the domestic market, and lower profits on the domestic sales of both exporters and non-exporters. However, export profits are not affected and exporters spread the fixed costs of market entry over higher initial domestic operating profits (see appendix A for a formal derivation). This means that the relative decline in profits they face will be smaller than for non-exporters. Both reductions in U.S. and Canadian tariffs will thus lead to relatively lower profits for non-exporters.

Melitz and Ottaviano (2008) also extend Melitz (2003) to a setting with asymmetric countries and tariff barriers while fixing the wage rate through the introduction of a freely tradable numeraire good. They further distinguish between short- and long-run effects of trade liberalizations. In the short run, the number of potential entrants is fixed as in Chaney, whereas in

the long run entry will reduce expected profits to zero.

The short-run effects of Melitz and Ottaviano are very similar to Chaney. Lower U.S. tariffs increase exporting opportunities while the absence of entry and factor market interactions mean that non-exporters are not affected. Lower Canadian tariffs reduce domestic profits for exporters and non-exporters alike but the existence of export profits together with the assumption of linear demand implies that exporters' profit decline is less severe than that of non-exporters.[4]

In the long run, the entry of new firms reverses some of the above effects. Lower U.S. tariffs again increase access to the U.S. market and thus raise the profits of exporting firms. This effect is now reinforced through the exit of U.S. firms which leave their market in the long run because of reduced domestic profit opportunities. However, lower U.S. tariffs now also trigger entry into the Canadian market by new domestic firms. This increases competition there and lowers the domestic profits of both exporters and non-exporters. Again, it is possible to show that the overall effect will more positive for exporters compared to non-exporters (see appendix *A*).

Decreases in Canadian import tariffs now also have the additional effect of triggering long run exit of Canadian firms which increases profits for the remaining firms. On the other hand, better access to the Canadian market leads to increased entry of U.S. firms which also serve their domestic market. This makes it more difficult for Canadian exporters to sell there, lowering profits from exporting. Linear demand again implies that the less productive non-exporters will see a stronger increase in their domestic profits than exporters. In addition, they do not suffer a reduction in their export profits. Thus, in the long run version of Melitz and Ottaviano, Canadian tariff reductions favor those non-exporters in Canada which do not exit the market entirely.

Table 1 summarizes the above predictions. Note that in all cases, exporters will gain relative to non-exporters in response to U.S. tariff reductions. The impact of Canadian tariff reductions is ambiguous and depends on whether long- or short-run effects will dominate future discounted profits, and whether the profit comparison is carried out for continuing firms only. Also note that all profit derivatives are monotonic in both tariffs. That is, the relative impact on exporters vs. non-exporters will be stronger in sectors with higher tariff cuts.

3 Description of Events

A key element of any event study is the identification of suitable events. In the present context, I am looking for points in time at which the likelihood of CUSFTA's implementation changed substantially. This is a potentially difficult challenge, given that the negotiation and ratification process covered a period of almost two years, from the start of negotiations in May 1986 until the eventual ratification by the Canadian parliament in December 1988. Given that the idea of liberalizing trade between Canada and the United States had also been around for some time before CUSFTA, the successful conclusion of negotiations and the subsequent signing and ratification of the agreement might have been anticipated to a large degree.

[4] In Melitz and Ottaviano and in Chaney, lower Canadian tariffs also lead to the exit of the least productive non-exporters, which reinforces the short-run profit effects of Canadian tariff cuts.

Fortunately, the Canadian general election on 21 November 1988 provides a more sharply defined event which can be usefully exploited for event study evidence. The first reason for this is that the ratification of CUSFTA was extremely contentious among the main Canadian political parties, with the governing Progressive Conservatives (who had negotiated the agreement) in favour, and broad sections of the main opposition parties (the Liberals and the New Democratic Party) opposed. Indeed, the Liberal Party's leader, John Turner, publicly vowed as late as October 1988 that he would dismantle CUSFTA in case of victory in the elections. The fate of CUSFTA thus directly depended on the election outcome on November 21.

Secondly, CUSFTA received an unprecedented amount of attention in the election campaign and was indeed the single-most important issue in voters' minds. In opinion polls taken in the month before the election, over 80% of the electorate cite CUSFTA as the most important election issue. Traditional areas of concerns such as inflation, unemployment, the budget deficit, welfare spending or national unity all were each mentioned by at most 2% of voters (Frizzell et al., 1989). One would thus expect that market reactions to a Conservative or Liberal victory in the elections would be predominantly determined by the consequences for the implementation of CUSFTA.

Finally, the outcome of the election was highly uncertain. Given the particularities of the Canadian electoral system, the Conservatives needed a vote share of slightly more than 40% to obtain a parliamentary majority (see Johnston et al., 1992). As late as the week before the vote on November 21, however, opinion polls showed Liberals and Conservatives head-to-head at 35% of the vote each.[5] Such an outcome would most likely have given Liberals and New Democrats a majority of parliamentary seats and would thus have meant that CUSFTA would not be ratified. The turning point came only with the publication of three nationwide polls on November 19, the Saturday before the election. All three polls put the Conservatives at over 40% and clearly ahead of the Liberals. These predictions proved indeed to be almost exactly correct, and on November 21 the Conservatives won the election with 43% of the popular vote, compared to 32% for the Liberal Party and 20% for the New Democrats.

Besides the election itself, I will look at three earlier events which also changed the likelihood of CUFTA's implementation. The second event is the reaching of an agreement on CUSFTA between Canada and the U.S. on 3 October 1987. Negotiations had been difficult and were only brought to a successful conclusion hours before the deadline on October 3. Thus, the reaching of an agreement was to some extent unexpected. At the same time, many of the key elements of CUSFTA (including the extent of the tariff reductions) had been agreed already so that market participants were probably aware of most of its consequences (Thompson, 1993).

The third event is again related to CUSFTA's ratification. On the morning of 20 July 1988, John Turner, the Liberal Party's leader, announced at a press conference that he had instructed the Liberal majority in the Senate to block the ratification of CUSFTA until a general election, which was expected to be called within the next months. This was seen by many as a move to revive the election prospects of his party which was trailing in the opinion polls (Johnston et al., 1992). By delaying the ratification, John Turner effectively turned the general election into a referendum on CUSFTA. This move destroyed any hopes for a quick ratification and

[5] All opinion polls quoted in this section are taken from Frizzell et al. (1989).

even raised the possibility that CUSFTA might not be implemented at all, given the hostility of Liberals and New Democrats to the agreement.

Finally, I also use a particularly dramatic change in opinion polls in the run-up to the election. After it had become clear that the Senate would not ratify CUSFTA, prime minister Brian Mulroney called a general election on October 1. In the initial phase of the election campaign, the Conservatives had a clear lead in the opinion polls with a predicted vote share of over 40%. As discussed above, this was enough to guarantee a parliamentary majority sufficient for CUSFTA's ratification. An important turning point came with the only two televised debates between the main parties' leaders on October 24 and 25. Against expectations, John Turner emerged as the clear winner from these debates and electoral fortunes started to change. The most dramatic and unexpected event in this phase of the campaign was the publication of a Gallup poll on November 7, putting the Liberals at 43% of the vote, compared to only 31% for the Conservatives and 22% for the New Democrats. While opinion polls had been gradually shifting since the debates, this presented a massive increase in support for John Turner's party and for the first time made a Liberal victory look likely.[6] In response, the Conservatives undertook a radical overhaul of their campaign strategy, enabling them to catch up in the opinion polls again (see Frizzell et al., 1989, for a detailed discussion). However, it was only with the above-mentioned publication of three nationwide opinion polls on November 19 that it became clear that the Conservatives would win.

Table 2 summarizes these events. My principal event is the election day itself (November 21) and the first trading day after the election (November 22). While markets could only react to the election results on November 22, the publication of the opinion polls on November 19 had already made a Conservative victory very likely.

The remaining three events are less important shifts in the likelihood of CUSFTA's implementation but are very useful as robustness checks. In particular, events three and four imply a decrease in the likelihood of ratification and should thus lead to opposite stock market reactions from the election event. Finally, events two and three present changes in the probability of CUSFTA's implementation which are unrelated to the election outcome. They thus provide additional evidence that market reactions were indeed due to CUSFTA rather than a Conservative election victory.[7]

4 Methodology, Data and Descriptive Statistics

Methodology. Testing the theoretical predictions from section 2 requires a model of "normal" stock returns which adjusts for differences in risk and other characteristics of stocks. A standard approach in the literature is to use the so-called market model which relates the return on security i at time t to a stock-specific constant and the return of the market portfolio, R_{mt}

[6] The financial press at the time did indeed interpret the Gallup poll as bad news for CUSFTA, fearing that an election win by the Liberal Party would jeopardize its ratification. See Brander (1991, p.828) for a number of corresponding quotes.

