

# Kicking the bad apples out: Tariff liberalization and bilateral trade

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November 4, 2009

## Abstract

In this paper, I present a simple model in which liberalization of a most-favored nation (MFN) tariff need not increase bilateral imports from all MFN sources. While liberalization must increase imports from high price MFN sources, it may *decrease* imports from low price MFN sources. This has stark implications for the role of the non-discrimination clause and the Article XXIV exception regarding preferential agreements in the GATT/WTO. Empirically, the predictions of the model are confirmed using a case study of unilateral MFN tariff reductions by New Zealand in the late 90's. Within narrowly defined products, I find that MFN tariff reductions increased imports of high price varieties, and reduced imports of low price varieties. As developing countries tend to specialize in low price varieties, this suggests that the benefits of tariff liberalization within the WTO may be skewed toward developed nations.

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# 1 Introduction

If one point has been made abundantly clear by the theory of international trade, it is that trade is often driven by heterogeneity. On a classical level, trade occurs when relative autarky prices differ via heterogeneous relative endowments or productivity. In "new trade theory", heterogeneous varieties of the same product are traded, and consumers reap gains by consuming from a larger variety-set. In the firm-heterogeneity literature, firms determine what is traded, and only those which are most-productive (Melitz, 2003), or those which produce at a higher quality (Johnson, 2009), can afford the sunk costs required for export. Even in the gravity literature, in which relatively proximate and relatively rich countries tend to trade in robust amounts, heterogeneity in distance plays a role in the determining the precise characteristics of the varieties traded between any two partners (Hummels and Skiba, 2004; Baldwin and Harrigan, 2008).

Regardless of the source, heterogeneity almost always reflects in prices. And, as many authors have documented (Schott 2004, in particular), trade data exhibits substantial variation in unit-values within precise product categories. As an example, consider the import of "Men's or Boys' Shirts, of Cotton" (HS6 code 620520) by New Zealand in 1999. Overall, New Zealand imported varieties within this product category from 50 different countries. While the average pre-tariff unit-value was \$20, exporter-specific unit values varied substantially. On one end of the spectrum, Belgium exported varieties at an average of \$75 per unit. On the other end, Indonesia exported at an average of \$3.60 per unit. Clearly, for this narrowly defined product, there is substantial price variation across export sources.

Despite the massive amount of heterogeneity in prices which occurs across trading partners within narrowly defined products, the rules of the GATT/WTO, on a basic level, seem designed for a more homogenous environment. With regard to tariffs, this point is particularly salient, as outside of special safeguards, retaliatory measures, and regional agreements, members have very little latitude regarding tariffs applied to different varieties of the same product. One particular guiding principle, "non-discrimination", imposes that all GATT/WTO members receive

equal treatment, usually via a common, or "most favored nation" (MFN), tariff. This applies within any product, across all export sources without preferential status, and (obviously) does not discriminate by quality or other characteristics. In the New Zealand example, despite "Men's or Boys' Shirts, of Cotton" from Belgium and Indonesia being very different, the rules of the GATT/WTO mandate that they are assessed the same tariff. In this case, both countries are assessed a 19% MFN tariff, along with 43 other countries which export varieties of Men's or Boys cotton shirts to New Zealand on an MFN basis. Further, if New Zealand was to liberalize this tariff, they would be required to do so on a non-discriminatory basis.

Overall, there is a clear friction between the precise intent of WTO rules regarding tariffs, and the natural differentiation which occurs in trade flows. Critically, even though the WTO prefers (and promotes) the multilateral process over other preferential or regional schemes, it remains unclear how the effects of MFN liberalization accrue within products that exhibit significant product-differentiation. In what way should MFN tariff reductions influence bilateral trade flows? Are certain countries more likely to gain from MFN liberalization based on the fundamental characteristics or quality of the products they sell? Do countries that benefit the most fall into the same group of development? Overall, how are the benefits of additional import market access distributed across *competing* and *differentiated* exporters?

This paper answers these questions. Using a very simple theoretical model, I show that liberalization of a common import tariff need not increase bilateral imports from all export sources. While liberalization must increase imports from high-price export sources, it will not necessarily increase imports from low-price export sources. Using a liberalization episode in New Zealand (and Australia as a "control" group), I find precise evidence supporting this prediction.

The intuition for this result is developed using a simple competitive framework.<sup>1</sup> A reduction in ad-valorem tariffs yields two effects on each exporter. The first is a *direct effect*, where lower tariffs decrease the supply-price of each variety. As this reduces the price which consumers pay,

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<sup>1</sup>Adjusted versions of Brander and Krugman (1983) and Melitz and Ottaviano (2005) also deliver similar results, and are available upon request.

all direct effects tend to increase trade. Further, by virtue of ad-valorem tariffs, the percentage reduction in the supply-price is equal across all imports. However, in assuming a common variable-elasticity demand framework, low-price suppliers sell on a more inelastic portion of the demand curve. Thus, given equal percentage reductions in price, if demand elasticity (in absolute terms) diminishes sufficiently in quantity, goods sold at a lower demand elasticity (lower price) will have a smaller increase in imports. Overall, for a wide class of demand functions, the direct effects of tariffs are larger for high-price goods.

In equilibrium, the *direct effect* is weighed against a *market size effect*, which tends to move in the opposite direction. Precisely, as MFN tariff cuts induce tougher competition in the import sector, the market size effect is a reduction in the residual demand for each variety. On average, the direct effect is always bigger than the market size effect, and trade liberalization must always increase aggregate imports. However, at the bilateral level, the direct effect may be larger or smaller than the market size effect. The latter is a function of imports from all countries, whereas the former is country specific. In equilibrium, there exists an exporter supply price threshold below which the direct effect is smaller than the market size effect. In this case, liberalization of a common tariff *reduces* bilateral trade. Indeed, a negative effect of liberalization is more likely in industries with high price-dispersion, as in these industries some prices may be very low relative to the average price. Further, as a larger domestic sector tends to dampen the market size effects of MFN tariffs, this threshold is less likely to be relevant in industries with a robust domestic presence.

This result is reminiscent of the classic Alchian-Allen hypothesis, and the subsequent empirical work by Hummels and Skiba (2004), in which per-unit transportation costs shift the distribution of exports toward higher quality (price) goods, and tariffs do the opposite. Thus, when distance is non-trivial, countries tend to "ship the good apples out". However, when tariffs are high, countries tend to export a lower quality mix. One can consider the present result to be an importer-analogue of the Alchian-Allen hypothesis, where a reduction in MFN tariffs results in "kicking the bad apples out", skewing the distribution of imports toward high-price MFN varieties. Indeed, the aggregated

effects of MFN tariff cuts can be so strong that demand for low-price varieties falls with MFN liberalization, even when prices are falling for these same varieties.

This result has stark implications for trade policy, where the interaction between prices and tariffs suggests a perverse effect of "non-discrimination". Specifically, the model suggests that not all exporters will benefit from liberalization by a common importer without allowing for discriminatory tariff reductions. This immediately questions whether the principle of non-discrimination, a pillar of the GATT/WTO system, is a barrier to countries specializing in low-price, low-quality products from benefiting during WTO liberalization rounds. Indeed, this may provide a new economic rationale for allowing preferential agreements within the GATT/WTO.<sup>2</sup>

Empirically, the model is tested using a case study of tariff liberalization in New Zealand. Importantly, the liberalization process in New Zealand was unilateral, and thus not related to rounds of negotiation within the WTO. This eliminates any effect of reciprocal tariff reductions on bilateral trade. Further, a close neighbor, Australia, engaged in minimal tariff cuts in both MFN and preferential tariffs, which will enable a difference-in-difference approach to estimation. In particular, this will help control for variation in trade flows attributable to exporter-specific shocks, and not the differential effect of tariff cuts. To test the model, I collect data from TRAINS and COMTRADE on bilateral trade and tariffs over the period 1996-2000, and examine how tariffs affect the distribution of trade into each importer as a function of world exporter prices.

While the body of the paper will present a battery of different specifications to test the model, the primary results are three. Across all specifications, the effects of MFN tariff reductions on bilateral MFN imports tend to be positive for high price varieties, and negative or insignificant for low price varieties. This result is more robust in products which exhibit significant within-product price variation, as the theory predicts. Further, this result is somewhat pronounced (though not using the most robust set of fixed effects) for products in which the importer has a relatively weak export sector. As weak export sectors likely signify a weak domestic sector, this is also consistent with the theory. Overall, not only do prices matter in evaluating the effects of tariffs, but the

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<sup>2</sup>Integrating the basic model within a model of trade agreements is an area of current work.

qualitative nature of these effects will differ substantially across industries in a way suggested by the theory.

This paper adds to a number of different areas related to trade, trade policy, and product quality. There is a relatively recent literature examining the design of the WTO within the context of heterogeneous countries and products. Saggi (2004) compares optimal tariffs set on an MFN basis with those set via unconstrained discrimination in a  $n$ -country oligopoly model with heterogeneous suppliers. If given the opportunity, countries will assess higher tariffs against low-cost suppliers, and lower tariffs against high-cost suppliers. MFN serves to remove this inefficiency, improving world welfare, though only under precise conditions do countries actually agree to reciprocal MFN. The model does not examine the removal of tariffs on an MFN basis, and the corresponding effects on trade, which is the focus of my work. Thus, rather than asking what happens when tariffs are liberalized via MFN, it queries how and why we're in an MFN environment in the first place. Generally, Saggi's model suggests that moving from non-cooperative discrimination to non-cooperative MFN benefits low cost suppliers since the optimal tariffs applied to their exports would be lower.<sup>3</sup>

Further, the paper is related to the work Rose (2004) and Subramanian and Wei (2007), who attempt to estimate the effects of GATT/WTO membership on bilateral trade flows.<sup>4</sup> However, neither examines the effects of MFN liberalization at the product level, which as discussed in Schott (2004), Hummels and Skiba (2004), Hallak (2005), and above, contains critical information

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<sup>3</sup>In later work, Saggi and Sara (2007) uses a two country model to examine the National Treatment clause when products may differ in quality. A similar result is reached as in Saggi (2004), where a national treatment clause tends to help those exporters selling the most competitive goods (highest quality goods).

<sup>4</sup>Rose (2004) presents a provocative (and controversial) analysis that questions whether the GATT/WTO system had any effect on world trade flows. Precisely, he finds that the GATT/WTO had an economically and statistically insignificant effect on bilateral trade patterns. This is described as intuitive on an aggregate level since many new GATT/WTO members received GATT/WTO-like benefits under the generalized system of preferences, and were required to concede little upon accession. Overall, Rose concludes that "it is very hard to demonstrate convincingly that the GATT and the WTO have dramatically encouraged trade".

Subramanian and Wei (2007) strongly disagree. Also using a gravity framework, and controlling for countries and products that were more likely to offer concessions upon accession to the GATT/WTO, they find a strong effect of GATT/WTO membership on bilateral trade. Given there should be no expectation of increased trade when meaningful liberalization did not occur, the authors find a large effect when the importing country is an industrial country, or their products were subject to tariff reductions. Overall, the authors document a significant role played by the GATT/WTO exactly where it should be expected to have one.

on the precise characteristics of trade flows. Further, as GATT/WTO negotiations involve a number of factors beyond products and their characteristics (resources available for negotiation, for example), using broad liberalization rounds to precisely assess the impact of MFN tariff reductions is problematic. Most importantly, the model suggests that this particular class of empirical studies is misspecified by failing to allow for differential effects of WTO membership as a function of tradable sector characteristics.

My paper also adds to the literature examining the effects of various factors on bilateral trade flows (Anderson and Van Wincoop, 2003; Hummels, 1999), and in particular, the role of product quality (Schott, 2004; Hummels and Skiba, 2004; Hallak, 2005; Johnson (2009) in explaining trade patterns. The paper is tangentially related to recent work that has provided broad justification for the motives underlying country-product-specific tariffs (Broda, Limao, and Weinstein; 2007), and the terms-of-trade theory as a motive for the removal of these tariffs (Bagwell and Staiger; 2007). In the present work, I focus instead on the role MFN tariff reductions might play for different countries producing different quality goods.

One final related paper is recent work by Romalis (2006), in which MFN trade liberalization by the United States increased both the degree of openness and the growth rates of developing countries. On a basic level, this finding seems contradictory to the results discussed in this paper, where I show that MFN liberalization in New Zealand likely decreased trade for the poorest countries in my sample. However, the Romalis framework does not allow for a differential effect of liberalization by different levels of development (or in my model, the average price of exports). Thus, an interesting extension of the Romalis model would be allowing for such an interaction.<sup>5</sup>

Finally, one lacking feature in the model and empirics is a precise treatment of the extensive margin of trade, as in Helpman, Melitz and Rubinstein (2007), Manova (2008), and Johnson (2009). The extensive margin in these papers is not modeled as a function of tariffs, which is the

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<sup>5</sup>Also, as detailed in Irwin (1998), a large portion of past ad-valorem equivalent tariffs in the US can be attributed to specific tariffs. Importantly, as prices have generally risen over time, specific tariffs have become less effective. Thus, a large portion of variation in US applied tariffs is attributable to inflationary impacts on the specific tariff, and not reductions in the ad-valorem MFN rate, which is the primary instrument in the Romalis framework.

primary focus of my work. Importantly, allowing for tariffs to play into the extensive margin of trade yields another margin of concern - the "agreements margin" of trade. That is, multilateral tariffs only effect those trade flows which are not governed by bilateral agreements. As countries enter bilateral arrangements for reasons which are not independent of other factors influencing trade flows, the agreements-margin of trade is an area left for development in a future paper.

