Trade liberalization, acquisition composition, and productivity: The case of New Zealand

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Abstract

In this paper, I develop a model of acquisitions within a setting of asymmetric countries and tariffs. Trade liberalization, whether by the small country or their large trading partner, decreases the share of acquisitions within the small country that are foreign. However, the effects of tariffs on aggregate productivity in the small country differ depending on who is liberalizing. Precisely, own-country tariff liberalization induces productivity-diminishing reallocation, and trading partner tariff liberalization induces productivity-enhancing reallocation.

Using a liberalization episode in New Zealand as a case study, I find little evidence that trading partner tariffs affect investment composition within New Zealand. In contrast, I find strong evidence that trade liberalization by New Zealand decreases the share of acquisitions that are foreign within New Zealand. Further, analyzing target-firm sales data, I find evidence that is consistent with the productivity results discussed in this paper. That is, import tariff liberalization yields smaller targets, and lower export market tariffs yield the opposite.

1 Introduction

Many recent insights in international trade theory result from an increased focus on behavior at the firm level. In particular, the seminal contributions of Melitz (2003) and Bernard, Jensen, Eaton and Kortum (2004) provide a basis for the study of heterogeneous firms, each providing rich frameworks that capture empirically relevant trade patterns and firm-level decisions. Generally, in their models, changing costs of trade induce selection in and out of markets.

It is these selection effects that have provided the basis for many other models that examine selection in and out of markets, and in and out of discrete investment choices.[1] This paper also focuses

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[1] For example, Helpman, Melitz and Yeaple (2004) develop a model in which heterogeneous firms choose between

on these selection effects, where I present a model in which firms make exit, export and investment choices based on their underlying productivity. This paper differs from the existing literature, however, in that I focus on the case of a small country where investment within its own borders by domestic and foreign firms is sensitive to asymmetric choices of its own import tariffs (inbound tariffs) and those of its trading partners (outbound tariffs). In previous work, tariffs are assumed to be identical across countries, focusing on instances of reciprocal liberalization. Breinlich (2007) and Spearot (2008b) are good examples. These models do not offer precise guidance for analyzing periods of unilateral or asymmetric liberalization. As I will soon show, when focusing on reallocation via acquisitions, inbound and outbound tariff liberalization have opposing short-run effects on aggregate productivity. Thus, ascertaining the sensitivity of acquisition choices to each is crucial to understanding the precise effects of trade liberalization on aggregate productivity.

As a fairly general rule, most recent episodes of trade liberalization occur within the framework of a trade agreement. However, a noteworthy exception to this rule is New Zealand in the 80's and 90's, where the New Zealand government executed an unprecedented unilateral shift from a closed and regulated economy to one with few regulations and open international markets. Empirically, the unilateral nature of this shift is particularly helpful, as one can isolate the effects of one government's policy choices without any coordinated policy choices of a trading partner. This is especially the case with tariffs. Since a significant portion of the New Zealand liberalization process involved tariff reductions, this makes New Zealand a very compelling case study in analyzing the effects of tariffs on industry-level measures and/or firm-level decisions.[2]

In particular, the period 1992-2006 provides a unique window into how tariff choices affect firm-level decisions occurring within New Zealand's borders. Reductions in import tariffs applied by New Zealand were nontrivial, and due to previous liberalization, these reductions were also quite credible. In addition, tariff reductions by their trading partners took place during a later period, mostly when New Zealand tariffs were stagnant. For these and other reasons, this period is quite useful in examining the effects of asymmetric tariff changes on investment.

For example, Kelsey (2000) describes how a number of multinational automotive companies altered production decisions in New Zealand in the face of accelerated liberalization of tariffs on automotive components and manufacturing. Toyota, Nissan, Mitsubishi and Honda each had final assembly facilities operating in New Zealand prior to 1997. After the final announcement of automotive tariff cuts, all four producers moved production off shore. This anecdote alone suggests that import tariffs

exports and foreign direct investment (FDI). Antràs and Helpman (2004) and Díez (2008) each develop models where firms choose between offshoring and outsourcing. Melitz and Ottaviano (2005) develop a model where the entry and exporting decisions of firms are strongly tied to market size effects, including those that may be asymmetric by country. Nocke and Yeaple (2006) analyze the choice between mergers and new investment. Bustos (2006) models heterogeneous firms and their choices of technology adoption in response to trade liberalization. Most recently, Arkolakis (2007) identifies endogenous marketing costs as a critical component in explaining the effects of tariff changes on some refined moments in the data.

[2] This is not the first study to use New Zealand as a case study. Along with others mentioned in the body of the paper, West (2004) examines tradeoffs associated with decreasing exchange rate volatility in New Zealand. Edwards (2006) presents a study of New Zealand current account imbalances, and the likelihood of a sudden structural reversal of their current account deficit.

have an effect on the dynamic investment choices of firms - even those with established investments in the host country.

To rigorously motivate an empirical examination of tariffs and acquisitions during this period, I develop a theoretical model of acquisition behavior that is similar to the models presented in Spearot (2008) and Spearot (2008b). The model consists of a small country (New Zealand) and a composite trading partner, "Rest of World". These countries differ only in their consuming populations. Two assumptions simplify the analysis. First, a fixed measure of firms compete for assets only in the small country, not the large composite country. This affords a clear examination of how small country tariffs and those of their trading partners affect acquisition/investment behavior in the small country. Second, I assume that the composite "Rest of World" levies a common tariff, abstracting away from any country-specific heterogeneity in tariffs or trading distances from the small country.

The main result of the theoretical model is while inbound and outbound tariffs have similar effects on the composition of the acquisition market, they have opposing effects on aggregate productivity. Unilateral trade liberalization by the small country decreases the share of acquisitions that are foreign.[3] The intuition is straightforward, and is similar to a "tariff-jumping" argument. Precisely, smaller tariffs diminish the incentive of foreign firms to avoid tariffs by a foreign acquisition. Since this primary effect puts downward pressure on the price of small country assets, more domestic firms find an acquisition profitable, and thus the foreign share of acquisitions decreases. In addition, since a lower acquisition price leads to fewer inefficient firms selling, unilateral liberalization of inbound tariffs tends to decrease aggregate productivity.

While a bit more complex, "Rest of World" trade liberalization also decreases the share of acquisitions within the small country that are foreign. However, in contrast with inbound tariffs, trade liberalization by other countries improves aggregate productivity in the small country.[4] With lower tariffs incurred by small country exporters, the effective size of the market for each of their varieties is larger. Thus, optimal firm-size is larger, and the domestic demand for assets increases. This tends to crowd-out foreign acquisitions, and decreases the share of acquisitions that are foreign.[5] Also, the higher domestic demand for assets tends to crowd out the least efficient firms, leaving a higher average productivity of active firms.

The response of aggregate productivity to asymmetric liberalization is different than the short-run response of aggregate productivity in Melitz and Ottaviano (2005). The difference is best explained by the exit mechanism. In Melitz and Ottaviano (2005), focusing on the case of inbound tariffs, liberalization leads to more product market competition in the short run. Thus, inefficient firms are less likely to be profitable, and a higher share of these firms exit. In contrast, I close down this mechanism, and focus instead on the demand for assets which firms require for production. Since

[3] I focus on acquisition share for reasons to be explained in the empirical section. However, within the setup of the theoretical model, share and value predictions are qualitatively identical.

[4] For this result to hold, the least productive active firm must not export.

[5] The effects of trading partner tariffs are different from related work by Blanchard (2005). In her model, lower tariffs actually encourage FDI by firms in the tariff-setting country, where lower tariffs increase the incentive for capital to flow from the previously protected country to the natural exporting country.

tariff liberalization reduces the overall demand for assets in the home market, the asset price will adjust downward and make production more profitable for all firms, including the least efficient.

After summarizing the historical experience of New Zealand in section three, I test the predictions of the model in section four. Using a merger database from *Thomson Financial* and tariff data from TRAINS, I construct an unbalanced panel of industry-level merger and acquisition behavior within New Zealand, along with the associated tariffs applied by New Zealand and her trading partners. Acquisition level target and acquiring firm sales data are also obtained, though are fairly sparse within the *Thomson* dataset. In addition, I control for New Zealand specific macroeconomic factors, including the exchange rate and real GDP.

Empirically, I first show that there is little relationship between trading partner tariffs and the foreign composition of acquisitions. However, three important caveats apply to this result. First, some of New Zealand's trading partners levy significant non-tariff barriers to trade, suggesting that observed ad-valorem tariff changes may do little to reduce overall restrictiveness. In addition, the average outbound tariff is constructed by averaging the applied tariffs of a number of heterogeneous trading partners, which is substantially different from the two-country model developed in section two. Finally, lower tariffs set by trading partners may support more export-oriented investment in New Zealand by foreign firms.

In contrast, the average inbound tariff is constructed using only New Zealand import tariffs. Also, non-tariff barriers to trade in New Zealand were eliminated prior to my sample period. Thus, it is more likely that the effects of inbound tariffs can be precisely estimated. Empirically, I find broad support for the theory, where there exists a positive relationship between New Zealand tariffs and the foreign share of acquisitions. This result is significant at refined levels of aggregation, and large in magnitude. Indeed, a 1 percentage point decrease in the New Zealand import tariff decreases the foreign share of acquisitions by roughly 3 percentage points. Given the 3.5 percentage point average decrease in New Zealand import tariffs over the period 1992-2006, this implies that New Zealand tariff reductions decreased the foreign share of the acquisition market by roughly 10.5 percentage points, or 17.5%.

To address the robustness of these results, I attempt to proxy for general trends in foreign investment into New Zealand by constructing the share of foreign acquisitions in wholesale and non-tradeable industries (which report no tariff data). Including this variable as an additional control does little to change the magnitude and significance of the original estimates. Further, I also test the model using the share of Australian acquisitions within New Zealand, rather than the share of all foreign acquisitions within New Zealand. Since Australian exports are governed by a bilateral free trade agreement and not multilateral tariffs, they should essentially function as domestic acquisitions in response to reductions in multilateral tariffs. Indeed, while insignificant, the point estimates support this point. More importantly, the results suggest that unobserved factors related to foreign investment are *not* spuriously correlated with tariff reductions.

Finally, to close the empirical section, I take a simple look at the relationship between tariffs and productivity. Firm-level productivity is proxied for using sales data, given the relatively poor reporting of other variables (such as employment and physical capital). Within broadly defined industries and years, I find that higher New Zealand import tariffs tend to increase the size of merger targets within New Zealand, and higher average tariffs set by New Zealand's trading partners tend to decrease the size of targets within New Zealand. The point estimates of these effects are unreasonably large to interpret as productivity, and highlight the need to obtain complete firm-level reporting of sales and inputs. However, despite this caveat, since the model dictates that targets are the least productive firms, these results imply that import tariff liberalization reduces aggregate productivity via the acquisition market, and export market liberalization does the opposite.

This paper contributes to a number of different areas in the literature. First, the equilibrium model contributes to the long line of papers examining market access and tariff jumping motives for investment. However, different from Brainard (1997), Helpman, Melitz and Yeaple (2004), and Tekin-Koru (2006), this paper tests the model by looking at asset level data in the target market, rather than sales or entry from the source market. In theory, the approach used in this paper could be applied to any input market in which domestic and foreign firms compete for assets.

Explicitly related to tariffs, the results in this paper are consistent with Blonigen (2002), which reports a moderate incentive for tariff jumping in response to US anti-dumping duties. Specific to mergers, this paper is related to Tekin-Koru (2006), who finds no evidence of tariff jumping merger activity using a database of Swedish firms. However, her panel is very long with widely spaced sampling points. Thus, I view her results to be long-run results, where the theory and empirics in this paper are more suited to address the short-run motives for tariff jumping and the effects thereof. Further, as discussed in Spearot (2008), mergers are intrinsically a more short-run investment given their speed advantage over greenfield investment. Breinlich (2007) also provides related work, using the US-Canada free trade agreement to analyze the effects of tariff reductions on the scale of acquisition activity. Since most US-Canadian mergers were domestic during that period, my model complements the work of Breinlich by focusing on the causes and effects of foreign acquisition demand. In addition, I focus more on the role of tariffs in determining target productivity (and hence, industry productivity). Lastly, the present model is closely related to Spearot (2008) and Spearot (2008b). In particular, the latter discusses the role of foreign investment in the average productivity of targets, which is similar to this work. However, Spearot (2008b) uses a larger sample absent tariff data, and the New Zealand case study presented below is well-suited to address the specific effects of tariffs.

2 Theory

In this section, I develop a simple model of investment within a small open economy. Precisely, I examine the exit/export/investment choices of M_H entrants in a small country "H", along with the export/investment choices of M_{rw} firms located in the large "Rest of World" (ROW).

There are two stages related to firm-level behavior. Firms are endowed with "lumps" of capital at the beginning of the game. Prior to producing varieties for the product market, firms trade lumps of industry-specific capital on a competitive acquisition market within country H. During this stage, domestic (Country H) firms may sell their capital and exit, do nothing, or buy all the capital of another domestic firm. Foreign firms located in ROW may purchase capital in country H to serve country H directly, or they can allocate capital from their existing operations in ROW for purposes of export from ROW to country H.

In the final stage, the "product market stage", firms sell their product and earn profits. During this stage, export sales will incur a tariff. If a country H firm chooses to serve the ROW by exports, it must pay a per-unit tariff τ_{rw}. If a foreign firm in ROW serves country H by exports, the firm must pay a per-unit tariff, τ_h. The objective of the model is to examine how these two tariffs individually affect the composition of acquisitions, and how each affect aggregate productivity in the small country via reallocation in the acquisition market.

As a final preliminary note, to capture the small country assumption, I assume that while fundamental tastes are identical across countries, there are more consumers in ROW. I assume that this difference is sufficiently large such that country H agents have no effect on ROW, and that ROW firms make the choice of how to serve country H independent of their existing operations within ROW.[6] The functional specifics of these assumptions will be laid-out alongside the development of the theoretical model.

2.1 Model

Solving the model by backward induction, I start by describing the demand side. Demand for each variety in country H is assumed to follow a simple linear relationship. The inverse demand function for variety i in country H is written as,

$$p_{i,h} = A - \frac{\widehat{b}}{L_h} \cdot q_{i,h} = A - b \cdot q_{i,h}. \tag{1}$$

In (1), the primitive demand function per consumer, $p_{i,h} = A - \widehat{b} \cdot q_{i,h}$, is aggregated over L_h consumers, where $b = \frac{\widehat{b}}{L_h}$.

I will also assume a simple linear demand specification for the rest of the world (ROW), where the inverse demand function for variety i in ROW is written as,

$$p_{i,rw} = A - \frac{\widehat{b}}{L_{rw}} \cdot q_{i,h} = A - b \cdot \lambda \cdot q_{i,rw}. \tag{2}$$

The only difference between (2) and (1) is that (2) has a scaler λ applied to the slope. This results from assuming that $L_h = \lambda L_{rw}$. To match the assumption that country H is small relative to ROW, I assume that $\lambda \in (0, 1)$. Thus, while consumers are identical in each country, there are more of them in ROW.

[6] These characteristics are similar to Flam and Helpman (1987), where in their model, actions in the small country do not affect the price of foreign varieties. The analogous assumption in my work is that anything specific to country H does not affect the opportunity cost of capital in ROW. That is, I completely abstract away from any reallocation within the ROW market, only focusing on reallocation in the country H market.

Finally, in both demand functions, $A's$ are taken as given. This simplification is for the sake of tractability, although this feature is recoverable from the preferences in Melitz and Ottaviano (2005), assuming no substitutability between varieties. Functionally, this guarantees that all competitive effects of trade liberalization will occur in the asset market, and not affect the demand for each variety in the product market. Thus, the mechanism in Melitz and Ottaviano (2005) will be shut down, and the paper will focus on competition for productive assets.

Country H Firms

Firms in country H may face two types of costs. First, all firms incur production costs. Similar to Perry and Porter (1985) and Spearot (2008, 2008b), the production costs in producing variety i in country H take the following form:

$$C\left(q_i|\alpha_i, v, K\right) = \frac{1}{2\alpha_i} \cdot \frac{\left(q_{i,H} + q_{i,rw}\right)^2}{K} \tag{3}$$

In (3), α_i is firm-level productivity, $q_{i,h}$ is production for country H, and $q_{i,rw}$ is production for export to ROW. Productivity is continuously distributed according to $g_h(\alpha)$, defined over $\alpha \in (0, \infty)$. The variable K represents industry-specific capital held by the firm, where each firm is endowed with k units of capital at the beginning of the game. Industry-specific capital is homogeneous across firms. Importantly, the direct effect of an acquisition is through the cost function, where via the acquisition of additional capital, an acquisition reduces variable production costs.