[7] As discussed in more detail below, my identification strategy will also control for additional effects of a Conservative victory by relying on variation in tariff cuts across sectors. In addition, the overwhelming importance of CUSFTA during the election campaign makes it likely that market reactions on November 21 and 22 were mainly due to the implications of a Conservative victory for CUSFTA, rather than for other policies.

(Campbell et al., 1989; Binder, 1998):

$$r_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2}$$

The error term ε_{it} captures "abnormal" returns which in the present context could be caused by the arrival of unexpected news about the implementation of CUSFTA. A straightforward way to measure abnormal returns related to CUSFTA is to directly model the error term in equation (2) according to the theoretical discussion from section 2:[8]

$$r_{it} = \alpha_i + \beta_i R_{mt} + \sum\nolimits_{e=1}^{E} d_{et} \left(d_j + \beta_{1e} d_{ix}\right) + \eta_{it} \tag{3}$$

where the d_{et} are a set of E dummy variables, each taking a value of one for one particular day during event window E. The d_j are industry fixed effects, and d_{ix} is a dummy variable which equals one if firm i exported to the U.S. in the year the event took place. The coefficient estimate $\hat{\beta}_{1e}$ thus represents the average abnormal return difference between exporters and non-exporters on event day e, after controlling for industry fixed effects. In the case where an event takes place over several days (as is the case for the first event in table 2), I calculate cumulative average abnormal returns (CAARs) which are defined as:

$$CAAR_E = \sum\nolimits_{e=1}^{E} \hat{\beta}_{1e}$$

As already discussed, one concern with (3) is that my main event (the general election) not only changed the likelihood of CUSFTA's implementation but also expectations about other policies. For example, a conservative victory might have been seen as particularly advantageous for exporting firms. I thus make use of the sectoral variation in tariff cuts implemented under CUSFTA by estimating the following specification:

$$r_{it} = \alpha_i + \beta_i R_{mt} + \sum\nolimits_{e=1}^{E} d_{et} \left(d_j + \beta_{1e} d_{ix} + \beta_{2e} d_{ix} d\tau_{CAN,j} + \beta_{3e} d_{ix} d\tau_{US,j}\right) + \eta_{it} \tag{4}$$

where $d\tau_{CAN,j}$ and $d\tau_{US,j}$ denote Canadian and U.S. tariff reductions in industry j between 1988 and 1996, respectively.[9] Recall from the earlier discussion that exporters should benefit more from higher U.S. tariff cuts relative to non-exporters (i.e., $\beta_3 < 0$, given that higher reductions imply a more negative $d\tau$). In contrast, no clear prediction emerged for Canadian tariff reductions. Introducing variation in tariff cuts in this way means that I only require the weaker identifying assumption that the differential impact of a Conservative victory on exporters and non-exporters does not vary systematically with the extent of U.S. or Canadian tariff cuts. I thus use (4) as my main specification.

Data. Estimation of (3) and (4) requires data on daily returns on individual stocks and the market portfolio, the tariff cuts implemented under CUSFTA, as well as information on whether

[8] See Binder (1998) for the advantages of measuring abnormal returns in a regression framework.

[9] 1996 is the last year for which I have tariff data. Manufacturing tariffs were phased out over a period of ten years under CUSFTA and were close to zero in 1996 (see Trefler, 2004).

a firm exports to the U.S. For comparability with the existing literature, I focus my analysis on manufacturing firms. This is also the sector which was most directly affected by CUSFTA because of the tradeability of its output, and for which I have information on tariff cuts.

Unfortunately, my data do not contain firms' export status for the majority of firms. However, all standard heterogeneous firm models display a strict hierarchy of export status with respect to productivity and sales. Furthermore, one of the clear empirical regularities which emerges from the literature on exporter premia (e.g. Bernard and Jensen, 1999) is that export status and sales or turnover are strongly positively correlated.[10] I thus use two proxy variables based on firm sales for my main specifications. First, I classify firms as exporters if their sales are above the 30th percentile of an industry's sales distribution. This threshold was chosen to match the fraction of non-exporters for the subsample of firms for which I observe exports. Secondly, I use a continuous definition by proxying the export dummies in (3) and (4) by the log of firm sales. In robustness checks, I show that for the subsample of firms for which I have information on exports, my proxies yield qualitatively and quantitatively similar results to using actual export status.[11]

I use daily stock returns from Datastream for all Canadian manufacturing firms listed on one or several Canadian or U.S. stock exchanges for which I have a least one year of return data prior to the event studied. This is the standard length in the event study literature for the pre-event window used to estimate the market model's parameters (see Binder, 1998). I also follow a large part of the literature by using the value-weighted CRSP portfolio as a proxy for the market portfolio.[12]

Sales and export data are also available from Datastream. I complement this information with data from Compustat North America whenever Datastream has missing values. This yields a sample of 257 publicly traded Canadian companies with primary activities in manufacturing for which I have information on sales, and a smaller sample of 55 firms for which I also observe the value of exports.

Tariff data are from Trefler (2004) who provides U.S. and Canadian ad-valorem tariffs for manufacturing industries at the four-digit level of the Canadian Standard Industrial Classication of 1980. I map these tariffs into the industry classification used by Datastream (the Industry Classification Benchmark, ICB) which sorts manufacturing firms into 21 broad industries.[13]

[10] The correlation between sales and exports for the subsample of firms for which I have information on both is 92%.

[11] In general, deviations of my proxies from actual export status can be thought of as classical measurement error which will tend to bias the results against finding significant effects. The fact that I find similar results for the subsample for which I have information on both exports and sales suggest that this bias is not substantial.

[12] I obtain data on CRSP portfolio returns from the Wharton Research Data Services (wrds.wharton.upenn.edu). Using the CRSP portfolio should be less susceptible to endogeneity concerns, given that the firms in my sample represent a large share of the overall market capitalization in purely Canadian-based portfolios such as the S&P/TSX Composite Index. Also note that CRSP contains a number of Canadian firms quoted on US stock exchanges (but which only account for a small fraction of overall US market capitalization).

[13] I use detailed descriptions of individual industries obtained from Datastream and Statistics Canada to construct a mapping from Trefler's 213 Canadian Standard Industrial Classification (CANSIC) industries to the 21 ICB industries used in this paper. This mapping was unique in 90% of cases, in the sense that each CANSIC industry could be mapped into one ICB industry only. I aggregate the tariff data to the ICB level by taking weighted averages across all CANSIC categories mapping into an ICB industry, using 1988 output shares of CANSIC industries as weights. Output data are also from Trefler (2004).

Summary Statistics and Figures. Table 3 provides summary statistics for the key variables. I note two main points. First, there is a strong variation in sales volume within industries, ranging from small start-ups with sales of less than a million Canadian dollars to big corporations with several billion dollars in turnover. Given the strong empirical correlation between sales and export status, these figures suggest that there should be substantial variation in export status within industries, which is a prerequisite for precise identification in the econometric analysis carried out below.

Secondly, tariff cuts also show substantial sectoral variation despite the relatively aggregate industry classification used here (columns 6-7). Canadian tariff cuts range from sectors which basically enjoyed free trade before CUSFTA to over 25% for 'Beverages'. U.S. tariff cuts are lower on average but still show strong sectoral differences, with tariff cuts between 0% and close to 10%.

Figure 1 takes a first closer look at the data by visualizing the identification strategy embodied in my key specification, equation (4). I focus on my main event, the general election on November 21. However, to fully appreciate the high degree of uncertainty surrounding the election outcome, it is useful to look at a slightly longer window, starting a week before the televised debates between the main parties' leaders on October 24 and 25. For this period, I plot cumulative average return (CAR) differences between large and small firms, defined as firms with sales above and below the 30th percentile in each industry, respectively.[14] This is the same classification underlying my binary proxy for export status mentioned above. I plot CAR differences for two groups of firms. Those belonging to the 50% of industries with the highest U.S. tariff cuts implemented under CUSFTA, and those with the 50% lowest tariff cuts.[15] CAR differences are normalized to zero for both groups one week before the televised debates on October 24 and 25.