The rest of the paper is organized as follows. Section two presents a simple theoretical model and some extensions. Section three details the dataset, and tests the predictions from section two. In section four, I briefly conclude.

## 2 A Simple Model

The model in this paper is simple by design in order to detail a new margin through which tariffs influence bilateral trade flows. Extensions allowing for monopoly mark-ups deliver similar results to those presented in this section.

### Demand

Consumption occurs in a small import market in which preferences are quasi-linear, non-homothetic, and exhibit love-of-variety within a differentiated sector. Similar to Melitz and Ottaviano (2005), preferences of this type can be defined as follows:

$$U = x_0 + \int_{i \in N} \theta q_i di - \frac{1}{2} \eta \left( \int_{i \in N} q_i di \right)^2 - \frac{1}{2} \gamma \int_{i \in N} (q_i)^2 di \quad (1)$$

Here,  $q_i$  is the consumption of variety  $i$ ,  $\theta$  ( $> 0$ ) is industry quality, and  $\eta$  ( $> 0$ ) determines the substitution pattern between the differentiated industry and the numeraire. Finally,  $\gamma$  ( $> 0$ ) represents the degree to which consumers value product variety. There is a measure  $N$  differentiated varieties available for purchase. Setting  $x_0$  as the numeraire, demand for each variety by the

representative consumer is written as:

$$p_i = \underbrace{\theta - \eta Q}_A - \gamma q_i = A - \gamma q_i \quad (2)$$

Here,  $Q$  is the aggregate quantity which is consumed.

## Supply

All varieties, whether preferential, domestic, or MFN, are supplied competitively. Further, as the import market is small, each supplier is assumed to sell the same variety to a large, unmodeled world market at a fixed world price. Defining  $q_l$  as the quantity of imports and  $V_l$  as the value of imports prior to the imposition of tariffs for variety  $l$ , and writing  $t_l = (1 + \tau_l)$ , where  $\tau_l$  is the tariff applied to variety  $l$ , I can derive the following equations for the "free-on-board" quantity and value of variety  $l$ :

$$q_l = \frac{A - p_l^w t_l}{\gamma} \quad (3)$$

$$V_l = p_l^w \frac{A - p_l^w t_l}{\gamma} \quad (4)$$

In (3) and (4), consumption decisions are based on a tariff adjusted world price,  $p_l^w t_l$ . Given that world prices are taken as given (which again is not required for any qualitative results), changes to  $q_l$  and  $V_l$  will be qualitatively identical. As the value of trade is of most concern to exporters, and most relevant for models of trade agreements, I restrict attention to  $V_l$  in the forthcoming analysis.

Next, assume that each variety is sourced from one of two "types" of supplier: MFN or preferential. Each supply category is of measure  $N_M$ , and  $N_P$ , respectively, where  $N = N_M + N_P$ . If a variety is sourced by a MFN supplier,  $t_l = t_M = (1 + \tau_M)$ , where  $\tau_M$  is common to all MFN imports. Otherwise, the variety is imported on a preferential basis, and thus  $t_l$  is variety specific. As a matter of convention, preferential varieties can be "domestic", in which case  $t_l = 1$ .

With import levels in-hand, I can now derive the main result of the paper, which is the equilibrium effect of  $t_M$  on MFN imports. Defining  $V_l^M$  as the value of imports if variety  $l$  is subject to MFN tariffs,  $\frac{\partial V_l^M}{\partial t_M}$  is written as:

$$\frac{\partial V_l^M}{\partial t_M} = p_l^w \frac{1}{\gamma} \left( \frac{\partial A}{\partial t} - p_l^w \right) \quad (5)$$

The first term in the parentheses,  $\frac{\partial A}{\partial t}$ , represents the *market size effect* of higher tariffs. This is generally positive, and is common across exporters (this will be proven and discussed below). The second term,  $p_l^w$ , is specific to each exporter, and represents the *direct effect* of MFN tariffs.

Given that the MFN tariff is assessed on a percentage basis, the relative supply price between any two varieties remains constant. However, given the demand function in (2), lower-price exporters sell on a less-elastic portion of the demand curve. Thus, the own-effects of liberalization (price-reduction) are smaller for low-price goods. This will be the crucial property that influences the main result of the paper. Generally, this result holds if the elasticity of demand, in absolute terms, decreases sufficiently as quantity increases.<sup>6</sup>

To fully solve for  $\frac{\partial V_l^M}{\partial t_M}$ , I must solve for  $Q$  and differentiate with respect to  $t_M$ . To begin, note that  $Q = Q_M + Q_P$ , where  $Q_M$  is total consumption of MFN varieties and  $Q_P$  total consumption of preferential varieties. To solve for  $Q_M$ , and  $Q_P$ , I aggregate (3) over MFN and preferential varieties, respectively:

$$\begin{aligned} Q_M &= \frac{N_M}{\gamma} (\theta - \eta Q - t_M \overline{p_M^w}) \\ Q_P &= \frac{N_P}{\gamma} (\theta - \eta Q - \overline{(tp^w)}_P) \end{aligned}$$

Here,  $\overline{p_M^w}$  is the average world price of MFN varieties, and  $\overline{(tp^w)}_P$  is the average tariff-adjusted

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<sup>6</sup>Precisely, for a general demand function, higher price goods experience a larger response to trade costs if  $\frac{\partial}{\partial p_i^w} \left( \frac{\partial q_i}{\partial t} \right) = \frac{\partial q_i}{\partial p_i} \left( \epsilon(q_i) + q_i \frac{\partial \epsilon(q_i)}{\partial q_i} \right) < 0$ . The critical requirement is that  $\frac{\partial \epsilon(q_i)}{\partial q_i}$  must be sufficiently positive (since elasticities are defined negatively). For linear demand, this requirement is satisfied. For CES, where  $\frac{\partial \epsilon(q_i)}{\partial q_i} = 0$ , lower price goods experience the largest effect of liberalization.

world price (the delivered price) of preferential varieties. Differentiating  $Q_M$  and  $Q_P$  with respect to  $t_M$ , and noting that  $\frac{\partial Q}{\partial t_M} = \frac{\partial Q_M}{\partial t_M} + \frac{\partial Q_P}{\partial t_M}$ ,  $\frac{\partial Q}{\partial t_M}$  is written as:

$$\frac{\partial Q}{\partial t_M} = -\frac{N_M}{\gamma + \eta N} \overline{p_M^w} < 0 \quad (6)$$

Given  $\frac{\partial A}{\partial t_M} = -\eta \frac{\partial Q}{\partial t_M} > 0$ , we see from (6) that increasing the MFN tariff increases the residual demand available to every variety, MFN, preferential, and domestic. As overall competition is now softer by virtue of MFN imports facing a higher tariff, all else equal, the residual demand for each variety shifts up. Further, holding the measure of total varieties ( $N$ ) fixed, we see that a higher number of MFN varieties amplifies the negative effect of MFN tariffs on total quantity consumed, and thus amplifies the effect of MFN tariffs on the residual demand for each variety. The intuition is fairly simple, as when MFN varieties comprise a large share of the overall market, there are fewer non-MFN varieties, domestic or preferential, to expand production in response to the higher costs incurred by MFN varieties.

Again, noting that  $\frac{\partial A}{\partial t_M} = -\eta \frac{\partial Q}{\partial t_M}$ , I now derive the central result of the paper, which is the effect of MFN tariffs on bilateral MFN imports. Substituting  $\frac{\partial A}{\partial t_M}$  into (5) yields:

$$\frac{\partial V_l^M}{\partial t_M} = p_l^w \frac{1}{\gamma} \left( \underbrace{-p_l^w}_{\text{direct}} + \underbrace{\frac{\eta N_M}{\gamma + \eta N} \overline{p_M^w}}_{\text{market}} \right) \quad (7)$$

Interpreting (7), we have the main result of the paper:

**Proposition 1** *If  $p_i^w < \frac{N_M}{\gamma + \eta N} \overline{p_M^w}$ , then  $\frac{\partial V_l^M}{\partial t_M} > 0$ . Else,  $\frac{\partial V_l^M}{\partial t_M} < 0$ .*

The dichotomy described in Proposition 1 is the main result of the paper. As  $\overline{p_M^w}$  represents the average pre-tariff price of MFN imports, the result in Proposition 1 states that MFN suppliers which sell varieties at or above the average MFN world price will surely win from trade liberalization. In contrast, suppliers selling varieties with a pre-tariff price sufficiently below the average MFN price will lose from MFN liberalization.

The intuition for Proposition 1 is fairly simple. Holding the actions of other MFN varieties constant, a given MFN supplier always receives a "direct" benefit of lower MFN tariffs. However, once accounting for the surge in imports from other MFN varieties, each receiving the same percentage tariff cut, this "direct" benefit must be weighed against the increased market competitiveness resulting from MFN tariff cuts. This increase in competitiveness is embodied in a reduction in  $A$  - a downward shift in demand for each variety. In equilibrium, as low-price MFN varieties experience a disproportionately small benefit from liberalization relative to other, high price MFN varieties, it is possible for the trade reducing increase in competitiveness to outweigh the trade enhancing effect of lower tariffs for the lowest-price MFN varieties.

At the industry level, Proposition 1 implies the following corollary:

**Corollary 1** *If the distribution of  $p_i^w$  is relatively disperse for MFN varieties,  $\frac{\partial V_l^M}{\partial t_M} > 0$  for some  $l$ . If the distribution of  $p_i^w$  is relatively concentrated for MFN varieties,  $\frac{\partial V_l^M}{\partial t_M} < 0$  for all  $l$ .*

Clearly, if all MFN varieties are identical, where  $p_i^w = \widetilde{p}_M^w$ , then  $\frac{\partial V_l^M}{\partial t_M}$  is written as

$$\frac{\partial V_l^M}{\partial t_M} = -\frac{\gamma + \eta \overbrace{(N - N_M)}^+}{\gamma(\gamma + \eta N)} \left(\widetilde{p}_M^w\right)^2 < 0$$

All MFN suppliers lose from higher MFN tariffs under the assumption that  $p_i^w = \widetilde{p}_M^w$ . Generally, since  $\frac{\eta N_M}{\gamma + \eta N} < 1$ ,  $\frac{\partial V_l^M}{\partial t_M} > 0$  only if a given variety's world price is sufficiently low relative to the MFN average. Thus, if the distribution of prices is fairly concentrated, this condition will not be satisfied for any variety.

While the effects of MFN tariffs on MFN imports are of primary interest, changes to MFN tariffs also affect imports supplied from preferential sources. Defining  $V_l^P$  as the value of imports if variety  $l$  is preferential, this effect is summarized in the following lemma:

**Lemma 1** *Higher MFN tariffs increase imports from preferential suppliers. Precisely,  $\frac{\partial V_l^{MP}}{\partial t_M} = p_l^w \frac{\eta N_M}{\gamma(\gamma + \eta N)} \overline{p}_M^w > 0$ .*

As discussed earlier, higher MFN tariffs increase the residual demand of each variety,  $A$ , including preferential varieties. Intuitively, the import market is now less competitive, and since there is no corresponding increase in costs for preferential varieties, imports must rise from preferential partners.<sup>7</sup>

### **Kicking the bad apples out**

The result detailed above is not the first to look at the relationship between prices and bilateral trade flows. For example, recent work by Johnson (2009) has allowed for a precise impact of quality, via prices, on trade flows. Further, Hummels and Skiba (2004) examine how trade costs and tariffs affect the price-composition of exports. However, to my knowledge, the above framework is the first to demonstrate that the impact of import liberalization may in fact be negative for the lowest price imported varieties

This main result is reminiscent of the classic Alchian-Allen hypothesis, and the subsequent empirical work by Hummels and Skiba (2004), in which transportation costs shift the distribution of exports toward higher quality goods. In their work, per-unit costs of shipping lower the relative price of high-quality goods, and thus increase the relative demand for these goods. In the parlance of Alchian-Allen, when distance plays a non-trivial role in exporting decisions, countries "ship the good apples out". Along with per-unit trade costs, Hummels and Skiba allow for an ad-valorem component, such as tariffs. Theoretically, they show that tariffs reduce the relative demand for high quality goods, thus lowering the average FOB price of exports.