Along with production costs, firms that export pay a per-unit tariff τ_{rw} for each unit sold. With this in mind, a firm with productivity draw α_i and capital level K faces the following profit maximization problem in the product market stage:

$$\begin{aligned}\pi\left(\alpha_i, K\right) &= \max_{q_i, q_{i,rw}} \left\{ \left(A - b \cdot q_{i,h}\right) \cdot q_{i,h} + \left(A - \tau_{rw} - b \cdot \lambda \cdot q_{i,rw}\right) \cdot q_{i,rw} - \frac{1}{2\alpha_i} \cdot \frac{\left(q_{i,h} + q_{i,rw}\right)^2}{K} \right\} \\ st &: \quad \{q_{i,h}, q_{i,rw}\} \geq 0 \end{aligned} \tag{4}$$

Solving (4) and dropping $i's$ for notational convenience, profits in the product market are written as:

$$\begin{aligned}\pi\left(\alpha, K\right) &= \left\{ \begin{array}{ll} \frac{A_h^2 \alpha K}{(4b_h \alpha K + 2)} & \alpha \leq \alpha_x(K) \\ \frac{A^2 \alpha K b(1+\lambda)}{2b(2b\lambda\alpha K + \lambda + 1)} - \frac{\tau_{rw}((2A - \tau_{rw})b\alpha K - \tau_{rw})}{2b(2b\lambda\alpha K + \lambda + 1)} & \alpha > \alpha_x(K) \end{array} \right\} \\ where, \quad \alpha_x(K) &= \frac{\tau_{rw}}{2bK(A - \tau_{rw})} \end{aligned} \tag{5}$$

It is verifiable that $\frac{\partial \pi(\alpha,K)}{\partial \alpha} > 0$ for all α, and $\frac{\partial \pi(\alpha,K)}{\partial \tau_{rw}} < 0$ for $\alpha > \alpha_x(K)$. For firms with $\alpha \leq \alpha_x(K)$, exporting is not profitable, so the tariff τ_{rw} is not relevant. In addition, $\frac{\partial \alpha_x(K)}{\partial \tau_{rw}} > 0$, where intuitively firms must be of higher productivity to profitably export subject to higher trade costs. Of course, for some trade to occur, I assume that $\tau_{rw} < A$. That is, the per-unit trade cost must be less than the maximum willingness to pay of each consumer in ROW.

With a general profit function defined, I now turn attention to the specific returns accruing to firms that acquire capital. For simplicity, I assume that acquisition behavior is lumpy, where a firm can only purchase one other firm of the same size in the acquisition stage. Thus, a firm in country H that purchased capital in the acquisition stage earns $\pi(\alpha, 2k)$ in the product market, while a firm that did nothing in the acquisition market earns $\pi(\alpha, k)$ in the product market. The payoff from an acquisition is simply the difference in these profit functions, and is written as:

$$BN(\alpha) = \left\{ \begin{array}{ll} \frac{A^2\alpha k}{2(4\alpha kb+1)(2\alpha kb+1)} & \alpha \leq \alpha_x(2k) \\ \frac{4A^2\alpha kb(1+\lambda)}{4b(4b\lambda\alpha k+\lambda+1)} - \frac{\tau_{rw}((2A-\tau_{rw})4b\alpha k-\tau_{rw})}{4b(4b\lambda\alpha k+\lambda+1)} + \frac{A_h^2\alpha k}{(4b_h\alpha k+2)} & \alpha_x(2k) < \alpha \leq \alpha_x(k) \\ \frac{(A+A\lambda-\tau_{rw})^2\alpha k}{2(4b\alpha k\lambda+\lambda+1)(2b\alpha k\lambda+\lambda+1)} & \alpha_x(k) < \alpha \end{array} \right\} \tag{6}$$

In (6), there are three "types" of firms. For $\alpha \leq \alpha_x(2k)$, a firm is unable to export to ROW before or after an acquisition. For $\alpha_x(2k) < \alpha \leq \alpha_x(k)$, a firm is unable to export to ROW before an acquisition, but the reduced production costs from an acquisition make exporting profitable post-acquisition. Finally, for $\alpha_x(k) < \alpha$, firms are able to export independent of acquisition decisions.

One issue complicates the analysis of $BN(\alpha)$, where I am allowing for λ to be arbitrarily low. If λ is low enough, then firms experience a large jump in elasticity upon reaching exporter status.[7] This characteristic is especially important if the marginal exporting firm operates on a relatively inelastic portion of the country H demand curve. For example, if a firm is operating at a low elasticity at home, the marginal incentive to invest will be low. However, if this same firm can also export to a foreign market with a very high elasticity, then the marginal incentive to invest will be high. To move forward, I make an assumption on trade costs ensuring that, for $\lambda > 0$, country H elasticity is relatively high for the marginal exporting firm. Precisely, I will assume the following for the remainder of the paper:

$$\tau_{rw} < \frac{2}{2+\sqrt{2}}A \tag{A1}$$

Thus, the difference in elasticity pre and post-acquisition will not be too large. The implications of this assumption are summarized in the following lemma:

Lemma 1 *Assuming A1, $BN(\alpha)$ has the following properties:*

$$\begin{array}{ll} \frac{\partial BN(\alpha)}{\partial \alpha} > 0 & \text{if} \quad \alpha < \frac{\sqrt{2}}{4bk}\left(\frac{\lambda+1}{\lambda}\right) \\ \frac{\partial BN(\alpha)}{\partial \alpha} < 0 & \text{if} \quad \frac{\sqrt{2}}{4bk}\left(\frac{\lambda+1}{\lambda}\right) < \alpha \end{array}$$

and,

$$\frac{1}{2}\pi(\alpha, 2k) < \pi(\alpha, k)$$

[7] For example, as λ approaches zero, the demand for each variety in ROW becomes perfectly elastic.

Proof. See Appendix ■

Lemma 1, via assumption A1, ensures that the incentives to acquire a domestic firm will be functionally identical to those in Spearot (2008).[8] Specifically, the upper and lower limits in (6) are zero, and the maximum occurs at a mid-range of productivity, $\alpha_{\max} = \frac{\sqrt{2}}{4bk}\left(\frac{\lambda+1}{\lambda}\right)$. Intuitively, these features are explained as follows. Low productivity firms are constrained by high costs, with or without an acquisition, and thus earn relatively little post-acquisition. On the other hand, high productivity firms earn little post-acquisition since they operate on a relatively inelastic portion of the demand curve, closer to the point where total revenues are maximized. Thus, it is the mid-productivity firms who benefit the most from an acquisition, being relatively less-constrained by revenues or costs.

Given the returns identified in (6), I now solve for optimal decisions of country H firms in the acquisition stage. In the country H capital market, capital will be traded at a price R_h per lump. Subject to this price, which is taken as given for the moment, firms choose between three options: sell all capital and exit, do nothing, or buy capital. Thus, profits earned in the acquisition market are defined by the following:

$$V_H(\alpha, R_h) = \max\{R_h, \pi(\alpha, k), \pi(\alpha, 2k) - R_h\} \tag{7}$$

In the first term of $V_H(\alpha, R_h)$, R_h represents the profits earned from selling and exiting. In the second term, $\pi(\alpha, k)$ represents the profits from doing nothing. Finally, $\pi(\alpha, 2k) - R_h$ represents the profits from buying.

Provided that R_h is low enough, I can define the following indifference points between options in the acquisition stage.

$$\begin{aligned} \pi(\alpha_S, k) &= R_h \\ BN(\underline{\alpha}_B) &= \pi(\underline{\alpha}_B, 2k) - \pi(\underline{\alpha}_B, k) = R_h \\ BN(\overline{\alpha}_B) &= \pi(\overline{\alpha}_B, 2k) - \pi(\overline{\alpha}_B, k) = R_h \end{aligned} \tag{8}$$

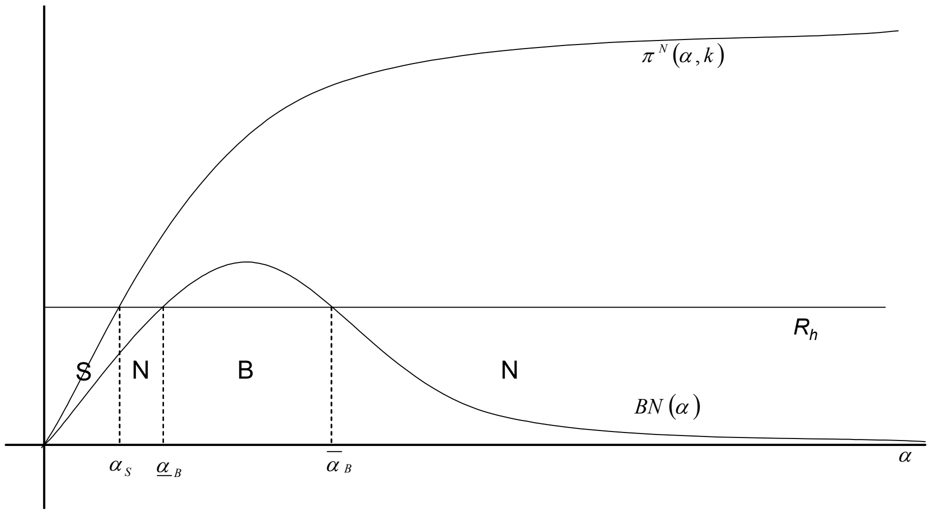
where,

$$\begin{aligned} \alpha &> \alpha_S \Longrightarrow N \succ S \\ \alpha &\in (\underline{\alpha}_B, \overline{\alpha}_B) \Longrightarrow B \succ N \end{aligned}$$

In (8), α_S represents the indifference point between selling and doing nothing, and $\underline{\alpha}_B$ and $\overline{\alpha}_B$ represent the lower and upper (respective) indifference points between buying and doing nothing. With these implicitly defined productivity cutoffs, using $\frac{1}{2}\pi(\alpha, 2k) < \pi(\alpha, k)$, optimal acquisition choice is identical to Spearot (2008). This is summarized in the following lemma.

[8] While these properties are different when assuming CES demand, the main results of the paper as they pertain to the composition of investment are not.

Figure 1: Optimal acquisition choice - country H firms



Lemma 2 *Assuming A1, if* $R_h < \max_{\alpha} \{BN(\alpha)\}$*, optimal acquisition choice is the following:*

$$
\begin{aligned}
For \quad & \alpha \in [0, \alpha_S(R_H)), \text{ firms sell} \\
& \alpha \in [\alpha_S(R_H), \underline{\alpha}_B(R_H)], \text{ firms do nothing} \\
& \alpha \in (\underline{\alpha}_B(R_H), \overline{\alpha}_B(R_H)), \text{ firms buy} \\
& \alpha \in [\overline{\alpha}_B(R_H), \infty), \text{ firms do nothing}
\end{aligned}
$$

Proof. See Appendix ■

The results in Lemma 2 are illustrated in Figure 1. In Figure 1, for $\alpha < \alpha_S$, the profits from selling are greater than profits from doing nothing. Also, the benefit of buying, $BN(\alpha)$, is less than the acquisition price, R_h. Thus, selling is the dominant option for the least efficient firms. There will exist a positive measure of these selling firms for $R_h > 0$.

If $R_h < \max_{\alpha} \{BN(\alpha)\}$, firms with productivity between $\underline{\alpha}_B$ and $\overline{\alpha}_B$ find an acquisition profitable.[9] For these firms, the benefit of the acquisition, $BN(\alpha)$, is greater than the acquisition price, R_h. Additionally, there exist two disjoint regions of productivity such that doing nothing is optimal. These regions are labeled by N in Figure 1. This follows from the "lumpiness" of assets.

To build intuition about the effects of relative country size on acquisitions within country H, the following lemma summarizes the effects of λ on $\underline{\alpha}_B$, and $\overline{\alpha}_B$.

Lemma 3 *The effects of* λ *are the following:*
$\frac{\partial \underline{\alpha}_B}{\partial \lambda} \geq 0 \quad \frac{\partial \overline{\alpha}_B}{\partial \lambda} < 0$

Proof. See Appendix ■

[9] If $R_h > \max_{\alpha} \{BN(\alpha)\}$, then no firms find a domestic acquisition profitable. Shortly, I will make an assumption that rules out this possibility.

As λ increases, ROW becomes smaller relative to the size of country H. For those firms that export, optimal firm size is smaller, and the incentive to acquire additional capital is smaller. Thus, given a fixed value of R_a, the range of firms that acquire must shrink. Put differently, as country H becomes smaller relative to ROW, the firms in country H have a higher incentive to engage in acquisitions.

One related result is that along with increasing the incentive to acquire, a lower value of λ will tend to skew acquisition incentives toward the highest productivity firms. Precisely, the productivity level that delivers the highest incentive to acquire, $\alpha_{\max} = \frac{\sqrt{2}}{4bk}\left(\frac{\lambda+1}{\lambda}\right)$, increases with lower values of λ. With lower λ, the aggregate demand elasticity increases, making acquisitions more profitable for high productivity firms. In summary, the larger ROW is in terms of consumers (lower λ), the more likely it will be that high productivity firms (who are exporters) have incentive to acquire.[10]

ROW Firms

In addition to the country H demand for country H assets, I will also assume that a fixed mass of firms, located in ROW, make decisions regarding if/how to serve country H. As mentioned above, I assume that country H is a relatively small market for ROW firms, and thus ROW firms can ignore the ROW market when making the decision how to serve country H. Precisely, I assume that the location of production for country H will not have a measurable effect on production costs in ROW, and thus the use of ROW capital to produce exports for country H incurs a negligible opportunity cost. Thus, I only focus on production and trade costs associated with the decision to serve country H, not any effects of this decision on the efficiency of a ROW firm's existing operations.[11]

Firms that choose to export from ROW to country H incur a per-unit tariff, τ_h. I assume that production costs are similar to (3). Given k units of capital used for production, the maximization problem for a ROW firm is written as,

$$\pi\left(\alpha_i, K\right) = \max_{q_{i,h}^{rw}} \left\{ \left(A - \tau_h - b \cdot q_{i,h}^{rw}\right) q_{i,h}^{rw} + \frac{1}{2\alpha_i} \cdot \frac{\left(q_{i,h}^{rw}\right)^2}{k} \right\}. \tag{9}$$

In (9), $q_{i,h}^{rw}$ is the production of ROW firm i for country H. Profits of exporting to country H are written as:

$$\pi_x\left(\alpha\right) = \frac{\left(A - \tau_h\right)^2 \alpha k}{\left(4b\alpha k + 2\right)}. \tag{10}$$

To ensure that exporting is not trivially unprofitable, I assume that $\tau_h < A$.

If a firm instead decides to serve country H directly by a foreign acquisition, it avoids all trade

[10] Note that if $\tau_{rw} = 0$, as $\lambda \to 0$, acquisition incentives are similar to Jovanovic and Rousseau (2002).

[11] If country H was a sizeable market, then the decision of how to serve country H may affect production costs in ROW, and involve a non-trivial share of ROW capital. Such a case is examined in Spearot (2007a).

costs.[12] Thus, profits are written as:

$$\pi_F(\alpha) = \frac{A^2 \alpha k}{(4b\alpha k + 2)}. \tag{11}$$

Moving back to the acquisition stage, foreign firms choose between exporting, foreign direct investment by acquisition, and not serving country H. The formal optimization problem is written as,

$$V_F(\alpha, A) = \max\{0, \pi_x(\alpha) - R_{rw}, \pi_F(\alpha) - R_h - \delta\}. \tag{12}$$

In (12), the first term represents the returns from not serving country H. The second term represents net profit from serving country H by exports, where R_{rw} is the exogenously given opportunity cost of using capital in ROW for purposes of export to country H. Finally, the third term represents the net profit from serving country H via a foreign acquisition, where δ is the added fixed cost of foreign investment that a firm must pay if investing directly in H. Assuming that the opportunity cost of using ROW assets is negligible, the maximization problem is re-written as:

$$V_F(\alpha, A) = \max\{0, \pi_x(\alpha), \pi_F(\alpha) - R_h - \delta\}. \tag{13}$$

Assuming that trade costs are not prohibitive ($\tau_h < A$), exporting is strictly preferred to doing nothing ($\pi_x(\alpha) > 0$). Thus, each ROW firm will either export or serve country H by foreign acquisitions.[13]

Each foreign firm chooses the option which maximizes profits. Assuming conditions to ensure existence (to be formalized shortly), the ROW firm that is marginally indifferent between exporting and foreign acquisitions is defined by:

$$\pi_F(\alpha_f, A) - \pi_x(\alpha_f, A) = R_h + \delta \tag{14}$$

In (14), α_f represents the productivity level such that a firm is indifferent between foreign acquisitions and exporting. Written in terms of model parameters:

$$\alpha_f = \frac{2(R_h + \delta)}{k\left((2A - \tau_h)\tau_h - 4b(R_h + \delta)\right)} \tag{15}$$

Since $\frac{\partial \pi_F(\alpha)}{\partial \alpha} > \frac{\partial \pi_x(\alpha)}{\partial \alpha}$, it follows that:

If $\alpha > \alpha_f$, firms prefer foreign acquisitions to exporting

In order to avoid trade costs via a foreign acquisition, firms must pay a composite fixed cost $(\delta + R_h)$.

[12] An obvious criticism of this setup is that ROW firms are using the same amount of capital subject to different prices. Allowing for different capital investment choices leaves the effects of tariffs on acquisitions unchanged. More generally, endogenously determining initial investment levels deserves attention in a separate paper.