The figure clearly shows a sharp divergence in the CAR differences between high- and low-tariff cut industries in the aftermath of the debates, as the Liberal Party's standing in the polls starts to improve. Note that this divergence is particularly dramatic on the day of the publication of the Gallup poll, November 7. Also visible in the graph is the stabilization in CAR differences between large and small firms, and between high- and low-tariff cut industries, after the Conservatives catch up in the polls again. (The week beginning November 14 brought a couple of opinion polls showing the parties head-to-head again.) Finally, the difference between high- and low-tariff cut industries narrows sharply on election day, November 21, and to a lesser extent on November 22.

This graphic analysis thus provides some first suggestive evidence that stock prices reacted to news about CUSFTA in a way consistent with the predictions of heterogeneous firm models.

[14] The cumulative average return of a group of stocks G between t_1 and t_2 is defined as $CAR_{t_1 t_2} = \sum_{s=t_1}^{t_2} \frac{1}{N_G} \sum_{i \epsilon G} r_{is}$, where r_{is} is the return of stock i at time s and N_G is the number of stocks in group G. The difference in $CARs$ between exporters and non-exporters in high tariff cut industries, for example, is then simply $CAR_{Xhigh} - CAR_{NXhigh}$. Using abnormal rather than simple returns yields a similar picture.

[15] I focus on U.S. tariff cuts since the theoretical predictions are unambiguous here. Graphs using Canadian tariff cuts yield a broadly similar if less clear-cut picture. This similarity reflects the positive correlation between U.S. and Canadian tariff concessions. As we shall see in the econometric analysis below, only U.S. tariff cuts have a robust impact on abnormal return patterns.

To see whether these findings hold up in a more thorough econometric analysis, I now turn to the estimation of the baseline equations (3) and (4).

5 Results

Column 1 of table 4 reports results based on specification (3), using my binary export proxy (indicating whether a firm's sales are above the 30th percentile of industry sales). As seen, exporting firms experienced abnormal returns which were one percentage point higher than those of non-exporters, with the difference being highly statistically significant. This is consistent with the predictions of Melitz-type models which predict such a differential effect across exporters and non-exporters. As already mentioned, this result could also capture a more positive impact of a Conservative election victory on bigger firms.

In column 2, I thus include the tariff interaction terms as in (4). As predicted, the sign on the U.S. tariff interaction is negative and significant. Thus, exporters observed stronger positive abnormal returns in sectors with larger U.S. tariff cuts, with the abnormal return difference increasing by 0.8 percentage points for each percentage point in tariff reductions. This is strongly supportive of a Melitz-type story in which exporters benefit from increased export opportunities.

Exporters also benefited from higher Canadian tariff cuts relative to non-exporters. As discussed in section 2, this is consistent with the short-run predictions of both Chaney (2008) and Melitz and Ottaviano (2008). While this effect is also highly statistically significant, it is smaller in absolute magnitude than the effect of U.S. tariff reductions, even after taking into account that Canadian tariff cuts were on average twice as large as U.S. tariff cuts (see table 3).

Taken together, these results imply that an exporter in the average Canadian industry (with U.S. tariff cuts of 2.4% and Canadian reductions of 5.1%) experienced positive abnormal returns which were 1.4 percentage points higher than those of non-exporters. For individual industries, the estimated total effect can be consirably higher, however. For example, the industry with the highest U.S. tariff cuts ('Personal Goods') experienced an abnormal return difference of 8.5 percentage points according to my results.

In columns 3 and 4, I reestimate specifications (3) and (4) using my second proxy for export status, log sales. As seen, the results for this measure are similar to the binary proxy discussed above. On its own, log sales enters positively and significantly (column 3). For each log point increase in sales, firms experience abnormal returns of 0.3%. When interacted with the two tariff measures, log sales enters negatively as expected. Note that the effect of U.S. tariff cuts is again bigger than that of Canadian tariff cuts, this time by an order of magnitude.

In the final two columns of table 4, I extend the event period to include the week before the elections, in order to evaluate to what extent the election results had been anticipated by market participants. As seen, the size of the coefficient estimates for the U.S. tariff interaction increases by around 50%, so the election outcome seems to have been priced in to a certain degree already. This is not entirely surprising, given that the Conservative Party had been catching up in the opinion polls in the week prior to the elections. Note, however, that the increase

in the coefficient magnitude is only about 0.09 per additional event day for the binary export proxy (0.04 for log sales). This is substantially below the comparable coefficient magnitude for November 21 and 22. Also note that the coefficient on the Canadian tariff cut interaction only changes very little with the extension of the event period. In the following, I thus focus on the more sharply defined event of the election itself (November 21 and 22).

6 Robustness

Actual Export Status. In table 5, I evaluate to what extent the use of proxies for export status is likely to bias the coefficient estimates in my main specifications. In columns 1 and 2, I reestimate equations (3) and (4) for the 55 firms for which I observe actual exports.[16] As in table 4, my results indicate that exporters experienced higher abnormal returns than non-exporters on November 21 and 22, with the difference being stronger in sectors with larger U.S. tariff cuts.

Note that the small size of this subsample precludes the use of industry fixed effects. Together with the change in sample structure, this makes a direct comparison of coefficient magnitudes with table 4 difficult. I thus reestimate equations (3) and (4) for this smaller sample, using my binary export proxy and excluding industry fixed effects. The results in columns 3 and 4 are surprisingly similar to columns 1 and 2 which use actual export status. Note that Canadian tariff cuts are now estimated to have led to lower relative returns of exporters, overturning the results from table 4. However, this result is obtained both when using actual export status and when using my binary proxy based on sales, again with almost identical coefficient magnitudes. In conclusion, it thus seems that using sales as a proxy for export status is unlikely to lead to a substantial bias in coefficient estimates.[17]

Fama-French Portfolios. In the first two columns of table 6, I consider a different abnormal returns model. One concern with the standard market model approach is that it does not control for some important systematic return differences across firms. For example, Fama and French (1992) show that firm size (as proxied by market capitalization) and book-to-market equity ratios are important determinants of the cross-sectional variation in average stock returns. The fact that size by itself is a good predictor of stock returns is potentially problematic, given that I use measures based on firm sales as my export status proxy in most specifications. One way to address this issue is to directly control for the role of size in calculating abnormal returns. I do so by using additional portfolios in the abnormal returns regressions, as suggested by Fama and French (1993):

$$r_{it} = \alpha_i + \beta_{i1} R_{mt} + \beta_{i2} SMB_t + \beta_{i3} HML_t + \sum_{e=1}^{E} d_{et} \left(d_j + \beta_{1e} d_{ix} + \beta_{2e} d_{ix} d\tau_{CAN,j} + \beta_{3e} d_{ix} d\tau_{US,j} \right) + \eta_{it}$$

[16] I only observe the value of total exports, not the value of exports to the United States. However, given that over 80% of Canadian exports go to the U.S., any firm that exports is likely to serve the U.S. market as well.

[17] Results using log sales for this smaller sample are harder to compare quantitatively to the results for actual export status because of the different functional form. But as seen in columns 5 and 6, results are again qualitatively similar.

where SMB_t is the difference in the returns on portfolios of small and large stocks, and HML_t is the difference in the returns of portfolios of high and low book-to-market equity stocks.[18]

The results in columns 1 and 2 are very close to my baseline specification.[19] The most likely explanation for this similarity to the results based on the simpler market model is that systematic differences in abnormal stock returns only become clearly apparent over longer event horizons. For the two-day window considered here, different abnormal return definitions yield almost identical results (compare the related discussion in Andrade et al., 2001).

Log Returns. In the remaining two columns of table 6, I reestimate my baseline specifications from table 4 but use log returns instead of simple returns. This provides a natural way of reducing the importance of large return outliers. However, as seen in columns 3 and 4, results are basically identical to my baseline specifications.