As mentioned in the introduction, one can consider the present result to be an importer-analogue of the Alchian-Allen hypothesis, where a reduction in MFN tariffs results in "kicking the bad apples out", skewing the distribution of imports toward high-price MFN varieties. Indeed, the aggregated effects of MFN tariff cuts can be so strong that demand for low-price varieties falls

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<sup>7</sup>This effect highlights a subtle, yet important, shortcoming of previous studies which examine the effects of WTO membership on trade. In particular, neither Rose (2004) or Subramanian and Wei (2007) control for the degree to which competing exporters are members of the WTO, or are members of preferential institutions that may make MFN imports less competitive.

with MFN liberalization, even when prices are falling for these same varieties.

Finally, as higher prices might signal higher quality, it is necessary to examine how the basic effects of tariffs change when allowing for a precise quality dimension.<sup>8</sup> As it turns out, the quality dimension will be exceptionally important for the theoretical predictions, and the empirics, where if consumers make choices based on quality adjusted prices, and quality-adjusted prices do not preserve the ranking of observed prices, then the fundamental properties of demand which determines who wins and who loses under MFN liberalization will be undermined.

To make this idea more concrete, suppose that each  $q_i$  in the utility function in (1) is multiplied by a quality parameter  $\lambda_i$ . Thus,  $Q$  will now be defined as quality-adjusted aggregate consumption.<sup>9</sup> Under this assumption, the result in (7) can be rewritten as

$$\frac{\partial V_l^M}{\partial t_M} = \frac{p_l^w}{\gamma} \left( \underbrace{-\frac{p_l^w}{\lambda_l}}_{direct} + \underbrace{\frac{\eta N_M}{\gamma + \eta (\lambda_M N_M + \lambda_P N_P)} \overline{p_M^w}}_{market} \right) \quad (8)$$

where  $\frac{p_l^w}{\lambda_l}$  is the quality-adjusted world price. In (8), the varieties with the highest quality adjusted world price are those which surely benefit from liberalization. Theoretically, this is intuitive, as low-price goods which are of poor quality may not be consumed in large amounts. Thus, low-price, low-quality goods may be sold at a relatively high elasticity.<sup>10</sup>

Equation (8) also presents a critical issue to be addressed in the empirical section. Specifically, the results in (8) suggest that the price relevant for the differential effect of MFN tariffs is the quality-adjusted price, not the observed price. However, since quality-adjusted prices are unobservable, this questions whether quality adjusted prices and observed prices are positively or negative correlated. Intuitively, the former will be the case if demand falls as price rises. In the

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<sup>8</sup>The literature is somewhat mixed on explicitly modeling a quality dimension. Hummels and Skiba (2004) do not, while Hallak (2005) and Johnson (2009) do.

<sup>9</sup>That is,  $Q = \int_{i \in N} \lambda_i q_i di$

<sup>10</sup>All else equal, increasing the quality component  $\lambda$  decreases the absolute elasticity of demand.

model, this is guaranteed if  $\frac{\partial V_l}{\partial p_l^w} < 0$ . This condition can be simplified as

$$q_l < \frac{\partial \left( \frac{p_l^w}{\lambda_l} \right) p_l^w t_l}{\partial p_l^w \gamma},$$

where  $\frac{p_l^w}{\lambda_l}$  is the quality adjusted price and  $\frac{\partial \left( \frac{p_l^w}{\lambda_l} \right)}{\partial p_l^w}$  is the effect of the world price on the quality adjusted price. Critically, only  $\frac{\partial \left( \frac{p_l^w}{\lambda_l} \right)}{\partial p_l^w} > 0$  is consistent with  $\frac{\partial V_l}{\partial p_l^w} < 0$ . Thus, a question in the forthcoming empirical results is whether  $\frac{\partial V_l}{\partial p_l^w} < 0$ . If this holds, then there is a likely a positive correlation between observed prices and quality-adjusted prices, and the results in Proposition 1 are the relevant results to test empirically.

## 2.1 A Case for Discrimination in the WTO?

Generally, a country is willing to expose their import sector to increased competition through lower tariffs only if there are other gains which more than compensate for import-sector losses. Within simple trade models, these gains take the form of lower consumer prices, and increased profits in export markets through reciprocal concessions by trading partners. It is this latter gain which is called into question by the above model. Precisely, the model suggests that countries which export the lowest price goods may not experience gains in the export market during episodes of multilateral liberalization.

Further, this result seems in direct conflict with the intent of the central tenet of the WTO: the principle of non-discrimination. Under this rule, any concession given to a WTO member must be extended to every other member. In its most simple form, the principle of non-discrimination is central to the paradox discussed above. That is, it is far from sufficient that the liberalization of an MFN tariff yields equal quantitative, or even qualitative, gains to each MFN supplier.

Of course, this begs the question whether there exists a discriminatory schedule of tariff reductions which guarantees that all exporters gain from an episode of liberalization. To examine this issue as clearly as possible, I will simplify the model presented above. First, assume that

every supplier is initially assessed a common tariff, and that the total measure of these suppliers is equal to one. Under this setup, the equation for  $V_i$  is written as,

$$V_i = \frac{p_i^w}{\gamma} (A - p_i^w t)$$

where  $A = \theta - \eta Q$  and  $Q$  is written as:

$$Q = \frac{1}{\gamma + \eta} \int_0^1 (\theta - p_i^w t) di$$

Now, suppose that the importer changes tariffs, but does so in a discriminatory manner, where the effective change in tariffs applied to imports from  $i$  is  $\partial t_i$ . Writing  $\partial q_i$  and  $\partial A$ , we have:

$$\partial V_i = p_i^w \left( \frac{1}{\gamma} \partial A - \frac{p_i^w}{\gamma} \partial t_i \right) \quad (9)$$

and

$$\partial A = -\eta \partial Q = \frac{\eta}{\gamma + \eta} \int_0^1 (p_s^w \partial t_s) ds. \quad (10)$$

Combining (9) and (10):

$$\partial V_i = \frac{p_i^w}{\gamma} \left( \frac{\eta}{\gamma + \eta} \int_0^1 (p_s^w \partial t_s) ds - p_i^w \partial t_i \right) \quad (11)$$

Using (11), I can prove the following proposition:

**Proposition 2** *There exists a discriminatory schedule of tariff reductions such that all exporters gain from liberalization by a common importer.*

**Proof.** Set  $p_i^w \partial t_i = \partial \bar{t}$  for each exporter. Writing (11) subject to this restriction, we have:

$$\begin{aligned} \partial V_i &= \frac{p_i^w}{\gamma} \left( \frac{\eta}{\gamma + \eta} \int_0^1 \partial \bar{t} di - \partial \bar{t} \right) \\ &= -\frac{p_i^w \partial \bar{t}}{\gamma + \eta} < 0 \end{aligned}$$

If  $\partial t_i = \frac{\partial \bar{t}}{p_i^w}$ , the effect of tariffs on all exporters is negative. Thus, by continuity, there exists a set of tariff liberalization schedules such that imports increase from all export sources. ■

Thus, if the degree to which variety-specific tariffs are liberalized is inversely proportional to the pre-tariff cost of the good, this guarantees that all exporters benefit from liberalization by a common importer.<sup>11</sup>

## Discussion

The results in Proposition 2 can be viewed in two ways. On a basic level, it is an unlikely indictment of the principle of non-discrimination. For the most part, this runs contrary to the prevailing view that MFN tends to increase efficiency for participating parties.<sup>12</sup> Although the intentions of non-discrimination are likely "good", this paper details how the effects of liberalization on trade may be negative for exporters producing the lowest value goods. Given that less-developed countries tend to specialize in these goods, it is not surprising that developing countries have been more vocal against MFN policies.<sup>13</sup> In this paper, I have detailed a new, micro-founded concern for developing nations. Less-developed countries may not gain from the world trading system because they tend to specialize in goods which naturally receive little benefit from equal tariff cuts.

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<sup>11</sup>While Proposition 2 guarantees that all exporters gain market share after the reduction of a common tariff, the precise value of additional market access accruing to each exporter is still increasing in price. Thus, while all exporters benefit from a tariff reduction, the high-price exporters receive a larger absolute benefit. This suggests that a schedule of tariff cuts which further discriminate against high-price exporters is needed to provide equal market access benefits across all exporters. A proof of existence for such a schedule of tariff cuts is available upon request.

<sup>12</sup>As detailed in Jackson (1997), there are three arguments which support the use of MFN. One is that MFN prevents policies which distort bilateral patterns of comparative advantage. Further, some argue that MFN results in more liberalization than under preferential systems. Finally, others argue that allowing for discriminatory tariffs would increase the costs of rule formation, where many tariff lines would be more costly to impose and enforce when compared to a single tariff line applied to all exporters.

<sup>13</sup>As stated in Jackson (1997, pg. 159):

*"It must be recognized, however, that counter-arguments do exist, and that certain categories of nations take positions on some MFN policies that run contrary to the full implementation of MFN obligations. During recent decades, this has been particularly true of developing countries, which have argued that the GATT world trade system operates in a manner that inhibits the economic development of societies with weaker international economic status. In the view of these countries, "preferences" should be arranged to compensate for the operation of this system, and generally for charitable reasons to assist the poorer nations to develop faster."*

On the other hand, the main result from this section *could* be viewed as an unlikely affirmation of Article XXIV in the GATT, and its successor in the WTO, where discriminatory tariffs are permitted via the formation of customs unions or regional free-trade areas. Perhaps the original signatories of the GATT envisioned a setting in which the scope of benefits via multilateral liberalization had its limits. Indeed, Irwin, Mavroidis, and Sykes (2007) describe this as one of Keynes' original concerns during the framing of the GATT. While this was mainly argued within the context of Great Britain's imperial relationships, Keynes seems to express a notion that the post-war trading system ought not to be constrained by MFN.<sup>14</sup> Relative to this paper, this supports the notion that preferential liberalization, or perhaps even preferential agreements, may act as a safety valve for relationships that may deteriorate under MFN. For example, perhaps less-developed countries form trade agreements with developed countries knowing that they will not benefit via the multilateral system. More regarding this possibility will be discussed in the concluding section.

Finally, the results in Proposition 2 may help motivate an alternative to the Generalized System of Preferences (GSP). Under a typical GSP program, it is common for developed nations to give partial or duty-free preference to developing countries. Over time, as standard MFN tariffs fall, these GSP preferences erode. Thus, designing a liberalization scheme more in-line with that in Proposition 2 may offer a more stable improvement in market-access to developing countries. Further, those developing nations receiving full GSP preferences may not be prepared or equipped to benefit from lower tariffs if their institutions are poor, firms are inefficient, or the products which are exporter are of insufficient quality. Providing a more gradual, and stable improvement in market access may be preferred to one that is sudden but gradually erodes over time.<sup>15</sup>

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<sup>14</sup>As stated by Keynes (from Irwin, Mavroidis, and Sykes, 2007, page 21) :

*"My so strong reaction against the word discrimination is the result of my feeling so passionately that our hands must be free to make something new and better of the postwar world; not that I want to discriminate in the old bad sense of the word - on the contrary, quite the opposite"*

<sup>15</sup>As this is a dynamic question, this also allows for a the possibility that sudden preferential access may promote a significant amount of quality upgrading. This was discussed within the context of the New Zealand-Thai preferential agreement in 2004, where Thai producers received preferential access (better than GSP) to a market with high quality standards. If Thai firms successfully meet these standards, it may be a signal to other developed markets that Thai products are worthy of their attention.

### **3 Tariff liberalization and bilateral trade patterns: The case of New Zealand**

In this section, I test the predictions of the theoretical model. The primary question is whether the negative effects of MFN tariffs on bilateral imports are amplified for high price varieties, and small and/or of opposite sign for low price varieties. Testing this prediction requires data on MFN tariffs, import values, and the world price of exported goods by country, product, and year. Also required is supplementary information on the presence of preferential tariffs to examine trade partnerships which are not pure MFN relationships.

Overall, there is ample data satisfying the above requirements. However, complicating matters is the way in which tariffs are usually liberalized. That is, very few instances of liberalization occur without the institutional guidance of a larger institution, or on a non-reciprocal basis. For example, consider liberalization within the WTO. Since the WTO has authority over more than just multilateral tariff bindings and the rules by which tariffs are applied against different exporters, liberalization within the WTO involves more than just a MFN tariff. For example, intellectual property measures mandated by the WTO are more likely to be relevant for high-price (high-tech) products, and correlated with rounds of tariff cuts. Further, the response of exporters to WTO liberalization may be dependent on whether these exporters offered their own reciprocal reductions in tariffs (especially for less-developed countries). Overall, since many of these factors, observed and unobserved, are correlated with tariffs and tariff changes, analysis using a WTO case study is likely to be quite imprecise. Thus, to move forward, I must work with a case study of tariff reductions which were not under the influence of larger institutions, nor were contingent on reciprocal concessions. New Zealand presents such a case.

