

## Trade Relations between New Zealand and China: An Empirical Analysis in the Context of a Free Trade Agreement

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**Abstract:** This study examines the bilateral trade relations between New Zealand and China from 1980 to 2012. It examines the strength of the trade relationship using export and import intensity indices; identifies the degree of trade reciprocity using a 'trade reciprocity index'; estimates the magnitude of intra-industry trade using the Grubel-Lloyd and Aquino indices; and analyses these indices to consider how trade patterns and relations have changed between 1980 and 2012.

Significant growth in trade between New Zealand and China has been achieved since the signing of a free trade agreement in 2008. The intensity of trade has strengthened; and there has been growth in reciprocal trade and intra-industry trade for a number of industries and product groups. The results foreshadow future bilateral trade, investment, technology transfer and economic relations between New Zealand and China.

**JEL Classifications:** F10, F02, F13, F14, F15

**Keywords:** International trade; New Zealand; China; Trade-intensity; Trade reciprocity; Intra-industry trade; Economic integration; FTA; CER

### 1. Introduction

Free trade agreements (FTAs) have come to dominate the agenda of trade negotiators in recent years. Asia is a relative latecomer in the negotiation of FTAs, but the region has been catching up rapidly over the past decade. As at September 2012, there were 103 FTAs, most of them bilateral, involving one or more countries from the region. There are another 26 FTAs already signed, 64 under negotiation and 60 more proposed. Most of the global action on FTAs involves an Asian country (Asia Forum 2013). It is in light of this development that the FTA, signed by China and New Zealand, gains significance.

In signing the FTA in Beijing in April 2008, New Zealand became the first developed nation to negotiate and subsequently sign such an agreement with China. From the outset this comprehensive agreement covered goods, services and investment as a 'single undertaking'. This study analyses the consequences of FTA agreement between the two countries in terms of the volume and pattern of trade between New Zealand and China. The paper incorporates the application of trade intensity, trade reciprocity and intra-industry trade indices. An innovation in this paper is the application of a modified Index of Trade Reciprocity to measure the level of reciprocity in the overall balance of trade between New Zealand and China. This study also used the Grubel-Lloyd and Aquino intra-industry trade indices. These alternative methodologies have not been used in such a detailed research framework, with a long term time series data set, previously.

This paper is organized into four sections as follows. Section 2 provides an overview of context and a brief literature review. Section 3 discusses the methodology and data used. Section 4 presents and analyses the results and Section 5 concludes.

## 2. Context and Previous Literature

The New Zealand-China FTA thus provides an interesting case study of the effects of the union or integration of two contrasting economies. New Zealand is a relatively small open economy, with a small population but high per capita income. China, on the other hand, is a large country with a huge population with a relatively low per capita income. Partly because of their different sizes and hence contrasting factor endowments, New Zealand is a labour-short, and China is a labour-abundant, economy. Both countries do not share a common language or similar culture and they are not close to each other geographically. Both New Zealand and China are members of the World Trade Organization (WTO) and the Asia Pacific Economic Cooperation (APEC) and have a close association with ASEAN.

New Zealand exports to China were US\$161 million in 1980, while imports were US\$ 44 million, leading to a bilateral trade surplus of US\$117 million. This turned into a deficit of US\$23.8 million in 1990 and subsequent years, with the highest deficit of US\$2,743 million being posted in 2008. Positive outcomes emerged in the year following the signing of the FTA. In 2011, New Zealand's trade deficit with China decreased to US\$1,204 million, which is 44 percent lower than that in the year 2008. This is the result of the significant increase in New Zealand exports to China from US\$1,787 million in 2008 to US\$4,701 million in 2011 and US\$5,591 million in 2012.

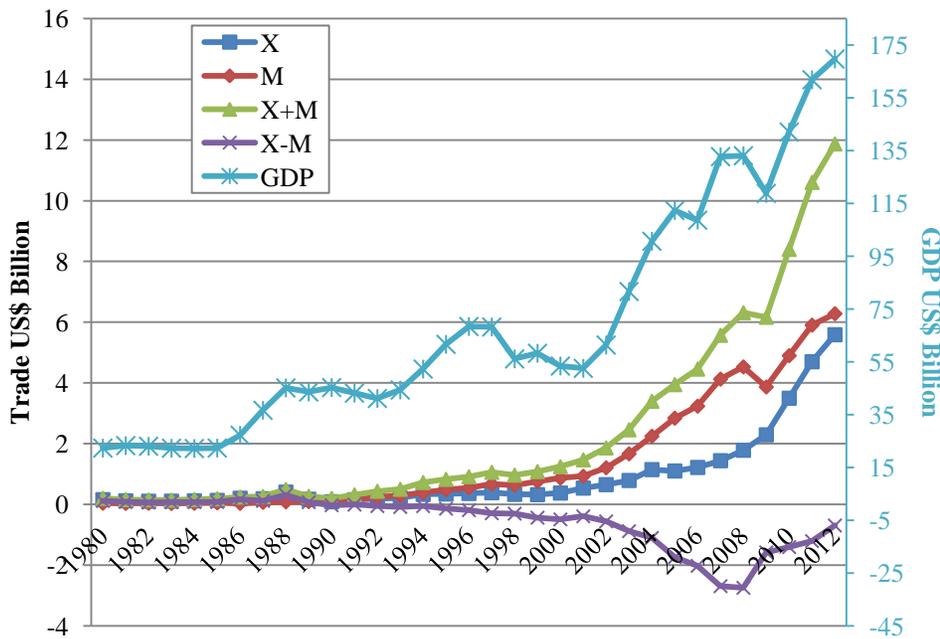
China's exports to New Zealand were only US \$30 million and imports US\$157 million in 1980, with a bilateral trade deficit. This turned into a trade surplus of US\$27 million in 2005 and subsequent years, with the highest surplus of US\$613 million achieved in 2008, which was, however, reduced after the signing of the FTA. A salient feature of China's trade with New Zealand is that the value of exports increased from US\$2,764 million in 2009 to US\$3,876 million in 2012, while imports increased from US\$ 2,476 million in 2009 to US\$ 5,806 million in 2012. China's bilateral trade balance (deficit) increased from US\$390 million in 2009 to US\$1,930 million in 2012. This outcome is the result of the significant increase in China's imports from New Zealand after the FTA. The evidence suggests that a free trade agreement between New Zealand and China would have trade creation and thus welfare-enhancing effects.