Input Tariffs. In the first two columns of table 7, I consider a potential alternative explanations for my results. As Amiti and Konings (2007) showed for Indonesia, lower tariffs on imported intermediate inputs can lead to significant increases in firm-level productivity. Furthermore, in their sample these gains were particularly pronounced among firms importing intermediates directly. In the present case, Canadian tariff reductions lowered the costs of inputs imported from the U.S. This should have increased profits of Canadian firms and potentially more so for importers. If importers are among the largest firms in each industry (as the empirical literature on firm-level imports does suggest), my interactions of tariff cuts and firm sales could simply be picking up the effect of cheaper imported intermediates. This is particularly true given the generally positive correlation between input and output tariffs.[20]

To control for this possibility, columns 1 and 2 include an interaction term between reductions in Canadian intermediate input tariffs with the same export proxies as before. I construct input tariffs by using the Canadian input-output matrix together with the information on Canadian tariff reductions used previously. In analogy to Amiti and Konings, I construct the input tariff for a given industry j as the weighted average of the Canadian output tariffs of all industries k supplying this industry:

$$input\_tariff_j = \sum_k w_{kj} \times tariff_k$$

where w_{kj} is the cost share of industry k in the production of goods in industry j in 1988. I construct input tariffs for 1988 and 1996 and use the difference as my measure of input tariff reductions due to CUSFTA.

[18] As Fama and French, I further subtract the one-month treasury bill rate from individual stock returns and the return to the market portfolio, R_{mt}. Data on all three factors were taken from Kenneth French's web page at Dartmouth which also contains additional information on their construction.

[19] Here and in the remaining sections of the paper, I focus on my main specification (4) for the sake of brevity. Results for specification (3) are available upon request. The general pattern of the omitted results is consistent with the predictions discussed in section 2. Events that increased the likelihood of CUSFTA's implementation always led to positive abnormal returns for exporters relative to non-exporters, and events that lowered the likelihood of implementation led to opposite results.

[20] In my sample, the correlation of Canadian input tariffs with Canadian output tariffs is 28%, and the correlation with U.S. output tariffs is 47%. See below for how import tariffs were constructed.

Columns 1 and 2 of table 7 show that this additional interaction term does indeed pick up differences between large and small firms, presumably because of the correlation between import status and size. Stronger reductions in input tariffs further increase the abnormal return difference between exporters and non-exporters as proxied by firm sales. However, while this new variable is strongly statistically and economically significant, the coefficient magnitudes on my other tariff interaction terms are only reduced by small amounts. A stronger profit enhancing effect of lower input tariffs for large firms can thus not explain my previous findings on its own.

Placebo Checks. I now turn to two settings for which I would *not* expect to find significant abnormal return differences between exporters and non-exporters, nor a strong variation of these differences across industries with high and low tariff cuts.

In the remaining two columns of table 7, I again reestimate my baseline equations from table 4, columns 1 and 3. This time, however, I do so for firms in industries whose output is generally classified as non-tradeable, such as commercial banking, insurance and other services sectors.[21] Since the most important element of CUSFTA were tariff reductions for manufactured goods, these firms should not be impacted by CUSFTA's implementation, or at least considerably less than manufacturing industries.[22] On the other hand, if my results so far were simply picking up the differential impact of the Conservative election victory, one would expect similar results to manufacturing firms.

Reassuringly, I am unable to find a strong effect for firms in non-tradeable industries. In columns 3 and 4 of table 7, I run my baseline regressions on the pooled sample of manufacturing firms and this new group of firms. I also include an interaction term between my export proxies and a dummy for manufacturing firms. For both export proxies, the interaction term is positive and significant. The results indicate that the effect of the Conservative election victory on the abnormal return differences between large and small firms was over three times as big for manufacturing industries. Indeed, for the binary export proxy, no significant abnormal return difference is observable for non-tradeable industries at all on November 21 and 22.

In table 8, I check whether my results might be picking up some inherent characteristics of firms or sectors other than export status and tariff cuts. I do so by estimating specification (4) for dates between 1 November 1987 and 30 June 1988, a period during which the likelihood of CUSFTA's implementation did not vary substantially. We thus would not expect export status to matter much as a determinant of abnormal returns, both on its own and when interacted with tariff cuts. To verify this, I repeatedly draw two consecutive dates from this period at random and estimate (4) for these dates. I then calculate cumulative average abnormal returns (CAARs) based on my estimates of $\hat{\beta}_{1e}$, $\hat{\beta}_{2e}$ and $\hat{\beta}_{3e}$ for these random two-day event windows. I repeat this procedure 1,000 times, thus obtaining a set of 1,000 CAARs estimates comparable

[21] See appendix B for a full list of industries classified as "non-tradeable". Information on sales and stock returns for firms in these sectors is again from Datastream. In total, I have information on 278 firms in non-tradeable industries.

[22] CUSFTA also contained provisions which made takeovers of Canadian firms easier for U.S. acquirers. If takeover targets are on average larger than other firms, this could also lead to positive abnormal return differences in non-tradeable industries. This is because takeover announcements generally lead to strongly positive abnormal returns for target firms (see Andrade et al., 2001).

to the ones presented in table 4. I report means, standard deviations and percentiles of the resulting distributions in table 8.

If there were some general characteristics of firms or sectors correlated with export status and tariff cuts that explained my earlier results, one would expect parameter estimates of the same magnitude as in my baseline results to show up frequently. For example, if large firms in sectors with high future US tariff cuts systematically experienced above average abnormal returns, my baseline and additional results might be due to some (unknown) omitted factor. Table 8 shows that this is not the case, at least for the U.S. tariff cut interaction. The probability of observing two-day U.S. tariff-related CAARs on randomly chosen dates which are bigger than the magnitudes reported in table 4 is about 1% for the log sales export proxy, and just above 5% for the binary proxy. In contrast, the probability of randomly generating two-day Canadian tariff-related CAARs larger than in table 4 is higher, around 25% for both export proxies.

Additional Events. I conclude my robustness checks by presenting results for the three additional events discussed in section 3. In columns 1-2 of table 9, I focus on the first trading day after the successful conclusion of negotiations on October 3, 1987. Similar to the election outcome itself, this event increased the likelihood of an implementation of CUSFTA. Consistent with the theoretical discussion from section 2, I again find stronger abnormal returns of exporters relative to non-exporters in industries with higher U.S. tariff cuts. The same is also true for Canadian tariff reductions, although the size of the corresponding coefficient is again an order of magnitude smaller (and the estimate is insignificant for my binary proxy).

In columns 3-4, I look at the effect of John Turner's announcement that he had instructed the Liberal majority in the Canadian Senate to block CUSFTA until after a general election. In columns 5-6, I focus on the impact of the publication of the Gallup poll on November 7 which predicted a twelve percentage point lead for the Liberal Party. Both events lowered the likelihood of a ratification of CUSFTA. According to the theoretical predictions, one would thus expect to see an effect opposite to the first two events. For U.S. tariff reductions, this is indeed what I find. The positive coefficient estimates on all the corresponding interaction terms indicates that exporters experienced a stronger decline in sectors in which CUSFTA foresaw higher tariff cuts. For Canadian tariff cuts, results are less clear cut. On November 7, we do indeed observe stronger relative losses for exporters in sectors with higher future cuts. However, the pattern on July 20 is more mixed, with the binary indicator actually showing a gain of exporters relative to non-exporters in high-tariff-reduction industries.

Discussion. Overall, the robustness checks confirm the validity of my baseline results. Firms in industries with higher U.S. tariff cuts saw stronger abnormal return differences between exporters and non-exporters in response to changes in the likelihood of CUSFTA's implementation. This is strongly supportive of the predictions of the heterogeneous firm models discussed in section 2. The results on Canadian tariff cuts are less consistent across specifications. The majority of specifications suggests that, in accordance with the short-run predictions of heterogeneous firm models, exporting firms also gained relative to non-exporting firms in response to such tariff reductions. But coefficient estimates were generally small, sometimes insignificant

and had the wrong sign in a number of cases. As was already pointed out, this is not necessarily evidence against the relevance of heterogeneous firm models in general, given that the long-run predictions of this class of models can take the exact opposite form of short-run predictions. Also, many of the results on domestic tariff reductions seem to depend on specific functional form assumptions (e.g., linear demand) and need not carry over to more general models.

7 Conclusions

This paper presented new empirical evidence on key predictions of heterogeneous firm models. Using the uncertainty surrounding the implementation of the Canada-United States Free Trade Agreement in 1987 and 1988, I showed that the pattern of abnormal returns of Canadian manufacturing firms was broadly consistent with the predictions of a class of models based on Melitz (2003).