Starting in the early 80's, the New Zealand government executed a broad set of reforms, where a large part of these reforms included trade liberalization. Indeed, in the 90's and onward, most other reforms were completed except for remaining tariff reductions in a wide variety of sectors. These tariffs averaged roughly 12% at the beginning of the 90s and were reduced to 3% by the

end of the decade. The striking feature of this period is that tariffs were almost all ad-valorem, reductions were entirely unilateral, and reductions were largely applied on an MFN basis. Thus, as argued above, since this massive liberalization episode occurred entirely outside of the framework set-forth within the GATT/WTO, this period presents a particularly compelling case in which the effects of MFN liberalization can be analyzed.

Commensurate with the data requirements mentioned above, and additional requirements discussed below, I will be testing the predictions of the model over the time period 1996-2000. Further, a neighbor of New Zealand, Australia, engaged in relatively few MFN tariff reductions over this same time period. Thus, I will use Australia as a "control" group to help account for variation in exporter-product characteristics in each year which are unrelated to import market tariff cuts.

## Data

Data on tariffs and trade are obtained from two common sources. Tariff data will be obtained from the TRAINS database, where both preferential rates and MFN rates are provided. Trade data will be obtained from COMTRADE (via WITS), which includes the quantity of trade, the value of trade, and the measure of quantity which is used. Trade values will be cleaned according to the basic procedure in Feenstra, Lipsey, Deng, Ma, and Mo (2005).<sup>16</sup>

To test the theoretical model in section two, I must make a distinction between what constitutes a variety, and what constitutes a product. Following Broda, Limao, and Weinstein (2006), I define product markets at the HS4-Importer level, and varieties as HS6-Exporter observations within each HS4-Importer market.<sup>17</sup> Thus, it is possible that a given exporter can export multiple varieties of the same product. Further, it is also possible that MFN tariffs may vary within a given product. However, likely for administrative reasons, this latter possibility is relatively uncommon. For New

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<sup>16</sup>Specifically, I supplement importer reported trade values with exporter reported trade values when the former is missing and the latter is available. As such, importer reported values are the predominant source of trade data in my sample.

<sup>17</sup>Other than to follow the existing literature, another motivation for doing this is to allow for the construction of fairly stable price distributions, which will be discussed shortly.

Zealand, this occurs for only 30% of HS4-Year pairs. For Australia, this occurs for only 23% of HS4-Year pairs.

The sample itself will consist of all HS4 products such that the following conditions hold:

1. There exist at least five MFN export sources in each year for both New Zealand and Australia
2. Units are consistent across all years and exporters for each HS4-Importer subsample.

Point 1 is crucial since I will be assigning MFN exporters into price quintiles to measure relative prices, where lacking five or more MFN exporters within each import market, quintiles are not defined. Point 2 is also crucial since prices are comparable only if measured in the same units. Prior to evaluating the number of units within each HS4 product, I convert units if they differ in some precisely measurable way (meters cubed to liters, for example). Further, if within an HS6 variety there exist multiple units that can be reconciled by comparing importer and exporter reported quantities, I do so using a median conversion factor.<sup>18</sup>

The regressand,  $Imp_{v,i,j,k,t}$ , will represent the value of variety  $v$  imports of product  $i$  from exporter  $j$  by importer  $k$  in year  $t$ .  $Imp_{v,i,j,k,t}$  will be measured in thousands of nominal US dollars. The variables  $t_{v,i,j,k,t}^{MFN}$  and  $t_{v,i,j,k,t}^{PRF}$  represent the most-favoured nation and preferential ad-valorem tariffs levied by importer  $k$  on variety  $v$  of product  $i$  from exporter  $j$  in year  $t$ . In the data, TRAINS reports the effective applied tariff, and the MFN tariff for each bilateral trade in each year. For a given HS6-Importer-Exporter triple, a bilateral relationship will be considered preferential if at any point over the period 1996-2000 the applied tariff and the MFN tariff differ.

Descriptive statistics for tariffs, calculated at the HS6 level, are presented in Table 1. A few features are worth noting. First in Table 1, the average applied MFN tariff in New Zealand fell 3.68 percentage points over the period 1996-2000. Similarly, the median fell 2.5 percentage points. For preferential agreements, there was also sizeable movement, where the average fell 2.28

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<sup>18</sup>For example, within some HS6-Importer subsamples, while the importer and a subset of exporters might report the quantity of trade in "items", remaining exporters might use alternate units, such as "pairs". In these cases, I calculate the median conversion rate over all Importer-Exporter observations such that both importers and exporters report trade quantities. Then, I convert exporter reported quantities into common units using these median, HS6 specific, conversions. A table of these conversions is available upon request.

Table 1: Tariffs - Descriptive Statistics

	Year	Nobs	MFN Tariffs			Preferential Tariffs		
			Mean	Med	Max	Mean	Med	Max
<b>Australia</b>	1996	33189	8.71	5	37	3.37	4	32
	1997	36726	8.20	5	34	3.39	4	29
	1998	35922	7.35	5	31	2.80	2.5	31
	1999	40204	6.78	5	28	2.78	3	28
	2000	46181	6.49	5	25	3.61	4	25
<b>New Zealand</b>	1996	22469	7.71	5	30	4.75	3.79	30
	1997	31053	6.64	5.5	26.5	4.50	4	22.5
	1998	31283	5.45	4.25	22.5	3.63	3.25	35
	1999	33466	4.53	3.5	19	3.13	2.75	19
	2000	25660	4.03	2.5	15	2.47	2	15

**Notes:**  
All types of tariffs for both Australia and New Zealand contain at least one zero.  
Tariffs are in percentage point terms

percentage points and the median fell roughly 2 percentage points. Over this period, New Zealand clearly continued their long history of tariff reductions in both MFN and preferential tariffs.

In contrast, Australia liberalized very little over this period. Focusing on tariffs applied on a preferential basis, neither the median or mean changed very much. Regarding MFN tariffs, the median did not change, though the mean fell by just shy of two percentage points, mostly attributable to reductions in very high tariffs. However, despite this small movement in averages, the lack of movement in median MFN tariffs suggests that Australia may be a useful country to "control" for variation in product and exporter-specific trade that may be spuriously related to New Zealand tariffs.

These features of New Zealand and Australian tariffs are further reinforced in Figure 1, where I have plotted the degree of liberalization between 1996 and 2000 for each country by the ranking of MFN and average preferential tariffs in 1996. For example, in the upper-left panel of Figure 1, the horizontal axis represents the ranking of preferential tariffs imposed by Australia in 1996 (averaged within each HS6 variety), and the vertical axis represents the degree to which each preferential tariff was liberalized between 1996 and 2000. In the lower-left panel, the horizontal axis represents the ranking of MFN tariffs imposed by Australia in 1996, and the vertical axis

represents the degree of liberalization for these tariffs.

Figure 1 identifies a few key points. First, we see that Australia, with the exception of the largest tariffs and a few others, did not systematically adjust preferential tariffs between 1996 and 2000. In contrast, New Zealand liberalized a large portion of their preferential lines.<sup>19</sup> The story is basically the same in the lower panels of Figure 1, where New Zealand adjusted 50% of their MFN tariff lines, and Australia around 20%. Thus, variation in MFN and preferential liberalization across countries, and tariff variation within New Zealand, will jointly identify the effects of MFN tariffs on bilateral trade flows.<sup>20</sup>

Further, as I am using Australia as a "control" group, this begs the question whether New Zealand and Australia import common proportions of each variety, and whether these varieties are sourced from a similar number of exporters. To examine this issue, Figure 2 includes two plots. In the left panel of Figure 2, I have plotted, for each HS6 product, the average number of exporters for Australia and New Zealand. Clearly, the plots indicate that similar products imported to New Zealand and Australia are likely to have similar numbers of export sources. In the right panel of Figure 2, I have plotted the log-share of HS6 imports in total imports for New Zealand and Australia, respectively. As there is a strong positive correlation between the log share in New Zealand and the log share in Australia, this suggests that HS6 products imported in relatively large proportions to New Zealand are also imported in relatively large proportions to Australia.

## Price Variables

The critical prediction in the model is the differential response of tariffs as a function of world exporter prices. To test this hypothesis explicitly, one must construct a measure of relative world

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<sup>19</sup>Preferential tariffs are relatively uncommon for both countries. Precisely, 8.7% of Australian observations are preferential, and 16.6% of New Zealand observations are preferential. The larger percentage for New Zealand is primarily due to a larger GSP program.

<sup>20</sup>Many preferential tariffs in New Zealand originate via the New Zealand GSP program. Interestingly, many of these GSP tariffs are exactly 80% of the full MFN tariff. In theory, this could provide an alternate test of the model. I plan to address these issues within a separate paper looking at the implications of the New Zealand GSP program.

Figure 1: 1996-2000 Liberalization: Australia and New Zealand, Preferential and MFN Tariffs

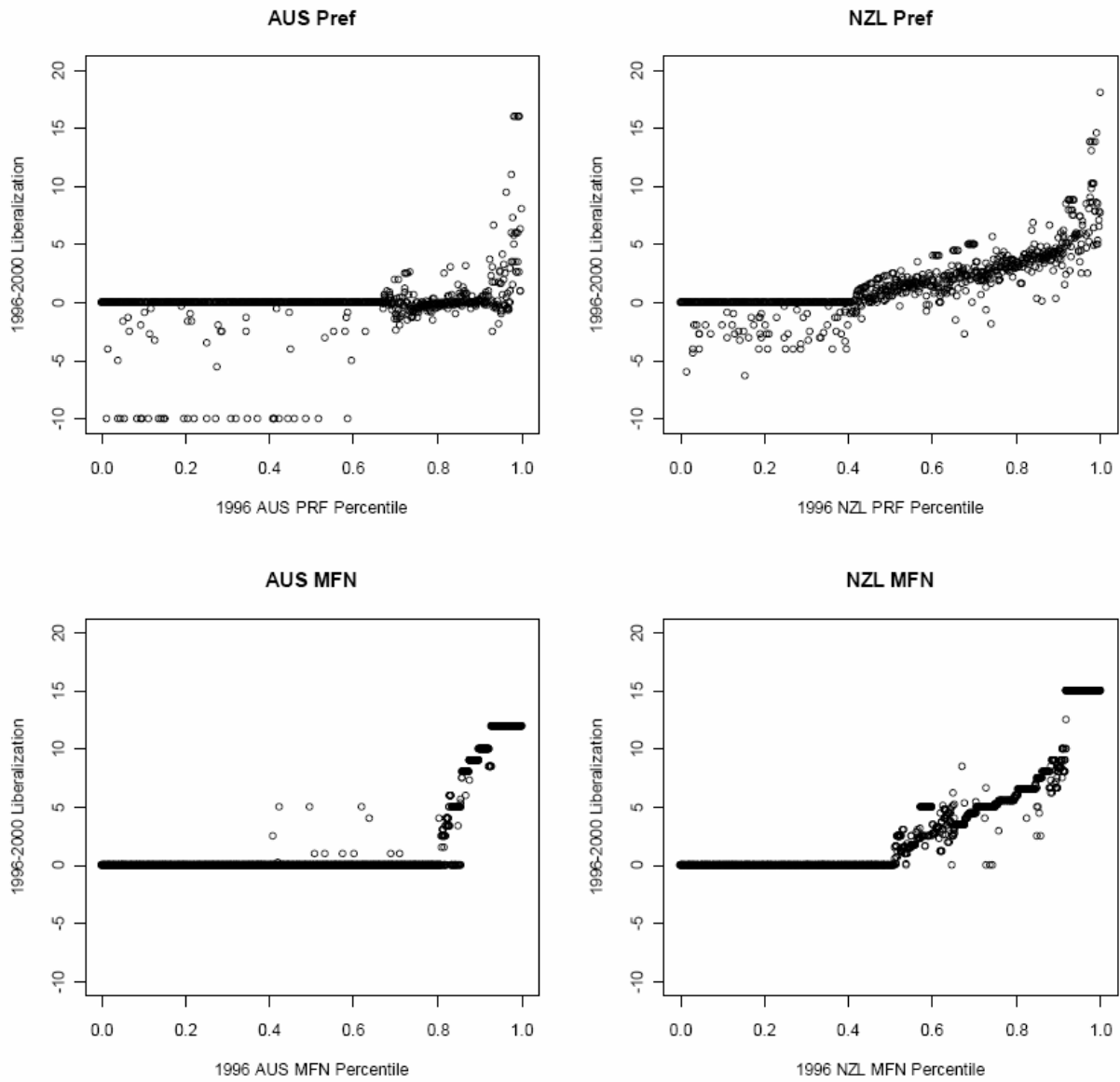
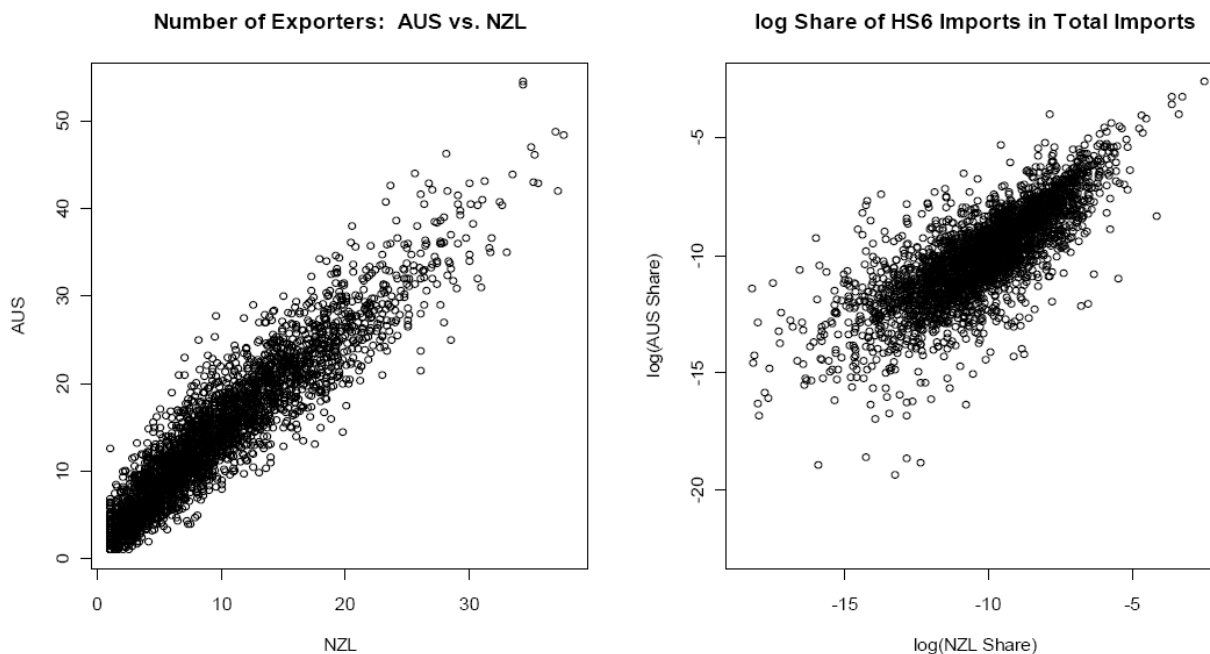