Figure 1 shows the trends in total bilateral trade, the trade balance between New Zealand and China, New Zealand's exports to China, and China's imports into New Zealand. Aside from a slight jump in 1988, New Zealand's exports to China have exhibited a relatively smooth and steady upward trend between 1980 and 2012. The value of exports remained comparatively low at less than US\$0.5 billion until 2000. But this increased sharply from 2001-2012, which may be attributed to China's economic reforms as well as to the various economic agreements between New Zealand and China in the early 2000's (e.g., the meat access protocols and other trade agreements). The rapid increase in the export index after 2009 and until 2012 may, of course, be attributed to the FTA between the two countries.

Figure 2 shows the growth of Chinese imports into New Zealand forming a relatively smooth curve rising over time. New Zealand's exports to China as a proportion of its total exports increased from one percent in 1980 to about 13 percent in 2012, but the proportion of imports coming from China showed a sharper increase from 0.8 percent in 1980 to over 16 percent in 2012. Tariff removal on New Zealand's logs, sawn timber and agricultural products was among the key

outcomes of the FTA. As a result of the FTA, New Zealand’s agricultural exports to China surged to \$3.5 billion in June 2011, representing an increase of 50 percent over the previous year. China’s middle class, estimated to number more than 100 million people and growing, is a substantial potential market for New Zealand's agricultural products.

From 1981 to 1991 there was an upward trend in the bilateral trade (X+M) between the two countries, although the rate of increase was low. There was a slight deviation from the trend around 1988, when the value of exports to China was higher than would have been expected from the existing trend. This was around the time when China and New Zealand signed a bilateral Investment Promotion and Protection Agreement, which may have had some impact, but to what extent, we don’t know.

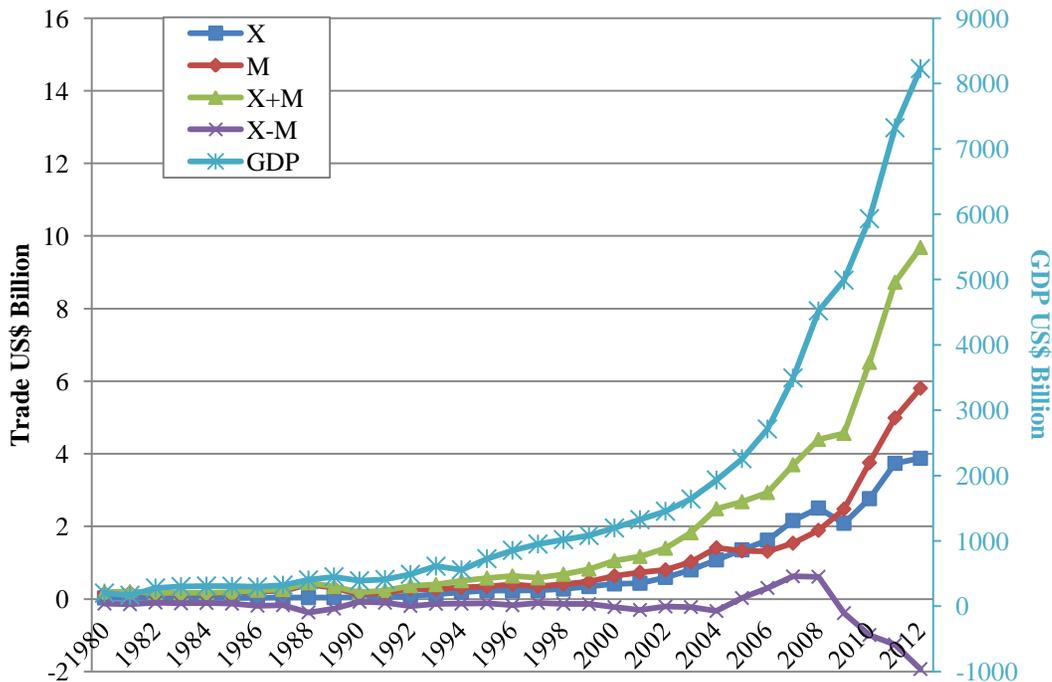


Data Sources: IMF: Direction of Trade and Statistics Yearbook, Various Issues

Figure 1. New Zealand-China Trade, 1980 – 2012 (in US\$ billions)