Specifically, the election victory of the ruling Conservative party (a strong supporter of CUSFTA) led to significant stock market gains of exporting firms relative to non-exporters. Moreover, these relative gains were higher in sectors with larger U.S. tariff cuts. The same pattern was also found for earlier events which increased the likelihood of CUSFTA's implementation. In contrast, events which lowered the likelihood of implementation resulted in negative abnormal returns of exporters relative to non-exporters. Again, these losses were stronger in sectors with higher expected U.S. tariff cuts. Results were less clear for the impact of Canadian tariff reductions. While most specifications supported the short-run predictions of the heterogeneous firm models discussed here, coefficient estimates were often small, sometimes insignificant and had the wrong sign in a number of cases.

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A Theoretical Predictions

In this appendix, I derive predictions for the impact of trade liberalizations on profits using two specific models of heterogeneous firms: Melitz and Ottaviano (2008) and Chaney (2008). Both allow for asymmetric country sizes and tariff barriers which makes them particularly suitable for analyzing bilateral agreements such as CUSFTA. Below, I keep the authors' notation to facilitate the comparability of the analysis with the original contributions.

A.1 Melitz and Ottaviano (2008)

I focus on the two-country version of Melitz and Ottaviano (see section 3 of their paper). As markets are segmented and firms produce under constant returns to scale, total firm profits can be split into profits derived from the domestic and from the export market (π_d and π_x, respectively). In line with the empirical section in this paper, I focus on Canadian firms only:

$$\pi_D^H(c) = \frac{L^H}{4\gamma}\left(c_D^H - c\right)^2$$

$$\pi_X^H(c) = \frac{L^F}{4\gamma}\left(\tau^F\right)^2\left(c_X^H - c\right)^2$$

where c denotes the marginal costs of a firm, and L^H and L^F the number of consumers in the home (Canadian) and foreign (U.S.) market, respectively. Iceberg-type trade costs associated with exporting to the U.S. are denoted by τ^F, and γ captures the degree of differentiation between products. Finally, c_D^H and c_X^H are the threshold levels of marginal costs above which Canadian firms do not enter their domestic or the U.S. market, respectively. Written in Melitz and Ottaviano's notation, the four partial derivatives of (1) are thus given by

$$\begin{aligned}
\frac{\partial \pi_D^H(c)}{\partial \tau^H} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial \tau^H} \\
\frac{\partial \pi_D^H(c)}{\partial \tau^F} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial \tau^F} \\
\frac{\partial \pi_X^H(c)}{\partial \tau^H} &= \frac{L^F}{2\gamma}\left(\tau^F\right)^2\left(c_X^H - c\right)\frac{\partial c_X^H}{\partial \tau^H} \\
\frac{\partial \pi_X^H(c)}{\partial \tau^F} &= \frac{L^F}{2\gamma}\tau^F\left(c_X^H - c\right)\left(\left(c_X^H - c\right) + \tau^F\frac{\partial c_X^H}{\partial \tau^F}\right)
\end{aligned}$$

The change in profits is thus determined by changes in the cutoffs.

For most of their analysis, Melitz and Ottaviano assume a Pareto parameterization of the cost draws c, i.e. $G(c) = (c/c_M)^k$ with $c\epsilon[0, c_M]$. They also distinguish between short-run and long-run effects. In the short run, the number of potential entrants is fixed at $\bar{N}_D$ and there is no entry or exit. Incumbent firms simply observe their cost draw c and decide whether to produce or not. The domestic Canadian cutoff is then implicitly defined by (see their equation 28, p. 308):

$$\frac{\alpha - c_D^H}{\left(c_D^H\right)^{k+1}} = \frac{\eta}{2(k+1)\gamma}\left[\frac{\bar{N}_D^H}{\left(\bar{c}_M^H\right)^k} + \left(\tau^H\right)^{-k}\frac{\bar{N}_D^F}{\left(\bar{c}_M^F\right)^k}\right]$$

where $\bar{c}_M^F$ and $\bar{c}_M^H$ denote the upper bound of the distribution of marginal costs of incumbent firms in the two countries. In the long-run, with the number of entrants determinant by a zero profit condition, this becomes:

$$c_D^H = \left[\frac{\gamma\phi}{L^H}\frac{1-\left(\tau^F\right)^{-k}}{1-\left(\tau^H\tau^F\right)^{-k}}\right]^{1/(k+2)}$$

Export cutoffs are simply the other country's domestic cutoff, divided by the trade costs of accessing the foreign market (for Canada, $c_X^H = c_D^F/\tau^F$). Thus, in the short-run c_X^H is implicitly defined by:

$$\frac{\alpha - c_X^H\left(\tau^F\right)}{\left(c_X^H\right)^{k+1}\left(\tau^F\right)^{k+1}} = \frac{\eta}{2\left(k+1\right)\gamma}\left[\frac{N_D^F}{\left(\bar{c}_M^F\right)^k} + \left(\tau^F\right)^{-k}\frac{N_D^H}{\left(\bar{c}_M^H\right)^k}\right]$$

In the long-run, c_X^H becomes:

$$c_X^H = \frac{c_D^F}{\tau^F} = \left(\tau^F\right)^{-1}\left[\frac{\gamma\phi}{L^F}\frac{1-\left(\tau^H\right)^{-k}}{1-\left(\tau^F\tau^H\right)^{-k}}\right]^{1/(k+2)}$$

A.1.1 Short-run effects

Taking partial derivates of the domestic cutoff with respect to the two tariffs, I obtain $\partial c_D^H/\partial\tau^F = 0$ and $\partial c_D^H/\partial\tau^H > 0$. That is, unilateral domestic liberalization lowers the cost cutoff (i.e. the least efficient firms exit), whereas lower U.S. tariffs have no impact. This implies that:

$$\begin{aligned}\frac{\partial\pi_D^H(c)}{\partial\tau^H} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial\tau^H} > 0\\ \frac{\partial\pi_D^H(c)}{\partial\tau^F} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial\tau^F} = 0\end{aligned}$$

Likewise, the impact of lower tariffs on the export cutoff is:

$$\begin{aligned}\frac{\partial c_X^H}{\partial\tau^F} &= \left(\tau^F\right)^{-1}\left(\frac{\partial c_D^F}{\partial\tau^F} - c_X^H\right)\\ \frac{\partial c_X^H}{\partial\tau^H} &= \left(\tau^H\right)^{-1}\frac{\partial c_D^F}{\partial\tau^H} = 0\end{aligned}$$

The total effect on export profits is thus

$$\begin{aligned}\frac{\partial\pi_X^H(c)}{\partial\tau^H} &= \frac{L^F}{2\gamma}\left(\tau^F\right)^2\left(c_X^H - c\right)\frac{\partial c_X^H}{\partial\tau^H} = 0\\ \frac{\partial\pi_X^H(c)}{\partial\tau^F} &= \frac{L^F}{2\gamma}\tau^F\left(c_X^H - c\right)\left(\frac{\partial c_D^F}{\partial\tau^F} - c\right) < 0\end{aligned}$$

That is, export profits increase as U.S. tariffs come down but are unaffected by Canadian tariff reductions.[23]

Since domestic profits are not affected by U.S. tariff reductions while export profits increase, it must be true that exporters gain relative to non-exporters (which by definition do not have export profits). Canadian tariff reductions reduce domestic profits of both exporters and non-exporters but it is easily verified that the former face a lower relative decline:

[23] To see that $\partial c_D^F/\partial\tau^F - c < 0$, first note that because we are looking at exporting firms we must have $c \leq c_X^H$. Thus, the above inequality becomes $\partial c_D^F/\partial\tau^F < c_X^H = c_D^F\left(\tau^F\right)^{-1}$. It is easily verified that this is true by using the implicit function theorem to calculate $\partial c_D^F/\partial\tau^F$.

$$\frac{\partial \pi_D^H(c)/\partial \tau^H}{\pi_D^H(c)} = \frac{2}{\left(c_D^H - c\right)} \frac{\partial c_D^H}{\partial \tau^H}$$

which is increasing in c. Since non-exporters have higher marginal costs than exporters, the proportional domestic profit decline is more severe for them.[24] In addition, non-exporters do not have export profits which are not affected by Canadian tariff reductions. Taken together, this means that the overall relative profit decline will be more severe for them.