[13] The qualitative results of the model (as they pertain to trade liberalization) remain unchanged if R_{rw} is small and positive. Contact the author for this alternate setup.

Thus, any firm that prefers a foreign acquisition to exporting will be at the higher end of productivity, $\alpha > \alpha_f$.

Up until this point, nothing has been assumed to ensure that foreign acquisitions are profitable. Examining (15), it is clear that $\frac{(2A-\tau_h)\tau_h}{4b} > (R_h + \delta)$ ensures that α_f is positive. That is, the net benefit of foreign acquisitions must be greater than the fixed cost. The following assumption over δ partially ensures that foreign acquisitions are profitable.

$$\frac{A^2}{4b} > \delta \tag{A2}$$

Using (A2) leads to the following lemma.

Lemma 4 *Assuming A2, if R_h is small, then there exists a range of trade costs $(\underline{\tau}_h, A)$ such that $\alpha_f > 0$.*

Proof. See Appendix ■

The intuition for this lemma is as follows. If trade costs τ_h are too high ($\tau_h > A$), then exporting will not be profitable. On the other hand, if trade costs are too low, then foreign acquisitions will never occur since the incentive to avoid trade costs is insufficient. In addition, small R_h is required since an arbitrarily high value of R_h will make foreign acquisitions trivially unprofitable relative to exporting.

With Lemma 4, optimal organizational choice by *ROW* firms is proven in the following lemma.

Lemma 5 *Assuming A2, if R_h is small, optimal acquisition choice is the following:*

For $\alpha \in [0, \alpha_f(R_h)]$, *firms serve country H by exports*
$\alpha \in (\alpha_f(R_h), \infty)$, *firms serve country H directly by a foreign acquisition*

Proof. See Appendix ■

The result in Lemma 5 is fairly simple, and similar to that in Helpman, Melitz and Yeaple (2004). Since I have assumed that country H is small, the decision of how to serve country H does not affect the production costs in *ROW*, as in Spearot (2008 and 2008b) Thus, the optimal choice of how to serve country H is a simple function of additional market access and the size of fixed costs. Higher productivity firms lose more by exporting and paying large outlays in trade costs, and thus have the largest incentive to pay an additional fixed cost to serve country H directly.

2.2 Equilibrium

Given optimal acquisition choice developed in the previous section, the equilibrium of the model is pinned down by the acquisition market clearing condition. In country H, the supply of capital is only a function of the mass of domestic firms that sell. On the demand side, both domestic and foreign firms may wish to acquire fixed assets in country H. If both domestic and foreign acquisitions occur in equilibrium, the acquisition market clearing condition for capital in country H is written as:

$$\overbrace{G_h(\alpha_s)M_hk}^{supply} = \overbrace{\left(G_h(\overline{\alpha}) - G_h(\underline{\alpha})\right)M_hk}^{domestic\ demand} + \overbrace{\left(1 - G_f(\alpha_f)\right)M_{rw}k}^{foreign\ demand} \tag{16}$$

The supply and demand for capital in country H will be determined by the acquisition price, R_h. On the left-hand side of (16), the supply of capital is increasing in the acquisition price. If $R_h = 0$, then no firms sell and $G_h(\alpha_s)M_Hk = 0$. If $R_h > \max_{\alpha}\{\pi(\alpha, k)\} = \frac{A^2}{4b} + \frac{(A-\tau_{rw})^2}{4b\lambda}$, then all domestic firms sell and $G_h(\alpha_s)M_Hk = M_Hk$.

The tricky part of the theoretical analysis occurs on the demand side, where there are two sources of acquisition demand that are a function of two independent distributions. Both sources of demand are decreasing in the acquisition price. In Lemma 5, it was proven that a small R_h is required for foreign acquisitions to be profitable over a non-empty range of trade costs. Similarly, a small value of R_h is required for domestic acquisitions to be profitable. Precisely, for domestic acquisitions to occur, the acquisition price must be less than the maximum incentive to acquire:

$$\max_{\alpha}\{BN(\alpha)\} = \frac{(3-2\sqrt{2})(A - \tau_{rw} + A\lambda)^2}{4b(\lambda+1)\lambda} > R_h$$

Thus, a sufficiently small R_h is required for domestic acquisitions to occur.

To move forward, a simple way to guarantee a small R_h is to assume that the distribution $g_h(\alpha)$ is downward sloping (Pareto or exponential, for example), and that a sufficient amount of the distribution mass occurs at the low end of productivity (low productivity dispersion). This ensures that supply will be comprised of very low productivity firms.[14] In equilibrium, this will guarantee that the market clearing R_h is sufficiently small such that both types of acquisition are profitable. Using this assumption, the equilibrium capital reallocation is summarized in the following proposition.

Proposition 1 *Assuming A1 and A2, if the distribution $g_h(\alpha)$ is downward sloping and skewed sufficiently toward the low end of productivity, then the equilibrium of the model consists of a unique R_h such that the acquisition market in (16) clears and that acquisition choice is summarized by the following:*

For $\alpha \in [0, \alpha_S)$, *firms in country H sell*
$\alpha \in [\alpha_S, \underline{\alpha}_B]$, *firms in country H do nothing*
$\alpha \in (\underline{\alpha}_B, \overline{\alpha}_B)$, *firms in country H buy capital*
$\alpha \in [\overline{\alpha}_B, \infty)$, *firms in country H do nothing*

For $\alpha \in [0, \alpha_f]$, *firms in ROW serve country H by exports*
$\alpha \in (\alpha_f, \infty)$, *firms in ROW serve country H directly by a foreign acquisition*

Proof. See Appendix ■

[14] In future work, I am planning to address how this might account for zeros in the data; i.e. industry-year pairs without any acquisitions.

Proposition 1 summarizes a rich set of acquisition choices as a function of productivity. Of primary interest are the direct effects of tariffs on the relative shares of each type of acquisition. However, all acquisitions are linked through the country H acquisition price. It is this acquisition price that will reinforce the direct effects of tariffs on the composition of investment, and determine the effects of tariffs on aggregate productivity.

2.3 Comparative Statics - Inbound and outbound tariffs

The purpose of developing this particular model of investment is to parsimoniously analyze how asymmetric tariff changes affect acquisitions within a small country. For example, in Breinlich (2007), Nocke and Yeaple (2006), and Spearot (2008b), the object of interest is a reciprocal liberalization of trade. These are certainly worthy and insightful exercises. However, they do not help in an analysis of any country that liberalizes outside the parameters of a trade agreement, or asymmetrically within a trade agreement. In particular, I will show that the selection and productivity effects of tariffs will differ depending on which country is engaging in liberalization.

I first examine the effects of an inbound tariff, τ_h. Throughout this section, I assume that A1-A2 hold, and that the distribution of productivity yields a low value of R_h. With this condition, the effects of τ_h are summarized in the following proposition.

Proposition 2 *The effects of τ_h are the following.*

$$\frac{\partial \alpha_S}{\partial \tau_h} > 0 \quad \frac{\partial \underline{\alpha}_B}{\partial \tau_h} > 0 \quad \frac{\partial \overline{\alpha}_B}{\partial \tau_h} < 0 \quad \frac{\partial \alpha_f}{\partial \tau_h} < 0$$

Proof. *See Appendix* ■

The intuition for Proposition 2 is straightforward. The direct effect of higher τ_h is to make exporting less profitable relative to foreign investment for firms that are located in ROW. Thus, more ROW firms decide to acquire country H capital ($\frac{\partial \alpha_f}{\partial \tau_h} < 0$). This puts upward pressure on the country H acquisition price, causing more firms to sell and fewer domestic firms to buy. Via more firms selling, the marginal selling firm must be more productive, and thus the average productivity of active firms in country H is higher. In terms of liberalization, Proposition 2 states that aggregate productivity worsens with unilateral liberalization of inbound tariffs.

Another way to phrase the result in Proposition 2 is the effect of τ_h on the share of acquisitions occurring in country H that are foreign.[15] Re-phrased in terms of an episode of unilateral liberalization, this is summarized in the following corollary of Proposition 2.

Corollary 1 *Unilateral liberalization (lower τ_h) decreases the foreign share of acquisition behavior occurring in country H.*

Proof. *See Appendix* ■

Since the direct effect of higher τ_h is to increase foreign acquisition demand, in equilibrium, more acquisitions occur ($\frac{\partial \alpha_S}{\partial \tau_h} > 0$). Given that the marginal selling firm is more productive, an indirect effect

[15] Focusing on predictions of the share of domestic acquisitions rather than the level of domestic acquisitions aids in the empirical implementation of the model. This will be discussed at length in the empirical section.

of higher τ_h is a higher acquisition price, which results in fewer domestic acquisitions. Spun in terms of unilateral liberalization, this implies that trade liberalization decreases the share of acquisitions that involve foreign acquiring firms.

The results in Proposition 2 and Corollary 1 can be linked back to productivity effects discussed parallel work. In Spearot (2008b), a reciprocal reduction in tariffs by identical countries yields an ambiguous outcome on aggregate productivity when both domestic and foreign acquisitions occur. However, these productivity effects were negative if the reciprocal reduction in tariffs disproportionately affects the incentives of foreign acquisitions. In Proposition 2 and Corollary 1, the only direct effect of lowering τ_h is to reduce the incentive of ROW firms to avoid trade costs and purchase country H capital. Since liberalization is not reciprocal, there are no countervailing effects on the export side that increase the domestic demand for assets. Thus, the isolated effect of liberalized import tariffs is lower aggregate productivity via reallocation in the acquisition market.

The response of aggregate productivity to asymmetric liberalization is different than the short-run response of aggregate productivity in Melitz and Ottaviano (2005). However, as alluded to in the introduction, the response of aggregate productivity is driven by product market competition, not competition for productive assets. Focusing on the case of inbound tariffs, liberalization leads to more product market competition in the short run. Thus, inefficient firms are less likely to profitably produce, and a higher share of these firms exit.

Finally, the result in Corollary 1 can be viewed as an alternate statement of the *tariff jumping* motive for investment, where firms invest abroad, "jumping" tariffs in the process. In most simple models, tariff liberalization leads to less tariff jumping behavior. In Corollary 1, the result is phrased in terms of the fraction of acquisitions that are foreign, where driven by the reduction in foreign acquisitions, the share of acquisitions in country H that are foreign decreases with inbound tariff liberalization. Indeed, this particular statement of the tariff-jumping hypothesis is a contribution to the literature, where in its most common form, the degree to which foreign investment occurs is measured by the relative sales of exporters to foreign affiliates. Brainard (1997) and Helpman, Melitz, and Yeaple (2004) use are good examples.[16] Thus, rather than relying on sales data, my model delivers an alternate way to test the tariff jumping hypothesis, relying on asset market data instead.

Along with the liberalization of τ_h, it is possible that there are concurrent changes in tariffs levied by foreign countries on exports from country H. Since these tariffs may also affect the composition of investment, it is necessary to ascertain their theoretical effects, and include these tariff changes in any empirical exercise. In extending the intuition from a two-country model to a multi-country setting, τ_{rw} can be viewed as a composite average tariff of all trading partners. Issues with this interpretation will be discussed shortly. The effects of τ_{rw} are summarized in the following proposition.

Proposition 3 *The effects of τ_{rw} are the following.*

[16] Precisely, Brainard (1997) uses the share of export sales in total sales, and Helpman, Melitz, and Yeaple (2004) use the sales of exporters divided by the sales of affiliates.

$$If\ \alpha_S < \alpha_x(k) \quad \frac{\partial \alpha_S}{\partial \tau_{rw}} < 0 \quad \frac{\partial \underline{\alpha}_B}{\partial \tau_{rw}} \lesseqgtr 0 \quad \frac{\partial \overline{\alpha}_B}{\partial \tau_{rw}} < 0 \quad \frac{\partial \alpha_f}{\partial \tau_h} < 0$$

$$If\ \alpha_S > \alpha_x(k) \quad \frac{\partial \alpha_S}{\partial \tau_{rw}} \lesseqgtr 0 \quad \frac{\partial \underline{\alpha}_B}{\partial \tau_{rw}} \lesseqgtr 0 \quad \frac{\partial \overline{\alpha}_B}{\partial \tau_{rw}} < 0 \quad \frac{\partial \alpha_f}{\partial \tau_h} < 0$$

Proof. See Appendix ■

Similar to Proposition 2, Proposition 3 can be rephrased as the effects of *ROW* trade liberalization on the share of foreign acquisitions.

Corollary 2 *ROW liberalization (lower τ_{rw}) decreases the foreign share of acquisition behavior occurring in country H.*
Proof. *See Appendix* ■

In Proposition 3, the direct effect of higher τ_{rw} is to reduce the effective size of the world market available to country H varieties. Thus, the optimal size of these firms is smaller, and the demand for capital by country H firms falls, putting downward pressure on the acquisition price. Through the lower acquisition price, more foreign firms in *ROW* choose to acquire capital in country H rather than export. The compound effect is summarized in Corollary 2, where higher τ_{rw} increases the share of acquisitions that are foreign. Spun in terms of unilateral liberalization, this implies that trade liberalization by *ROW* decreases the share of reallocation that involves foreign acquiring firms within country H.

Focusing on the case where the marginal selling firm does not export ($\alpha_S < \alpha_x(k)$), an implication of Proposition 3 is that liberalization of outbound tariffs will tend to increase aggregate productivity via reallocation in the acquisition market.[17] Liberalizing τ_{rw} will increase domestic acquisition demand, and give incentive for additional inefficient firms to exit the market.[18] This is in contrast with the results in Proposition 2, where liberalization of inbound tariffs results in lower productivity by reducing foreign acquisition demand. As in Spearot (2008b), it becomes an empirical question as to which effect is larger. Although detailed firm-level information is at a minimum, I will take a preliminary look at both effects in the following sections using a common database.

The result in Proposition 3 also displays a new feedback on investment associated with tariff changes that is different from existing work (Blanchard, 2005). Precisely, an implication of my model is that the higher tariff applied on country H exporters reduces the price of assets in country H. This makes foreign investment more attractive to firms from the tariff imposing country. Thus, a pro-FDI feedback (for the tariff setting country) is that higher tariffs will not only protect their import-competing industry, but may also make foreign investment more profitable for their multinational firms. Blanchard (2005), using a specific-factors model, finds a different result. Similar to my model, her model assumes only one host of foreign investment. However, in her model, higher tariffs actually

[17] This is also analogous to Melitz and Ottaviano (2005). In their work, liberalization of outbound tariffs increases long-run aggregate productivity via increased entry in the export-oriented sector.

[18] If the marginal selling firm was an exporter, the liberalizing τ_{rw} will tend to decrease the incentive to sell and exit. In equilibrium, this leads to an ambiguous effect on α_S. However, this ambiguous effect does not overturn the share prediction.

discourage FDI by firms in the tariff-setting country. Her results are rooted in the effects of tariffs on the terms of trade, where higher tariffs increase the incentive for capital owners to locate in the protected location rather than the location with deteriorating terms of trade.

Finally, one caveat that applies to both Proposition 3 and Corollary 2 is that the results are contingent on an exporter response in country H. In practice, τ_{rw} will represent a composite tariff constructed from the individual tariffs of many trading partners. If trade liberalization is undertaken by only minor trading partners, the response within country H will likely be weak. Similarly, if non-tariff barriers are a significant part of restrictiveness, then ad-valorem rates will have only a small effect on the acquisition market. In the next two sections, I discuss specifically how these issues present a problem in examining the effects of *ROW* tariffs, and also provide evidence to suggest that these issues are not a problem in examining the effects of New Zealand tariffs. Thus, for natural reasons, the following empirical section will focus on the effects unilateral liberalization by the New Zealand government.

3 The Case of New Zealand

Simply put, New Zealand undertook "one of the most notable episodes of liberalization that history has to offer" (Evans, Grimes, Wilkinson, and Teece, 1996, pg. 1856). Occurring primarily during the 80's and 90's, this episode of liberalization consisted of many areas of economic reform that some believe dramatically reduced unemployment, inflation, and provided an environment in which economic growth could be sustained (WTO, 1996). Others beg to differ, focusing on the transitional consequences and the government's response to them (Kelsey, 2000). In this section, I summarize the aspects of this liberalization period that pertain to trade and investment, and discuss why the period of 1992-onward (which is in-line with available data) is a particularly compelling period for analysis.

Summary

Trade liberalization was a very important part of the New Zealand economic liberalization process. Stated clearly by the WTO (1996), "Trade liberalization, privatization, and domestic deregulation have transformed New Zealand's economy from one of the most heavily protected and regulated into one of the most market-oriented and open in the world." With respect to trade liberalization, the most striking aspect is that this liberalization was almost entirely unilateral. The process of trade of liberalization occurred in three primary stages, and will be summarized in order.

The first stage, occurring during the 80's and very early 90's, was made up of three key elements. The first was a unilateral decision to lower applied MFN rates by 50% between the years 1988 and 1992. The second was the elimination of virtually all non-tariff barriers to trade by 1992, and, with the exception of fishing and air travel, national treatment for all foreign investment by 1990.[19]

[19] See WTO (1996).