A study by New Zealand’s Ministry of Foreign Affairs and Trade (MFAT 2004) suggested that an FTA between New Zealand and China would have a positive impact on the former’s economy. Gains were expected to result from the removal of tariff and non-tariff measures (NTMs) across all areas, including agriculture and the non-durable manufacturing sectors, as well as services exports such as education services, investment and trade facilitation. Comprehensive and reciprocal elimination of trade barriers would also allow citizens of both countries to benefit from increased efficiency and competition, and hence lower prices and a greater variety of goods and services.

By way of contrast New Zealand’s agriculture sector, in particular stood to benefit from an FTA with China. However, not everyone agreed that the impact of the FTA would be positive. New Zealand’s clothing unions, for instance, claimed that the arrangement would bring in a flood of cheap Chinese imports. Analysts also warned against China’s practice of dumping cheap goods on foreign markets.



Data Sources: IMF: Direction of Trade and Statistics Yearbook, Various Issues

Figure 2. China-New Zealand Trade, 1980 –2012 (US\$ billions)

Traditional international trade models suggest that trade is determined by comparative advantage of trading partners and free trade is the ‘first best’ theory as it maximises welfare. Integration between nations and/or regions is a move towards free trade, at least among members of the FTA or union. Economic integration is therefore welfare-enhancing. Being discriminatory to non-members, the move (towards integration) is, however, considered to be a ‘second best’ theory and policy option (Verdoorn 1960, Viner 1950).

In the context of bilateral trade relations and pure trade theory, Bhagwati (1964) states that ... “established trade theory provides no a priori grounds for deciding whether bilateral trade is of no importance, of some importance or all important”. There has been increased attention to Closer Economic Relations (CER) and other forms of Preferential Trading Arrangements, at bilateral, tri-lateral, mini-lateral and regional levels. The analysis of this research shows that bilateral trade between countries does matter in contemporary trading environment. A New Zealand Ministry of Foreign Affairs and Trade (2004) study suggested that NZ-China FTA is expected to increase New Zealand exports to China between 20 and 39 percent which in values terms represents about \$260 to \$400 million a year.

Tan and Cai’s (2010) study analysed the impacts of the China-New Zealand FTA, on both economies, using the GTAP Models. Their findings indicated that implementation of a FTA will enhance the national welfare of both countries. Fan Ying’s (2005) study indicated that a China-New Zealand FTA will have trade creation effects which in turn will increase economic growth, productivity and FDI. Such integration between countries of such differing locations will be helpful to stimulate the comparative advantages, mutual gains and prosperities for both countries. Zhu Ying’s (2006) study found that building of the free trade area will bring positive effects on trade in goods and services and foster investment and Han, Z and Ying N. ‘s (2008) research found that

the agricultural products from New Zealand are important to China and China's manufacturing industry plays a significant role in New Zealand's imports. They also found that the trade between China and New Zealand is very complementary. Sandrey and Grinstead's (2008) study found considerable welfare gain to New Zealand of \$478 million and the welfare gains to China was about \$323- Indicating that a small economy can stand to gain from an FTA with a larger one.

### 3. Data and Methodology

Annual statistics covering the sample period 1980-2012 were obtained from the IMF's Direction of Trade Statistics Yearbook, World Economic Outlook database, and the UN Commodity Trade database. We chose 1980 as the starting point because China started its economic policy reforms in 1979. New Zealand adopted more or less similar reforms in 1985. Data is available only up to 2012, and hence this provides the endpoint. Intra-industry trade is estimated from 1990 to 2012 due to data availability.

Trade intensity, trade reciprocity and intra-industry trade indices are the three most appropriate methodologies for this study; each is explained below.

#### 3.1 Trade Intensity

Pioneered by Brown (1947) and later developed and popularised by Kojima (1964), the intensity of trade index explains variations in trade over time and across bilateral trading relationships by analysing the nature and importance of resistance factors. Trade between a country and its trading partners is more intense than with the rest of the world when the resistance between them is lower. Trade intensity provides a way of measuring trading relations without the bias resulting from the comparative size of the trading partners. Trade intensity analysis allows us, for instance, to infer that New Zealand's exports to China are high, not because these countries are economically large (or small) but because the resistances between them are relatively low.