A.1.2 Long-run effects[25]

From the above long-run cutoffs, it is easy to see that $\frac{\partial c_D^H}{\partial \tau^F} > 0$, $\frac{\partial c_D^H}{\partial \tau^H} < 0$, $\frac{\partial c_X^H}{\partial \tau^F} < 0$ and $\frac{\partial c_X^H}{\partial \tau^H} > 0$. The corresponding changes in profits are

$$\begin{aligned}
\frac{\partial \pi_D^H(c)}{\partial \tau^H} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial \tau^H} < 0 \\
\frac{\partial \pi_D^H(c)}{\partial \tau^F} &= \frac{L^H}{2\gamma}\left(c_D^H - c\right)\frac{\partial c_D^H}{\partial \tau^F} > 0 \\
\frac{\partial \pi_X^H(c)}{\partial \tau^F} &= \frac{L^F}{2\gamma}\tau^F\left(c_X^H - c\right)\left(\frac{\partial c_D^F}{\partial \tau^F} - c\right) < 0 \\
\frac{\partial \pi_X^H(c)}{\partial \tau^H} &= \frac{L^F}{2\gamma}\left(\tau^F\right)^2\left(c_X^H - c\right)\frac{\partial c_X^H}{\partial \tau^H} > 0
\end{aligned}$$

U.S. tariff reductions thus increase export profits which raises profits of exporters relative to non-exporters. However, I still need to check whether the relative decline in domestic profits is not sufficiently stronger for exporters to overcompensate this effect:

$$\frac{\partial \pi_D^H(c)/\partial \tau^F}{\pi_D^H(c)} = \frac{2}{\left(c_D^H - c\right)} \frac{\partial c_D^H}{\partial \tau^F}$$

This is again increasing in c so that the percentage profit decline is stronger for non-exporters. On the other hand Canadian tariff reductions make continuing non-exporters relatively better off. This is because export profits decrease and the increase in domestic profits is stronger for non-exporters (again, $\left(\partial \pi_d(c)/\pi_d(c)\right)/\left(\partial \tau^F \partial c\right) > 0$).

A.2 Chaney (2008)

I also study Chaney's extension of Melitz (2003) to asymmetric countries and trade barriers. In contrast to Melitz (2003) and Melitz and Ottaviano (2008), Chaney abstracts from long-run entry by taking the number of potential entrants as given. Again, I retain the author's original notation.

In Chaney's model, firm-level profits of Canadian firms associated with serving market j are

$$\pi_{ij}(\gamma) = \frac{r_{ij}(\gamma)}{\sigma} - F_{ij}$$

where the r_{ij} denotes revenues from selling on market j, γ is a firm's labour productivity,

[24] The above analysis abstracts from the entry of firms into the export market. It is straightforward to show that the results for existing exporters extent to this group so that we abstract from this additional complication here. In the empirical analysis, the term "exporters" is thus best understood to include both existing and new exporters.

[25] Note that all results in this subsection are comparisons of two long-run equilibria. They are thus best understood as applying only to those firms active in both equilibria.

F_{ij} are fixed costs associated with entering a market j from i, and σ denotes the elasticity of substitution between varieties in the underlying CES utility function.

I now turn to a two country version of Chaney's model and denote Canadian and U.S. variables with subscripts d and f, respectively. I also set intra-national variable trade costs to $\tau_{ii} = 1$, and normalize intra-national fixed cost to unity ($F_{ii} = 1$). Inserting the equilibrium values for components of $r_{ij}(\gamma)$, I obtain:

$$\pi_{dd}(\gamma) = \sigma^{-1}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\gamma^{\sigma-1}\lambda_2^{\sigma-1}\left(Y_d/Y\right)^{\frac{\sigma-1}{a}}\left(Y_d + Y_f\left(\frac{w_d}{w_f}\right)^{a}\tau_{fd}^{-a}F_{fd}^{\frac{\sigma-1-a}{\sigma-1}}\right)^{\frac{1-\sigma}{a}} - F_{dd}$$

for the domestic market ($j = i$) and

$$\pi_{df}(\gamma) = \sigma^{-1}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\gamma^{\sigma-1}\lambda_2^{\sigma-1}\left(Y_f/Y\right)^{\frac{\sigma-1}{a}}\left(Y_d F_{df}^{\frac{\sigma-1-a}{\sigma-1}} + \tau_{df}^{a}Y_f\left(\frac{w_d}{w_f}\right)^{a}\right)^{\frac{1-\sigma}{a}} - F_{df}$$

for the export market. In these expressions, $\lambda_2 > 0$ summarizes model constants, Y_j is expenditure in country j and Y total world expenditure. Canadian and U.S. wages are denoted by w_d and w_f and a is the shape parameter of the productivity distribution which is assumed to be Pareto with a cutoff of one.

Computing the four partial derivatives of (1) I obtain:

$$\begin{aligned}
\frac{\partial\pi_{dd}(\gamma)}{\partial\tau_{df}} &= 0 \\
\frac{\partial\pi_{dd}(\gamma)}{\partial\tau_{fd}} &= \pi_{d,op}(\gamma)(\sigma-1)\left(\left(Y_d/Y_f\right)\left(\frac{w_d}{w_f}\right)^{-a}F_{fd}^{-\frac{\sigma-1-a}{\sigma-1}}\tau_{fd}^{a}+1\right)^{-1}\tau_{fd}^{-1} > 0 \\
\frac{\partial\pi_{dx}(\gamma)}{\partial\tau_{df}} &= \pi_{dx,op}(\gamma)(1-\sigma)\left(1+\left(Y_d/Y_f\right)F_{df}^{\frac{\sigma-a-1}{\sigma-1}}\left(\frac{w_d}{w_f}\right)^{-a}\tau_{df}^{-a}\right)^{-1}\tau_{df}^{-1} < 0 \\
\frac{\partial\pi_{dx}(\gamma)}{\partial\tau_{fd}} &= 0
\end{aligned}$$

where $\pi_{.,op}(\gamma)$ denotes operating profits, i.e. profits before paying the fixed costs associated with production for a given market.

From the above expressions, it follows immediately that U.S. tariff reductions ($d\tau_{df} < 0$) raise profits of exporters relative to non-exporters. The effect of Canadian tariff reductions is more nuanced since both exporters and non-exporters suffer a decline in their domestic profits. As in Melitz and Ottaviano, however, export profits are not affected. It is also straightforward to show that non-exporters suffer the bigger relative decline in domestic profits:

$$\frac{\left(\partial\pi_{dd,X}(\gamma)/\partial\tau_{fd}\right)/\pi_{dd,X}(\gamma)}{\left(\partial\pi_{dd,NX}(\gamma)/\partial\tau_{fd}\right)/\pi_{dd,NX}(\gamma)} = \left(\frac{\pi_{dd,op,X}(\gamma)/\pi_{dd,op,NX}(\gamma)}{\left(\pi_{dd,op,X}(\gamma)+\pi_{dx,op,X}(\gamma)-F_{dd}-F_{df}\right)/\left(\pi_{dd,op,NX}(\gamma)-F_{dd}\right)}\right)$$

This is smaller than unity if

$$\frac{\pi_{dx,op,X}(\gamma)-F_{df}}{\pi_{dd,op,X}(\gamma)} > \frac{F_d}{\pi_{dd,op,X}(\gamma)} - \frac{F_d}{\pi_{dd,op,NX}(\gamma)}$$

which is true because the left-hand side expression is positive for exporting firms and the right-hand side is negative given that $\pi_{d,op,X}(\gamma) > \pi_{d,op,NX}(\gamma)$.

B List of ICB Industries Classified as Non-Tradeable.

Banks; Equity & Nonequity Investment Instruments; Financial Services; Food & Drug Retailers; Gas, Water & Multiutilities; General Retailers; Life Insurance; Mobile Telecommunications; Nonlife Insurance; Real Estate Investment & Services; Software & Computer Services; Travel & Leisure.

Table 1: Predictions of Heterogeneous Firm Models

	Reduction in domestic tariffs			Reduction in foreign tariffs		
	Domestic profits	Export profits	Profits Exporters/Non-Exporters	Domest. profits	Export profits	Profits Exporters/Non-Exporters
Melitz (2003)	?	?	**?**	-	+	**+**
Melitz-Ottaviano (2008)						
- short run	-	0	**+**	0	+	**+**
- long run	+	-	**-**	-	+	**+**
Chaney (2008)	-	0	**+**	0	+	**+**

Notes: Table shows the predictions of the heterogeneous firm models listed in the first column with respect to the impact of domestic and foreign tariff reductions on firm-level profits. See text for details.