The final key element of the first stage of liberalization was bilateral rather than unilateral. Specifically, the first period liberalization included the creation of a free-trade agreement between New Zealand and their largest single trading partner, Australia. The *Closer Economic Relations Trade Agreement* (CER), originally signed in 1983, virtually eliminated all bilateral restrictions on trade by 1990. Since Australia accounts for 20% of trade with New Zealand, by 1990, a sizeable chunk of New Zealand's trade would take place subject to no import duty.

During the second stage of liberalization, occurring primarily during 1992-1999, additional unilateral action was taken both within and apart from the formation of Asia Pacific Economic Cooperation (APEC). Planned and executed unilateral reductions in MFN tariffs measured 33% between 1992 and 1996, and then an additional 50% between 1996 and 2000 (WTO, 2006). In percentage point terms, this would bring the average MFN rate down to 3% by the year 2000.

A significant feature of the second stage was the formation of APEC. Trade with APEC member countries generally accounts for around 50% of New Zealand trade in goods and services, the biggest trading partner by region (WTO, 1996). In an agreement signed during a 1994 meeting in Bogor, Indonesia, member countries committed to a goal of removing all barriers to trade and investment between APEC member countries by 2020. As a developed country, New Zealand agreed to remove all barriers by 2010. However, aside from the end goal, this was not according to any multilateral schedule, where "concerted unilateral liberalization" (Yamazawa, 1997) was the primary course of action for each APEC member. This liberalization scheme relies on trust, where member countries are expected to eventually reciprocate the commitments by other members. Contrary to the "Western" philosophy of negotiations, there were no dispute mechanisms or punitive damages to not complying. New Zealand, via their own unilateral actions taken during the 90's, played a particularly proactive role in helping other nations commit to their own unilateral tariff reductions. Indeed, as we will see shortly, New Zealand average tariff reductions pre-dated average tariff reductions of their trading partners by a number of years.

There is no evidence to suggest any ex-post adjustment of the planned policy choices during the period 1992-1999. Since previous experience with liberalization was viewed as broadly positive, the New Zealand government was particularly keen to commit and let further liberalization take its course. However, a planned review of all tariffs began in 1998, where the intent of this review was to choose among the different ways in which duty free status could be achieved (on a unilateral track) for all goods and services, post-1999. During this time, political opposition to further liberalization schemes grew considerably (Kelsey, 2000). The end result of this meeting was that tariffs in 2000 would be frozen at 1999 levels until 2006. The period of 2000 onward would be the third stage of liberalization.

Despite the mounting political opposition, this policy shift was unexpected. As stated in by the Ministry of Economic Development (2003), "This decision constituted a significant departure from the previous Government's policy of unilaterally removing all tariffs by 2006 - most by July 2001". According to the WTO (2003), the reason behind this unexpected policy shift was that most unilateral gains accruing to New Zealand had already been achieved, and that additional gains from trade liberalization would occur in natural export industries. Thus, New Zealand kept their average tariff line at around 3% (average bound rate at 12%), where any reductions in MFN tariffs before 2006 would occur reciprocally.[20] However, in-line with the goals of the 1994 APEC agreement, New Zealand still planned to execute unilateral reductions as necessary post-2005 to achieve the 2010 goal of free trade.[21]

Suitability of available data

Of course, given the firm-level focus of the model in section two, availability of data is an issue. However, thanks to an accessible merger database and publicly available tariff data, a dataset of mergers and acquisitions and tariffs can be constructed for the period 1992-2006. Guided by the above historical information, this period is particularly well-suited for analysis for the following reasons:

1. New Zealand entered no large coordinated reciprocal commitments between 1992 and 2006.
2. Tariffs were zero on almost every product for trade with Australia.
3. Nearly all foreign investment received national treatment post-1990.
4. Although an unexpected policy shift occurred in 2000, it was not tied to investment.

Regarding point 1, APEC could be considered a reciprocal commitment. However, the timing of reductions were to take place over a 15-25 year period, and left to the discretion of member countries. This asymmetric timing of tariff changes will be useful in analyzing the short-run effects of inbound and outbound tariffs on investment composition.[22] Point 2 is also related, where the only significant coordinated reciprocal commitments were completed two years prior to the beginning of my sample. Thus, there is likely to be little direct correlation between New Zealand tariff changes and those of their trading partners.

Point 3 is important in that only a small portion of my sample (Fishing industries) will be subject to some controls on foreign investments. Of course, industry effects will be utilized to control for this and other instances where industries may fundamentally differ in their underlying propensity for foreign ownership. Overall, since many periods of liberalization involve trade and investment liberalization, not having to consider the latter is particularly helpful.

Point 4 addresses the potential endogeneity between the composition of investment and tariff choices. Prior to 1992, and during the early part of the present sample, the New Zealand government kept to their planned and very transparent tariff schedules. There is no evidence to suggest that these schedules were adjusted due to any indicator related to investment. Thus, the causality (if any) is very likely to flow from tariff changes to investment choices, not in the other direction. And, as mentioned in point 4 and the preceding paragraphs, the decision to freeze tariffs was primarily motivated to retain some bargaining power for multilateral negotiations, and was not related to investment issues.

Finally, point 4 also mentions that this policy shift was, to some extent, unexpected. Since there

[20] One exception during this period is that all products from the 45 least-developed countries were allowed to enter duty-free (WTO, 2003).

[21] Interestingly, even New Zealand is considering holding off in some industries until 2013. See Ministry of Economic Development (2003).

[22] New Zealand did enter into a "closer economic partnership"with Singapore in 2001. I will partially account for small agreements as such by using a import-weighted average tariff in the empirical analysis.

may be anticipatory or lagging effects of tariffs on investment choices, this policy shift provides some much-needed variability in the data that is not fully expected by firms. Using this policy shift, I will examine to what extent average investment behavior anticipates or lags behind actual tariff choices.

4 Liberalization, Reallocation and Firm size

As discussed in section three, the liberalization process executed by New Zealand provides a unique opportunity to analyze the effects of inbound and outbound tariffs on the composition of acquisition behavior. Further, despite data limitations, it allows for a "first cut" analysis regarding the effects of tariff changes on productivity via the acquisition market. To begin the analysis, I will first describe the data sources and variables used in estimation.

4.1 Data and Variables

Data on mergers and acquisitions is obtained from *Thomson Financial*. Motivated by Corollaries 1 and 2, the object of estimation will be the share of acquisitions within New Zealand that are foreign. Shares are used to avoid using acquisition value, which suffers from a number of missing values. In addition, using levels requires controlling for factors affecting the overall scale of acquisition activity rather than just factors affecting composition.[23]

For each year in the sample, every acquisition of a New Zealand firm in a SIC agriculture or manufacturing industry is collected and identified as a domestic acquisition, or an inward foreign acquisition. For each industry i and year t, $ForShare_{i,t}$ is calculated by the following:

$$ForShare_{i,t} = \frac{\#For_{i,t}}{\#Dom_{i,t} + \#For_{i,t}} \tag{17}$$

In (17), $\#Dom_{i,t}$ is the number of acquisitions which are domestic or from Australia occurring in industry i during year t. Likewise, $\#For_{i,t}$ is the number of inward foreign acquisitions (not from Australia) in industry i during year t. Australian acquisitions are included with domestic acquisitions since Australian exports are not subject to MFN tariffs.[24]

Tariff data is collected from the TRAINS database. Tariff measures will be constructed using a simple average of applied tariffs across trading partners and products, along with a weighted average using inbound and outbound bilateral trade values as weights (also obtained from TRAINS). Importantly, when constructing the average tariff applied by New Zealand's trading partners, using a weighted average will control for at least some heterogeneity in trading partners.[25]

[23] For example, suppose that during a period of trade liberalization, an industry receives an idiosyncratic shock that increases the profitability of domestic and foreign acquisitions equally. Even if the foreign share of the acquisition market decreases as the theory would predict, it is possible that the level of foreign acquisitions also increases. If only examining the level of foreign acquisitions, it is possible to reach the false conclusion that trade liberalization enhances the proftibility of foreign ownership.

[24] The results are largely unaffected by this distinction, and will be discussed at length within the sensitivity analysis. Results are available upon request which include Australian acquisitions in foreign acquisitions.

[25] For example, if a distant trading partner lowers its tariff, the effects will be different than those of a nearby trading

Focusing on import tariffs set by New Zealand, a general average tariff for industry i in year t, $IM_{i,t}$, is defined as:

$$IM_{i,t} = \frac{\sum_j \sum_{s \in i} w_{j,s,t} \cdot \tau_{j,s,t}}{\sum_j \sum_{s \in i} w_{j,s,t}} \tag{18}$$

In (18), $\tau_{j,s,t}$ represents the tariff applied on imports to New Zealand of country j products in industry i subsection s during year t. In this paper, s and i will represent either the SIC2 or SIC4 level of refinement. The term $w_{j,s,t}$ is the associated weight placed on each observation. For the simple average, $w_{j,s,t} = 1$ for all j, s, and t. For the weighted average, $w_{j,s,t} = M_{j,s,t}$, where $M_{j,s,t}$ represents the imports from country j in sub-industry s during year t.

The average tariff levied on exports from New Zealand is defined in a similar fashion:

$$EX_{i,t} = \frac{\sum_j \sum_{s \in i} x_{j,s,t} \cdot \tau_{j,s,t}}{\sum_j \sum_{s \in i} x_{j,s,t}} \tag{19}$$

In (19), $\tau_{j,s,t}$ represents the tariffs applied on country $j's$ imports of New Zealand products in industry i subsection s during year t, where $x_{j,s,t}$ is the associated weight placed on each observation. Again, for the simple average, $x_{j,s,t} = 1$. For the weighted average, $x_{j,s,t} = X_{j,s,t}$, where $X_{j,s,t}$ represents New Zealand exports to country j in sub-industry s in year t.

Two other variables will be included in the analysis (along with industry fixed effects). First, real GDP of New Zealand in each year, gdp_t, will be included to control for New Zealand specific income gains. In addition, I will include the exchange rate of the New Zealand dollar, $rate_t$ ($NZ\$/US\$$), to control for any changes in the relative value of New Zealand assets relative to a common international benchmark. Both of these variables are collected from the *Penn World Tables*.

Summary Statistics - Tariffs and Merger Share

Before presenting the empirical specifications and results, it is useful to examine the tariff and merger data. Summary statistics by year, for all observations for which merger data is available, are presented in Table 1.

Drawing attention to the column labeled "Acquisitions", it is clear that from 1992 through the year 2000, the foreign share of acquisitions decreased substantially. Looking at the rolling three year average, the share of foreign acquisitions fell from 57% to 42% by the end of the primary period of liberalization. This corresponds to a roughly 26% decrease in the foreign share of acquisitions. Interestingly, most of the movement in the foreign share of acquisitions occurs at the beginning of the sample period. Independent of each trend, the composition of the acquisition market also exhibits a good deal of variability by year. This is helpful, and will allow a joint examination of any fundamental trends in acquisition patterns along with the effects of tariffs on acquisition behavior.

Now focusing on the tariff data, looking at the columns under the heading "New Zealand Tariff

partner that implements the same tariff reduction. Appealing to the gravity literature, since trade flows are negatively related to distance, using bilateral trade as a weight will at least partially account for this type of heterogeneity.

Table 1: Summary Statistics by Year

	Acquisitions			New Zealand Tariff Data				ROW Tariff Data			
Year	**Obs**	**Foreign Share**	**3-Year Avg**	**Mean**	**SD**	**Max**	**WMean**	**Mean**	**SD**	**Max**	**WMean**
1992	50	0.66		5.61	6.32	16.50	5.74	12.69	8.81	27.75	11.691
1993	99	0.55		7.52	7.38	37.50	7.61	10.74	8.03	31.64	6.674
1994	131	0.56	0.574								
1995	197	0.44	0.502								
1996	169	0.50	0.492	5.08	6.46	27.94	4.14	10.43	9.85	37.00	7.500
1997	127	0.46	0.466	5.20	3.42	11.86	5.09	13.13	8.16	41.69	6.912
1998	175	0.45	0.471	3.67	3.90	21.60	3.22	9.99	8.48	37.84	5.994
1999	151	0.47	0.459	3.46	2.51	11.72	2.82	12.26	9.12	43.12	5.535
2000	222	0.48	0.468	2.73	2.95	13.93	2.35	11.22	8.11	27.25	5.215
2001	203	0.44	0.463								
2002	166	0.32	0.421	2.13	2.25	6.47	1.58	6.74	7.31	27.57	1.476
2003	203	0.43	0.402	2.98	3.70	17.13	2.54	6.47	6.77	27.42	2.889
2004	230	0.43	0.400	3.07	3.59	18.30	2.59	14.23	27.32	104.10	2.593
2005	263	0.45	0.438	2.26	3.05	17.66	1.76	8.50	14.73	77.80	2.902
2006	312	0.39	0.421	3.13	3.68	17.00	3.01	4.68	3.75	13.96	2.926
Notes:	In each year, New Zealand and ROW each have at least one zero applied tariff. These columns have been omitted to save space. Data for 1994, 1995 and 2001, and pre 1992 are missing in the TRAINS database.										

Data", the mean and weighted mean tariffs fall steadily between the years 1992 and 1999. In addition, with the exception of 2005, the maximum applied tariff decreases as well. After 2000, tariffs were fairly stagnant, which matches the behavior of the policy shift described in section three.

Under the heading "ROW Tariff Data", the mean tariff (and weighted mean) also fall, though show more variability year to year. Also, the movement in these tariffs tends to occur later, starting in earnest after 2000.[26] In addition, the variability of tariffs is larger relative to New Zealand, and likely reflects the heterogeneity in tariffs applied by multiple trading partners. As mentioned in the discussion of Corollary 2, this heterogeneity may make it difficult to assess the impacts of tariffs levied by New Zealand's trading partners.

Import and Export Tariff Changes

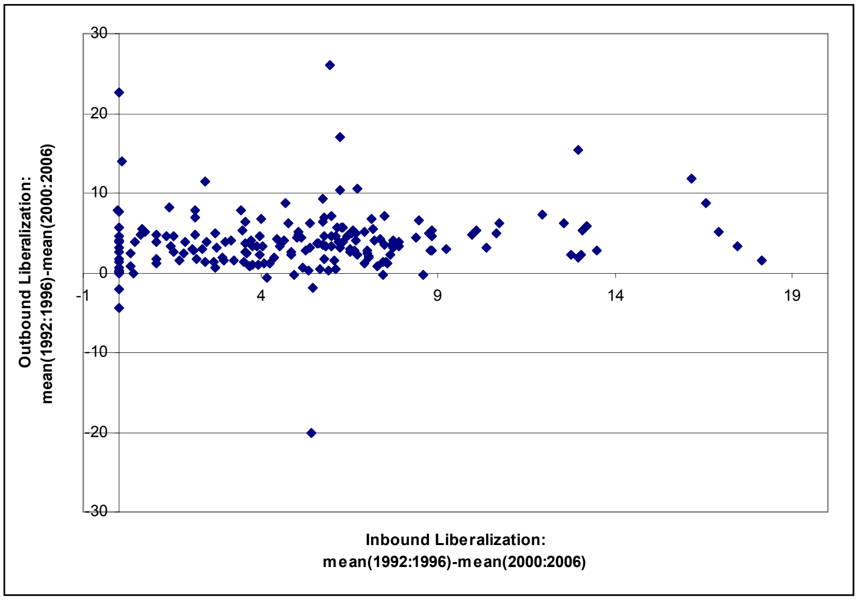
Continuing with the discussion of tariffs, a common problem within many liberalization episodes is that import and export tariffs change at the same time and in similar magnitudes. Empirically, this is problematic since the problem of multicollinearity would prevent precise estimation of the effects of each tariff. Within the period analyzed in this paper, multicollinearity is hardly an issue. This is illustrated in Figure 2.

In Figure 2, the vertical axis represents the difference in the average tariff applied by export destinations over the period 1992-1996 and the average over the period 2000-2006. In other words, it measures the extent to which export destinations lowered their own import tariffs over the entire sample period. The horizontal axis measures the same idea, but for New Zealand tariffs.[27] The key observation in Figure 2 is that the long-run tariff changes between New Zealand and her trading partners do not appear to be correlated in obvious any way. While both New Zealand and her trading

[26] These are likely due to the implementation of Uruguay round commitments by APEC countries.

[27] The specific averaging periods were chosen given the availability of tariff data at the beginning of the sample (missing data for 1994 and 1995), and the halt in New Zealand tariff reductions occuring in 2000.

Figure 2: Long run Import and Export Tariff Changes



partners tend to lower tariffs over this period, there appears to be no systematic relationship between these changes. Further, at the short–run (yearly) level, the correlation between industry-specific New Zealand tariff changes and those of her trading partners is 0.0208. Either in the short-run or long-run, the tariff changes appear to be unrelated.

