Is there a dirty little secret? Non-tariff barriers and additional gains from trade

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Abstract

We estimate tariff equivalents (TEs) of non-tariff barriers (NTBs) for selected countries using a series of gravity equations. Our analysis focuses on New Zealand, a nation that has energetically pursued bilateral trade agreements in recent years and has a comprehensive free trade agreement with Australia. We estimate reductions in TEs following trade negotiations as the difference between New Zealand-Australia TEs and those applying to trade between New Zealand and other nations. Simulating reductions in tariff and NTBs in a computable general equilibrium (CGE) model indicates that gains from trade liberalisation are much larger (up to 22 times) when tariffs and NTBs are consider than when only tariffs are reduced.

Key words: trade liberalisation, free trade agreements, computable general equilibrium modelling

JEL codes: F15, D58

1. Introduction

Krugman (1995, p31) notes, "there is a dirty little secret in international trade analysis. The measurable costs of protectionist policies… are not all that large." Conventional examinations of the effects of trade liberalisation, however, typically consider trade distortions that result in rents flowing to domestic agents, such as tariffs and quotas, but ignore more subtle (and sometimes unintended) trade barriers that involve real resource costs and are therefore likely to result in greater welfare losses than tariffs and quotas that result in equivalent price distortions.[1] Such barriers are commonly referred to as non-tariff barriers (NTBs) and include health and safety regulations, competition laws, technical standards (e.g., licensing and certification regimes) and customs clearance procedures (Philippidis and Sanjuán, 2007a). Anderson and van Wincoop (2001, p. 209) highlight the real resource cost of such barriers by noting that NTBs may necessitate "gathering information about foreign regulations, hiring lawyers, and adjusting product designs to make them consistent with foreign customs regulations."

Typically, trade negotiations cover issues broader than tariff reductions. We attempt to estimate gains from trade liberalisation when NTBs are considered by estimating ad valorem tariff equivalents (TEs) of NTBs and simulating reductions tariffs and NTBs in a computable general equilibrium (CGE) model. Building on studies by Park (2002), Lejour *et al.* (2004), Philippidis and Carrington (2005) and Philippidis and Sanjuán (2007a, 2007b) we estimate TEs using a series of gravity equations. This approach allows NTBs applying to a particular bilateral route to be compared to those that would exist in a free trade scenario. Our analysis singles out TEs faced by New Zealand exports to Australia and four possible FTA partners, and TEs levied on New Zealand imports from Australia and (in aggregate) all other nations. To reflect the resource cost of NTBs, we represent NTBs as iceberg transport costs.

We focus on New Zealand as this nation is a small, open economy that has energetically pursued bilateral free trade agreements (FTAs) in recent years,[2] and

[1] As is well know, quotas can also result in real resource costs if there is rent seeking behaviour.

[2] New Zealand signed the New Zealand and Singapore Closer Economic Partnership in 2001 (which was subsumed by the Trans-Pacific Strategic Economic Partnership between New Zealand, Singapore, Chile and Brunei Darussalam in 2005), the New Zealand-Thailand Closer Economic Partnership

examining New Zealand's trade allows us to benchmark NTBs between New Zealand and potential FTA partners against NTBs that would exist following several rounds of far-reaching negotiations. This is because, as a member of the Australia and New Zealand Closer Economic Relations (CER) Trade Agreement, New Zealand is privy to one of the most comprehensive FTAs in the world. The two Australasian nations signed the New Zealand-Australia Free Trade Agreement in 1965 (a limited preferential trade agreement), which was superseded by the CER Agreement in 1983. Free trade in goods and services was achieved in 1990 and subsequent negotiations have focused on other aspects of economic integration. For example, the Trans-Tasman Mutual Recognition Agreement, launched in 1998, allows most goods legally able to be sold and most practitioners registered to practice an occupation in one CER nation to be, respectively, legally sold and registered for practice in the other CER nation without undergoing further testing or registration. We estimate potential gains from trade liberalisation by assuming that NTBs between New Zealand and possible FTA partners can be reduced to those applying to trade within the CER block by trade negotiations.

Similar to other authors (e.g., Lejour *et al.*, 2004; Philippidis and Sanjuán, 2007a, 2007b) we find that TEs in agro-food sectors are larger than TEs in other sectors. Our simulations reveal that bilateral negotiations between New Zealand and China, New Zealand and Japan, New Zealand and Thailand, and New Zealand and ASEAN – regions that account for just over one quarter of New Zealand's trade – result in an increase in New Zealand welfare of 1.5% when tariffs are eliminated and 16.3%when tariffs and NTBs are abolished. Thus, we show that although a conventional approach to estimating the benefits from trade liberalisation produces a small increase in welfare, a broader analysis produces a substantial welfare improvement. We also find that, contrary to other studies, nearly half of New Zealand's gains from trade originate from liberalisation of manufacturing trade.

This paper has three further sections. Section 2 details our estimates of TEs of NTBs. Section 3 outlines our CGE model and details results from our simulation exercises. The final section concludes.

Agreement in 2005, and is currently negotiating FTAs with the Association of South East Asian Nations (ASEAN), China, the Gulf Cooperation Council, Hong Kong, and Malaysia.

2. Tariff equivalents of non-tariff barriers

We estimate TEs of NTBs by estimating a series of gravity equations. In its simplest form, the gravity model predicts that bilateral trade flows are increasing in the exporter's production and the importer's consumption and decreasing in distance between two nations. More sophisticated models add other variables to proxy for trade costs, such as whether or note two nations share a common border. We estimate the following gravity equation.

$$x_{ij} = \beta_0 + \beta_1 prod_i + \beta_2 cons_j + \beta_3 d_{ij} + \beta_4 CONT_{ij} + \beta_5 COLO_{ij} + \beta_6 LANG_{ij} + \beta_7 \ln(1+T_{ij}) + \beta_8 \ln(1+S_{ij}) + \beta_9 NAFT_{ij} + \beta_{10} EU_{ij} + \beta_{11} MERC_{ij} \quad (1)$$

where logged variables are in lower case; x_{ij} denotes exports from region i to j; *prod* and *cons* are domestic production and consumption respectively; d is distance between regions i and j; *CONT*, *COLO* and *LANG* are dummy variables equal to one if regions i and j, respectively, share a common border, a colonial relationship or a common language; T_{ij} denotes the ad valorem tariff imposed by region j on imports from i; S_{ij} is the ad valorem export subsidy paid to exporters in region i for goods shipped to country j; and *NAFT*, *EU* and *MERC* are dummy variables equal to one if i and j are, respectively, are members of NAFTA, the EU15 or MERCOSUR.[3]

Gravity equations can be used to determine the affect of international borders on trade by comparing international trade flows with domestic trade flows (see, for example, McCallum, 1995 and Anderson and van Wincoop, 2003). Accordingly, we also include several dummy variables to capture the influence of international borders. Specifically, $b_{NZL,AUS}$, $b_{NZL,CHN}$, $b_{NZL,JPN}$, $b_{NZL,KOR}$ and $b_{NZL,ASN}$ equal one if the dependent variable measures New Zealand's exports to, respectively, Australia, China, Japan, Korea or ASEAN; $b_{AUS,NZL}$ and $b_{OTH,NZL}$ equal one if x_{ij} relates to New Zealand imports from, respectively, Australia or any region except Australia; and b^{OTHER} is equal to one if exports cross any international border not already specified.