The indices also show in a rather simple way whether New Zealand's trade with China is greater or less than might have been expected given the importance of the trading partner's share in total world trade. If New Zealand is home country  $i$  and China is country  $j$ , then the intensity of trade index ( $III_{ij}$ ) for both exports and imports is calculated using the formulas:

$$XII_{ij} = (X_{ij}/X_i)/[M_j/(M_w - M_i)] \quad MII_{ij} = (M_{ij}/M_i)/[X_j/(X_w - X_i)] \quad (1a, 1b)$$

where:

$X_{ij}$ = country $i$ exports to country $j$	$M_{ij}$ = country $i$ imports to country $j$
$X_i$ = total exports of country $i$	$M_i$ = total imports of country $i$
$M_j$ = total imports of country $j$	$X_j$ = total exports of country $j$
$M_w$ = total world imports	$X_w$ = total world exports
$XII_{ij}$ = export intensity index	$MI_{ij}$ = import intensity index

$X_{ij}/X_i$ , is the proportion of exports that are sent to the trading partner as a percentage of total domestic exports. This indicates how significant the trading partner is to the home country for its exports.  $M_j/(M_w - M_i)$  is the trade partner's total imports as a proportion of total world imports less the import of the domestic economy. Countries that import at proportionally high levels from the same country to which they send most of their exports have a higher trade intensity ( $XII_{ij}$ ). Conversely, a country with diverse markets that is not reliant on any one country for its imports has

a lower trade intensity ( $XII_{ij}$ ). A trade-intensity index greater than one indicates that a country is exporting more to its partner than would be expected by its share in world trade, while an index of less than one indicates the opposite.

Garnaut and Drysdale (1994), however, regard the intensity of trade index as only a rough index of relative resistances because it does not allow for the varying commodity composition of countries' foreign trade. When commodities are not substitutable, opportunities for bilateral trade are limited by the degree to which one country's exports complement another country's imports.

### 3.2 Trade Reciprocity Index

Trade reciprocity refers to the mutual changes in trade policy which bring about changes in the volume of each country's imports that are of equal value to changes in the volume of its exports. It enables the levels of reciprocity in the overall balance of trade between two countries to be identified. It was developed by Wadhva and Asher (1985) with index measured using the following formula:

$$\theta = 1 - \frac{\sum_{j=1}^n \left[ \frac{|a_{ij} - a_{ji}|}{(a_{ij} - a_{ji})} \cdot \sum_{i=1}^n a_{ij} \right]}{(n-1) \cdot \sum_{i=1}^n \sum_{j=1}^n a_{ij}} \quad (2)$$

where:  $a_{ij}$  = exports of country  $i$  (NZ) to partner  $j$  (China)  
 $a_{ji}$  = exports of country  $j$  (China) to partner  $i$  (NZ)  
 $n$  = total number of countries involved in the context of the bilateral or regional groups  
 $\theta$  = the trade reciprocity index (TRI).

This formula results in an index that will always lie between 0 and 1. When every pair of countries in a group tends to have a perfectly balanced two-way trade, the value of  $\theta$  reaches its maximum, which is unity. On the other hand, when there exists only one-way flow of trade between a pair of trading partners (say, complete dependence of country A on country B for its imports or exports), the value of  $\theta$  is at its minimum, which is zero. The index thus measures the degree of trade reciprocity. It is however difficult to apply Wadhva and Asher's equation for measuring trade reciprocity, so we modify the index by re-writing the equation, with the first part of the numerator inside the summation mark.

Since a country cannot export to itself, Equ. (2) has a specific case of  $n=2$ :

$$\theta = 1 - \frac{\left[ 0 + \frac{|a_{12} - a_{21}|}{(a_{12} - a_{21})} a_{12} + \frac{|a_{21} - a_{12}|}{(a_{21} - a_{12})} a_{21} + 0 \right]}{(2-1)(0 + a_{12} + a_{21} + 0)} \quad (3)$$

Ratnayaka (2004) used this method to measure the extent of trade between Sri-Lanka and Japan from 1951 to 2000. The results show trade reciprocity values of less than one, suggesting that bilateral trade between Sri-Lanka and Japan is non-reciprocal or far from balanced. This modified

formula has been used in this study. A more detailed explanation and an example are available from the author.<sup>1</sup>

### 3.3 Intra-Industry Trade

Intra-industry trade is the simultaneous export and import of goods within the same industry. Intra-industry trade provides a case for economic integration between nations which are similar in terms of factor endowments, human capital, technologies, cultures and levels of development. Intra-industry trade analysis suggests that the greater the similarity between countries in terms of income levels, factor endowments and levels of development, the higher will be the trade intensities between them (Linder 1961).

A comprehensive survey of the various ways of measuring intra-industry trade (IIT) can be found in Tharakan (1983), Aquino (1978), Bano (1991), Lloyd and Lee (2002), and Lloyd and Grubel (2003). Among these measures, the Grubel and Lloyd (1975) indices have been the most popular and widely used. This study uses the Grubel-Lloyd single industry index ( $IITB_i$ ), the Grubel-Lloyd weighted mean index (IITB), the Grubel-Lloyd trade imbalance adjusted index (IITC) and the Aquino adjusted index (IITQ). We first look at the Grubel and Lloyd Index (1975), and then briefly the Aquino adjusted Measure (Aquino,1978).