In summary, the tariffs applied by New Zealand and her trading partners exhibit characteristics that are not identical, and change according to differing schedules. *ROW* tariffs tend to be larger, more variable, and any reductions in these tariffs occurred at a time when New Zealand tariffs were not moving at all. This asymmetric timing of tariff reductions is an extremely helpful characteristic of the data, where multicollinearity is unlikely to be an issue, and thus the precise effects (if any) of New Zealand and trading partner tariffs can be estimated. This would not necessarily be the case if examining trade liberalization within the framework of a reciprocal trade agreement (CUSFTA, for example - see Breinlich, 2007), where the timing of tariff reductions is likely to be similar across trading partners and products.

4.2 Basic Specification

Motivated by the theoretical model in section two, I adopt a linear, reduced-form equation to estimate the relationship between tariffs and investment composition. Precisely, the basic empirical specification is written as follows:

$$\begin{aligned} ForShare_{i,t} &= \beta_{IM} IM_{i,t} + \beta_{EX} EX_{i,t} + \beta_{gdp}\log(gdp_t) \\ &\quad + \beta_{rate} rate_t + \overrightarrow{\beta}_{sic}\overrightarrow{SIC} + \epsilon_{i,t} \end{aligned} \tag{20}$$

Table 2: Tariffs and Acquisition Composition - Basic Specification

	SIC2 Aggregation				**SIC2 Aggregation - Weighted Tariffs**			
R^2	0.5	0.5131	0.5257	0.5247	0.5049	0.5078	0.5252	0.5246
DOF	187	186	139	138	187	186	139	138
β_{IM}	**0.0381*****	**0.0174**	**0.0192**	**0.011**	**0.0433*****	**0.0384*****	**0.0349****	**0.0251**
	(0.0136)	(0.0157)	(0.0182)	(0.0217)	(0.0134)	(0.014)	(0.0168)	(0.0198)
β_{EX}		**0.0274*****	**0.0323*****	**0.0266****		**0.0128**	**0.0231*****	**0.0179***
		(0.0093)	(0.011)	(0.0116)		(0.0094)	(0.0088)	(0.0102)
β_{rate}			**-0.0159**	**-0.0341**			**0.0249**	**0.0009**
			(0.0999)	(0.1017)			(0.0968)	(0.0972)
β_{gdp}				**-0.1718**				**-0.1772**
				(0.1813)				(0.1818)
	SIC4 Aggregation				**SIC4 Aggregation - Weighted Tariffs**			
R^2	0.4376	0.4443	0.451	0.4536	0.4373	0.4418	0.451	0.4554
DOF	236	225	154	153	236	225	154	153
β_{IM}	**0.0407*****	**0.0383*****	**0.0401*****	**0.0264****	**0.0371*****	**0.0335*****	**0.0377*****	**0.0269****
	(0.0113)	(0.0113)	(0.0103)	(0.012)	(0.0104)	(0.0115)	(0.0111)	(0.0122)
β_{EX}		**0.0033**	**0.0005**	**-0.0001**		**0.0026**	**-0.0012**	**-0.007**
		(0.003)	(0.0032)	(0.0028)		(0.0072)	(0.0073)	(0.007)
β_{rate}			**-0.0459**	**-0.0619**			**-0.0497**	**-0.0621**
			(0.0946)	(0.095)			(0.0937)	(0.0943)
β_{gdp}				**-0.2768***				**-0.3251****
				(0.1474)				(0.1504)

Notes: Dependent variable is the foreign share of acquisitions. $\overrightarrow{\beta}_{sic}$ not reported. Robust standard errors are in parentheses. ***, **, and * denote estimates that are significant at the 1%,5%, and 10% level, respectively

The parameters of interest are β_{IM} and β_{EX}, the effects of the average New Zealand import tariff ($IM_{i,t}$) and the average tariff levied on New Zealand exports ($EX_{i,t}$) on the foreign share of acquisitions in New Zealand ($ForShare_{i,t}$). Guided by the analysis in section two, I hypothesize these effects to be positive. In addition, the term $\overrightarrow{\beta}_{sic}\overrightarrow{SIC}$ represents a vector of industry fixed effects and their associated coefficients. The results of estimating (20) are reported in Table 2.

Focusing on β_{IM}, the point estimates are unanimously positive, which is supportive of the theory and intuition presented in section two. Further, with the exception of the unweighted tariff at the SIC2 level of aggregation, the results are highly significant. Among the significant estimates, the quantitative size of the parameters is fairly consistent across specifications. Indeed, at the lower-bound of estimates, a 1 percentage point increase in the inbound import tariff increases the foreign share of acquisitions by roughly 3 percentage points. This is sizeable, since in Table 1, the mean tariff across all products and trading partners fell by roughly 3.51 percentage points from 1992-2006. Thus over the 1992-2006 period, the results predict a 10.5 percentage point decrease in the share of foreign acquisitions attributable to reductions in the average inbound import tariff. Relative to the initial average, this amounts to a 17% decrease in the share of foreign acquisitions attributable to import tariff liberalization.

Focusing on β_{EX}, at the SIC2 level of aggregation, the results seem to be in-line with the theory presented in section two. That is, a higher average tariff applied by exporters tends to increase the share of acquisitions which are foreign. However, at further levels of aggregation, the parameter estimates are small, of varied sign, and insignificant. This suggests that there is significant product level heterogeneity that is driving the results using the SIC2 level of aggregation. Thus, I conclude that the basic empirical estimates neither support or reject this particular aspect of the theory developed in section 2.

As foreshadowed earlier, a likely reason for the relative ambiguity of β_{EX} is that $EX_{i,t}$ represents a composite tariff aggregated across different destination markets. In contrast, $IM_{i,t}$ represents a composite tariff aggregated over different exporters for the same, New Zealand market. Thus, it is plausible to expect that $IM_{i,t}$ has a precise direct effect on the acquisition decisions of foreign firms within New Zealand. With $EX_{i,t}$, the effects of individual tariffs are being smoothed out over a number of different trading partners. Also, another potential reason for this ambiguity is that all non-tariff barriers were eliminated in New Zealand, while many of their trading partners still have NTB's in place. Thus, the *ROW* tariffs may not comprise a large share of overall restrictiveness.

Finally, these results might also reflect an inflow of foreign acquisitions in export-based industries. If falling tariffs against New Zealand exports provide additional incentive for this type of investment, the ambiguity in β_{EX} should not be surprising. Importantly, if this type of investment were modeled explicitly, while the results relating to foreign share would be different, the results relating to productivity would not. Thus, it is possible that while there is little relationship between the foreign share of acquisitions and export tariffs, there still may be a relationship between tariffs and the productivity of target firms (and thus the industry as a whole).

4.3 Sensitivity Analysis

One possible issue in using $ForShare_{i,t}$, as constructed in (17), is that all acquisitions in year t are included, where some of these acquisitions may be in anticipation of expected future tariff changes, or a laggard response to previous tariff changes. In general, this is a problem with using panel data to examine policy changes. Unless the policy choice is unexpected, anticipatory/laggard bias cannot be ruled out. Within the context of this study, without some exogenous variation in tariff changes that was unexpected by firms, the parameter estimates in Table 2 may be biased.

In the case of New Zealand, during the earlier periods of the sample, the maintained trade liberalization was most definitely expected, and expected to continue toward free-trade at a steady pace. However, as described in section three, there was an unexpected policy shift that occurred in the year 2000, freezing MFN tariffs at their 1999 values until suitable multilateral negotiations facilitated lower tariffs, or APEC commitments mandated a unilateral move toward free trade. It is this policy change that I use to examine to what extent firm-level investment behavior anticipates, moves-with, or lags behind tariff changes.

To put structure on this idea, I will now estimate the following modified version of equation (20).

$$\begin{aligned} ForShare_{i,t} &= \beta_{IM} IM_{i,t} + \beta_{EX} EX_{i,t} + \beta_{Shift} D_{shift} + \\ &\quad \beta_{gdp} \log(gdp_t) + \beta_{rate} rate_t + \overrightarrow{\beta}_{sic} \overrightarrow{SIC}_i + \epsilon_{i,t} \\ where\ D_{shift} &= \mathbf{1}\left(Year \geq 2000\right) \end{aligned} \tag{21}$$

In equation (21), the new element is the dummy variable D_{shift} and its accompanying coefficient β_{Shift}.

Table 3: Tariffs and Acquisition Composition - Basic Specification with Policy Shift

	SIC2 Aggregation				**SIC2 Aggregation - Weighted Tariffs**			
R^2	0.4997	0.5105	0.5227	0.5222	0.5049	0.5057	0.5225	0.5221
DOF	186	185	138	137	186	185	138	137
β_{IM}	**0.0301***	**0.0178**	**0.0175**	**0.0081**	**0.0361****	**0.0355****	**0.0322***	**0.0226**
	(0.0167)	(0.017)	(0.0193)	(0.0227)	(0.0156)	(0.0158)	(0.0179)	(0.0203)
β_{EX}		**0.0278*****	**0.0305*****	**0.0262****		**0.011**	**0.0212****	**0.0176***
		(0.0104)	(0.0115)	(0.0116)		(0.0104)	(0.0097)	(0.0102)
β_{rate}			**-0.0025**	**-0.086**			**0.0391**	**-0.0471**
			(0.1062)	(0.1389)			(0.104)	(0.1317)
β_{gdp}				**-0.3288**				**-0.3194**
				(0.3439)				(0.3272)
β_{Shift}	**-0.0548**	**0.0051**	**-0.0258**	**0.0677**	**-0.0552**	**-0.0272**	**-0.0315**	**0.0635**
	(0.0545)	(0.0599)	(0.0635)	(0.121)	(0.052)	(0.0571)	(0.0652)	(0.1177)
	SIC4 Aggregation				**SIC4 Aggregation - Weighted Tariffs**			
R^2	0.4401	0.4491	0.4513	0.4501	0.4408	0.4491	0.4528	0.4518
DOF	235	224	153	152	235	224	153	152
β_{IM}	**0.0314*****	**0.0274****	**0.0336*****	**0.0254****	**0.0289*****	**0.0265****	**0.0336*****	**0.0263****
	(0.0119)	(0.012)	(0.011)	(0.0125)	(0.011)	(0.0117)	(0.0114)	(0.0127)
β_{EX}		**0.002**	**0.0001**	**-0.0001**		**-0.0039**	**-0.0055**	**-0.0069**
		(0.0025)	(0.0028)	(0.0028)		(0.0075)	(0.0071)	(0.0069)
β_{rate}			**0.0000**	**-0.0825**			**0.0104**	**-0.0752**
			(0.0994)	(0.1216)			(0.0989)	(0.1227)
β_{gdp}				**-0.3458**				**-0.3684**
				(0.305)				(0.3061)
β_{Shift}	**-0.0823***	**-0.1027****	**-0.0802**	**0.029**	**-0.0874***	**-0.1222****	**-0.0966***	**0.0182**
	(0.0454)	(0.0455)	(0.0563)	(0.1166)	(0.0454)	(0.0487)	(0.0579)	(0.1176)

Notes: Dependent variable is the foreign share of acquisitions. $\overrightarrow{\beta}_{sic}$ not reported. Robust standard errors are in parentheses. ***, **, and * denote estimates that are significant at the 1%,5%, and 10% level, respectively

The variable D_{shift} identifies observations that take place after the unexpected policy change. To interpret its accompanying coefficient, β_{Shift}, I draw on the possible anticipatory/lag effects mentioned above.

If firms anticipate free trade occurring in the near future, the New Zealand acquisition market should be slanted more towards domestic acquisitions in the year 2000 than actual tariffs would support. Thus, under the anticipatory hypothesis, firms on the margin should re-adjust toward foreign acquisitions after realizing that free-trade in the near future is no longer a certainty. Precisely, if firms anticipate tariff changes, it should be the case that β_{Shift} is significantly positive.

On the other hand, if firms lag behind tariff changes, β_{Shift} should be significantly negative. That is, since tariffs are not moving in any significant way as a result of the policy shift, witnessing a lower foreign share of acquisitions after the policy shift suggests that firms are "catching-up" with the current fundamentals. With this in mind, the results of estimating (21) are presented in Table 3.

As illustrated in Table 3, the effect of the policy shift (outside of tariffs) embodied in β_{Shift} is broadly negative, and at the SIC4 level, significant when not including economy aggregates gdp_t and $rate_t$. Thus, to the extent that inference regarding anticipatory/laggard behavior can be drawn from this unexpected policy shift, if anything, the results in Table 3 suggest that the average response was laggard rather than anticipatory. However, given that β_{Shift} changes substantially in magnitude and significance when including gdp_t and $rate_t$, this suggests that this policy shift is correlated with some larger macroeconomic condition. Thus, when taken with the fact that the coefficient estimates

Table 4: Primary industry matching

Industry (SIC2)	Non tradable Match (SIC2)
AGRICULTURAL PRODUCTION CROPS (01)	FOOD STORES (54), WHOLESALE TRADE- NONDURABLE GOODS (51) EATING AND DRINKING PLACES (58)
AGRICULTURAL PRODUCTION LIVESTOCK (02)	FOOD STORES (54), WHOLESALE TRADE- NONDURABLE GOODS (51) EATING AND DRINKING PLACES (58)
AGRICULTURAL SERVICES (07)	WHOLESALE TRADE - NONDURABLE GOODS (51)
FORESTRY (08)	WHOLESALE TRADE - NONDURABLE GOODS (51)
FISHING, HUNTING, AND TRAPPING (09)	WHOLESALE TRADE - NONDURABLE GOODS (51)
METAL MINING (10)	WHOLESALE TRADE - DURABLE GOODS (50)
COAL MINING (12)	WHOLESALE TRADE - DURABLE GOODS (50)
OIL AND GAS EXTRACTION (13)	PIPELINES, EXCEPT NATURAL GAS (46), ELECTRIC, GAS, AND SANITARY SERVICES (49) WHOLESALE TRADE- NONDURABLE GOODS (51)
NONMETALLIC MINERALS, EXCEPT FUELS (14)	WHOLESALE TRADE - DURABLE GOODS (50)
GENERAL BUILDING CONTRACTORS (15)	WHOLESALE TRADE - DURABLE GOODS (50), REAL ESTATE (65)
HEAVY CONSTRUCTION, EX. BUILDING (16)	WHOLESALE TRADE - DURABLE GOODS (50), REAL ESTATE (65)
SPECIAL TRADE CONTRACTORS (17)	WHOLESALE TRADE - DURABLE GOODS (50)
FOOD AND KINDRED PRODUCTS (20)	FOOD STORES (54), WHOLESALE TRADE- NONDURABLE GOODS (51)
TOBACCO PRODUCTS (21)	GENERAL MERCHANDISE STORES (53), WHOLESALE TRADE- NONDURABLE GOODS (51)
TEXTILE MILL PRODUCTS (22)	APPAREL AND ACCESSORY STORES (56), WHOLESALE TRADE- NONDURABLE GOODS (51)
APPAREL AND OTHER TEXTILE PRODUCTS (23)	APPAREL AND ACCESSORY STORES (56), WHOLESALE TRADE- NONDURABLE GOODS (51)
LUMBER AND WOOD PRODUCTS (24)	WHOLESALE TRADE - DURABLE GOODS (50)
FURNITURE AND FIXTURES (25)	FURNITURE AND HOME FURNISHINGS STORES (57)
PAPER AND ALLIED PRODUCTS (26)	WHOLESALE TRADE- NONDURABLE GOODS (51)
PRINTING AND PUBLISHING (27)	WHOLESALE TRADE- NONDURABLE GOODS (51)
CHEMICALS AND ALLIED PRODUCTS (28)	WHOLESALE TRADE- NONDURABLE GOODS (51)
PETROLEUM AND COAL PRODUCTS (29)	PIPELINES, EXCEPT NATURAL GAS (46), WHOLESALE TRADE- NONDURABLE GOODS (51)
RUBBER AND MISC. PLASTICS PRODUCTS (30)	WHOLESALE TRADE- NONDURABLE GOODS (51)
LEATHER AND LEATHER PRODUCTS (31)	WHOLESALE TRADE- NONDURABLE GOODS (51), APPAREL AND ACCESSORY STORES(56)
STONE, CLAY, AND GLASS PRODUCTS (32)	WHOLESALE TRADE - DURABLE GOODS (50)
PRIMARY METAL INDUSTRIES (33)	WHOLESALE TRADE - DURABLE GOODS (50)
FABRICATED METAL PRODUCTS (34)	WHOLESALE TRADE - DURABLE GOODS (50)
INDUSTRIAL MACHINERY AND EQUIPMENT (35)	WHOLESALE TRADE - DURABLE GOODS (50)
ELECTRONIC + OTHER ELECTRIC EQUIPMENT (36)	WHOLESALE TRADE - DURABLE GOODS (50)
TRANSPORTATION EQUIPMENT (37)	WHOLESALE TRADE - DURABLE GOODS (50), WATER TRANSPORTATION(44) TRANSPORTATION BY AIR (45), AUTOMOTIVE DEALERS + SERVICE STATIONS (55) LOCAL AND INTERURBAN PASSENGER TRANSIT (41), RAILROAD TRANSPORTATION (40)
INSTRUMENTS AND RELATED PRODUCTS (38)	WHOLESALE TRADE - DURABLE GOODS (50)
MISCELLANEOUS MANUFACTURING INDUSTRIES (39)	WHOLESALE TRADE - DURABLE GOODS (50), WHOLESALE TRADE - DURABLE GOODS (50)

of β_{IM} do not change substantially with the inclusion of this dummy variable (relative to Table 2), I conclude that evidence for anticipatory or laggard firm-level behavior is lacking.