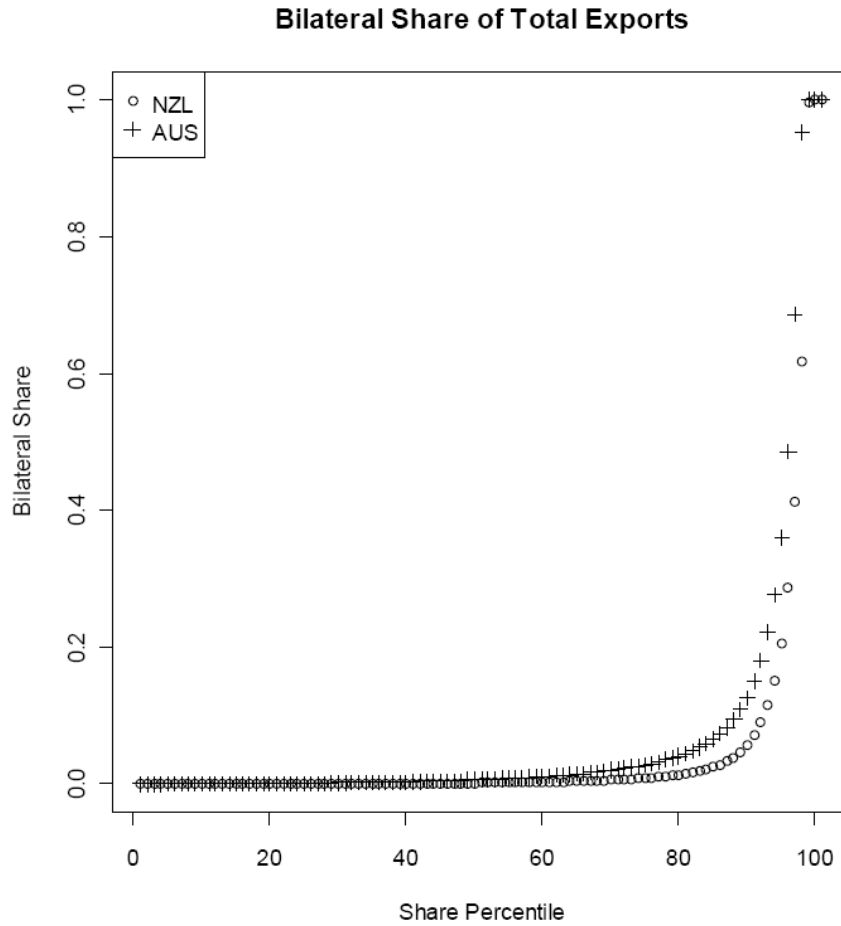
Figure 2: Importer Comparison - # of Exporters and Import Share by HS6 Product



exporter prices for every variety within an HS4-Importer-Year triple. To construct this measure, I will first calculate the aggregate world exporter price of each variety (HS6-Exporter-Year), and then rank each via a quintile approach within each HS4-Importer-Year. The specific details of this approach will be discussed shortly. Before doing so, however, I will discuss the suitability of aggregate world exporter prices within the context of the model.

In the model in section two, the importer is assumed to be small, thus having no influence over the world price of each variety. If this is a suitable assumption, on average, it should be the case that Australia and New Zealand are relatively small importers in each exporter's market in each year. To examine this issue, for each HS6 variety in each year, I divide the value of imports by importer  $k$  from exporter  $j$  by the exporter  $j$  reported total exports to the world market. Calling this measure the "Bilateral Share of Total Exports", percentiles of this measure are presented in Figure 3 for both New Zealand and Australia. Overall, New Zealand and Australia both appear to be very small relative to every export market. For Australia, they import more than 10% of a given supplier's HS6 exports only 11% of the time. For New Zealand, this occurs only 8% of

Figure 3: AUS and NZL Import Share in Export Markets.



the time. Thus, for most HS6-Exporter-Year observations, New Zealand and Australia import a very small portion of each exporter's supply to the world market.

Continuing with the precise construction of relative world prices, for each HS6-Exporter-Year triple, I first divide the total value of exports by the total quantity of exports. I will refer to this as the "raw world export price". Next, to construct a measure of relative prices across MFN import "markets", within each HS4-Importer-Year triple, each HS6-Exporter-Year observation subject to MFN tariffs is assigned to either the 1st, 2nd, 3rd, 4th, or 5th quintile of MFN prices based on their raw world export price. Assigning dummy variables for each group, the vector of these dummy variables will be defined as  $\vec{P}_{v,i,j,k,t}^M$ .

Using a quintile method has its advantages over using raw prices, or a normalized price.

Table 2: MFN Prices and Transition Probabilities

		MFN Price Quintile in 2000					
		1	2	3	4	5	Not Observed
MFN Price Quintile in 1996	1	<b>0.393</b>	0.148	0.056	0.024	0.015	0.363
	2	0.131	<b>0.27</b>	0.161	0.061	0.026	0.351
	3	0.048	0.136	<b>0.259</b>	0.173	0.05	0.334
	4	0.024	0.045	0.128	<b>0.282</b>	0.172	0.349
	5	0.015	0.023	0.042	0.12	<b>0.422</b>	0.377
<b>Notes</b>		This table presents the evolution of MFN Price Categories between 1996 and 2000. Specifically, the table presents the probability of being in quintile Y in 2000 given that the observation was in quintile X is 1996. "Not Observed" identifies HS6-Imp-Exp observations are reported in 1996, but not in 2000.					

Regarding the first, raw prices tend vary wildly, and thus outliers can become an issue. Outliers are also a problem when normalizing prices, which may artificially inflate the within import market variance of prices. As I do not intend to drop extremely high or low unit values, using a quintile approach smooths the raw price data by using the relative ranking as a measure of relative prices. Further, using a quintile approach essentially equates the variance of relative prices across all HS4-Importer-Year triples. Motivated by the model, I can thus estimate separate effects of tariffs across products exhibiting differing levels of price dispersion.

I will also use a price vector,  $\vec{P}_{v,i,j,k,t}$ , which is similar to  $\vec{P}_{v,i,j,k,t}^M$  with the exception that it is constructed over the set of all exporters, not just MFN exporters. This variable will be used to control for how relative prices influence trade flows, and not the differential effect of MFN tariffs, which is only relevant for MFN suppliers.

To get a sense of how relative prices change over time, Table 2 presents the distribution of MFN price quintiles in 2000 as a function of MFN price quintiles in 1996. A number of features are worth mentioning. First, conditional on reporting a price in both 1996 and 2000, an HS6-Exporter observation is most likely to remain in the same price category. Further, if relative prices do change between 1996 and 2000, an HS6-Exporter observation rarely moves more than 1 quintile above or below its 1996 quintile. Overall, for a given HS6-Importer-Exporter triple, relative prices do not

seem to vary randomly by year. However, note that many HS6-Importer-Exporter relationships with observed prices in 1996 are not observed in 2000. This is not surprising, as there exist roughly 71,000 observations in 2000 and roughly 55,000 observations in 1996. This increase in observations is due to both a natural increase via the extensive margin over this period, and an improvement in data quality over this period. Differentiating between the two is not feasible at this time.<sup>21</sup>

Finally, this increase in observations between 1996 and 2000 highlights an issue in applying differencing techniques, such as those used in Treffer (2004), to my dataset.<sup>22</sup> Obviously, differencing would tend to drop HS6-Importer-Exporter relationships which are reported infrequently. This would tend to disproportionately drop observations for developing countries. As I will soon show, prices are positively correlated with development, and thus differencing would tend to disproportionately drop low-price observations. Since low-price observations are critical to testing the theoretical model, this approach is unappealing within this particular context. Instead, as mentioned in the introduction and the beginning of this section, I will test the model using a difference-in-difference structure complemented by a robust set of fixed effects.

## **Prices and development**

Before presenting the empirical specification, it is worth documenting the types of countries which produce low price and high price goods. As a matter of policy, if countries are assigned randomly into price categories, then the differential effect of tariffs likely does not matter for policy discussions. On the other hand, if certain exporters tend to specialize in low price goods, then some countries may in fact specialize in the wrong goods and hence lose from multilateral liberalization.

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<sup>21</sup>Table 2 highlights a difficulty in accounting for selection issues using highly disaggregate panel data. While it is possible that trade zeros decrease over time as a result of development and enhanced bilateral relationships, it is impossible to concretely disentangle those observations which result from selection, and those which result from poor data reporting in earlier years. I choose to leave these issues for a separate paper, using an enhanced HS6 database over all importers. At that time, I will also examine different decision rules regarding which HS6 bilateral zeros are likely pure selection versus reporting errors. Further, this will allow a precise treatment of how the endogeneity of trade agreements plays into selection issues, as discussed in the introduction.

<sup>22</sup>In Treffer (2004), analysis is restricted to those firms, generally large, which operate (and thus report data) in every period.

Table 3: Price Categories and Development

Country/Group	Within-product Price Category				
	0-20%	20-40%	40-60%	60-80%	80-100%
Random Exporter	0.200	0.200	0.200	0.200	0.200
Random MFN Exporter	0.190	0.192	0.198	0.201	0.218
Random GSP Exporter	0.382	0.247	0.170	0.118	0.083
New Zealand	0.142	0.153	0.171	0.233	0.300
<b>Notes</b>	This table presents the price distribution for a number of exporter categories. Other averages are available upon request				

To examine this issue further, in Table 3, I have presented the price distribution for different types of exporter: a random exporter, a MFN exporter, a developing-country exporter that is eligible to obtain a tariff preference under New Zealand’s GSP tariff scheme, and New Zealand. Any random exporter has a 20% chance of being in each quintile (by construction). The data seems to suggest that a random MFN exporter is very close to this, though slightly skewed toward higher price categories. In contrast, a randomly selected GSP exporter is much more likely to export a variety classified by a low price category. Clearly, lower-income countries tend to specialize in low-price export varieties. Finally, New Zealand tends to export relatively high price goods (to the Australian Import Market).

For more information regarding preferential tariff coverage, and which countries fall under the New Zealand GSP program, see Table 6 at the end of the manuscript.