[3] We do not include the 10 nations granted EU membership in 2004 in the EU as our analysis uses 2001 data.

We also include separate dummies for each exporter and importer to account for multilateral resistance (Anderson and van Wincoop, 2003).

To estimate equation (1), we source data on bilateral international trade flows, bilateral tariffs, bilateral export subsidies, production and consumption from version 6 of the Global Trade Analysis Project (GTAP) database (Dimaranan 2006). Following Wei (1996), we estimate a nation's exports to itself by subtracting each nation's aggregate exports (to all international destinations) from its domestic production. The GTAP database identifies 87 regions and 57 sectors. We filter GTAP's regional data by omitting composite regions identified in the GTAP database (Rest of Oceania, Rest of East Asia etc) and nations with GDP less than US$30 billion. Forty-seven countries are included in our regression analysis, which are listed in Table A.1. We organise the sectoral data by forming 23 aggregated sectors, which are listed in Table 4. Our sectoral aggregation includes New Zealand's important export commodities (e.g., meat and dairy products), commodities used intensively as intermediate inputs by New Zealand's key export industries (e.g., animal products and raw milk) and New Zealand's sensitive import-competing industries (e.g., textiles clothing and footwear (TCF)).[4]

For distance, we employ harmonic-mean, weighted distance measures available from the Centre D'Etudes Prospectives et D'Informations Internationales (CEPII).[5] Guided by Head and Mayer (2002), CEPII calculate bilateral distance between two countries by calculating population-weighted average distances between the major cities belonging to those two countries. One advantage of this measure it that it provides a consistent procedure for calculating both internal distance, which is calculated using an approximation based on a each region's land area, and international distances. Data for our dummy variables capturing the effects of contiguity, sharing a colonial relationship (equal to one if two nations have had a colonial relationship after 1945) and speaking a common language (equal to one if a language is spoken by at least 9% of the population in both nations) are also sourced from CEPII.

[4] We do not include "other services" in our gravity regression as this sector is largely non-traded.
[5] See http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

Guided by Silva and Tenreyro (2006), we estimate equation (1) using the Poisson pseudo–maximum likelihood (PPML) estimator by implementing a Poisson regression of exports on the logarithm of distance, contiguous, communal language and colonial heritage, the logarithm of one plus the relevant import tariff, the logarithm of one plus the relevant export subsidy, border dummy variables, and importer and exporter fixed effect dummy variables.[6] As the PPML estimator is unlikely to fully account for heteroskedastcity we base inference on robust standard errors.

Results from estimating equation (1) after pooling observations across agro-food sectors (vegetables and fruit – other food), manufacturing sectors (textiles, clothing and footwear – other manufacturing), service sectors (trade and transport – public services) and all sectors are displayed in Table 1. Most coefficients have the expected signs and are statistically significant. The distance coefficients imply that the impact of geography on trade is greatest for agro-food sectors and smallest for service sectors. Like Silva and Tenreyro (2006), we find that the elasticity of trade flows with respect to distance is much less than one. Production and consumption have a positive effect on trade flows, except in the manufacturing equation, where only production influences exports. Nations that share a common border are expected to trade 47.4% (=exp(0.388) – 1) more than nations that are disjoined in the all-sectors regression, but contiguity does not influence trade in services. Similarly, having a colonial relationship after 1945 has a positive effect on trade in the agro-food, manufacturing and all-sectors regressions but not in the services equation. Sharing a common language increases trade in all sectors and has the largest influence on agro-food trade. With the exception of manufacturing tariffs, tariffs and export subsidies either do not have a statistically significant effect on trade or influence exports in a counterintuitive way. This is not uncommon in gravity equations (see, for example, Philippidis and Sanjuán, 2007a, 2007b).[7] NAFTA and EU membership have a

[6] Silva and Tenreyro (2006) show that estimating the gravity equation in is multiplicative form using (PPML) estimator has several advantages over applying OLS to the log-linear model. First, using Jensen's inequality the authors show that estimating a gravity equation in logarithms using OLS can lead to severely biased and inconsistent estimates when heteroskedastcity is present. Second, as the logarithm of zero is undefined, the sample must be truncated or the dependent variable rescaled when exports between a particular pair of countries are zero.

[7] Philippidis and Sanjuán (2007b) note that the unexpected results for tariffs could be because tariffs are commonly used to protected sensitive sectors for which nations have a comparative disadvantage.

positive effect on trade in all regression but MERCOSUR allegiance only increases exports in the agro-food regression. Estimates the NAFTA and EU dummy variables are in broad agreement with those produced by other authors (See, for example, Anderson and van Wincoop, 2003 and Silva and Tenreyro, 2006).

The most important estimates from our point of view are those relating to the influence of international borders. As highlighted by Anderson and van Wincoop (2003), after controlling for distance and other factors, the ratio of *i*'s exports to *j* to *i*'s exports to itself is given by the exponential of the *i-j* border dummy, b_{ij}. So, in the all-sectors regression, New Zealand's (conditional) exports to Australia are 30.0% (=exp(-1.348)) of New Zealand's self exports. Corresponding figures for New Zealand's exports to China, Japan, Korea, ASEAN and other regions are 14.3%, 24.1%, 17.4%, 20.7% and 1.2%. These figures confirm that New Zealand goods shipped to Australia face lower barriers than goods transported to other nations. Additionally, comparing the coefficients on $b_{AUS,NZL}$ and $b_{OTH,NZL}$ indicates that there are also lower barriers on New Zealand imports from Australia than New Zealand imports from elsewhere.

Turning to other results, the first column of results reveals that impediments to agro-food trade between New Zealand and Australia are also lower than those applying to New Zealand agro-food trade with other nations (in both directions). Moreover, the size of the border coefficients in the agro-food equation indicate that the CER agreement has reduced the influence of international borders on agro-food trade to a larger extent than it has reduced the border effects for trade in other commodities. The manufacturing regression suggest that there is a inverted New Zealand-Australia border effect (i.e., the New Zealand-Australia border results in greater New Zealand exports than would be expected given distance and other characteristics of the bilateral relationship) and that Chinese, Japanese, Korean and ASEAN borders do not impede New Zealand exports. These results are unexpected but may reflect the fact that the New Zealand economy is different from most other developed economies. Specifically, it appears that that New Zealand manufacturers produce to export rather than to sell on the domestic market. Nevertheless, these numbers indicate that it is

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Also, export subsidies are negatively correlated with comparative advantage as most observations for this variable relate to the EU's agricultural exports.

easier for New Zealand goods to enter Australia than other overseas markets. Likewise, the data suggest that hurdles facing New Zealand imports of manufacturing from its CER partner are lower than those opposing New Zealand imports from other nations. Border effects in the services regression are strikingly large. For example, New Zealand's services exports to Australia are only 0.15% of New Zealand's (conditional) domestic exports, which reflects the non-tradable nature of many services. Additionally, it appears that New Zealand service providers have greater access to markets in China, Japan, Korea and ASEAN than in Australia. Overall, the estimated border coefficients in Table 1 give a strong indication that NTBs applying to New Zealand exports to and imports from Australia are less than those relating to, respectively, New Zealand exports to and imports from other nations, which validates our use of CER border effects to benchmark post-trade negotiation NTBs.