To further test the sensitivity of the results in Table 2 and Table 3, I now will adjust the specification in (20) to account for trends in the data that may be due to unmeasured foreign investment policies For example, while there was a relaxation of foreign investment policies prior to my sample, the lagging effects could possibly be biasing the foreign share measurements upward precisely when tariffs were still high. Thus, controlling for unmeasured changes to foreign investment restrictions is quite important in order to obtain unbiased estimates.

I will examine this issue in two different ways. First, I will "proxy" for trends related to foreign investment but unrelated to tariffs using the share of foreign acquisitions that occur in related industries which are either wholesale or clearly non-tradeable. Importantly, there are no tariffs issued for these industries. The idea here is that any fundamental changes in investment policies are likely to be correlated with the foreign acquisition share in industries with stagnant or non-measureable tariffs. This matching is done at the two-digit SIC level, where I select the closest counterpart(s) within SIC 50-59 that match primary agricultural and manufacturing industries. This matching is displayed in Table 4.

In Table 4, industries are matched broadly to a wholesale or non-tradeable industry. This matching is not mutually exclusive, where for example, wholesale durable and nondurable goods are used as a match to a number of broadly defined industries. Finding precise matches is clearly difficult, and the goal here is to simply provide a proxy for the general trend of foreign investment flowing into New

Table 5: Tariffs and Acquisition Composition - Match

	SIC2 Aggregation				**SIC2 Aggregation - Weighted Tariff**			
R^2	0.4895	0.5018	0.5122	0.5116	0.4948	0.4959	0.5109	0.5104
DOF	185	184	137	136	185	184	137	136
β_{IM}	**0.0296***	**0.0158**	**0.0145**	**0.0053**	**0.0357****	**0.0348****	**0.0313***	**0.0217**
	(0.0168)	(0.0171)	(0.0198)	(0.0231)	(0.0157)	(0.0159)	(0.0181)	(0.0204)
β_{EX}		**0.0297*****	**0.0333*****	**0.0289****		**0.0116**	**0.0219****	**0.0183***
		(0.0105)	(0.0121)	(0.0123)		(0.0103)	(0.0097)	(0.0103)
β_{rate}			**-0.0238**	**-0.106**			**0.0272**	**-0.0583**
			(0.1111)	(0.1415)			(0.1078)	(0.1335)
β_{gdp}				**-0.3252**				**-0.3176**
				(0.3489)				(0.3289)
β_{Shift}	**-0.0637**	**-0.0128**	**-0.0407**	**0.052**	**-0.0632**	**-0.0383**	**-0.0426**	**0.0521**
	(0.0608)	(0.0641)	(0.0661)	(0.1249)	(0.058)	(0.0624)	(0.0681)	(0.1215)
β_{Match}	**-0.0327**	**-0.0804**	**-0.089**	**-0.0877**	**-0.0304**	**-0.0488**	**-0.0625**	**-0.0615**
	(0.105)	(0.1036)	(0.1135)	(0.1116)	(0.1055)	(0.1044)	(0.1114)	(0.1096)
	SIC4 Aggregation				**SIC4 Aggregation - Weighted Tariff**			
R^2	0.438	0.447	0.4478	0.4465	0.4385	0.4471	0.4492	0.4483
DOF	234	223	152	151	234	223	152	151
β_{IM}	**0.0316*****	**0.0275****	**0.0336*****	**0.0254****	**0.0288*****	**0.0268****	**0.0336*****	**0.0263****
	(0.012)	(0.0121)	(0.011)	(0.0125)	(0.0111)	(0.0118)	(0.0114)	(0.0127)
β_{EX}		**0.0019**	**0.0001**	**0.0001**		**-0.0047**	**-0.0057**	**-0.0072**
		(0.0025)	(0.0028)	(0.0027)		(0.0074)	(0.0072)	(0.007)
β_{rate}			**0.0027**	**-0.0797**			**0.0133**	**-0.0717**
			(0.1025)	(0.1242)			(0.1023)	(0.125)
β_{gdp}				**-0.3458**				**-0.3709**
				(0.3054)				(0.3066)
β_{Shift}	**-0.0721**	**-0.0914***	**-0.0777**	**0.0315**	**-0.08**	**-0.1107****	**-0.0946**	**0.0218**
	(0.0512)	(0.051)	(0.0576)	(0.1173)	(0.0505)	(0.0531)	(0.0586)	(0.1183)
β_{Match}	**0.0401**	**0.0476**	**0.014**	**0.014**	**0.0301**	**0.0542**	**0.0131**	**0.0183**
	(0.1016)	(0.1026)	(0.1066)	(0.1066)	(0.1018)	(0.1014)	(0.1072)	(0.1068)
Notes	Dependent variable is the foreign share of acquisitions. $\overrightarrow{\beta}_{sic}$ not reported. Robust standard errors are in parentheses. ***, **, and * denote estimates that are significant at the 1%,5%, and 10% level, respectively							

Zealand that is not directly affected by tariff reductions.

To construct this proxy, which is labeled $MatchShare_{i,t}$, for each SIC2 or SIC4 industry, I calculate the share of acquisitions in the match industry that are foreign. Once calculated, it is integrated into the basic specification in (20) as follows:

$$\begin{aligned} ForShare_{i,t} &= \beta_{IM}IM_{i,t} + \beta_{EX}EX_{i,t} + \beta_{Shift}D_{shift} + \beta_{Match}MatchShare_{i,t} + \\ &\quad \beta_{gdp}\log(gdp_t) + \beta_{rate}rate_t + \overrightarrow{\beta}_{sic}\overrightarrow{SIC}_i + \epsilon_{i,t} \end{aligned} \tag{22}$$

The results of estimating (22) are presented in Table 5.

The important feature to note in Table 5 is that the parameter estimates related to import and exporter tariffs are largely unaffected by the inclusion of $MatchShare$. Indeed, there also seems to be little relationship between $MatchShare$ itself and the dependent variable. While this may be a result of adding in a variable which by construction shows little variation across SIC2 and SIC4 sectors, it is at least comforting that the foreign share of acquisitions is not trivially related to trends in other industries.

As a final robustness check, I employ yet another approach. Specifically, I will examine the relationship between tariffs and the share of *Australian* acquisitions which take place in New Zealand.

Table 6: Tariffs and Acquisition Composition - Australia

	SIC2 Aggregation				**SIC2 Aggregation - Weighted Tariff**			
R^2	0.2544	0.2509	0.2606	0.262	0.2545	0.2506	0.2609	0.2603
DOF	187	186	139	138	187	186	139	138
β_{IM}	**-0.0034**	**-0.0057**	**-0.0111**	**-0.0023**	**-0.0038**	**-0.0043**	**-0.0095**	**-0.0015**
	(0.0089)	(0.0099)	(0.0104)	(0.013)	(0.0084)	(0.008)	(0.0092)	(0.0118)
β_{EX}		**0.0029**	**0.0067**	**0.0128**		**0.0013**	**0.0035**	**0.0079**
		(0.0064)	(0.007)	(0.0086)		(0.0084)	(0.0095)	(0.0119)
β_{rate}			**-0.0541**	**-0.0347**			**-0.0468**	**-0.027**
			(0.0766)	(0.0754)			(0.0771)	(0.0733)
β_{gdp}				**0.1835**				**0.1463**
				(0.1541)				(0.1528)
	SIC4 Aggregation				**SIC4 Aggregation - Weighted Tariff**			
R^2	0.3737	0.3994	0.3657	0.3618	0.3733	0.3973	0.3586	0.3554
DOF	236	225	154	153	236	225	154	153
β_{IM}	**-0.0039**	**-0.0052**	**-0.0065**	**-0.0045**	**-0.0016**	**-0.0017**	**-0.0052**	**-0.0028**
	(0.0047)	(0.0045)	(0.0045)	(0.0059)	(0.0046)	(0.0057)	(0.0057)	(0.0067)
β_{EX}		**0.002**	**0.0041**	**0.0042**		**0.0008**	**0.0026**	**0.0038**
		(0.002)	(0.0029)	(0.003)		(0.005)	(0.0059)	(0.0059)
β_{rate}			**-0.0408**	**-0.0385**			**-0.0457**	**-0.0429**
			(0.0625)	(0.0619)			(0.0611)	(0.0606)
β_{gdp}				**0.0398**				**0.0724**
				(0.1231)				(0.1212)
Notes	Dependent variable is the Australian share of acquisitions. $\overrightarrow{\beta}_{sic}$ not reported. Robust standard errors are in parentheses. ***, **, and * denote estimates that are significant at the 1%,5%, and 10% level, respectively							

Trade between Australia and New Zealand is primarily governed by the *Closer Economic Relations* agreement, and not the MFN tariffs which were adjusted during New Zealand's unilateral liberalization episode. If anything, we should expect Australian acquisitions to function effectively as domestic acquisitions, as the reduction of MFN tariffs is irrelevant to their direct costs of serving the foreign market. Importantly, what I shouldn't find is that Australian acquisitions correlate positively with New Zealand import and trading partner tariffs. If this is the case, then this would suggest a spurious correlation driving the basic results of this section.

Putting more structure on this idea, I estimate the following equation by OLS:

$$\begin{aligned} AUShare_{i,t} &= \beta_{IM} IM_{i,t} + \beta_{EX} EX_{i,t} + \beta_{gdp} \log(gdp_t) \\ &\quad + \beta_{rate} rate_t + \overrightarrow{\beta}_{sic} \overrightarrow{SIC} + \epsilon_{i,t} \end{aligned} \tag{23}$$

In equation (23), $AUShare_{i,t}$ is the share of Australian acquisitions in New Zealand for industry i and year t. The results from estimating (23) are presented in Table 6.

The results in Table 6 clearly show no significant relationship between New Zealand import and exporter tariffs and the Australian share of acquisition within New Zealand. While according to the theory we would expect a negative sign, the lack of significance is not particularly surprising given that Australia is a much bigger country than New Zealand. Thus, New Zealand reductions in tariffs (or those of their trading partners) may have an indistinguishable effect on Australian acquisitions in to New Zealand. Breinlich (2007) finds a similar result when looking at the effects of CUSFTA reductions. Precisely, most effects of reciprocal tariff cuts were small for the US, and larger/more significant for Canada.

The more important result (or non-result) is that Australian acquisitions are not positively related to tariffs in a way which would suggest a spurious correlation between tariff cuts and the clear reduction in the share of foreign acquisitions occurring within New Zealand. Along with the results in Table 5, this suggests that there is little in the way of unobserved factors that are affecting the share of investment within New Zealand that might be correlated with observed tariff reductions.

4.4 A first look at productivity and trade liberalization

As a final empirical component of this paper, I will take a "first" look at the relationship between tariffs and the productivity of exiting firms. Unlike the effects of tariffs on the foreign acquisition share, there is a differential effect of tariffs on the aggregate productivity of firms that sell, and hence, the aggregate productivity of firms that remain. Precisely, the model predicts that inbound tariff liberalization should lower the average productivity of firms that sell, and outbound liberalization should do the opposite, improving aggregate productivity.

Of course, to test this prediction, one needs a hearty complement of firm-level data that can convincingly proxy for productivity. For the case of New Zealand, I am forced to rely on a very simple measure of firm-size to proxy for productivity. In particular, I assume that the log value of sales (in millions) is an acceptable proxy for firm-level productivity.[28]

Estimation is not without issues, either. In many cases, at refined industry definitions, I only have one observation with complete sales data per industry throughout the entire sample. Thus, absent an alternate approach, most mergers would provide very little information that could be explained by something other than industry variation.

To move forward given these data issues, I first expand the dataset to include acquisitions that occur in wholesale and nontradable industries. Along with increasing the efficiency of the estimates (by including more observations), it will provide a "control group" of firms that experienced no clear change to the cost of serving foreign markets. With this is mind, I estimate the following specification predicting target sales

$$\log(TSales_j) = \delta_{IM} IM_j + \delta_{EX} EX_j + \delta_A \log(ASales_j) + \overrightarrow{\delta}_{SIC}\overrightarrow{SIC}_j + \overrightarrow{\delta}_{Year}\overrightarrow{Year}_j + \epsilon_j \qquad (24)$$

In 24, $TSales_j$ is the reported target sales in millions for acquisition j. Likewise, $ASales_j$ is the reported acquiring firm sales in millions for acquisition j. While there is no explicit prediction regarding sign of the coefficient on $ASales_j$, I would expect the coefficient to be positive, embodying some sort of positive assortative matching within the merger market.

Regarding tariffs, IM_j is the New Zealand import tariff, and may be weighted according to the procedure detailed at the beginning of this section. Likewise, EX_j is the average tariff of New Zealand's trading partners, constructed in the same manner. Both tariff measures are constructed at the SIC4 level of aggregation if SIC4 tariffs are reported. If not, which is the case for SIC2 industries

[28] Other measures, such as market values, employment, and fixed capital are much more sparse compared with Sales data.

Table 7: Tariffs and Target Size

	Basic Tariff		Weighted Tariff	
$AdjR^2$	0.9449	0.9462	0.949	0.9497
DOF	38	37	38	37
δ_{IM}	**0.5597***	**0.5555***	**0.3383**	**0.3491***
	(0.3125)	(0.2908)	(0.2007)	(0.1966)
δ_{EX}	**-0.1171*****	**-0.1111*****	**-0.2938*****	**-0.2771*****
	(0.0329)	(0.0304)	(0.045)	(0.0438)
δ_A		**0.1306**		**0.1127**
		(0.0994)		(0.1003)
Notes:	Industry and Year controls not reported. Robust standard errors are in parentheses. ***, **, and * denote estimates that are significant at the 1%,5%, and 10% level, respectively			

40 and above, then the tariff is assumed to be zero for all years. This is the primary assumption in viewing these industries as the control group. Finally, I include SIC2 industry controls and year controls.[29]

The results from estimating (24) are presented in Table 7. While certainly a coarse analysis (with only 37-38 degrees of freedom remaining!), the results are certainly suggestive of the productivity results discussed in the paper. That is, within industries and years, higher New Zealand import tariffs tend to increase the size of merger targets within New Zealand, and higher average tariffs set by New Zealand's trading partners tend to decrease the size of targets within New Zealand. Given the theoretical results in the paper, this implies that New Zealand tariff liberalization tended to reduce aggregate productivity via the acquisition market, and reductions to trading partner tariffs accomplished the opposite.

In terms of magnitude, the results are quite unrealistic.[30] Looking at the different point estimates, which are mostly significant, a one percentage point increase in the average New Zealand import tariff increases the average size of the target between 33% and 55%. Regarding export tariffs, a one percent increase in the average tariff of New Zealand's export markets tends to decrease the size of the average target by between 11% and 30%. Using the magnitude of both estimates, the predicted effect of a reciprocal reduction in tariffs suggests that the overall effect on productivity may in fact be negative. This was a theoretical possibility brought up in Spearot (2008b), and is certainly worthy of future study with a larger dataset.

Finally, it seems that while somewhat insignificant, larger acquiring firms tend to buy larger selling firms. This suggests that there may unmodeled matching occurring in the acquisition market that could be an avenue for future work.

[29] SIC2 controls are used rather than SIC4 since there are very few refined industries that report mergers with full firm-level data over multiple years.

[30] Like Spearot (2008b), where sales values are also used, these values are much too high to interpret as productivity. But, importantly, Spearot (2008b) shows that most results when using the log value of sales are qualitatively similar to using the log sales per employee, which are much more reasonable to interpret as productivity effects. Thus, it is the qualitative results here which are important.

5 Conclusion

In summary, the tariff choices of domestic and foreign governments should be expected to influence firm-decisions both within and outside of their own borders. Presented in this paper, the tariff policy choices of the New Zealand government have a clear relationship with the composition of acquisition behavior that occurs within their own borders. Trade liberalization increases the share of acquiring firms that are domestic. While there is a theoretical relationship between the trade policy choices of outsiders and the composition of investment in New Zealand, the evidence is empirically weak.

An ideal setting would not only facilitate an examination of acquisition composition, but would also facilitate a complete analysis of aggregate productivity. While the results presented above suggest that tariffs are affecting target firm size in a way which is consistent with the theory, it would be ideal to complement this analysis with the effects of tariffs on all active firms. While I currently do not have data suitable for this type of analysis, I have taken steps toward acquiring such a data set. However, via contact with *Statistics New Zealand*, early indications are that this data would be restricted, or very costly to access. Thus, adapting my model to the Canada-US free-trade agreement may be a necessary next step. Aspects of this trade agreement have already been studied by Breinlich (2007). Although liberalization was reciprocal, and reallocation was primarily domestic, this case study may prove to be a useful setting through which the inbound and outbound responses to liberalization, and their welfare effects, can be analyzed.