### 3.1 Basic Specification

I will adopt a reduced form specification to estimate import flows as a function of tariffs. Precisely, it is assumed that imports are determined by the following equation:

$$\begin{aligned}
\ln(Imp_{v,i,j,k,t}) = & \left( \beta_{PRF} \cdot t_{v,i,j,k,t}^{PRF} + \beta_{PRF\_PC} \cdot t_{v,i,j,k,t}^{PRF} \cdot \ln(Exp\_PerCap_{j,t}) \right) \cdot (1 - D_{v,i,j,k,t}^{MFN}) \\
& + \left( \beta_{D\_MFN} + \beta_{MFN} \cdot t_{v,i,j,k,t}^{MFN} + \vec{\beta}_{MFN\_P} \cdot t_{v,i,j,k,t}^{MFN} \cdot \vec{P}_{v,i,j,k,t}^M \right) \cdot D_{v,i,j,k,t}^{MFN} \\
& + \left( \beta_{MFN\_PC} \cdot t_{v,i,j,k,t}^{MFN} \cdot \ln(Exp\_PerCap_{j,t}) \right) \cdot D_{v,i,j,k,t}^{MFN} + \vec{\beta}_P \cdot \vec{P}_{v,i,j,k,t} + \beta_{Tar} \cdot AvgTar_{i,-v,k,t} \\
& + \beta_{EPC} \ln(Exp\_PerCap_{j,t}) + \beta_{IPC} \ln(Exp\_PerCap_{k,t}) + \beta_{IMP} \ln(Exp\_Pop_{k,t}) \\
& + \beta_{NZL} D_{v,i,j,k,t}^{NZL} + \beta_{XR} \ln(XRate_{k,j,t}) + \beta_{Dist} \ln(dist_{j,k}) + Fixed + \epsilon_{v,i,j,k,t}
\end{aligned} \tag{12}$$

In (12), the first line represents all effects of preferential tariffs. Note that  $D_{v,i,j,k,t}^{MFN}$  is a dummy variable identifying whether the HS6-Importer-Exporter relationship is subject to MFN. The composite term  $\beta_{PRF} \cdot t_{v,i,j,k,t}^{PRF} + \beta_{PRF\_PC} \cdot t_{v,i,j,k,t}^{PRF} \cdot \ln(Exp\_PerCap_{j,t})$  represents the effects of preferential tariffs, both related to income and unrelated to income. I include an interaction between  $t_{v,i,j,k,t}^{PRF}$  and  $\ln(Exp\_PerCap_{j,t})$  to control for the possibility that the response of imports to tariffs correlates with development. For example, if a less-developed country has poor institutions, or their exporting firms have relatively inelastic supply curves, the response to MFN liberalization may be laggard relative to higher income countries. Overall, I hypothesize the average effects of  $t_{v,i,j,k,t}^{PRF}$  to be negative, and that there may be a differential response of preferential tariffs to income which may also be negative. Regressions with and without the income interaction will be presented.

Next, the second line and the first term of the third line account for the effects of MFN tariffs. Again, these terms are set equal to zero via  $D_{v,i,j,k,t}^{MFN}$  if the HS6-Importer-Exporter relationship is

preferential. Here, the effects of MFN tariffs are allowed to vary by both prices and income level. The discussion of income is identical to the preceding paragraph, though more important since, as shown in Table 3, income is correlated with prices. The differential response of MFN tariffs across different price groups will be estimated by  $\vec{\beta}_{MFN\_P} \cdot t_{v,i,j,k,t}^{MFN} \cdot \vec{P}_{i,j,k,t}^M$ . The regression equation will be arranged such that  $\vec{\beta}_{MFN\_P}$  estimates the differential effect of MFN tariffs relative to the lowest price group.

The remaining variables in the third line will control for other factors that are not fixed by importer, exporter, or importer-exporter pair. As discussed earlier,  $\vec{P}_{v,i,j,k,t}$  represents the effects of relative prices on trade flows within each product market. While higher prices should result in lower import flows, this may be reversed if quality is sufficiently important to the consumer. Critically, the theory predicts that the effects of tariffs should be magnified for high price goods only if demand is falling with price. Thus, it is critical to the interpretation of the empirical results that  $\vec{P}_{v,i,j,k,t}$  exhibits a downward sloping demand curve. The term  $\beta_{Tar} \cdot AvgTar_{i,-v,k,t}$  estimates the effect of tariffs applied against all competing varieties within each HS4-Importer-Year triple. As higher tariffs against competitors should make competition "softer", the coefficient  $\beta_{Tar}$  is hypothesized to be positive.

The fourth line includes controls for exporter per-capita income, importer per-capita income, and the size of the import market as proxied by population. The fifth line controls other mean differences between the New Zealand and Australian import markets (via the dummy variable  $D_{v,i,j,k,t}^{NZL}$ ), for the bilateral exchange rate in each year,  $XRate_{k,j,t}$  (importer currency per unit exporter currency), and the log distance between each importer-exporter combination ( $\log(dist_{j,k})$ ).

Finally, I will utilize fixed effects to control for other factors not captured by those variables described above. Specifically, I will run separate regressions allowing for HS4-Importer-Year, HS4-Exporter-Year, and HS4-Importer-Exporter-Year fixed effects. As products are defined at the HS4 level, the HS4-Exporter-Year fixed effect assumption is the most appropriate for the difference-in-difference structure of the empirical model.<sup>23</sup> However, the expanded HS4-Importer-

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<sup>23</sup>As there are 119628 unique HS4-Exporter-Year combinations in the data set, a within estimator will be used

Exporter-Year fixed effect structure may control for other issues, such as detailed past relationships, as discussed in Eichengreen and Irwin (1996). Thus, I will provide results for all three sets of fixed effects to test the robustness of the model. The results of estimating (12) are presented in Table 4.

**Preferential Tariffs:** To begin the discussion of Table 4, I will first start with the effects of preferential tariffs, which are presented in the first row. The average effects of preferential tariffs are always negative. In columns 1 and 2, assuming HS4-Importer-Year fixed effects, the results imply that a one percent reduction in a preferential tariff will result in a 7-8% increase in the value of bilateral trade. This average effect is much smaller and insignificant when assuming HS4-Exporter-Year fixed effects, or HS4-Importer-Exporter-Year fixed effects in columns 4, 5, 7, and 8, respectively. As most preferential tariffs are specific to exporters at the HS4 or HS6 levels of aggregation, this drop in significance is not surprising.

Next, focus attention on columns 3, 6, and 9 in Table 4. Here, I have allowed for an interaction between tariffs and exporter income. If anything, the results in column 3 suggest that low-income countries tend to have a dampened response to changes to preferential tariffs. That is, the negative response of bilateral trade to preferential tariffs is magnified for high-income countries. However, this result is not robust when allowing for any exporter-specific fixed effect structure.

**MFN Tariffs:** I now turn to the primary focus of the empirical section - the effects of MFN tariffs and the relationship to prices. First, focusing on the average effects of MFN tariffs, which are presented in columns 1, 4, and 7. In column 1, the results suggest that a one percent reduction in the MFN tariff increases bilateral trade by 2.3%. However, this average effect is small and insignificant in columns 4 and 7. While much of this is likely a result of a more robust fixed effect structure, this may also be a result of the forces discussed in the model, where trade liberalization may be stronger for higher price groups, and of opposite sign for low price groups.

To examine this possibility, focus attention on columns 2, 5, and 8, which report the effects

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to estimate the model.

of MFN tariffs for each price group. For these regressions, the row  $\ln(t_{i,k,t}^{MFN})$  represents the average effect of MFN tariffs for the lowest-20% MFN price group, where the other rows labeled  $PX_{i,t}^M \cdot \ln(t_{i,k,t}^{MFN})$  represent the differential effect of MFN tariffs on the Xth MFN price group, *relative to the lowest price group*. First, note that the coefficient on  $\ln(t_{i,k,t}^{MFN})$  is positive in columns 2, 5, and 8, and significant in 5 and 8. Using column 5 as the benchmark specification (the closest to a true difference-in-difference specification), the results suggest that a one percent reduction in MFN tariffs leads to a 2% reduction in bilateral imports for the lowest price group. In contrast, for the highest price group ( $P5_{i,t}^M$ ), a one percent reduction in MFN tariffs leads to an increase in bilateral imports which is 3.34% higher than the lowest price group. Overall, a one percent reduction in MFN tariffs increases imports of varieties in the highest price quintile by 1.32%. This effect is significantly positive (0.56 standard error, clustered by HS4-Importer-Year). All price quintiles experience an elasticity with respect to MFN tariffs which is significantly different from the lowest price group, and in the direction suggested by the theory. Overall, a reduction in MFN tariffs increases bilateral imports significantly for high price suppliers, and has an insignificant or negative effect on bilateral imports from low price suppliers.

The effects of an additional interaction between MFN tariffs and income are consistent with the results for preferential tariffs. The results are presented in columns 3, 6, and 9. If anything, it seems that higher-income countries tend to be more sensitive to the positive effects of lower tariffs. However, this result is often insignificant when using exporter-specific fixed effects. Most importantly, the differential response to MFN tariffs by different price groups is robust to the inclusion of a MFN tariff-income interaction.

**Other variables:** Before moving to regressions which examine different industry types, I will discuss briefly the effects of other control variables. Across the board, the coefficient on  $D_{i,j,k,t}^{MFN}$  suggests that after controlling for other factors, varieties imported under MFN are smaller than those imported on a preferential basis. As for the effects of competitor tariffs, the coefficient on  $\ln(AvgTar_{i,-j,k,t})$  is large, positive, and significant for the regressions utilizing HS4-Importer-Year

fixed effects, but is negative and economically small when using exporter based fixed effects. The former is supportive of the theory, as higher tariffs against competitors, all else equal, should increase own trade flows.

The price variables  $P2 - P5$  measure the effect of price groups relative to the lowest price group (across all export varieties within a given product market). In columns 1-3, higher-price groups tend to have smaller trade flows. Thinking back to the discussion of quality adjusted prices, this suggests that quality-adjusted prices are rising in the world price. This is critical, as if this wasn't the case the predicted effects of MFN by price group should (in theory) be the opposite of what is reported in Table 4. As I adopt a more refined fixed effect structure in columns 4-6 and columns 7-9, the result deteriorates somewhat, which is not surprising since prices are strongly correlated with exporter-specific characteristics. Nevertheless, even with a more robust fixed effect structure, the largest price groups across all specifications tend to have smaller trade values when compared to the lower price groups.

Distance tends to have a negative effect on trade when not controlling for exporter fixed effects (controlling for exporter fixed effects basically removes all variation in distance since Australia and New Zealand are relatively proximate import markets). Exporter per capita income has a positive relationship with trade flows, which is consistent with the notion that richer countries tend to have more robust export sectors. Importer specific factors tend to be insignificant, but of expected sign. Lastly, the exchange rate (importer market currency over export market currency) has a positive effect on trade value. On one level, this seems odd since a depreciation of the importer's currency would suggest an erosion of purchasing power on international markets. However, it is only significant when using HS4-Importer-Year fixed effects, and thus may be capturing cross-sectional variation in trade flows and exchange rates specific to each exporter.

### **Product breakdown - Price Variation**

In section two, while the effects of MFN tariffs are predicted to be larger for relatively high-price goods, the effects are predicted to be of opposite sign for low price goods only if there is sufficient

dispersion in prices within a given industry. More precisely, low-price firms lose from liberalization only if their price is sufficiently below the average industry price. In the previous regressions, by using price quintiles within products, cross-product variation in prices was eliminated. To test for any effect of price dispersion, I will interact a dummy variable,  $CV_{i,k}$ , with the MFN tariff variables. The variable  $CV_{i,k}$  is constructed by first calculating the coefficient of variation in prices within each import market for each HS4 product in each year. Then,  $CV_{i,k}$  is given a value of one if a given HS4-Importer is above the median coefficient of variation over all importer  $k$  observations *in every year*, and zero otherwise. Thus,  $CV_{i,k} = 1$  for HS4-Importer subsamples with consistently high price variation.

The results of interacting  $CV_{i,k}$  with the MFN slope coefficients are presented in columns 1-3 in Table 5. Two specific results are worth noting as they are consistent with the theory. First, across all specifications, there is a larger differential effect of MFN tariffs between low and high price varieties in industries with consistent above median price variation. For example, in column two, the difference in elasticities between the lowest and highest price groups is -3.894 for high-variation industries and -1.924 for low-variation industries. Second, the likelihood of a "kicking the bad apples out" prediction is higher in high-variation industries. Precisely, the estimated value of the coefficient on  $\ln(t_{i,k,t}^{MFN})$  is positive and significant for high-variation industries in all three regressions, and positive and significant for low-variation industries in none of the three regressions. On this basic level, industries which exhibit above median price variation tend to exhibit a more disparate effect of tariffs across price groups.

### **Product breakdown - Trade Balance**

As a final test of the theory, I will now evaluate the predictions of the model relative to the strength of the domestic sector. In the discussion of  $\frac{\partial Q}{\partial t_M}$  in (6), I noted that the market size effects embodied in  $\frac{\partial Q}{\partial t_M}$  are dampened when the measure of domestic varieties is larger relative to MFN varieties. As domestic sector data is almost impossible to acquire at the HS4 level, I will make the assumption that a relatively robust export sector in the importing country is positively

correlated with a robust domestic sector. Precisely, I will test whether HS4 products which are above the median in terms of Net Exports, and thus likely to have a relatively robust domestic sector, are more likely to have effects of MFN tariffs which are broadly negative across all price groups.