#### a. Grubel and Lloyd IIT Measure

Grubel and Lloyd (1975) define IIT as the value of exports in an industry which is exactly matched by imports in the same industry, and is measured by:

$$IITB_i = \frac{(X_i + M_i) - |X_i - M_i|}{X_i + M_i} \times 100 \quad (4)$$

Where  $X_i$  and  $M_i$  are exports and imports of industry  $i$ , respectively. This measure varies from 0 to 100, with higher values representing higher levels of intra-industry trade. Grubel and Lloyd devised a summary measure to calculate IIT trade across industries (or countries) at a given SITC (United Nations Standard International Trade Classification) product group level of aggregation. The summary measure is a weighted average of  $IITB_i$ , the weight being the share of each industry in the country's total trade. The Grubel-Lloyd summary measure is:

$$IITB = \overline{IITB}_i = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i)} \times 100 \quad (5)$$

Where IITB is the weighted average of the value of  $IITB_i$  across industries  $i = 1, 2, \dots, n$ , where  $n$  is the number of industries in the sample.  $IITB_i$  is an accurate measure if there is balanced bilateral trade, but if total trade (or the trade of the subset of industries being measured) is unbalanced, then

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<sup>1</sup> My attention was drawn by Piyadasa Ratnayaka from Saga University, Japan, regarding the Trade Reciprocity Index (TRI) developed by Wadhva and Asher (1985) and, in particular, the measurement difficulties in its original form. We therefore modified the Wadhva trade reciprocity index. It was then first used by Piyadasa Ratnayaka in his book *Lost Opportunities: Sri Lanka's Economic Relationship with Japan* (2004). His acknowledgement of my contribution is appreciated. Full derivation of equation (2) is available from the author on request.

the index is downward biased because the denominator is overstated. In such a situation, the  $IITB_i$  measure cannot attain its maximum value of 100. In order to avoid any bias introduced by unbalanced trade, the mean must be adjusted by removing this trade imbalance effects. Accordingly, Grubel and Lloyd devised the adjusted measure shown as follows:

$$IITC = \frac{\sum_{i=1}^n (X_i + M_i) - \sum_{i=1}^n |X_i - M_i|}{\sum_{i=1}^n (X_i + M_i) - \left| \sum_{i=1}^n X_i - \sum_{i=1}^n M_i \right|} \times 100 \quad (6)$$

*b. Aquino Adjusted IIT Measure*

To avoid bias, introduced by unbalanced trade, Aquino (1978) suggested adjustments at each industry level rather than at the aggregate level. Aquino simulates balanced trade by calculating 'theoretical values' of exports and imports at the industry level:

$$X_i^e = X_i \frac{1}{2} \frac{\sum_{i=1}^n (X_i + M_i)}{\sum_{i=1}^n X_i} \quad M_i^e = M_i \frac{1}{2} \frac{\sum_{i=1}^n (X_i + M_i)}{\sum_{i=1}^n M_i} \quad (7)$$

The derived values for exports ( $X_i^e$ ) and imports ( $M_i^e$ ) are applied to the Grubel-Lloyd measures to arrive at the corresponding measures of  $IITQ_i$  at the industry level and  $IITQ$  for total trade. The Aquino measure is represented by the following equation:

$$IITQ = \frac{\sum_{i=1}^n (X_i^e + M_i^e) - \sum_{i=1}^n |X_i^e - M_i^e|}{\sum_{i=1}^n (X_i^e + M_i^e)} \times 100 \quad (8)$$

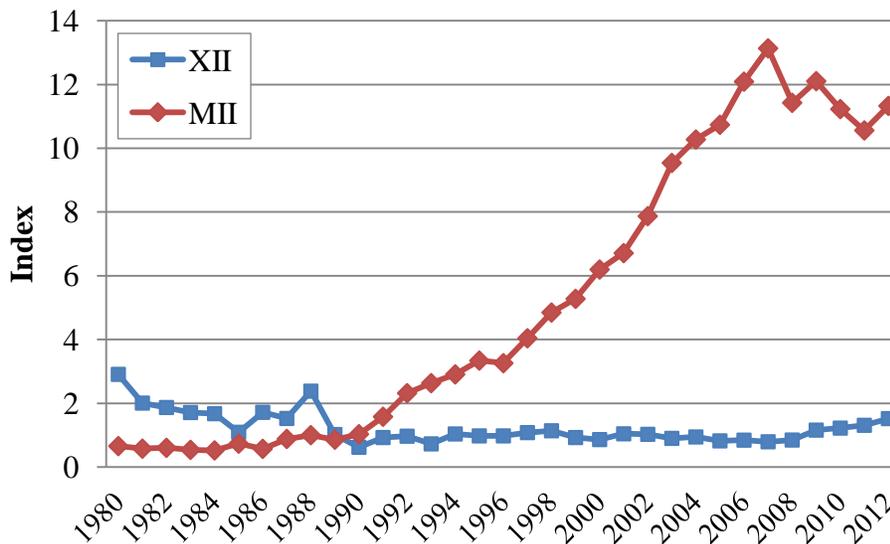
These IIT methods have been applied to calculate the magnitude of intra-industry trade between New Zealand and China. IIT was calculated for each industry as well as across industries at 3-digit SITC levels for selected years.