Table 2: Summary of Events

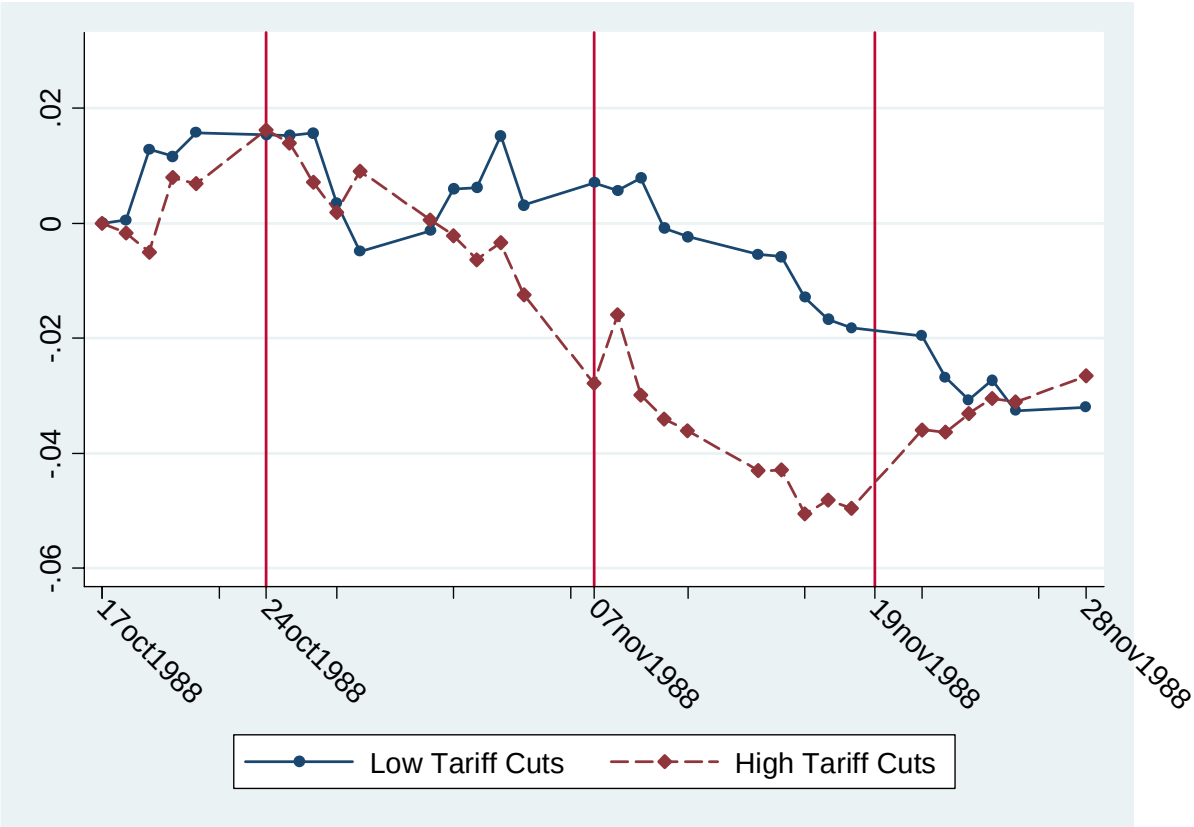
Event Description	**Event Date**	**Likelihood of CUSFTA's implementation**
1. Three nationwide opinion polls put the Conservative Party ahead of the opposition on Saturday, November 19. The Conservatives win the election on November 21.	November 21 and 22, 1988	Strongly increased
2. The United States and Canada reach an agreement on CUSFTA on Saturday, October 3, 1987.	October 5, 1987	Increased
3. John Turner instructs the Liberal majority in the Canadian Senate to block the ratification of CUSFTA until after a general election.	July 20, 1988	Decreased
4. A Gallup poll published on November 7 shows a twelve percentage point lead for the oppositional Liberal Party.	November 7, 1988	Decreased

Table 3: Descriptive Statistics

Industry	#	Sales			$d\tau_{CAN}$	$d\tau_{US}$
		Median	Min	Max		
Aerospace & Defense	10	238.7	39.5	1456.4	-2.7%	-2.6%
Automobiles & Parts	6	412.0	113.2	15943.3	-0.4%	-0.2%
Beverages	9	57.1	4.7	4611.0	-26.6%	-1.8%
Chemicals	7	158.0	32.8	1385.4	-5.2%	-4.5%
Construction & Materials	21	206.5	0.7	4715.0	-6.0%	-2.9%
Electronic & Electrical Equipment	14	72.3	0.1	1797.7	-3.3%	-2.7%
Fixed Line Telecommunications	10	363.2	3.2	15253.0	-5.1%	-4.9%
Food Producers	19	354.5	3.2	3804.0	-4.3%	-2.2%
Forestry & Paper	22	526.1	43.1	5819.1	-3.3%	-0.6%
General Industrials	8	467.5	1.5	6499.8	-7.5%	-2.8%
Healthcare Equipment & Services	4	33.0	0.3	205.9	-4.3%	-2.8%
Household Goods	12	101.8	10.4	450.5	-8.2%	-3.0%
Industrial Engineering	18	97.2	2.7	1737.5	-0.8%	-0.4%
Industrial Metals	24	408.6	0.1	10175.0	-2.8%	-2.0%
Leisure Goods	6	308.9	93.7	1110.5	-4.6%	-3.0%
Media	27	159.2	0.2	4467.9	0.0%	0.0%
Oil Equipment & Services	20	14.5	0.7	3941.0	-2.3%	-1.5%
Personal Goods	3	157.1	8.7	1217.2	-12.7%	-8.7%
Pharmaceuticals & Biotechnology	6	0.9	0.1	156.3	-4.7%	-2.3%
Technology Hardware & Equipment	9	28.5	2.7	6451.3	-1.6%	-1.9%
Tobacco	2	2629.2	413.9	4844.5	-1.4%	0.0%
Total	257	191.6	0.1	15943.3	-5.1%	-2.4%

Notes: Table shows descriptive statistics on the number of firms per industry, firm-level sales (in mill. $CND), and average tariff cuts implemented under CUSFTA. See text for details.

Figure 1: Cumulative average returns over the sample period.



Notes: Figure shows differences in cumulative average returns for exporters and non-exporters for two groups: the 50% of industries with the largest U.S. tariff cuts and the 50% of industries with the smallest U.S. tariff cuts. All cumulative average returns are normalised to zero on October 17. See text for details.

Table 4: Baseline Results

	(1) Return	(2) Return	(3) Return	(4) Return	(5) Return	(6) Return
$d_e * d_x$	0.010	-0.014	0.003	-0.005	-0.039	-0.012
	(8.976)**	(8.502)**	(11.039)**	(12.201)**	(6.628)**	(8.154)**
$d_e * d_x * d\tau_{CAN}$		-0.216		-0.020	-0.225	-0.011
		(7.225)**		(5.115)**	(2.305)*	(0.836)
$d_e * d_x * d\tau_{US}$		-0.825		-0.340	-1.268	-0.522
		(9.492)**		(19.102)**	(4.271)**	(8.144)**
Export Status Definition	$>$ 30th percent.	$>$ 30th percent.	log(sales)	log(sales)	$>$ 30th percent.	log(sales)
Firms	257	257	257	257	257	257
Event Window	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 14-22	Nov. 14-22
Length Event Window	2 days	2 days	2 days	2 days	7 days	7 days
Observations Event Window	514	514	514	514	1799	1799

Notes: Table shows cumulative average abnormal returns from market-model OLS regressions (figures in brackets are t-stats based on standard errors clustered per trading day). The dependent variable are daily stock returns. See text for specification details (equations 3 and 4). The independent variables shown in the table are event dummies (d_e) interacted with export status (d_x), and triple interactions between the event dummy, export status and Canadian tariff cuts ($d\tau_{CAN}$) or US tariff cuts ($d\tau_{US}$), respectively. In columns 1, 2 and 5, firms are classified as exporters if their sales are bigger than the 30th percentile in a given industry. Columns 3, 4 and 6 use a continuous definition of export status (log sales). All specifications include industry fixed effects interacted with the event dummy. +, *, and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