To test for any effect of export sector robustness, I will interact a dummy variable,  $NX_{i,k}$ , with the MFN tariff variables. The variable  $NX_{i,k}$  is constructed by first calculating the value of Net Exports within each import market for each HS4 product in each year. Then,  $NX_{i,k}$  is given a value of one if a given HS4-Importer is above the median Net Export value in every year, and zero otherwise.

The results of this approach are presented in columns 4-6 in Table 5. In column 4, HS4-Importer-Year observations with a relatively low value of Net Exports are more likely to exhibit a "kicking the bad apples out" prediction in which the lowest price groups lose from MFN tariff liberalization. In columns 5 and 6, this result deteriorates in the opposite direction. To the extent that the relative strength of the export sector correlates with the relative strength of the domestic sector, this prediction of the theory is supported only when controlling for the most basic exporter characteristics. However, as the relationship between  $NX_{i,k}$  and domestic strength may be tenuous on a number of levels, and that  $NX_{i,k}$  itself is likely endogenous to  $\ln(Imp_{v,i,j,k,t})$  in concentrated import sectors, future work must adopt a more precise measure of domestic strength at the product level.

## 4 Discussion and Conclusion

This paper has presented a simple model of import market liberalization and bilateral trade. Theoretically, the paper shows that following the liberalization of a common tariff, trade must increase from some exporter sources, but may decrease from others. The higher the price of the import, the more likely that multilateral liberalization is trade enhancing at the bilateral level. Overall, the traditional effects of tariffs should be stronger for the highest price goods. Using

a liberalization episode within New Zealand as a case study, and Australia as a control country which engaged in much less in terms of tariff reductions, I find strong support for this prediction.

As discussed above, there is likely a strong role for sample selection in the evaluation of tariffs and their effects on bilateral trade flows. While I have adopted a simple reduced form specification for this paper, later work must take into account the choice between MFN arrangements and bilateral arrangements when estimating trade flows. Indeed, countries which export low-price goods are likely to have higher incentives to sign preferential agreements, since otherwise they may lose from an episode of multilateral liberalization. Further, importers may recognize this poor bargaining position relative to MFN, and target preferential agreements at these same exporters. As detailed in the following table, which presents all countries with whom New Zealand signed a recent trade agreement, the type of agreement, and the distribution of MFN prices (in descending order), it seems that the recent proliferation of preferential agreements in New Zealand has followed this exact pattern.

Country	Distribution of $\vec{P}_{i,j,k,t}^M$					Agreement	Signed?
	0-20%	20-40%	40-60%	60-80%	80-100%		
China	0.584	0.178	0.111	0.074	0.053	Bilateral	Yes
India	0.452	0.255	0.153	0.085	0.055	Bilateral	
Malaysia	0.450	0.225	0.151	0.094	0.079	Bilateral	Yes
Thailand	0.400	0.244	0.167	0.114	0.076	Bilateral	Yes
Korea	0.263	0.255	0.205	0.159	0.117	Bilateral	
Peru	0.239	0.144	0.254	0.209	0.154	Plurilateral	
Chile	0.234	0.188	0.175	0.232	0.171	Plurilateral	Yes
Singapore	0.231	0.216	0.201	0.191	0.160	Bilateral	Yes
United States	0.183	0.207	0.224	0.210	0.176	Plurilateral	
Japan	0.077	0.110	0.151	0.227	0.435	Bilateral	
Brunei	0.000	0.333	0.000	0.333	0.333	Plurilateral	Yes

In particular, among those countries which specialize heavily in the lowest price varieties, all have chosen bilateral agreements rather than a plurilateral framework (via the "Trans Pacific Economic Partnership"). However, as this is purely anecdotal, the relationship between export characteristics and the propensity to form bilateral agreements is an issue I plan to address in future work.

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Table 4: Log Import Value on Tariffs, Prices, and their interaction

	1	2	3	4	5	6	7	8	9
$\ln(t^{PRF}_{v,i,j,k,t})$	-8.3594*** (0.5131)	-7.6766*** (0.5129)	30.7423*** (3.1588)	-1.0492 (1.0224)	-0.8879 (1.0197)	-14.3658*** (4.4096)	-0.7978 (2.0543)	-0.5184 (2.0487)	-13.6239 (12.2371)
$\ln(Exp\_PerCap_{j,t}) \cdot \ln(t^{PRF}_{v,i,j,k,t})$			-4.3583*** (0.3660)			1.5284*** (0.5081)			1.4411 (1.3497)
$\ln(t^{MFN}_{v,i,j,k,t})$	-2.3085*** (0.3075)	0.4939 (0.3826)	19.4893*** (1.7150)	-0.0668 (0.3559)	2.0289*** (0.6014)	0.4986 (2.1646)	0.3233 (1.0710)	2.7321** (1.1119)	-6.9221 (8.9693)
$P2^{M}_{i,t} \cdot \ln(t^{MFN}_{v,i,j,k,t})$		-2.1871*** (0.2143)	-1.6622** (0.1963)		-1.4964*** (0.2158)	-1.4931*** (0.2175)		-1.727*** (0.2731)	-1.7201*** (0.2766)
$P3^{M}_{i,t} \cdot \ln(t^{MFN}_{v,i,j,k,t})$		-3.3554*** (0.2481)	-2.4281*** (0.2120)		-2.6782*** (0.2457)	-2.6725*** (0.2486)		-2.9662*** (0.3180)	-3.0192*** (0.3193)
$P4^{M}_{i,t} \cdot \ln(t^{MFN}_{v,i,j,k,t})$		-3.8143*** (0.2698)	-2.5365*** (0.2222)		-3.0085*** (0.2737)	-3.0043*** (0.2767)		-3.3073*** (0.3608)	-3.3705*** (0.3608)
$P5^{M}_{i,t} \cdot \ln(t^{MFN}_{v,i,j,k,t})$		-3.8102*** (0.2990)	-2.2399*** (0.2500)		-3.348*** (0.3148)	-3.3488*** (0.3181)		-3.8491*** (0.4053)	-3.933*** (0.4056)
$\ln(Exp\_PerCap_{j,t}) \cdot \ln(t^{MFN}_{v,i,j,k,t})$			-2.048*** (0.1699)			0.1619 (0.2328)			1.0016 (0.9245)
$D^{MFN}_{v,i,j,k,t}$	-0.2747*** (0.0279)	-0.3033*** (0.0279)	-0.369*** (0.0291)	-0.349*** (0.0513)	-0.3658*** (0.0516)	-0.3582*** (0.0516)	-0.6441*** (0.0953)	-0.6589*** (0.0961)	-0.6492*** (0.0968)
$\ln(AvgTar_{i,-v_i,k,t})$	1.825*** (0.4615)	2.158*** (0.5004)	1.6111*** (0.5016)	-0.1646*** (0.0318)	-0.1672*** (0.0317)	-0.1673*** (0.0317)			
$P2_{v,i,j,k,t}$	-0.0593*** (0.0154)	0.0397** (0.0169)	0.0175 (0.0167)	-0.0308 (0.0236)	0.0492* (0.0259)	0.0486* (0.0260)			
$P3_{v,i,j,k,t}$	-0.146*** (0.0158)	0.0193 (0.0181)	-0.0233 (0.0175)	-0.1135*** (0.0284)	0.0334 (0.0301)	0.0328 (0.0303)			
$P4_{v,i,j,k,t}$	-0.2055*** (0.0162)	-0.0113 (0.0192)	-0.0723*** (0.0182)	-0.1893*** (0.0332)	-0.0216 (0.0354)	-0.022 (0.0356)			
$P5_{v,i,j,k,t}$	-0.4764*** (0.0167)	-0.2812*** (0.0202)	-0.3583*** (0.0190)	-0.4261*** (0.0363)	-0.2422*** (0.0394)	-0.2422*** (0.0397)			
$\ln(dist_{j,k})$	-0.3698*** (0.0128)	-0.3576*** (0.0129)	-0.3457*** (0.0129)	0.0386 (0.0550)	0.0754 (0.0546)	0.0915* (0.0549)			
$\ln(Exp\_PerCap_{j,t})$	0.1106*** (0.0125)	0.1176*** (0.0121)	0.2601*** (0.0125)						
$XRate_{k,j,t}$	0.2514*** (0.0093)	0.2461*** (0.0093)	0.235*** (0.0092)	0.0204 (0.0574)	-0.0114 (0.0571)	-0.0037 (0.0583)			
$\ln(Imp\_PerCap_{k,t})$				1.3427 (1.2393)	1.3294 (1.2430)	1.3222 (1.2442)			
$\ln(Imp\_Pop_{k,t})$				6.3774 (3.9515)	6.1407 (3.9651)	6.2188 (3.9711)			
$D^{NZL}_{v,i,j,k,t}$				9.3507 (6.0937)	8.9607 (6.1153)	9.0789 (6.1246)			
$R^2$	0.0245	0.0272	0.0303	289125	289112	289112	0.0077	0.0103	0.0109
N	289125	289112	289112				315819	315806	307235
Fixed Cluster		HS4-Imp-Year HS4-Exp-Year			HS4-Exp-Year HS4-Imp-Year			HS4-Imp-Exp-Year HS4-Imp-Year	
Notes:	Standard Errors are heteroskedasticity robust and clustered according to the row "cluster". ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively								

Table 5: Log Import Value on Tariffs, Prices, and their Interaction - Industry Groups

	1	2	3	4	5	6
$\ln(t^{PRF}_{i,j,k,t})$	-7.7142*** (0.5132)	-0.9289 (1.0219)	-0.4879 (2.0497)	-7.8515*** (0.5152)	-0.8253 (1.0217)	-0.4125 (2.0932)
$\ln(t^{MFN}_{i,k,t})$	low CV -0.4398 (0.4723)	low CV 1.1122 (0.6939)	low CV 0.1013 (1.7150)	low NX 2.0212*** (0.4039)	low NX 1.0077* (0.5997)	low NX -0.508 (1.2372)
$P2^M_{i,t} \cdot \ln(t^{MFN}_{i,k,t})$	high CV 0.8877** (0.4381)	high CV 2.4027*** (0.6091)	high CV 4.1149*** (1.3246)	high NX -0.412 (0.4722)	high NX 2.9197*** (0.6504)	high NX 5.2791*** (1.4963)
$P2^M_{i,t} \cdot \ln(t^{MFN}_{i,k,t})$	-1.24*** (0.3072)	-0.8537** (0.3746)	-0.9333* (0.5260)	-2.0083*** (0.2725)	-1.1705*** (0.3133)	-1.2965*** (0.4191)
$P2^M_{i,t} \cdot \ln(t^{MFN}_{i,k,t})$	-2.2047*** (0.3328)	-1.6193*** (0.4270)	-1.5101** (0.6241)	-3.5438*** (0.2955)	-2.5137*** (0.3644)	-2.5858*** (0.5149)
$P4^M_{i,t} \cdot \ln(t^{MFN}_{i,k,t})$	-4.445*** (0.3420)	-3.5615*** (0.4970)	-3.9261*** (0.7625)	-4.0831*** (0.3203)	-2.9087*** (0.3954)	-3.1194*** (0.5692)
$P5^M_{i,t} \cdot \ln(t^{MFN}_{i,k,t})$	-4.2862*** (0.3590)	-3.8938*** (0.5912)	-4.506*** (0.8780)	-3.4993*** (0.3285)	-0.8042 (0.4208)	-3.5034*** (0.5854)
$CV_{i,k}$ or $NX_{i,k}$						
$D^{MFN}_{i,j,k,t}$	-0.3013*** (0.0282)	-0.3629*** (0.0517)	-0.6481*** (0.0964)	-0.3028*** (0.0280)	-0.3652*** (0.0516)	-0.6577*** (0.0958)
$\ln(AvgTar_{i-j,k,t})$	2.1441*** (0.4989)	-0.167*** (0.0320)		2.7226*** (0.4798)	-0.1575*** (0.0309)	
$P2_{i,t}$	0.0344** (0.0169)	0.0464* (0.0260)	0.0656* (0.0336)	0.0393** (0.0169)	0.0486* (0.0259)	0.0678** (0.0334)
$P3_{i,t}$	0.0098 (0.0181)	0.0263 (0.0302)	0.0665* (0.0389)	0.02 (0.0181)	0.0337 (0.0301)	0.0765** (0.0386)
$P4_{i,t}$	-0.0247 (0.0190)	-0.033 (0.0356)	0.0095 (0.0456)	-0.0102 (0.0191)	-0.021 (0.0354)	0.0259 (0.0452)
$P5_{i,t}$	-0.2922*** (0.0198)	-0.2538*** (0.0397)	-0.2203*** (0.0510)	-0.2792*** (0.0201)	-0.2416*** (0.0394)	-0.2024*** (0.0502)
$\ln(dist_{j,k})$	-0.3585*** (0.0129)	0.0694 (0.0545)		-0.3561*** (0.0129)	0.062 (0.0545)	
$\ln(Exp\_PerCap_{j,t})$	0.1177*** (0.0121)			0.1175*** (0.0122)		
$XRate_{k,j,t}$	0.2463*** (0.0093)	-0.011 (0.0574)		0.2455*** (0.0093)		
$\ln(Imp\_Pop_{k,t})$		1.3302 (1.2404)				
$D^{NZL}_{i,j,k,t}$		6.1348 (3.9569)				
$R^2$	0.0274	0.0789	0.0108	0.0274	0.079	0.011
N	289096	289096	315789	289112	289112	315806
Fixed Cluster	HS4-Imp-Year HS4-Exp-Year	HS4-Exp-Year HS4-Imp-Year	HS4-Imp-Exp-Year HS4-Imp-Year	HS4-Imp-Year HS4-Exp-Year	HS4-Exp-Year HS4-Imp-Year	HS4-Imp-Exp-Year HS4-Imp-Year
Notes:	Standard Errors are heteroskedasticity robust and clustered according to the row "cluster". ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.					