## 4. Results and Analysis

### 4.1 Trade Intensity

In 1980 the export intensity index was 2.9, indicating strong New Zealand representation in China's markets. In subsequent years trade intensity decreased, with some minor increases later, but not to any great extent. After the signing of the FTA, the index increased from 0.8 in 2008 to 1.2 in 2009, 1.3 in 2010 and 1.5 in 2012.

Figure 3 shows the movements in the export (XII) and import intensity (MII) indices for the period 1980 to 2012; three stages can be discerned. From 1980 to 1990 the MII fluctuated at a low level, which is not surprising, as the level of bilateral trade during that period was low. During the second stage, 1990-2007, the MII increased and showed stability. In the third stage, after 2008, the MII tended to decrease while the XII increased slightly but at a very low level.



Data Sources: IMF: Direction of Trade and Statistics Yearbook, Various Issues; Author’s Calculations

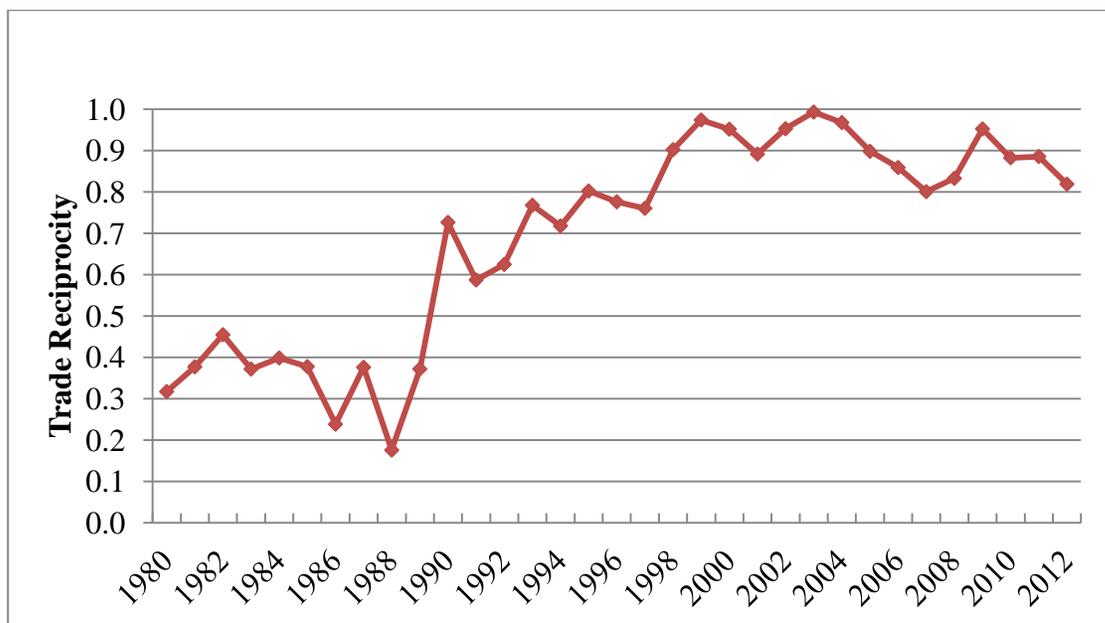
Figure 3. Export and Import Intensity Indexes of New Zealand to China, 1980-2012

At first glance, these movements and tendencies of both MII and XII are surprising. First, the XII stayed stable at a low level almost the whole time except after the signing of the FTA. Before that, the XII seems not to have responded to any of the economic integration efforts. The increase in XII after the FTA has also not been significant. On the other hand, the MII increased with bilateral trade during 1990- 2007 period, although two integration efforts - the first when China joined the WTO and the second when New Zealand recognized China as a market economy –seems to have had no influence on the MII. Moreover, the MII seems to have decreased in response to the FTA.

Secondly, because the trade intensity index shows the percentage of bilateral trade in a country’s total trade, any trade increase can only be a small part of China’s trade. It is thus not surprising to see a steadily low level of XII in the New Zealand-China bilateral trade. The small size of New Zealand meanwhile tends to amplify the increase/decrease in MII, but it cannot explain the drop in the MII after the FTA, since imports actually increased significantly. A possible reason for this seemingly aberrant behaviour is the increase in New Zealand’s trade diversification after 2008

#### 4.2 Trade Reciprocity

At first glance, there is no clear pattern in the movement of trade reciprocity and bilateral trade between New Zealand and China. The trade reciprocity index (TRI), which was initially quite low at 0.32 in 1980, has been going up and by 2012 has reached 0.89, as shown in Figure 4. The TRI increased with bilateral trade until 2000, with imports increasing faster than exports. The TRI peaked at 0.99 in 2003, and then decreased until 2007. Thereafter, there was an upward move until 2009, after which there was again a decrease as Chinese imports became dominant over New Zealand’ exports. TRI shows a value of less than unity after 2008, indicating that bilateral trade between the two is not yet balanced. Trade data suggests a tendency towards reciprocal bilateral trade between NZ and China, however, a bilateral balanced trade is yet to be achieved



**Data Sources:** IMF: Direction of Trade and Statistics Yearbooks, Various Issues; Author's Calculations.

**Figure 4.** Trade Reciprocity of New Zealand and China, 1980-2012 (TRI Values)

### 4.3 Intra-industry Trade

This section examines the extent of New Zealand's intra-industry trade with China for the years 1990-2012. IIT was computed using the UN Standard International Trade Classification at the 3-digit level (SITC Rev.3) for all industries from SITC 0 to SITC 9. The 3-digit summary values were also computed for SITC across all industries for the years 1990-2012. The trade data used in the analysis are from the UN Statistical Department, Commodity Trade Division database. All export and import values are in US dollars for each calendar year.