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6 Technical Appendix

Proof of Lemma 1

To begin, I will focus on $\alpha \leq \alpha_x(2k)$. Differentiating $\frac{A^2\alpha k}{2(4\alpha kb+1)(2\alpha kb+1)}$ with respect to α yields:

$$\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} = \frac{A\alpha k\left(1-8b^2\alpha^2k^2\right)}{2(4\alpha kb+1)^2(2\alpha kb+1)^2}$$

$\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} = 0$ (for positive α) at $\alpha = \frac{\sqrt{2}}{4bk}$. However, this maximum is irrelevant if $\alpha_x(2k) < \frac{\sqrt{2}}{4bk}$. This condition simplifies to $\frac{\sqrt{2}}{4bk}\left(\frac{2A-(2+\sqrt{2})\tau_{rw}}{A-\tau_{rw}}\right) > 0$. This is satisfied if $\tau_{rw} < \frac{2}{2+\sqrt{2}}A$. Thus, $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} > 0$ for $\alpha \leq \alpha_x(2k)$

Now turning to $\alpha_x(2k) < \alpha \leq \alpha_x(k)$, over this range, $\widehat{BN}(\alpha)$ has two roots (in α). They are written as:

$$\begin{aligned}
\alpha_1 &= \frac{\sqrt{2}\left(-A(\lambda+1)+\left(2+\sqrt{2}\right)\tau_{rw}\right)}{4bk\left(-A\lambda+(A-\tau_{rw})\left(\sqrt{2}+1\right)\right)} \\
\alpha_2 &= -\frac{\sqrt{2}\left(A(\lambda+1)-\left(2-\sqrt{2}\right)\tau_{rw}\right)}{4bk\left(A\lambda+(A-\tau_{rw})\left(\sqrt{2}-1\right)\right)}
\end{aligned}$$

Again, I will compare each root to $\alpha_x(2k)$.

$$\alpha_1 - \alpha_x(2k) = \frac{\sqrt{2}\left(A\lambda+A-\tau_{rw}\right)\overbrace{\left(\left(2+\sqrt{2}\right)\tau_{rw}-2A\right)}^{\text{(-) if } \tau_{rw}<\frac{2}{2+\sqrt{2}}A}}{8bk\left(A-\tau_{rw}\right)\underbrace{\left(-A\lambda+(A-\tau_{rw})\left(\sqrt{2}+1\right)\right)}_{\text{(+) for all } \lambda \text{ if } \tau_{rw}<\frac{2}{2+\sqrt{2}}A \text{ (see below)}}} < 0$$

$$\alpha_2 - \alpha_x(2k) = -\frac{\sqrt{2}\left(A\lambda+A-\tau_{rw}\right)\overbrace{\left(2(A-\tau_{rw})+\sqrt{2}\tau_{rw}\right)}^{+}}{8bk\left(A-\tau_{rw}\right)\underbrace{\left(A\lambda+(A-\tau_{rw})\left(\sqrt{2}-1\right)\right)}_{+}} < 0$$

To see that $-A\lambda+(A-\tau_{rw})\left(\sqrt{2}+1\right) > 0$ if $\tau_{rw} < \frac{2}{2+\sqrt{2}}A$, we can rearrange the first expression to read $\tau_{rw} < \left(1-\frac{\lambda}{1+\sqrt{2}}\right)A$. This expression is decreasing in λ, and is satisfied for $\lambda \in (0,1)$ if satisfied for $\lambda = 1$. Thus, for all λ, if $\tau_{rw} < \frac{2}{2+\sqrt{2}}A$, then $\tau_{rw} < \left(1-\frac{\lambda}{1+\sqrt{2}}\right)A$.

Both $\alpha_1 - \alpha_x(2k) < 0$ and $\alpha_2 - \alpha_x(2k) < 0$ imply that if $\tau_{rw} < \frac{2}{2+\sqrt{2}}A$, the roots of $\widehat{BN}(\alpha)$ do not occur over the range $\alpha_x(2k) < \alpha \leq \alpha_x(k)$. Thus, the sign of $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha}$ is constant over this range. To see that $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} > 0$, note that:

$$\frac{\partial \widehat{BN}\left(\alpha_x(2k)\right)}{\partial \alpha} = \frac{k(A-\tau_{rw})^2\overbrace{\left(2A^2-4A\tau_{rw}+\tau_{rw}^2\right)}^{\text{(+) if } \tau_{rw}<\frac{2}{2+\sqrt{2}}A}}{2(2A-\tau_{rw})^2}$$

Finally, for $\alpha_x(k) < \alpha$, I can write:

$$\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} = \frac{k\left(A\lambda + A - \tau_{rw}\right)\left(1 + 2\lambda + \lambda^2 - 8b^2\alpha^2k^2\lambda^2\right)}{2(4\alpha kb\lambda + \lambda + 1)^2(2\alpha kb\lambda + \lambda + 1)^2}$$

The positive root of $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha}$ is $\frac{\sqrt{2}(\lambda+1)}{4bk\lambda}$. Is is also clear that for $\alpha < \frac{\sqrt{2}(\lambda+1)}{4bk\lambda}$, $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} > 0$, and for $\alpha > \frac{\sqrt{2}(\lambda+1)}{4bk\lambda}$, $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} < 0$.

To finish proving the properties in Lemma 1, I must show that $\frac{1}{2}\pi(\alpha, 2k) < \pi(\alpha, k) < \pi(\alpha, 2k)$ for $\alpha > 0$. The condition $\pi(\alpha, k) < \pi(\alpha, 2k)$ is trivial through lower costs. The condition $\frac{1}{2}\pi(\alpha, 2k) < \pi(\alpha, k)$ is true if $BN(\alpha) < \pi(\alpha, k)$. Expanding $BN(\alpha)$, we get $\pi(\alpha, 2k) - \pi(\alpha, k) < \pi(\alpha, k)$, which simplifies to $\frac{1}{2}\pi(\alpha, 2k) < \pi(\alpha, k)$. Thus, I will now show that $BN(\alpha) < \pi(\alpha, k)$.

To do this, I will first show that $BN(0) = \pi(0, k)$, and then $\frac{\partial BN(\alpha)}{\partial \alpha} < \pi(\alpha, k)$ for all α. Showing $BN(0) = \pi(0, k)$ is straightforward, given the multiplicative nature of α. For $\alpha \leq \alpha_x(2k)$, I can write $\frac{\partial \widehat{BN}(\alpha)}{\partial \alpha} - \pi(\alpha, k)$ as:

$$\frac{\partial BN(\alpha)}{\partial \alpha} - \pi(\alpha, k) = -\frac{2A^2\alpha^2k^2b}{(4\alpha kb + 1)(2\alpha kb + 1)} < 0$$

For $\alpha_x(2k) < \alpha \leq \alpha_x(k)$, I can write $\frac{\partial BN(\alpha)}{\partial \alpha} < \pi(\alpha, k)$ as:

$$\frac{\partial BN(\alpha)}{\partial \alpha} - \pi(\alpha, k) = -\frac{k\begin{pmatrix} 2\alpha kb(\tau_{rw} - A)+ \\ \tau_{rw} + 2A\alpha kb\lambda \end{pmatrix}\begin{pmatrix} 2\alpha kb(A - \tau_{rw}) + 2A(1+\lambda) \\ +6b\lambda\alpha kA - \tau_{rw} \end{pmatrix}}{(4\alpha kb\lambda + \lambda + 1)^2(2\alpha kb + 1)^2}$$

This term has the roots:

$$\begin{aligned} \overline{\alpha}_1 &= \frac{\tau_{rw}}{2bk\left(A - \tau_{rw} - A\lambda\right)} \gtrless 0 \\ \overline{\alpha}_2 &= -\frac{2A\lambda + 2A - \tau_{rw}}{2bk\left(A - \tau_{rw} + 3A\lambda\right)} < 0 \end{aligned}$$

The second root is clearly negative. The first root is ambiguous However, note that $\overline{\alpha}_1 = \alpha_x(k)$ if $\lambda = 0$, and $\frac{\partial \overline{\alpha}_1}{\partial \lambda} = \frac{\tau_{rw}A}{2bk(A - \tau_{rw} - A\lambda)^2} > 0$. Thus, $\overline{\alpha}_1$ is not relevant. Thus, the roots are not over the relevant range of α, and $\frac{\partial BN(\alpha)}{\partial \alpha} - \pi(\alpha, k)$ for $\alpha_x(2k) < \alpha \leq \alpha_x(k)$ has the same sign as $\frac{\partial BN(\alpha_x(k))}{\partial \alpha} - \pi(\alpha_x(k), k)$. Writing as a function of model parameters:

$$\frac{\partial BN(\alpha_x(k))}{\partial \alpha} - \pi(\alpha_x(k), k) = -\frac{\left(A - \tau_{rw}\right)^2\left(4A - \tau_{rw}\right)k\tau_{rw}}{\left(2A - \tau_{rw}\right)^2} < 0$$

Finally, for $\alpha_x(k) < \alpha$, I can write $\frac{\partial BN(\alpha)}{\partial \alpha} < \frac{\pi(\alpha, k)}{\partial \alpha}$ as:

$$\frac{\partial BN(\alpha)}{\partial \alpha} - \pi(\alpha, k) = -\frac{4bk^2\lambda\alpha\left(A\lambda + A - \tau_{rw}\right)^2\left(3b\lambda\alpha k + \lambda + 1\right)}{(4\alpha kb\lambda + \lambda + 1)^2(2\alpha kb\lambda + \lambda + 1)^2} < 0$$

Proof of Lemma 2

To prove Lemma 2 for small R_a, I need to establish that $\alpha_S < \underline{\alpha}_B < \overline{\alpha}_B$. Once this ranking is established, Lemma 2 is immediate via the preference conditions in (8). To show $\alpha_S < \underline{\alpha}_B$, first note that from the equilibrium conditions in (8) it must be the case that:

$$\pi(\underline{\alpha}_B, 2k) - \pi(\underline{\alpha}_B, k) = \pi(\alpha_S, k)$$

Rearranging,

$$\frac{1}{2}\pi\left(\underline{\alpha}_B, 2k\right) - \pi\left(\underline{\alpha}_B, k\right) = \pi\left(\alpha_S, k\right) - \frac{1}{2}\pi\left(\underline{\alpha}_B, 2k\right)$$

Since $\frac{1}{2}\pi\left(\underline{\alpha}_B, 2k\right) < \pi\left(\underline{\alpha}_B, k\right)$, the RHS must also be negative in equilibrium. This is only possible if $\alpha_S < \underline{\alpha}_B$. By definition, $\underline{\alpha}_B < \overline{\alpha}_B$. Using this result and $\alpha_S < \underline{\alpha}_B$, this completes the proof that $\alpha_S < \underline{\alpha}_B < \overline{\alpha}_B$.

Proof of Lemma 3

To prove Lemma 3, I need to first derive the sign of $\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda}$, and $\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \lambda}$. First, if $\underline{\alpha}_B < \alpha_x(2k)$, then $\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda} = 0$ since the marginal firm $\underline{\alpha}_B$ doesn't export. If $\alpha_x(2k) < \underline{\alpha}_B < \alpha_x(k)$, then $\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda} = \frac{\pi(\alpha,2k)}{\partial \lambda} < 0$. If $\alpha_x(k) < \underline{\alpha}_B$, then write:

$$\begin{aligned}
\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda} &= -\frac{\underline{\alpha}_B k(A\lambda + A - \tau_{rw})Z}{(4b\lambda\underline{\alpha}_B k + \lambda + 1)^2(2b\lambda\underline{\alpha}_B k + \lambda + 1)^2} \\
\text{where } Z &= 8b^2\underline{\alpha}_B^2 k^2 \lambda A - \tau_{rw} - 3b\underline{\alpha}_B k\tau_{rw} + 3b\lambda\underline{\alpha}_B kA + \\
&\quad 3A\underline{\alpha}_B kb - \tau_{rw}\lambda - 6\tau_{rw}b\lambda\underline{\alpha}_B k - 8b^2\underline{\alpha}_B^2 k^2\tau_{rw}\lambda
\end{aligned}$$

The sign of this term is determined by the sign of Z. To sign $\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda}$, I can show that:

$$\begin{aligned}
Z(\alpha_x(k)) &= \frac{\tau_{rw}(A\lambda + A - \tau_{rw})}{2(A - \tau_{rw})} > 0 \\
\frac{\partial Z}{\partial \alpha} &= bk(16b\lambda\alpha k\left(A - \tau_{rw}\right) + 3\left(A - \tau_{rw}\right) + 3A\lambda - 6\tau_{rw}\lambda) \\
\frac{\partial Z(\alpha_x(k))}{\partial \alpha} &= (2\tau_{rw}\lambda + 3A - 3\tau_{rw} + 3A\lambda)bk
\end{aligned}$$

Thus, using the first property of Z, $Z(\alpha_x(k)) > 0$ and thus $\frac{\partial BN(\alpha_x(k))}{\partial \lambda} < 0$. From the second property, if α is large enough, then $\frac{\partial Z}{\partial \alpha} > 0$. The third property establishes that this is the case for $\alpha_x(k) < \alpha$. Thus, for $\alpha_x(k) < \underline{\alpha}_B$, $\frac{\partial BN(\alpha_x(k))}{\partial \lambda} < 0$.

Using $\frac{\partial BN(\alpha_x(k))}{\partial \lambda}$, and differentiating the equilibrium condition in (8), we get:

$$\frac{\partial \underline{\alpha}_B}{\partial \lambda} = -\frac{\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \lambda}}{\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \alpha}} > 0$$

Using a similar procedure, I can show that:

$$\frac{\partial \overline{\alpha}_B}{\partial \lambda} = -\frac{\frac{\partial BN(\overline{\alpha}_B)}{\partial \lambda}}{\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}} < 0$$

Thus, we have the desired result.

Proof of Lemma 4

The following must hold if there exists a value of trade costs such $\alpha_f > 0$

$$\frac{\left(2A - \tau_h\right)\tau_h}{4b} > R_h + \delta$$

The relevant bounds of $\frac{(2A-\tau_h)\tau_h}{4b}$ are 0 at $\tau_h = 0$ and $\frac{A^2}{4b}$ at $\tau_h = A$. Over this region, $\frac{\partial}{\partial \tau_h}\frac{(2A-\tau_h)\tau_h}{4b} > 0$. Thus, since $\delta < \frac{A^2}{4b}$ by assumption, there exists a value of τ_h such that:

$$\frac{(2A-\tau_h)\,\tau_h}{4b} - \delta > 0$$

Therefore, if R_h is small, there must exist a value $\underline{\tau}_h$ such that:

$$\frac{(2A-\underline{\tau}_h)\,\underline{\tau}_h}{4b} - \delta > R_h$$

Since $\frac{\partial}{\partial \tau_h}\frac{(2A-\tau_h)\tau_h}{4b} > 0$, for $\tau_h \in (\underline{\tau}_h, A)$, $\alpha_f > 0$.

Proof of Proposition 1

Suppose that domestic acquisitions are profitable if $R_h < R_h^D$ and foreign acquisitions are profitable if $R_h < R_h^F$. Suppose that $R_h^F < R_h^D$. For a market clearing price R_h such that $R_h^F < R_h < R_h^D$, the market clearing condition is written as $G_h(\alpha_S, y) = G_h(\overline{\alpha}_B, y) - G_h(\underline{\alpha}_B, y)$, where y denotes the degree of skewness toward the low end of productivity. For example, y could represent the shape parameter on the exponential or Pareto distributions. Holding R_h constant and increasing y yields $G_h(\alpha_S, y) > G_h(\overline{\alpha}_B, y) - G_h(\underline{\alpha}_B, y)$. Since there is more supply than demand, and that supply/demand is increasing/decreasing in the acquisition price, the acquisition price must fall so that $G_h(\alpha_S, y) = G_h(\overline{\alpha}_B, y) - G_h(\underline{\alpha}_B, y)$. Thus, by repeating this process, there exists a level of skewness such that $R_h < R_h^F < R_h^D$ and $G_h(\alpha_S, y) = G_h(\overline{\alpha}_B, y) - G_h(\underline{\alpha}_B, y) + 1 - G_f(\alpha_f)$.