We calculate sectoral border effects by estimating equation (1) for each sector.[8] Regression results are reported in Tables A.2 and A.3 and we indicate the frequency for which each variable is (a) significant and has a correct sign, (b) significant and has an incorrect sign, and (c) insignificant, where we infer statistical significance using a five percent critical value. Like in our previous analyses, distance, which is significant and has a correct sign in all regression, is an important determinant of trade flows. The explanatory power of our contiguous and colonial variables is mixed. Coefficients on these variables are only significant and of the correct sign in around one-third of the equations. Perhaps surprisingly, neither variable is significant and of the correct sign in our service regressions, although this result is consistent with the findings of Lejour *et al.* (2004) and Philippidis and Sanjuán (2007b). Sharing a common language is a significant determinant of trade flows in all service sectors and just over 80% of all regressions. Three of the four insignificant language coefficients are in agro-food sectors. Tariffs have a mixed effect on agricultural trade but a significant and negative effect on trade in five of the six manufacturing equations. Export subsidies also have greater explanatory power in manufacturing sectors (positive and significant in four out of six equations) than agro-food sectors (positive and significant in one out of seven equations).

[8] We do no include production and consumption in our sectoral regressions due to colinearity between, respectively, production and exporter fixed-effects, and consumption and importer fixed effects.

Turing to the FTA coefficients, like in our aggregated regressions, EU and NAFTA membership have a greater positive influence on trade flows than MERCOSUR association. Sectoral comparisons of the FTA variable reveal that FTA membership enhances trade in agro-food sectors (significant in 73.3% of sectors) more than manufacturing (55.5%) and services (20.0%). Regarding the border coefficients, four of the five positive border coefficients (which represent inverted border effects) are in manufacturing and an equal proportion is associated with the New Zealand-Australia border. All positive border effects (New Zealand-Australia border dummies in fishing, TCF, chemicals and other equipment, and the New Zealand-Japan border dummy for chemicals) are associated with large export-to-output ratios. For example, 14.6% of New Zealand's TCF output is exported to Australia whereas the corresponding figure for manufacturing as a group is 8.8%. The large proportion of positive or insignificant border coefficients (70%) lends support to our hypothesis that most New Zealand manufacturers produce for foreign rather than domestic markets. Like in our aggregated regressions, comparing coefficients on $b_{NZL,AUS}$ with other border coefficients capturing impediments to New Zealand's exports and coefficients on $b_{AUS,NZL}$ with those on $b_{OTH,NZL}$ indicate that, in general, trans-Tasman trade in agro-food and manufacturing faces fewer impediments than trade elsewhere but this is not the case for trade in services.

Anderson and van Wincoop (2003), highlight that the ad valorem tariff equivalent of border barriers facing exports from country i to country j, t_{ij}^{*}, is given by.[9]

$$t_{ij}^{*} = \exp[\beta_{ij} /(1-\sigma_{ij})] - 1 \qquad (2)$$

where β_{ij} is the coefficient applying to the border dummy b_{ij}, and σ is the elasticity of substitution between goods, which we calculate as weighted average of elasticities of

[9] An alternative method for determining TEs of NTBs is the residual approach. This technique computes the ratio of actual to predicted trade flows normalised to a free trade benchmark, commonly defined as the country with the largest positive difference between actual and predicted trade flows, which, when combined with an estimate of the elasticity of substitution, can be used to estimate TEs (Park, 2002; Philippidis and Carrington, 2005 and Philippidis and Sanjuán, 2007a, 2007b). We favour the dummy variable approach described above as this method allows our estimating equation to recognise border barriers and may result in improve econometric estimates.

substitution between domestic and imported varieties, σ^{DM}, and between imports by country of origin, σ^{MM} sourced from the GTAP database.[10] Specifically,

$$\sigma_{ij} = \alpha_{ij}\sigma^{DM} + (1-\alpha_{ij})\sigma^{MM} \tag{3}$$

where α_{ij} is the proportion of *j*'s imports sourced from *i*.

As we control for transport costs, tariffs and exports subsidies, we assume that border costs reflect NTBs. We also presuppose that trade negotiations can reduce NTBs facing New Zealand exports to non-Australian markets to those applying to New Zealand exports to Australia. Specifically, we calculate CER-normalised TEs of NTBs facing New Zealand exports to country *j* by subtracting $t^*_{nzl,aus}$ from $t^*_{nzl,j}$ if $t^*_{nzl,j} > t^*_{nzl,aus}$. In cases where $t^*_{nzl,aus} > t^*_{nzl,j}$, we assume that trade negotiations will not change NTBs as an increase in impediments to trade following trade discussions seems unlikely. Similarly, we estimate trade negotiation-induced reductions in NTBs applying to New Zealand imports by calculating CER-normalised TEs as $t^*_{i,nzl}$ - $t^*_{i,nzl}$ if $t^*_{i,nzl} > t^*_{i,nzl}$, zero otherwise.

CER-normalised tariffs are reported in Table 3. TEs of 300% or more are not uncommon in agro-food sectors, which are consistent with gravity estimates of TEs elsewhere (see, for example, Philippidis and Sanjuán, 2007a, 2007b). The ad valorem tariff equivalent on New Zealand's fish exports to China, however, seems implausible. Consequently, we replace this number with the next highest tariff equivalent applying to New Zealand's fish exports, 579%. There are also significant TEs on New Zealand meat and dairy products shipped abroad. In other sectors, all New Zealand manufacturing imports face relatively high TEs and TEs applying to New Zealand's imports and exports of services are zero in most cases. In general, the numbers suggest the removal of NTBs on New Zealand's agro-food exports and manufacturing imports will generate the largest welfare gains.

[10] σ^{DM} and σ^{MM} are not indexed by *i* and *j* as elasticities are the same for all bilateral trade flows in the GTAP database.

3. Modelling framework and results

Our modelling exercises utilise the GTAP6inGAMS model (Rutherford 2005) and Version 6 of the (GTAP) database. GTAP6inGAMS is a static, perfectly competitive, global CGE model that captures both bilateral trade flows between regions and inter-sectoral linkages within regions. Intra-industry trade flows are facilitated by the Armington assumption (Armington 1969). That is, composite imports are differentiated from domestic products and imports are differentiated by country of origin using a multi-level constant elasticity nest. There is a representative firm in each sector that gathers intermediate inputs, which are composites of domestically produced and imported varieties, and a primary factor composite, which is a Cobb-Douglas aggregation of primary factors. Factor prices are endogenous so there is full employment, and factors are perfectly mobile across sectors (but immobile internationally). Consumption is governed by a representative consumer in each region, which allocates expenditure between private consumption, government consumption and investment.

In addition to identifying a large number of regions and sectors, the GTAP database also collects data on five factors of production (skilled and unskilled labour, capital, land and resources). In our modelling exercises, we aggregate the database into nine regions – so that New Zealand, potential FTA partners and other significant trading partners are identified – and 23 sectors to match the sectoral aggregation used previously. The compositions of regions and sectors identified in our model in terms of components recognised in the GTAP database are highlighted in Table 4.