Table 5: Actual Export Status and Comparison with Proxies

	(1) Return	(2) Return	(3) Return	(4) Return	(5) Return	(6) Return
$d_e * d_x$	0.016	0.013	0.014	0.011	0.002	0.002
	(14.323)**	(12.798)**	(16.242)**	(11.732)**	(14.919)**	(10.733)**
$d_e * d_x * d\tau_{CAN}$		0.059		0.055		0.009
		(2.944)**		(7.631)**		(9.064)**
$d_e * d_x * d\tau_{US}$		-0.281		-0.333		-0.050
		(7.644)**		(10.447)**		(10.689)**
Export status definition	Actual	Actual	$>$30th percent.	$>$30th percent.	log(sales)	log(sales)
Firms	55	55	55	55	55	55
Event Window	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22
Event Window Length	2 days	2 days	2 days	2 days	2 days	2 days
Observations Event Window	110	110	110	110	110	110

Notes: Table shows cumulative average abnormal returns from market-model OLS regressions (figures in brackets are t-stats based on standard errors clustered per trading day). The dependent variable are daily stock returns. See text for specification details (equations 3 and 4). The independent variables shown in the table are an event dummy (d_e) interacted with export status (d_x), and triple interactions between the event dummy, export status and Canadian tariff cuts ($d\tau_{CAN}$) or US tariff cuts ($d\tau_{US}$), respectively. In columns 1 and 2, I use actual export status. In columns 3 and 4, firms are classified as exporters if their sales are bigger than the 30th percentile in a given industry. Columns 5 and 6 use a continuous definition of export status (log sales). See text for details. +, *, and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

Table 6: Alternative Abnormal Return Model (Fama-French), Log Returns

	(1) Return	(2) Return	(3) Log Return	(4) Log Return
$d_e * d_x$	-0.020	-0.006	-0.014	-0.005
	(7.711)**	(7.256)**	(8.640)**	(12.892)**
$d_e * d_x * d\tau_{CAN}$	-0.171	-0.023	-0.218	-0.020
	(3.976)**	(3.389)**	(7.765)**	(5.096)**
$d_e * d_x * d\tau_{US}$	-1.093	-0.334	-0.793	-0.350
	(9.566)**	(10.181)**	(9.322)**	(18.909)**
Abnormal Returns Model	Fama-French	Fama-French	Market Model	Market Model
Export Status Definition	$>$ 30th percent.	log(sales)	$>$ 30th percent.	log(sales)
Firms	257	257	257	257
Event Window	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22
Length Event Window	2 days	2 days	2 days	2 days
Observations Event Window	514	514	514	514

Notes: Table shows cumulative average abnormal returns from OLS regressions (figures in brackets are t-stats based on standard errors clustered per trading day). The dependent variable are daily stock returns in columns 1-2, and log returns in columns 3-4. See text for specification details (equations 3 and 4). The independent variables shown in the table are an event dummy (d_e) interacted with export status (d_x), and triple interactions between the event dummy, export status and Canadian tariff cuts ($d\tau_{CAN}$) or US tariff cuts ($d\tau_{US}$), respectively. In columns 1 and 3, firms are classified as exporters if their sales are bigger than the 30th percentile in a given industry. Columns 2 and 4 use a continuous definition of export status (log sales). All specifications include industry fixed effects interacted with the event dummy. See text for details. +, *, and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

Table 7: Controlling for Input Tariffs, Results for Non-Tradeable Sectors

	(1) Return	(2) Return	(3) Return	(4) Return
$d_e * d_x$	-0.032	-0.007	0.000	0.001
	(6.802)**	(10.326)**	(0.065)	(2.865)**
$d_e * d_x * d_{manufacturing}$			0.010	0.002
			(5.704)**	(5.853)**
$d_e * d_x * d\tau_{CAN}$	-0.202	-0.019		
	(6.746)**	(4.754)**		
$d_e * d_x * d\tau_{US}$	-0.632	-0.311		
	(6.001)**	(15.630)**		
$d_e * d_x * d\tau_{INPUT}$	-0.458	-0.059		
	(4.143)**	(3.341)**		
Export Status Definition	$>$ 30th percent.	log(sales)	$>$ 30th percent.	log(sales)
Firms	257	257	535	535
Event Window	Nov. 21-22	Nov. 21-22	Nov. 21-22	Nov. 21-22
Length Event Window	2 days	2 days	2 days	2 days
Observations Event Window	514	514	1018	1018

Notes: Table shows cumulative average abnormal returns from market-model OLS regressions (figures in brackets are t-stats based on standard errors clustered per trading day). The dependent variable are daily stock returns. See text for specification details (equations 3 and 4). The independent variables shown in the table are event dummies (d_e) interacted with export status (d_x), and triple interactions between the event dummy, export status and Canadian tariff cuts ($d\tau_{CAN}$) or US tariff cuts ($d\tau_{US}$), respectively. All specifications include industry fixed effects interacted with the event dummy. +, *, and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

Table 8: Parameter Estimates for Non-Event Dates

Coefficient estimate	Mean (sd)	Percentiles 1st	5th	10th	50th	90th	95th	99th
β_{1e}, log sales export proxy	0.000 (0.003)	-0.009	-0.005	-0.004	0.000	0.004	0.005	0.007
β_{2e}, Canadian tariff-export status interaction, log sales export proxy	-0.001 (0.032)	-0.084	-0.063	-0.047	0.001	0.039	0.046	0.060
β_{3e}, U.S. tariff-export status interaction, log sales export proxy	0.004 (0.147)	-0.349	-0.221	-0.188	-0.005	0.188	0.310	0.353
β_{1e}, binary export proxy	0.000 (0.012)	-0.033	-0.019	-0.014	0.001	0.015	0.018	0.026
β_{2e}, Canadian tariff-export status interaction, binary export proxy	-0.015 (0.249)	-0.669	-0.443	-0.334	-0.001	0.318	0.350	0.484
β_{3e}, U.S. tariff-export status interaction, binary export proxy	0.019 (0.623)	-1.733	-0.880	-0.659	-0.074	0.781	1.200	1.543
Number of draws	1,000							
Number of firms	257							
Length Event Window	2 day							
Obs. per Event Window	514							

Notes: Table shows mean, standard deviation and percentiles for the distributions of coefficient estimates shown in the left column. These estimates were obtained by estimating the specification underlying table 4, columns 2 and 4, for randomly chosen pairs of consecutive days in the period 1 November 1987 to 30 June 1988. Results are based on 1,000 repetitions. See text and table 4 for further details.

Table 9: Additional Events

	(1) Return	(2) Return	(3) Return	(4) Return	(5) Return	(6) Return
$d_e * d_x$	0.002	-0.001	0.002	0.000	0.004	0.000
	(3.266)**	(4.506)**	(2.867)**	(1.808)+	(3.026)**	(1.136)
$d_e * d_x * d\tau_{CAN}$	-0.005	-0.008	-0.049	0.004	0.098	0.030
	(0.359)	(4.994)**	(2.735)**	(1.886)+	(4.731)**	(9.522)**
$d_e * d_x * d\tau_{US}$	-0.234	-0.055	0.362	0.040	0.608	0.072
	(7.630)**	(8.406)**	(8.279)**	(5.174)**	(9.187)**	(5.875)**
Export Status Definition	$>$ 30th percent.	log(sales)	$>$ 30th percent.	log(sales)	$>$ 30th percent.	log(sales)
Firms	257	257	257	257	257	257
Event Window	Oct.5, 1987	Oct.5, 1987	July 20, 1988	July 20, 1988	Nov. 7, 1988	Nov. 7, 1988
Length Event Window	1 day	1 day	1 day	1 day	1 day	1 day
Observations Event Window	257	257	257	257	257	257

Notes: Table shows cumulative average abnormal returns from market-model OLS regressions (figures in brackets are t-stats based on standard errors clustered per trading day). The dependent variable are daily stock returns. See text for specification details (equations 3 and 4). The independent variables shown in the table are event dummies (d_e) interacted with export status (d_x), and triple interactions between the event dummy, export status and Canadian tariff cuts ($d\tau_{CAN}$) or US tariff cuts ($d\tau_{US}$), respectively. All specifications include industry fixed effects interacted with the event dummy. +, *, and ** denote statistical significance at the 10%, 5% and 1% level, respectively.