Proof of Proposition 2 and Corollary 1

To begin, note that the system of equilibrium conditions in (8), (14), and (16) can be differentiated with respect to τ_h and rewritten as:

$$\begin{bmatrix} -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} & 0 & 0 \\ -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & 0 & \frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha} & \\ -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & 0 & 0 & \frac{\partial\left(FX(\alpha_f,A_h)\right)}{\partial \alpha} \\ M_h g_h(\alpha_S) & M_h g_h(\underline{\alpha}_B) & -M_h g_h(\overline{\alpha}_B) & M_{rw} g_f(\alpha_f) \end{bmatrix} \cdot \begin{bmatrix} \frac{\partial \alpha_S}{\partial \tau_h} \\ \frac{\partial \underline{\alpha}_B}{\partial \tau_h} \\ \frac{\partial \overline{\alpha}_B}{\partial \tau_h} \\ \frac{\partial \alpha_f}{\partial \tau_h} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ -\frac{\partial\left(FX(\alpha_f,A_h)\right)}{\partial \tau_h} \\ 0 \end{bmatrix} \tag{25}$$

In (25), I have defined $FX(\alpha_f, A_h) = \pi_F(\alpha_f, A_h) - \pi_x(\alpha_f, A_h)$. The term $\frac{\partial(FX(\alpha_f,A_h))}{\partial \tau_{rw}}$ is the only direct effect of inbound tariffs, and is written as:

$$\frac{\partial\left(FX(\alpha_f, A_h)\right)}{\partial \tau_h} = \frac{(A-\tau_h)\alpha_f k}{2(2b\alpha_f k + 1)} > 0$$

Thus, (26) is solved and signed as follows:

$$\frac{\partial \alpha_S}{\partial \tau_h} = \frac{\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \frac{\partial\left(FX(\alpha_f,A_h)\right)}{\partial \tau_{rw}} M_{rw} g_f(\alpha_f)}{D} > 0$$

$$\frac{\partial \underline{\alpha}_B}{\partial \tau_h} = \frac{\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} \frac{\partial\left(FX(\alpha_f,A_h)\right)}{\partial \tau_{rw}} M_{rw} g_f(\alpha_f)}{D} > 0$$

$$\frac{\partial \overline{\alpha}_B}{\partial \tau_h} = -\frac{\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} \frac{\partial\left(FX(\alpha_f,A_h)\right)}{\partial \tau_{rw}} M_{rw} g_f(\alpha_f)}{D} < 0$$

$$\frac{\partial \alpha_f}{\partial \tau_h} = -\frac{\left(\begin{array}{c} \overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} g_h(\underline{\alpha}_B) + \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} g_h(\overline{\alpha}_B) \\ + \overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} g_h(\alpha_S) \end{array}\right) M_h \frac{\partial (FX(\alpha_f, A_h))}{\partial \tau_{rw}}}{D} < 0$$

where

$$\begin{aligned} D &= M_h g_h(\underline{\alpha}_B) \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} \overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial (FX(\alpha_f, A_h))}{\partial \alpha} + M_h g_h(\overline{\alpha}_B) \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \frac{\partial (FX(\alpha_f, A_h))}{\partial \alpha} \\ &\quad + M_{rw} g_f(\alpha_f) \frac{\partial \pi(\alpha_S,k)}{\partial \alpha} \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} + M_h g_h(\alpha_S) \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} \overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)}^{+} \frac{\partial (FX(\alpha_f, A_h))}{\partial \alpha} \\ &> 0 \end{aligned}$$

To apply to Corollary 1, note that:

$$DomShare = \frac{G_h(\overline{\alpha}_B) - G_h(\underline{\alpha}_B)}{G_h(\alpha_S)}$$

Differentiating with respect to τ_h :

$$\frac{\partial DomShare}{\partial \tau_h} = \frac{\overbrace{\left(g_h(\overline{\alpha}_B) \frac{\partial \overline{\alpha}_B}{\partial \tau_h} - g_h(\underline{\alpha}_B) \frac{\partial \underline{\alpha}_B}{\partial \tau_h}\right)}^{-} G_h(\alpha_S) - \overbrace{\left(G_h(\overline{\alpha}_B) - G_h(\underline{\alpha}_B)\right) g_h(\alpha_S) \frac{\partial \alpha_S}{\partial \tau_h}}^{+}}{G_h(\alpha_S)^2} < 0$$

Since $\frac{\partial DomShare}{\partial \tau_h} < 0$, $\frac{\partial ForShare}{\partial \tau_h} > 0$.

Proof of Proposition 3 and Corollary 2

Similar to above, note that the system of equilibrium conditions in (8), (14), and (16) can be differentiated with respect to τ_{rw} and rewritten as:

$$\begin{bmatrix} -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & \frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha} & 0 & 0 \\ -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & 0 & \frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha} & 0 \\ -\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} & 0 & 0 & \frac{\partial (FX(\alpha_f, A_h))}{\partial \alpha} \\ M_h g_h(\alpha_S) & M_h g_h(\underline{\alpha}_B) & -M_h g_h(\overline{\alpha}_B) & M_{rw} g_f(\alpha_f) \end{bmatrix} \cdot \begin{bmatrix} \frac{\partial \alpha_S}{\partial \tau_{rw}} \\ \frac{\partial \underline{\alpha}_B}{\partial \tau_{rw}} \\ \frac{\partial \overline{\alpha}_B}{\partial \tau_{rw}} \\ \frac{\partial \alpha_f}{\partial \tau_{rw}} \end{bmatrix} = \begin{bmatrix} \frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} \\ \frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} \\ \frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} \\ 0 \end{bmatrix} \quad (26)$$

The key to solving this system of equations is the sign of $\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}}$ and $\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}}$. First, note that if the marginal selling firm is an exporter, then all active firms are exporters before and after an acquisition. With some work, I can show that:

$$\begin{aligned} \frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} &= \frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} \\ &= \frac{A_h \tau_{rw}}{2b(A\lambda + A - \tau_{rw})} > 0 \end{aligned} \quad (27)$$

If the marginal selling firm is not an exporter, then $\frac{\partial \pi^N(\alpha_S)}{\partial \tau_h} = 0$. Given that $\frac{\partial BN(\alpha)}{\partial \tau_{rw}} < 0$:

$$\begin{aligned}
\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} &= -\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} > 0 \\
\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} &= -\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} > 0
\end{aligned}$$

Via the condition $\tau_{rw} < \frac{2}{2+\sqrt{2}}A$, we have guaranteed that the most productive firms that acquires, $\overline{\alpha}_B$, is an exporter before and after an acquisition. However, nothing is guaranteed to ensure that $\underline{\alpha}_B$ is an exporter. If $\underline{\alpha}_B < \alpha_x(2k)$, then:

$$\begin{aligned}
\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} &= 0 \qquad (28) \\
\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} - \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} &= -\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} > 0
\end{aligned}$$

I will use this shortly when evaluating the comparative statics. If $\alpha_x(2k) < \underline{\alpha}_B < \alpha_x(k)$, then the analysis is a bit trickier. To start, define the following:

$$\widehat{BN}(\alpha) = \frac{(A + A\lambda - \tau_{rw})^2 \alpha k}{2(4b\alpha k\lambda + \lambda + 1)(2b\alpha k\lambda + \lambda + 1)} \qquad (29)$$

This is simply the acquisition incentive for firms that can export before and after an acquisition. However, I am now defining it without reference to bounds on α. Now, note that for $\alpha_x(2k) < \underline{\alpha}_B \leq \alpha_x(k)$:

$$\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} = \frac{\partial \widehat{BN}(\underline{\alpha}_B)}{\partial \tau_{rw}}$$

That is, even though $\widehat{BN}$ is not directly relevant for the equilibrium over this range, $\frac{\partial \widehat{BN}(\underline{\alpha}_B)}{\partial \tau_{rw}} = \frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}}$. Now, note also that:

$$\begin{aligned}
\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} - \frac{\partial \widehat{BN}(\underline{\alpha}_B)}{\partial \tau_{rw}} &= -\frac{2A\underline{\alpha}_B kb - 2b\underline{\alpha}_B k\tau_{rw} - \tau_{rw}}{2b(2b\lambda\underline{\alpha}_B k + \underline{\alpha}_B k + 1)} \\
&\implies \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} > \frac{\partial \widehat{BN}(\underline{\alpha}_B)}{\partial \tau_{rw}} \;\; if \;\; \underline{\alpha}_B \leq \alpha_x(k)
\end{aligned}$$

Thus, for $\underline{\alpha}_B \leq \alpha_x(k)$, we have that:

$$\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} = \frac{\partial \widehat{BN}(\underline{\alpha}_B)}{\partial \tau_{rw}} < \frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}}$$

All together, this gives us the following result:

$$If \;\; \alpha_x(2k) < \underline{\alpha}_B \leq \alpha_x(k), \; -\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_{rw}} < -\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_{rw}} \qquad (30)$$

Using (27), (28) and (30), (26) can be solved and signed as follows:

$$\begin{aligned}
\frac{\partial \alpha_S}{\partial \tau_{rw}} &= -\frac{\overbrace{\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}}^{>0}\overbrace{\left(-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \alpha}\right)}^{>0} M_h g_h(\underline{\alpha}_B)\overbrace{\left(\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_h}-\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}}{D} \\
&\quad -\frac{\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}\overset{+}{\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \alpha}} M_h g_h(\overline{\alpha}_B)\overbrace{\left(\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_h}-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}}{D}+\frac{\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \alpha}\overbrace{\left(-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \alpha}\right)}^{>0}\overbrace{\left(-\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_{rw}}\right)}^{+} M_{rw} g_f(\alpha_f)}{D} \\
&\gtrless 0
\end{aligned}$$

Note that if $\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}} = 0$, i.e. the marginal selling firm is not an exporter, $\frac{\partial \alpha_S}{\partial \tau_{rw}} < 0$.

$$\begin{aligned}
\frac{\partial \underline{\alpha}_B}{\partial \tau_{rw}} &= \frac{\overbrace{\left(-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \alpha}\right)}^{>0}\overbrace{\left(\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_h}-\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}\left(\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} M_{rw} g_f(\alpha_f)+M_h g_h(\alpha_S)\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}\right)}{D} \\
&\quad -\frac{\left(\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\right) M_h g_h(\overline{\alpha}_B)\overbrace{\left(\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \tau_h}-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}}{D}+\frac{\overbrace{\left(-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \alpha}\right)}^{>0}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} M_{rw} g_f(\alpha_f)\left(-\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}}\right)}{D} \\
&\gtrless 0
\end{aligned}$$

$$\begin{aligned}
\frac{\partial \overline{\alpha}_B}{\partial \tau_{rw}} &= -\frac{\overbrace{\left(\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_h}-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}\left(\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} M_{rw} g_f(\alpha_f)+M_h g_h(\alpha_S)\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}\right)}{D} \\
&\quad -\frac{\left(\frac{\partial\left(FX\left(\alpha_f, A_h\right)\right)}{\partial \alpha}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\right) M_h g_h(\underline{\alpha}_B)\overbrace{\left(\frac{\partial BN\left(\underline{\alpha}_B\right)}{\partial \tau_h}-\frac{\partial BN\left(\overline{\alpha}_B\right)}{\partial \tau_h}\right)}^{>0}}{D}-\frac{\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_h}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha} M_{rw} g_f(\alpha_f)\overbrace{\left(-\frac{\partial \pi^N\left(\alpha_S\right)}{\partial \tau_{rw}}\right)}^{+}}{D} \\
&< 0
\end{aligned}$$

Despite $\frac{\partial \underline{\alpha}_B}{\partial \tau_{rw}} \gtrless 0$, note that total domestic acquisition demand (per variety) decreasing. That is:

$$
\begin{aligned}
\frac{\partial\left(G_h(\overline{\alpha}_B)-G_h(\underline{\alpha}_B)\right)}{\partial \tau_{rw}} &= -\frac{g_h(\overline{\alpha}_B)\left(\frac{\partial BN(\underline{\alpha}_B)}{\partial \underline{\alpha}_B}\right)\left(\overbrace{\left(\frac{\partial \pi^N(\alpha_S)}{\partial \tau_h}-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}M_{rw}g_f(\alpha_f)\right)}{D} \\
&\quad -\frac{g_h(\overline{\alpha}_B)\left(\frac{\partial BN(\underline{\alpha}_B)}{\partial \underline{\alpha}_B}\right)\left(\overbrace{\left(\frac{\partial \pi^N(\alpha_S)}{\partial \tau_h}-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}M_h g_h(\alpha_S)\frac{\partial\left(FX\left(\alpha_f,A_h\right)\right)}{\partial \alpha}\right)}{D} \\
&\quad -\frac{g_h(\underline{\alpha}_B)\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \overline{\alpha}_B}\right)\left(\overbrace{\left(\frac{\partial \pi^N(\alpha_S)}{\partial \tau_h}-\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}M_{rw}g_f(\alpha_f)\right)}{D} \\
&\quad -\frac{g_h(\underline{\alpha}_B)\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \overline{\alpha}_B}\right)\left(\overbrace{\left(\frac{\partial \pi^N(\alpha_S)}{\partial \tau_h}-\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}M_h g_h(\alpha_S)\frac{\partial\left(FX\left(\alpha_f,A_h\right)\right)}{\partial \alpha}\right)}{D} \\
&\quad -\frac{\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\left(-\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}}\right)g_f(\alpha_f)\left(g_h(\overline{\alpha}_B)\frac{\partial BN(\underline{\alpha}_B)}{\partial \underline{\alpha}_B}+g_h(\underline{\alpha}_B)\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \overline{\alpha}_B}\right)\right)}{D} \\
&< 0
\end{aligned}
$$

Finally,

$$
\begin{aligned}
\frac{\partial \alpha_f}{\partial \tau_{rw}} &= -\frac{\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\right)M_h g_h(\underline{\alpha}_B)\overbrace{\left(\frac{\partial BN(\underline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}}{D}-\frac{\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}M_h g_h(\overline{\alpha}_B)\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}}{D} \\
&\quad -\frac{\left(-\frac{\partial \pi^N(\alpha_S)}{\partial \tau_{rw}}\right)M_h g_h(\alpha_S)\left(\frac{\partial BN(\overline{\alpha}_B)}{\partial \alpha}\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}\right)}{D}<0
\end{aligned}
$$

where

$$
\begin{aligned}
D &= M_h g_h(\underline{\alpha}_B)\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}\frac{\partial\left(FX\left(\alpha_f,A_h\right)\right)}{\partial \alpha}+M_h g_h(\overline{\alpha}_B)\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}\frac{\partial\left(FX\left(\alpha_f,A_h\right)\right)}{\partial \alpha} \\
&\quad +M_{rw}g_f(\alpha_f)\frac{\partial \pi(\alpha_S,k)}{\partial \alpha}\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}+M_h g_h(\alpha_S)\frac{\partial BN(\underline{\alpha}_B)}{\partial \alpha}\overbrace{\left(-\frac{\partial BN(\overline{\alpha}_B)}{\partial \tau_h}\right)}^{>0}\frac{\partial\left(FX\left(\alpha_f,A_h\right)\right)}{\partial \alpha} \\
&> 0
\end{aligned}
$$

To apply to Corollary 2, again note that:

$$
DomShare = \frac{G_h(\overline{\alpha}_B)-G_h(\underline{\alpha}_B)}{G_h(\alpha_S)}
$$

Differentiating with respect to τ_h:

$$\frac{\partial DomShare}{\partial \tau_{rw}} = \frac{\left(g_h(\overline{\alpha}_B)\frac{\partial \overline{\alpha}_B}{\tau_{rw}} - g_h(\underline{\alpha}_B)\frac{\partial \underline{\alpha}_B}{\tau_{rw}}\right) - \frac{\left(G_h(\overline{\alpha}_B)-G_h(\underline{\alpha}_B)\right)}{G_h(\alpha_S)} g_h(\alpha_S)\frac{\partial \alpha_S}{\tau_{rw}}}{G_h(\alpha_S)} < 0$$

This result can be seen by differentiating the acquisition market clearing condition:

$$\begin{aligned}
g_h(\alpha_s)\frac{\partial \alpha_S}{\tau_{rw}} &= g_h(\overline{\alpha}_B)\frac{\partial \overline{\alpha}_B}{\tau_{rw}} - g_h(\underline{\alpha}_B)\frac{\partial \underline{\alpha}_B}{\tau_{rw}} - g_f(\alpha_f)\frac{M_{RW}}{M_H}\frac{\partial \alpha_f}{\tau_{rw}} \\
g_f(\alpha_f)\frac{M_{RW}}{M_H}\frac{\partial \alpha_f}{\tau_{rw}} &= g_h(\overline{\alpha}_B)\frac{\partial \overline{\alpha}_B}{\tau_{rw}} - g_h(\underline{\alpha}_B)\frac{\partial \underline{\alpha}_B}{\tau_{rw}} - g_h(\alpha_s)\frac{\partial \alpha_S}{\tau_{rw}} < 0 \\
&\implies g_h(\overline{\alpha}_B)\frac{\partial \overline{\alpha}_B}{\tau_{rw}} - g_h(\underline{\alpha}_B)\frac{\partial \underline{\alpha}_B}{\tau_{rw}} < g_h(\alpha_s)\frac{\partial \alpha_S}{\tau_{rw}}
\end{aligned}$$

Thus, the mass of domestic buying firms decreases by more than the mass of selling firms. Since $\frac{\left(G_h(\overline{\alpha}_B)-G_h(\underline{\alpha}_B)\right)}{G_h(\alpha_S)} < 1$, this guarantees that the movement of the selling firms will not outweigh the movement of domestic acquisitions. Since $\frac{\partial DomShare}{\partial \tau_h} < 0$, $\frac{\partial ForShare}{\partial \tau_h} > 0$.