We modify the 2001 GTAP database by removing erroneous tariffs on trade between New Zealand and Australia using Rutherford's (2005) "impose" routine and implementing shocks representative of the EU enlargement in 2004, the Australia-US and ASEAN free trade agreements, New Zealand's unilateral tariff reductions and China's accession to the WTO through to 2008. Our simulation exercises focus on possible FTAs likely to have a significant impact on New Zealand. Specifically, using the updated database, we simulate full trade liberalisation between New Zealand and China (NZL-CHN), New Zealand and Japan (NZL-JPN), New Zealand and Korea (NZL-KOR), and New Zealand and ASEAN (NZL-ASN) individually and collectively (NZL-ALL) when (a) only tariffs are removed, and (b) tariffs and NTBs

are abolished.[11] As NTBs typically impose real resource costs, we represent NTBs as iceberg transport costs as described by Samuelson (1954). So, region i's effective imports from j (M_{ij}^{e}) equal observed imports (M_{ij}^{o}) multiplied by a parameter characterising transport technology specific to each bilateral route (λ_{ij}). As λ_{ij} is equal to one in or benchmark data, we do not need to recalibrate the GTAP database to incorporate NTBs. We simulate reductions in NTBs by setting λ_{ij} equal to one plus the relevant TE.

To assist interpretation of the results, we summarise trade relationships between New Zealand and the four regions previously mentioned by reporting trade shares and trade-weighted average tariffs and TEs of NTBs in Table 5. The data reveal that Japan, which is the destination for 11.9% of New Zealand's exports and supplies 7.6% of this nation's imports, is New Zealand's most significant trading partner of the four regions considered. Additionally, Japan imposes a higher tariff on New Zealand goods than other regions considered, and New Zealand's largest TE import barrier applies to Japan. Other characteristics likely to influence the results include (a) Korean tariffs on New Zealand products are relatively high, and (b) ASEAN accounts for a relatively large share of New Zealand's trade, and (c) ASEAN TEs on New Zealand exports are higher than those imposed by other potential FTA partners.

Annual additions to welfare for each region, which we quantify using the Hicksian equivalent variation in income, measured in 2001 US dollars and as fraction of GDP presented in Tables 5 and 6 respectively.[12] The model predicts that the elimination of tariffs on New Zealand-China trade would benefit New Zealand by US$85.2 million dollars (0.19% of GDP) per year. The equivalent New Zealand-Japan FTA simulation produces an estimate welfare gain of US$394.7million (0.86%). Given the descriptive

[11] Changes in New Zealand welfare following trade liberalisation when only tariffs are considered are also reported by Scollay and Gilbert (2001) and Winchester (2005, 2006).

[12] For several reasons, our results should be interpreted as indicative welfare changes resulting from the FTAs considered. First, as we examine possible FTAs likely to be most important to New Zealand using a parsimonious approach, our regional aggregation does not allow our baseline to account for the Trans-Pacific Strategic Economic Partnership and our NZL-ASN simulation does not recognise that New Zealand will likely have FTAs with Malaysia and Thailand before a New Zealand-ASEAN agreement is signed. Second, we only estimate TEs for trade involving New Zealand so, despite the inclusion of Australia in New Zealand-ASEAN trade talks and the probability that Australia will complete an FTA with Japan before New Zealand, our NZL-ASN and NZL-JPN simulations do not simulate free trade between Australia and, respectively, ASEAN and Japan. Third, the elimination of all tariff and non-tariff barriers is an optimistic representation of the outcome of trade negotiations.

statistics highlighted above, it is not surprising that the estimated increase in New Zealand welfare is larger in the NZL-JPN simulations than any other bilateral agreement. Likewise, the relative magnitude of New Zealand welfare gains from the removal of tariffs on New Zealand-Korea and New Zealand-ASEAN trade can be rationalised in terms of the magnitude of initial trade flows and tariffs. Simulating tariff reductions in all bilateral relationships results in a welfare gain of US$679.1 million (1.5%), which is approximately equal to the sum of welfare changes when the agreements are simulated individually.

Strikingly, welfare declines in Japan, Korea and ASEAN and China experiences a small welfare gain (around 12% of the dollar value of the increase in New Zealand welfare) following the removal of bilateral tariffs on trade with New Zealand. Although some trade diversion is observed, welfare changes for New Zealand's potential partners are largely driven by unrealistic terms of trade movements. Brown (1987) demonstrates that terms of trade movements are considerable in Armington-type models because national product differentiation implies a country has a complete monopoly in the market for its exports. Under this assumption, the reallocation of resources and increased export supply resulting from the removal of a nation's tariffs results in the deterioration of the reforming nation's terms of trade. Terms-of-trade movements are severe for New Zealand's FTA partners following trade removes because New Zealand exports large quantities of agricultural commodities. As there is a fixed supply of land, there is limited scope for displaced capital and labour to migrate to agricultural sectors not disrupted by New Zealand produce. The end result is that these factors are forced into manufacturing sectors for which New Zealand's potential FTA partners have a comparative advantage.

New Zealand welfare changes are much larger when NTBs are removed. In the New Zealand-China FTA simulation the US$1389.1 (3.1%) rise in New Zealand welfare is 16.3 times larger than when only tariffs are eliminated. Corresponding ratios for simulations relating to New Zealand's FTAs with Japan, Korea and ASEAN are 10.5, 7.9 and 21.6 respectively. Although these numbers are staggering, they are not out of line with estimates from other studies that consider NTBs. For example, Philippidis and Sanjuán (2007b) estimate that the welfare gain to MERCOSUR from the Free Trade Area of the America (FTAA) is equivalent to 1.2% of GDP when tariffs are

removed, and 11.6% when reductions in tariffs and non-tariff barriers are considered. Additionally, the corresponding figures for Morocco due to an EU-Morocco FTA are 0.14% and 3.3% (Philippidis and Sanjuán, 2007b).

New Zealand welfare increases by US$4,155.4 million (9.2%) in the NZL-JPN simulation. This is not a trivial amount – such a welfare gain would increase New Zealand per capita income by US$2,400 and raise New Zealand's global ranking from 40 to 37 according to figures in the 2007 CIA World Factbook. Furthermore, completing all four FTAs under consideration would boost New Zealand welfare by US$7,328.8 million (16.3%), which would raise New Zealand per capita income by US$4,250 and improve New Zealand's global ranking to 31, one place ahead of France. New Zealand's FTA partners also experience welfare gains when tariffs and NTBs are considered. Although these gains are small proportions of each nation's GDP, they are large in absolute value. For example, ASEAN gains US$1,808.6 million from free trade with New Zealand, which is larger than the dollar-increase in New Zealand welfare but only equivalent to 0.32% of ASEAN GDP.