Table 1 reports high and low levels of IIT between New Zealand and China. The results show high IIT in SITC 0 ('Food and Live Animals'). Only two products out of thirteen industries in this section (Sugars, Molasses, Honey SITC 061 and Coffee, Coffee substitutes SITC 071) show high levels of IIT ranging from 46 percent to about 98 percent in 2012. It is noticeable that 'Sugars, Molasses, Honey, Fish dried, Salted, Smoked, and Crustaceans, Molluscs, etc. had high IIT ranging from 59 to 76percent in 1990. The remaining product in this group, 'Fruit' (SITC 058), shows expectedly low levels of IIT but high inter-industry trade, with a trade deficit with China in this category. Given the differences in factor endowments of the two countries, trade in this sector seems to be consistent with the predictions of traditional trade theory. The gains from inter-industry trade are explained by the well-known Heckscher-Ohlin-Samuelson (HOS) comparative advantage trade theory. Intra-industry trade, on the other hand, is explained by theories of economies of scale, product differentiation, technological gap and product life cycle.

The highest IIT in 2012(99 percent) belongs to 'Crude Vegetable Materials' (SITC 292). Within SITC 5 ('Chemicals and related products'), a wide variation in the distribution of inter and intra-industry trade is observed. For example, 'Medicaments' (SITC 542), 'Dying, Tanning Extracts, Synthetic Tanning Materials' (SITC 532), and 'Plastics, N.E.S.' (SITC 575) show high IIT intensity, while the remaining products also have high values of inter-industry trade in 2012. In 1990, 'Starches' (SITC 592) and 'Inorganic Chemical, Elements' (SITC 522) showed high IIT. By

2011 average IIT across industries was 12 percent compared to 23 percent in 1990. A possible explanation is that a large proportion of China's trade in this category is with the US, Japan and other OECD countries. In addition, new products have emerged in this category. It is also observed that there have been trade-widening effects in this category; for example, new products that are traded both ways have also emerged in this category.

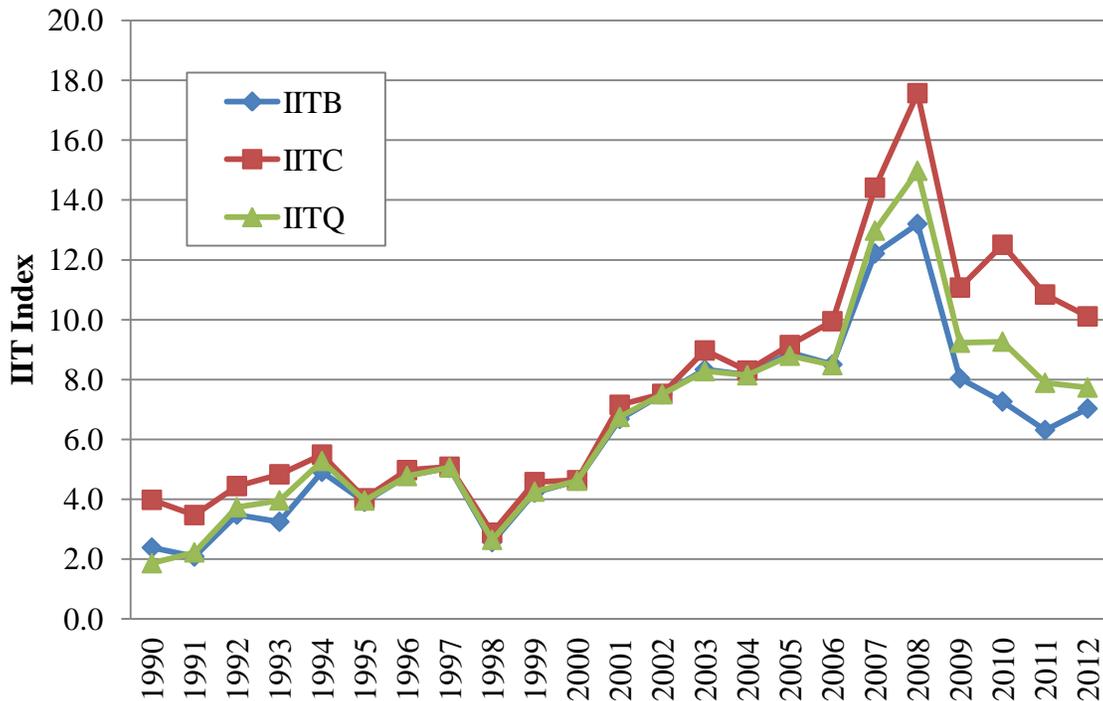
'Perfumery, Cosmetics, Toilet Preparations, Excluding Soaps' (SITC 553) are at the lower end of the IIT index in both 1990, and 2012. All other goods' classifications which appeared at the high and low ends of each industry in 2012 are different from those in 1990, indicating a broad and ever-changing industry classification. There is high IIT in SITC 6, which covers 'Manufactured Goods Classified by Materials', in 2012. This is particularly true in SITC 641: 'Paper, Paperboard' (72 percent IIT), SITC 655: 'knitted or crocheted fabrics' (57 percent IIT) and SITC 634, 'veneers, plywood, particle board, and other wood'. Other industries however show relatively low levels of IIT, but overall the results show that specialization is concentrated on a wide range of products where intra-industry trade has potential for growth.