Table 6: Exporter Summary - Preferential Coverage, GSP Status

Exporter	Australian Market				New Zealand Market				Australian Market				New Zealand Market				
	Exporter	Preferential Share All	$Pref > 0$	N	Preferential Share All	$Pref > 0$	N	GSP	Exporter	Preferential Share All	$Pref > 0$	N	GSP	Exporter	Preferential Share All	$Pref > 0$	N
Albania	0.000	0.000	5	0	0.000	6	Yes	Kuwait	0.333	0.667	7	Yes	0	0.000	-	3	Yes
Algeria	0.000	0.000	9	0	-	0	Yes	Kyrgyz Republic	0.000	0.000	6	Yes	0	0.000	-	0	Yes
Argentina	0.255	0.375	494	286	0.497	0.869	Yes	Latvia	0.000	0.000	75	Yes	0.000	0.000	20	Yes	
Armenia	0.000	0.000	6	1	0.000	1.000	Yes	Lebanon	0.172	0.249	408	Yes	0.877	1.000	73	Yes	
Australia	-	-	0	10852	0.590	1.000	1669	Lithuania	0.000	0.000	85	Yes	0.000	0.000	18	Yes	
Austria	0.000	0.000	2742	0	0.000	0.000	0	Luxembourg	-	-	0	Yes	0.000	0.000	48	Yes	
Azerbaijan	0.000	0.000	3	0	-	-	0	Macao	0.032	0.034	377	Yes	0.120	0.132	283	Yes	
Bahamas, The	0.000	0.000	19	3	0.000	0.000	3	Macedonia, FYR	0.321	0.441	138	Yes	0.962	0.962	26	Yes	
Bangladesh	0.730	0.844	89	48	0.958	0.979	Yes	Madagascar	0.180	0.611	61	Yes	0.625	1.000	32	Yes	
Barbados	0.000	0.000	3	1	1.000	1.000	Yes	Malawi	0.037	0.207	27	Yes	0.667	1.000	12	Yes	
Belarus	0.000	0.000	39	14	0.000	0.000	14	Malaysia	0.188	0.257	4304	Yes	0.515	0.758	2810	Yes	
Belgium	0.000	0.000	1762	1053	0.000	0.000	1053	Maldives	1.000	1.000	6	Yes	-	-	0	Yes	
Belize	0.000	0.000	4	0	-	-	0	Mali	0.222	0.222	6	Yes	0.000	0.000	3	Yes	
Bolivia	0.108	0.151	74	39	0.205	0.286	Yes	Malta	0.174	0.204	121	Yes	0.625	0.875	56	Yes	
Botswana	0.000	0.000	2	0	-	-	0	Mauritius	0.041	0.056	143	Yes	0.246	0.293	69	Yes	
Brazil	0.276	0.369	1689	1130	0.516	0.843	Yes	Mexico	0.174	0.225	1780	Yes	0.509	0.727	1247	Yes	
Brunei	0.250	0.400	8	6	0.000	0.000	6	Moldova	0.000	0.000	4	Yes	0.000	0.000	1	Yes	
Bulgaria	0.089	0.113	197	13	0.500	0.681	Yes	Mongolia	0.000	0.000	4	Yes	0.000	0.000	1	Yes	
Cambodia	0.806	1.000	36	13	0.769	0.769	Yes	Morocco	0.105	0.130	124	Yes	0.146	0.175	48	Yes	
Cameroon	0.500	1.000	6	3	0.667	1.000	Yes	Namibia	0.000	0.000	4	Yes	0.000	0.000	1	Yes	
Canada	0.094	0.136	3258	2263	0.606	0.935	Yes	Nepal	0.870	1.000	54	Yes	1.000	1.000	29	Yes	
Chile	0.181	0.351	431	288	0.403	0.933	Yes	Netherlands	0.000	0.000	5317	Yes	0.000	0.000	3996	Yes	
China	0.137	0.200	8355	6786	0.429	0.698	Yes	New Zealand	0.724	1.000	6267	Yes	-	-	0	Yes	
China	0.094	0.125	213	97	0.526	0.718	Yes	Nicaragua	0.143	0.250	14	Yes	0.182	0.500	11	Yes	
Colombia	0.000	0.000	2	0	0.000	0.000	0	Niger	0.250	0.500	8	Yes	0	0	0	Yes	
Comoros	0.000	0.000	2	0	0.000	0.000	0	Nigeria	0.000	0.000	5	Yes	0.000	0.000	3	Yes	
Costa Rica	0.108	0.139	93	84	0.286	0.323	Yes	Norway	0.000	0.000	1317	Yes	0.000	0.000	1104	Yes	
Cote d'Ivoire	0.154	0.286	13	5	0.600	1.000	Yes	Oman	0.333	0.400	12	Yes	0.500	1.000	2	Yes	
Croatia	0.229	0.284	436	152	0.559	0.628	Yes	Panama	0.000	0.000	13	Yes	0.000	0.000	4	Yes	
Cuba	0.000	0.000	7	2	1.000	1.000	Yes	Paraguay	0.143	0.250	6	Yes	0.750	1.000	4	Yes	
Cyprus	0.211	0.274	123	27	0.000	0.000	Yes	Peru	0.057	0.076	369	Yes	0.380	0.508	171	Yes	
Czech Republic	0.165	0.210	1400	721	0.165	0.210	Yes	Philippines	0.146	0.202	1180	Yes	0.451	0.567	663	Yes	
Denmark	0.000	0.000	2695	2071	0.000	0.000	Yes	Poland	0.167	0.210	1010	Yes	0.511	0.640	519	Yes	
Denmark	0.000	0.000	2	0	0.000	0.000	0	Portugal	0.000	0.000	1343	Yes	0.000	0.000	790	Yes	
Dominican Republic	0.000	0.000	10	9	0.667	0.667	Yes	Qatar	0.000	0.000	4	Yes	0.000	0.000	1	Yes	
Dominica	0.000	0.000	10	9	0.667	0.667	Yes	Romania	0.112	0.124	456	Yes	0.172	0.239	192	Yes	
Ecuador	0.130	0.191	100	70	0.586	0.695	Yes	Russian Federation	0.000	0.000	452	Yes	0.000	0.000	300	Yes	
Egypt, Arab Rep.	0.251	0.323	171	51	0.667	0.872	Yes	Saudi Arabia	0.272	0.398	173	Yes	0.492	0.838	63	Yes	
El Salvador	0.075	0.087	53	21	0.333	0.389	Yes	Senegal	0.368	0.636	19	Yes	-	-	0	Yes	
Estonia	0.000	0.000	91	5	0.000	0.000	Yes	Seychelles	0.000	0.000	4	Yes	1.000	1.000	4	Yes	
Ethiopia(excludes Eritrea)	0.000	0.000	1	2	0.000	0.000	Yes	Slovak Republic	0.191	0.285	4908	Yes	0.000	0.000	2625	Yes	
Ethiopia(excludes Eritrea)	0.000	0.000	1	2	0.000	0.000	Yes	Slovenia	0.167	0.196	802	Yes	0.387	0.495	263	Yes	
Finland	0.000	0.000	237	151	0.834	1.000	Yes	South Africa	0.000	0.000	1675	Yes	0.000	0.000	788	Yes	
France	0.000	0.000	1776	1132	0.000	0.000	Yes	Spain	0.000	0.000	4340	Yes	0.000	0.000	2903	Yes	
France	0.000	0.000	7108	5243	0.000	0.000	Yes	Sri Lanka	0.086	0.122	232	Yes	0.398	0.553	118	Yes	
Gabon	0.000	0.000	3	5	0.600	0.600	Yes	St. Kitts and Nevis	1.000	1.000	1	Yes	-	-	0	Yes	
Georgia	0.000	0.000	5	1	0.000	0.000	Yes	St. Vincent and the Grenadines	0.000	0.000	1	Yes	-	-	0	Yes	
Germany	0.000	0.000	8828	7395	0.000	0.000	Yes	Sudan	0.091	1.000	11	Yes	0.000	0.000	2	Yes	
Ghana	0.323	0.526	31	5	0.600	1.000	Yes	Swaziland	0.000	0.000	3	Yes	1.000	1.000	2	Yes	
Greece	0.000	0.000	1203	383	0.000	0.000	Yes	Sweden	0.000	0.000	3402	Yes	0.000	0.000	2696	Yes	
Guatemala	0.027	0.035	150	76	0.434	0.600	Yes	Switzerland	0.000	0.000	4657	Yes	0.000	0.000	3072	Yes	
Guinea	1.000	1.000	2	0	0.000	0.000	Yes	Taiwan, China	0.161	0.212	2653	Yes	0.000	0.000	2052	Yes	
Guyana	-	-	0	5	0.600	1.000	Yes	Tanzania	0.279	0.857	43	Yes	0.381	1.000	21	Yes	
Haiti	0.000	0.000	2	1	1.000	1.000	Yes	Thailand	0.152	0.206	3740	Yes	0.445	0.662	2585	Yes	
Honduras	0.000	0.000	2	1	1.000	1.000	Yes	Togo	0.000	0.000	5	Yes	-	-	0	Yes	
Hong Kong, China	0.107	0.145	4774	3363	0.000	0.000	Yes	Trinidad and Tobago	0.400	0.667	5	Yes	0.286	1.000	7	Yes	
Hong Kong, China	0.107	0.145	4774	3363	0.000	0.000	Yes	Tunisia	0.142	0.163	120	Yes	0.200	0.250	25	Yes	
Hungary	0.157	0.189	961	420	0.490	0.629	Yes	Turkey	0.198	0.198	1766	Yes	0.457	0.633	836	Yes	
Hungary	0.000	0.000	97	53	0.000	0.000	Yes	Uganda	0.125	1.000	16	Yes	0.000	0.000	1	Yes	
Iceland	0.000	0.000	97	53	0.000	0.000	Yes	Ukraine	0.000	0.000	47	Yes	0.000	0.000	24	Yes	
India	0.136	0.190	5109	3299	0.417	0.663	Yes	United Kingdom	0.000	0.000	9595	Yes	0.011	0.019	8641	Yes	
Indonesia	0.137	0.178	4511	2801	0.445	0.633	Yes	United States	0.000	0.000	10696	Yes	0.000	0.000	9719	Yes	
Iran, Islamic Rep.	0.212	0.310	305	101	0.554	0.963	Yes	Uruguay	0.152	0.202	112	Yes	0.313	0.556	16	Yes	
Ireland	0.000	0.000	1496	1140	0.000	0.000	Yes	Venezuela	0.419	0.621	43	Yes	0.564	0.704	39	Yes	
Israel	0.167	0.252	172	84	0.000	0.000	Yes	Zambia	1.000	1.000	8	Yes	0.750	1.000	4	Yes	
Italy	0.000	0.000	7979	6236	0.000	0.000	Yes	Zimbabwe	0.282	0.344	39	Yes	0.353	0.600	17	Yes	
Jamaica	0.000	0.000	26	15	0.400	0.545	Yes										
Japan	0.000	0.000	8142	6938	0.000	0.000	Yes										
Jordan	0.191	0.394	68	23	0.565	0.813	Yes										
Kazakhstan	0.000	0.000	7	9	0.000	0.000	Yes										
Kazakhstan	0.118	0.250	85	38	0.526	1.000	Yes										
Kenya	0.000	0.000	3	0	-	-	Yes										
Kiribati	0.000	0.000	3	0	-	-	Yes										
Korea, Rep.	0.183	0.236	5887	4731	0.478	0.736	Yes										

Notes: "Preferential Share" reports the average value of  $D_{v,i,j,k,t}^{PRF}$  which is a dummy variable identifying which HS6-Importer-Exporter relationships are different from MFN at least once over the sample. "All" represents the mean over all observations, and  $Pref > 0$  the mean over observations when the MFN tariff is positive (and thus preferences can be given).  $N$  identifies the number of observations for each Importer-Exporter pair, and GSP whether the Exporter is eligible for preferences under the New Zealand GSP program.