The inclusion of NTBs in trade negotiations alters the relative standings of the NZL-CHN, NZL-KOR and NZL-ASN simulations when ranked according to benefits accruing to New Zealand. Specifically, New Zealand-ASEAN free trade generates the smallest New Zealand welfare increase when only tariffs are eliminated, but the same FTA generates benefits greater than both the NZL-CHN and NZL-KOR FTAs when tariffs and non-tariff barriers are abolished. This is because ASEAN imposes lower tariffs on New Zealand goods (the trade-weighted average tariff on New Zealand products 5.2%) than either China (6.9%) or Korea (7.4%) but ASEAN TEs of NTBs on New Zealand products (45.6%) are higher than those imposed by China (34.0%) or Korea (38.5%).

We decompose sources of New Zealand welfare gains by simulating reductions in tariffs and NTBs for three divisions: agro-food, manufacturing (including resource based sectors) and services. The results are reported in Table 8.[13] Strikingly,

[13]The sum of welfare changes for the different divisions do not equal welfare changes in the "All sectors" row (which, by design, is the same as in first row of results in Table 6) as our decomposition analysis does not consider interaction terms associated with the liberalisations of each division.

liberalisation of manufacturing improves New Zealand welfare by US$3,750.1 million – around 50% of New Zealand's total welfare gain – in the NZL-ALL simulation when tariffs and NTBs are eliminated. In contrast, liberalisation in the manufacturing division accounts for only 9.4% of the total New Zealand welfare gain when only tariffs are removed. The estimated gains from liberalisation of trade in services are small due to low estimated tariff equivalent of NTBs. Examining the FTAs individually reveals that the inclusion of NTBs greatly increases the share of welfare gains attributable to manufacturing in all simulations and in the NZL-CHN and NZL-ASN simulations manufacturing liberalisation generates greater gains than agricultural liberalisation. Unlike conventional studies of bilateral trade liberalisation involving New Zealand – see, for example, Winchester (2005) – these finding suggest that engaging in trade negotiations that exclude agriculture can generate substantial gains for New Zealand. Given the resistance of many of New Zealand's potential FTA partners to reduce barriers to agricultural trade, this outcome is good news for New Zealand.

4. Conclusions

This paper has estimated welfare changes resulting from four FTAs involving New Zealand when tariffs and NTBs are considered. Reductions in NTBs due to trade negotiations were estimated using a series of gravity equations. We assumed that trade negotiations will reduce NTBs on trade between New Zealand and its potential FTA partners to levels applying to trade between New Zealand and Australia. We justified this approach on the grounds that the two nations have a long-standing FTA and are highly integrated. The results revealed that gains from trade liberalisation are much greater when NTBs are taken into account than in conventional analyses. Our most ambitious simulation indicated that benefits to New Zealand from signing comprehensive FTAs with China, Japan, Korea and ASEAN – regions that account for a little over one-quarter of New Zealand's trade – would be equal to more than 16% of GDP. This is not a finding trade economists should treat as a "dirty little secret".

Our analysis also has several implications for New Zealand policy makers. First, as the inclusion of NTBs alters the relative benefits to New Zealand from the FTAs considered, it appears that, *ceteris paribus*, New Zealand's negotiating capital should

be used to target a FTA with ASEAN before considering free trade with China and Korea, whereas conventional examinations suggest a New Zealand-ASEAN FTA should be a relatively low priority. Second, the inclusion of NTBs in FTA simulations suggests that New Zealand's potential FTA partners will experience substantial welfare gains following free trade with New Zealand. Thus, New Zealand may find it easier to "sell" FTAs to prospective partners. Finally, given the resistance of many of New Zealand's potential FTA partners to reduce barriers to agricultural trade, the finding that New Zealand can derive significant benefits from FTAs that exclude agriculture is good news for New Zealand.

Several caveats to our analysis should be noted before closing. First, our simulations do not capture welfare changes associated with the realisation of economies of scale, dynamic gains due to additions to the capital stock, and productivity improvements due to the transfer of technology. Second, our assumption that trade negotiations will reduce NTBs to those within the CER block may be a little ambitious. As Australia-New Zealand economic integration has taken several decades, initial reductions in NTBs between New Zealand and other nations may be much less than postulated in our analysis. Third, as we focused on the effect of NTBs using a parsimonious approach, our study was not able to consider some aspects of New Zealand's bilateral negotiations likely to be important, such as the inclusion of Australia in New Zealand-ASEAN trade negotiations.

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Table 1: Regression coefficients for aggregated regression

	Agro-food	Manufacturing	Services	All sectors
Constant	0.997***	2.182*	0.060	-0.073
	(0.381)	(1.244)	(0.243)	(0.389)
ln(distance)	-0.620***	-0.426***	-0.136***	-0.365***
	(0.046)	(0.045)	(0.025)	(0.035)
ln(production)	0.871***	0.673***	0.841***	0.799***
	(0.029)	(0.099)	(0.046)	(0.040)
ln(consumption)	0.164***	0.076	0.156***	0.200***
	(0.031)	(0.099)	(0.046)	(0.040)
Contiguous	0.232**	0.393***	-0.075	0.388***
	(0.110)	(0.110)	(0.182)	(0.098)
Colonial	0.517***	0.580***	0.088	0.574***
	(0.168)	(0.193)	(0.124)	(0.185)
Language	0.603***	0.464***	0.456***	0.455***
	(0.091)	(0.094)	(0.071)	(0.071)
ln(1+tariff)	-0.563	-7.538***	-	0.443*
	(0.364)	(1.050)		(0.235)
ln(1+esub)	-4.981***	-1.951	-	-4.782***
	(1.700)	(2.189)		(1.052)
NAFTA	1.082***	0.604**	-0.31	0.782***
	(0.209)	(0.242)	(0.242)	(0.236)
EU	0.941***	0.231*	0.478***	0.442***
	(0.095)	(0.126)	(0.090)	(0.086)
MERCOSUR	1.377***	0.309	-2.343***	0.398
	(0.378)	(0.367)	(0.297)	(0.310)
$b_{NZL,AUS}$	-0.991**	1.225***	-6.597***	-1.348***
	(0.501)	(0.468)	(0.382)	(0.477)
$b_{NZL,CHN}$	-2.503***	0.021	-6.302***	-1.942***
	(0.348)	(0.442)	(0.331)	(0.402)
$b_{NZL,JPN}$	-2.788***	0.853	-5.947***	-1.424***
	(0.338)	(0.612)	(0.390)	(0.453)
$b_{NZL,KOR}$	-2.624***	0.329	-6.086***	-1.746***
	(0.605)	(0.557)	(0.399)	(0.486)
$b_{NZL,ASEAN}$	-1.100***	-0.177	-5.846***	-1.577***
	(0.416)	(0.365)	(0.299)	(0.353)
$b_{AUS,NZL}$	-0.991*	-1.802***	-8.319***	-2.849***
	(0.563)	(0.620)	(0.402)	(0.540)

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.

Table 1: Regression coefficients for aggregated regression (continued)

	Agro-food	Manufacturing	Services	All sectors
$b_{OTH,NZL}$	-1.834***	-3.717***	-7.340***	-4.441***
	(0.355)	(0.485)	(0.299)	(0.331)
b_{OTHER}	-2.470***	-1.065***	-5.568***	-2.627***
	(0.198)	(0.221)	(0.243)	(0.212)
Pseudo R^2	0.9804	0.9278	0.996	0.962
N	22,090	13,254	11,045	46,389

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.

Table 2: Regression coefficients sign and (5%) significance summary counts

	Correct sign	Incorrect sign	Insignificant	Total
ln(distance)	21	0	0	21
Contiguous	8	2	11	21
Colonial	6	1	14	21
Language	17	0	4	21
ln(1+tariff)	10	1	5	16
ln(1+esub)	5	2	6	13
NAFTA	11	1	9	21
EU	16	1	4	21
MERCOSUR	8	8	5	21
$b_{NZL,AUS}$	11	4	6	21
$b_{NZL,CHN}$	17	0	4	21
$b_{NZL,JPN}$	15	1	5	21
$b_{NZL,KOR}$	16	0	5	21
$b_{NZL,ASEAN}$	15	0	6	21
$b_{AUS,NZL}$	13	0	8	21
$b_{OTH,NZL}$	17	0	4	21
b_{OTHER}	20	0	1	21
Total	226	21	97	344

Table 3: CER-normalised ad valorem TEs of NTBs

	On New Zealand's exports to:				On New Zealand's imports from:			
	China	**Japan**	**Korea**	**ASEAN**	**China**	**Japan**	**Korea**	**ASEAN**
Vegetables and fruit	0	0	54	0	0	0	0	0
Animal products	177	311	185	486	328	315	313	318
Wool	0	0	0	0	0	0	0	0
Other agriculture	139	67	155	119	0	0	0	0
Forestry	0	0	0	0	110	107	107	112
Fishing	16,660	84	305	579	0	0	0	0
Resources	14	0	34	23	0	0	0	0
Meat products	0	52	40	9	0	0	0	0
Dairy	71	93	107	76	0	0	0	0
Other food products	88	88	166	0	156	158	158	169
TCF	27	27	27	27	54	41	41	42
Wood & paper	0	0	0	0	73	72	71	78
Chemicals	36	0	15	31	35	36	35	37
Transport equipment	112	13	6	15	56	89	56	57
Other equipment	24	40	48	24	41	44	39	44
Other manuf.	0	0	0	0	28	18	14	17
Trade & transport	4	0	0	0	0	0	0	0
Comm.	151	0	0	0	0	0	0	0
Financial & bus. services	0	0	0	0	0	0	0	0
Rec. services	0	0	0	0	0	0	0	0
Public services	0	0	0	0	0	0	0	0

Table 4: Regional and commodity aggregation

	Regions		Commodities
1.	**New Zealand**	**1.**	**Vegetables, fruits and nuts**
2.	**China**	**2.**	**Animal products**
3.	**Japan**		Bovine cattle, sheep and goats, horses; animal products not elsewhere classified (nec)
4.	**Korea**	**3.**	**Raw milk**
5.	**ASEAN**[1]	**4.**	**Wool**
	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Rest of Southeast Asia	**5.**	**Forestry**
		6.	**Fishing**
6.	**Australia**	**7.**	**Other agriculture**
7.	**EU25**		Paddy rice; wheat; cereal grains; oil seeds; sugar cane, sugar beet; plant-based fibres; crops nec
	Austria, Belgium, Cyprus, Denmark, Czech Republic, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Spain, Sweden	**9.**	**Resource based sectors**
			Coal, oil, gas, mineral nec
		10.	**Meat products**
			Bovine meat products; meat products nec
		11.	**Dairy products**
8.	US	**12.**	**Other food products**
9.	Rest of World (ROW)		Vegetable oils and fats, processed rice, sugar, food products nec, beverages and tobacco products
	All other regions	**13.**	**Textiles, clothing and footwear**
			Textiles; wearing apparel, leather products
		14.	**Wood and paper products**
			Wood products; paper products, publishing
		15.	**Chemical and metal products**
			Petroleum, coal products; chemical, rubber, plastic products, mineral products nec; ferrous metals; metal nec; metal products
		16.	**Transport equipment**
			Motor vehicles and parts, transport equipment nec
		17.	**Electronic machinery and equipment**
			Electronic equipment, machinery and equipment nec
			Manufactures nec
		18.	**Trade and transport**
			Trade; transport nec; water transport; air transport
		19.	**Communication**
		20.	**Financial and business services**
			Financial services nec; insurance; business services nec
		21.	**Recreational and other services**
		22.	**Public services**
			Public administration, defence, education, health
		23.	**Other Services**
			Electricity; gas manufacture, distribution; water; construction; dwellings

Note: (1) Includes Timor-Leste

Table 5: Bilateral trade shares, tariffs and TEs of NTBs, percent

	China	Japan	Korea	ASEAN
New Zealand exports	5.6	11.9	4.4	8.4
Partner exports	0.2	0.3	0.2	0.3
New Zealand imports	5.5	8.5	2.3	7.6
Partner imports	0.4	0.6	0.5	0.4
Tariff on New Zealand exports	6.9	8.6	7.4	5.2
Tariff on New Zealand imports	5.1	4.6	3.5	1.6
TE on New Zealand exports	34.0	28.3	38.5	45.6
TE on New Zealand imports	45.1	61.6	41.8	44.3

Table 6: Global welfare effects (equivalent variation, 2001 US dollars, million)

	NZL-CHN		NZL-JPN		NZL-KOR		NZL-ASN		NZL-ALL	
NTBs removed?	✖	✓	✖	✓	✖	✓	✖	✓	✖	✓
New Zealand	85.2	1389.1	394.7	4155.4	149.0	1181.6	78.0	1681.5	679.1	7328.8
China	10.6	1095.2	-18.2	-32.6	-4.7	20.1	8.7	253.5	4.8	929.2
Japan	0.4	27.7	-292.0	1069.2	-15.9	-16.3	4.0	146.1	-282.3	918.3
Korea	-2.4	3.3	-11.2	-38.8	-130.8	501.3	1.8	73.4	-124.0	234.9
ASEAN	-6.1	17.8	-20.1	-99.0	-8.9	-11.9	-15.8	1808.6	-43.2	1129.1
Australia	-12.5	-124.3	-32.6	-251.4	-11.0	-111.3	-13.7	-233.0	-66.0	-506.5
Europe	-13.9	-94.0	-60.8	-312.4	-23.0	-96.0	-4.6	-52.7	-89.2	-290.8
US	-34.9	-638.6	-56.5	-867.6	-10.8	-386.7	-54.8	-1326.3	-158.4	-2166.1
ROW	-12.6	11.6	-55.7	-216.3	-12.9	-58.2	0.7	163.6	-69.7	-43.3

Source: Simulation results described in text.

Table 7: Global welfare effects (equivalent variation as a fraction of GDP)

	NZL-CHN		NZL-JPN		NZL-KOR		NZL-ASN		NZL-ALL	
NTBs removed?	✖	✓	✖	✓	✖	✓	✖	✓	✖	✓
New Zealand	0.189	3.081	0.875	9.216	0.331	2.621	0.173	3.729	1.506	16.255
China	0.001	0.115	-0.002	-0.003	0.000	0.002	0.001	0.027	0.000	0.097
Japan	0.000	0.001	-0.008	0.030	0.000	0.000	0.000	0.004	-0.008	0.025
Korea	-0.001	0.001	-0.003	-0.010	-0.034	0.131	0.000	0.019	-0.032	0.061
ASEAN	-0.001	0.003	-0.004	-0.018	-0.002	-0.002	-0.003	0.323	-0.008	0.202
Australia	-0.004	-0.038	-0.010	-0.077	-0.003	-0.034	-0.004	-0.072	-0.020	-0.156
Europe	0.000	-0.001	-0.001	-0.004	0.000	-0.001	0.000	-0.001	-0.001	-0.004
US	0.000	-0.006	-0.001	-0.009	0.000	-0.004	-0.001	-0.013	-0.002	-0.022
ROW	0.000	0.000	-0.001	-0.004	0.000	-0.001	0.000	0.003	-0.001	-0.001

Source: Simulation results described in text.

Table 8: Decomposition of New Zealand welfare changes (equivalent variation, 2001 US dollars, million)

	NZL-CHN		NZL-JPN		NZL-KOR		NZL-ASN		NZL-ALL	
NTBs removed?	✖	✓	✖	✓	✖	✓	✖	✓	✖	✓
Agro-food	66.1	283.9	385.0	2315.0	131.2	737.4	66.7	541.4	626.8	3757.8
Manufacturing	19.5	1099.0	11.2	1841.2	18.5	452.5	11.5	1135.4	63.9	3750.1
Services	0.0	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
All sectors	85.2	1389.1	394.7	4155.4	149.0	1181.6	78.0	1681.5	679.1	7328.8

Source: Simulation results described in text.

Table A.1: Countries included in the gravity regression

Argentina	Finland	Korea	Singapore
Australia	France	Malaysia	South Africa
Austria	Germany	Mexico	Spain
Bangladesh	Great Britain	Morocco	Sweden
Belgium	Greece	Netherlands	Switzerland
Brazil	Hong Kong	New Zealand	Taiwan
Canada	Hungary	Peru	Thailand
Chile	India	Philippines	Turkey
China	Indonesia	Poland	USA
Columbia	Ireland	Portugal	Venezuela
Czech Republic	Italy	Romania	Vietnam
Denmark	Japan	Russia	

Table A.2: Gravity regression results for agro-food sectors

	Vegetables and fruit	Animal products	Wool	Other agriculture	Forestry	Fishing	Resources	Meat products	Dairy	Other food products
Constant	8.477***	10.014***	5.635***	8.410***	10.095***	7.891****	13.980***	11.120***	9.348***	9.391***
	(0.525)	(0.756)	(0.624)	(0.482)	(0.861)	(0.734)	(0.641)	(0.707)	(0.898)	(0.406)
ln(distance)	-0.743***	-0.730***	-0.458***	-0.436***	-1.059***	-0.938***	-1.057***	-0.761***	-0.807***	-0.448***
	(0.068)	(0.096)	(0.087)	(0.059)	(0.125)	(0.105)	(0.117)	(0.079)	(0.126)	(0.044)
Contiguous	-0.008	0.706***	-0.563	0.172	1.274***	0.129	-0.095	0.228	0.683***	0.453***
	(0.154)	(0.156)	(0.365)	(0.190)	(0.212)	(0.244)	(0.267)	(0.160)	(0.254)	(0.110)
Colonial	0.567*	0.548	0.620***	0.506*	-0.041	2.003***	-0.553*	-0.431	-0.016	0.861***
	(0.323)	(0.452)	(0.223)	(0.275)	(0.405)	(0.247)	(0.323)	(0.536)	(0.393)	(0.214)
Language	1.138***	0.296	-0.266	0.473***	0.522***	0.312	0.636***	0.687***	0.519***	0.575***
	(0.143)	(0.198)	(0.200)	(0.157)	(0.198)	(0.217)	(0.233)	(0.192)	(0.152)	(0.088)
ln(1+tariff)	-2.302***	-5.139***	-6.256***	0.828***	-6.602	-3.479***	0.465	0.343	0.142	-1.136**
	(0.637)	(1.549)	(1.571)	(0.232)	(4.267)	(1.346)	(2.516)	(0.423)	(0.380)	(0.578)
ln(1+esub)	-0.201	-12.807	-	1.503	-	-	-14.342***	-0.344	3.710***	-12.967***
	(0.436)	(12.872)		(1.502)			(4.401)	(1.581)	(0.990)	(3.543)
NAFTA	2.305***	1.587***	0.751	1.672***	0.340	2.181***	1.179***	1.014***	-0.124	0.615***
	(0.195)	(0.200)	(0.705)	(0.181)	(0.392)	(0.511)	(0.340)	(0.291)	(0.238)	(0.229)
EU	1.877***	0.622***	1.848***	1.529***	1.006***	1.508***	0.913***	1.418***	2.552***	1.012***
	(0.171)	(0.194)	(0.309)	(0.146)	(0.293)	(0.186)	(0.335)	(0.172)	(0.244)	(0.135)
MERCOSUR	2.962***	-1.414***	0.552	2.740***	-3.514***	0.247	2.006***	0.896**	1.926***	0.438*
	(0.285)	(0.347)	(0.411)	(0.535)	(0.537)	(1.524)	(0.383)	(0.363)	(0.316)	(0.240)

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.

Table A.2: Gravity regression results for agro-food sectors (continued)

	Vegetables and fruit	Animal products	Wool	Other agriculture	Forestry	Fishing	Resources	Meat products	Dairy	Other food products
$b_{NZL,AUS}$	-2.708***	-0.794	-7.231***	-0.920*	-6.127***	1.591**	1.224*	-4.520***	-1.241**	0.004
	(0.492)	(0.602)	(0.672)	(0.553)	(0.731)	(0.721)	(0.674)	(0.750)	(0.515)	(0.357)
$b_{NZL,CHN}$	-2.182***	-1.983***	-4.410***	-4.283***	-1.699***	-7.674***	-1.582***	-4.457***	-3.604***	-1.817***
	(0.523)	(0.595)	(1.317)	(0.523)	(0.630)	(0.621)	(0.582)	(0.715)	(0.611)	(0.334)
$b_{NZL,JPN}$	-1.931***	-2.775***	-6.889***	-2.502***	-1.909***	-0.695	-0.802	-6.425***	-4.623***	-1.816***
	(0.614)	(0.521)	(0.591)	(0.569)	(0.644)	(0.650)	(0.639)	(0.800)	(0.565)	(0.392)
$b_{NZL,KOR}$	-3.459***	-1.982**	-7.282***	-4.596***	0.352	-1.740***	-3.608***	-5.989***	-4.946***	-2.822***
	(0.490)	(0.813)	(0.593)	(0.506)	(0.643)	(0.622)	(0.615)	(0.704)	(0.576)	(0.307)
$b_{NZL,ASEAN}$	-2.631***	-3.534***	-7.617***	-3.842***	-0.124	-2.672***	-2.529***	-4.873***	-3.802***	-0.902
	(0.557)	(0.742)	(0.585)	(0.700)	(0.779)	(0.958)	(0.764)	(0.933)	(0.579)	(0.569)
$b_{AUS,NZL}$	-0.072	-0.713	-14.128***	-2.668***	-1.019	-2.638***	-4.962***	-0.752	0.395	-0.434
	(0.551)	(0.679)	(0.665)	(0.547)	(0.914)	(0.698)	(0.772)	(0.922)	(0.585)	(0.367)
$b_{OTH,NZL}$	-0.547	-2.873***	-8.686***	-3.899***	-2.907***	-1.728*	-3.854***	-0.736	-0.088	-2.694***
	(0.671)	(0.762)	(0.702)	(0.613)	(0.945)	(0.889)	(1.063)	(0.914)	(0.755)	(0.356)
b_{OTHER}	-2.123***	-2.847***	-6.350***	-3.407***	-2.742***	-1.558	-2.357***	-3.908***	-4.118***	-2.548***
	(0.525)	(0.756)	(0.624)	(0.482)	(0.861)	(0.734)	(0.641)	(0.707)	(0.898)	(0.406)

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.

Table A.3: Gravity regression results for manufacturing and service sectors

	TCF	Wood & paper	Chemicals	Transport equipment	Other equipment	Other manuf.	Trade & transport	Comm.	Financial & bus. services	Rec. services	Public services
Constant	10.573***	10.495***	11.154***	11.226***	7.528***	7.145***	10.628***	8.223***	9.459***	8.533***	12.303***
	(0.982)	(0.441)	(0.322)	(0.561)	(0.882)	(0.596)	(0.273)	(0.366)	(0.364)	(0.453)	(0.483)
ln(distance)	-0.772***	-0.634***	-0.558***	-0.487***	-0.315***	-0.438***	-0.149***	-0.117***	-0.100***	-0.291***	-0.300***
	(0.119)	(0.047)	(0.037)	(0.064)	(0.055)	(0.067)	(0.035)	(0.033)	(0.033)	(0.041)	(0.048)
Contiguous	0.245	0.627***	0.303***	0.233**	0.459***	-0.121	0.241	-0.164*	-0.153	-0.465	-0.969***
	(0.180)	(0.102)	(0.077)	(0.116)	(0.115)	(0.197)	(0.237)	(0.091)	(0.110)	(0.137)	(0.191)
Colonial	0.294	0.268***	0.627***	-0.666*	0.406***	0.641**	-0.025	-0.042	0.302	-0.119**	-0.515**
	(0.394)	(0.291)	(0.171)	(0.343)	(0.154)	(0.308)	(0.132)	(0.240)	(0.194)	(0.285)	(0.255)
Language	0.556***	0.373***	0.567***	0.129	0.481***	0.599***	0.353***	0.346***	0.423***	0.274	0.634***
	(0.162)	(0.087)	(0.078)	(0.152)	(0.095)	(0.200)	(0.092)	(0.098)	(0.092)	(0.117)	(0.191)
ln(1+tariff)	-3.667**	-5.541***	-7.898***	-7.934***	-12.354***	-1.096	-	-	-	-	-
	(1.597)	(0.963)	(0.841)	(1.147)	(1.735)	(3.060)					
ln(1+esub)	0.784	8.035***	8.451***	48.347***	10.634	65.822***	-	-	-	-	-
	(1.159)	(2.775)	(2.296)	(9.222)	(22.137)	(11.493)					
NAFTA	-0.296	0.680***	0.255	1.397***	0.699**	0.939***	-0.724**	0.138	-0.173	0.027	0.429*
	(0.290)	(0.170)	(0.160)	(0.223)	(0.215)	(0.365)	(0.317)	(0.182)	(0.243)	(0.230)	(0.235)
EU	0.005	0.292***	0.260***	0.690***	0.117	-0.263	0.393***	0.814***	0.711	-0.058	-0.582***
	(0.166)	(0.096)	(0.082)	(0.182)	(0.145)	(0.221)	(0.123)	(0.099)	(0.097)	(0.148)	(0.168)
MERCOSUR	-0.083	0.008	0.507***	1.978***	0.953***	-1.106**	-2.371***	-2.024***	-2.535	-1.264***	-1.903***
	(0.227)	(0.181)	(0.100)	(0.429)	(0.306)	(0.541)	(0.363)	(0.110)	(0.159)	(0.180)	(0.196)

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.

Table A.3: Gravity regression results for manufacturing and service sectors (continued)

	TCF	Wood & paper	Chemicals	Transport equipment	Other equipment	Other manuf.	Trade & transport	Comm.	Financial & bus. services	Rec. services	Public services
$b_{NZL,AUS}$	2.015***	0.414	0.866***	-1.744***	2.057***	-0.261	-6.227***	-6.839***	-6.587***	-6.674***	-8.789***
	(0.655)	(0.476)	(0.277)	(0.414)	(0.359)	(0.522)	(0.286)	(0.269)	(0.277)	(0.337)	(0.363)
$b_{NZL,CHN}$	1.336*	0.547	-1.021***	-4.975***	-0.185	1.005	-6.251***	-7.179***	-5.763***	-6.502***	-7.755***
	(0.713)	(0.625)	(0.280)	(0.440)	(0.315)	(0.679)	(0.205)	(0.285)	(0.260)	(0.332)	(0.375)
$b_{NZL,JPN}$	-0.150	-0.098	0.974***	-2.237***	-1.096***	-0.322	-5.651***	-6.765***	-5.581***	-6.351***	-7.929***
	(0.726)	(0.494)	(0.297)	(0.490)	(0.291)	(0.525)	(0.331)	(0.283)	(0.251)	(0.335)	(0.381)
$b_{NZL,KOR}$	1.346*	-0.360	0.366	-1.983***	-1.538***	-0.942	-5.623***	-6.775***	-5.786***	-6.642***	-7.961***
	(0.698)	(0.530)	(0.319)	(0.531)	(0.303)	(0.611)	(0.332)	(0.276)	(0.259)	(0.350)	(0.386)
$b_{NZL,ASEAN}$	1.320*	0.839	-0.778**	-2.309***	-0.160	-1.077*	-5.651***	-6.524***	-5.199***	-6.180***	-7.841***
	(0.782)	(0.625)	(0.387)	(0.684)	(0.353)	(0.579)	(0.370)	(0.357)	(0.342)	(0.372)	(0.390)
$b_{AUS,NZL}$	-0.617	-0.601	-1.290***	-2.243***	-1.670***	-2.598***	-7.332***	-7.678***	-9.689***	-6.985***	-10.212***
	(0.704)	(0.531)	(0.308)	(0.513)	(0.412)	(0.632)	(0.346)	(0.295)	(0.296)	(0.373)	(0.449)
$b_{OTH,NZL}$	-2.220***	-2.836***	-2.784***	-4.082***	-3.770***	-3.530***	-6.650***	-7.000***	-8.023***	-6.294***	-8.969***
	(0.763)	(0.539)	(0.304)	(0.581)	(0.409)	(0.534)	(0.391)	(0.304)	(0.292)	(0.365)	(0.450)
b_{OTHER}	-0.387	-1.831***	-1.108***	-2.370***	-0.571**	-1.775***	-5.342***	-6.022***	-5.183***	-5.801***	-7.349***
	(0.434)	(0.314)	(0.188)	(0.379)	(0.223)	(0.356)	(0.307)	(0.256)	(0.222)	(0.308)	(0.285)

Note: ***, **, and * denote significance at the 1%, 5% and 10% significance level respectively. Robust standard errors are reported in parentheses.