SITC 7 covering 'Machinery and Transport Equipment', Textile and leather machines (724), Electric power machinery (771), were at the high end of IIT in 1990 at 95 and 85 percent, respectively. IIT values in 'Thermionic, Cold Cathode, or Photocathode Valve' (776) and 'Machine Tools for Working Metal' (733) are significantly high at 99 and 86 percent, respectively, in 2012. Machinery and equipment specialised for particular industries (728), and power generating machinery and parts (718) show IIT values ranging from 51 to 57 percent in 2012. There was very little IIT in SITC 8, which covers 'miscellaneous manufactured articles'.

In each industry except one, a greater number of goods can be classified as being in the 'high' end of the IIT index in 2012 compared to 1990. This makes sense, considering the general trend, which is one of increasing IIT between New Zealand and China during this period. But perhaps the most striking finding is the high level of IIT in non-manufactured goods such as SITC 0-2. In a sense, this indicates a harmonization of 'old' and 'new' trade. China and New Zealand continue to concentrate on their respective areas of comparative advantage in labour-intensive and land-intensive agricultural products such as food and food preparations, but have also developed specific differentiation in a few products, processing them further to satisfy consumer demand. China appears to have comparative advantage in (SITC 0-4) 'processed food, crude materials' (SITC 2) and 'finished manufactured products' (SITC 8), sectors which show low IIT (and high inter-industry trade) with China.

Tables 2-4 show summary values of IIT across product groups at the SITC 3-digit for selected years. The results show that in 1990, the first year of the study period, IIT as a proportion of New Zealand's trade with China was high under the Grubel-Lloyd weighted mean index and the Grubel-Lloyd and Aquino adjusted indexes, but was slightly lower during the period 1991-1995. From 1998 to 2001, New Zealand's IIT with China increased significantly on all the three indexes. From 2001 to 2002 the indices were relatively constant at just above the 2000 level. IIT values for 2005 and 2006 were slightly higher than those of 2004, but IIT values were so much higher in 2007 than in previous years.

The entry of China into the WTO also saw a fall in average tariffs from 25 to 10 percent, making New Zealand's products increasingly attractive to Chinese consumers. Thus, following the expansion of IIT up to 2006, the comparative advantages of each country were reflected in their increasing inter-industry trade. It is very clear that since the FTA went into effect in 2008, the IITC index has decreased to about 10 percent in 2009. IITB and IITQ indices also decreased in 2009, 2010 and 2011, but IITB marginally increased in 2012.



**Data Source:** UN Comtrade Database, and Author's calculations

**Figure 5.** Intra-Industry Trade of New Zealand with China, 1990 – 2012

At this point, three observations concerning the use of the three IIT indices may be made, namely, that: (a) they move in the same direction; (b) their values vary during different years and the variations are substantial during some years; and (c) the Aquino adjusted measure is higher than the Grubel-Lloyd average measure in most of the cases.

As discussed earlier, together with the increase in bilateral trade between the two countries, intra-industry trade also increased, especially in the industries mentioned above. However, the IIT indices tell a different story. Figure 5 shows that before 2000 all three IIT indices kept increasing; but after China joined the WTO in 2001, the IIT began to increase moderately until 2007, but then started decreasing, with the decrease even intensifying after the signing of the New Zealand-China FTA in 2008.

Does the foregoing result lead to the conclusion that economic integration between New Zealand and China is actually negatively related to intra-industry trade? Not necessarily. The relation between economic integration and intra-industry trade remains, in our view, positive. The observed negative relation may be explained by the fact that with the economic integration between New Zealand and China, the number of tradable categories also expanded rapidly. As a result, along with the rapid increase of intra-industry trade, new tradable industries arose which made inter-industry trade grow even faster than previously. This has the effect of reducing the IIT indices, since intra-industry trade and inter-industry trade move in opposite directions. For example, the list of traded goods at the 3-digit SITC level in 2012 is five times longer than the 1990 list. The other evidence is that there are new products and industries that have been classified under the category 'others', SITC 9. (This is not included in our tables, but data and results are available on request from the author.)

## 5. Conclusion

We examined the strength of New Zealand's trade relations with China by estimating trade reciprocity indices, intra-industry trade indices, and trade-intensity indices in the context of an FTA. The results show that New Zealand's trading relations with China has strengthened and intensified since 2008. Trade reciprocity between New Zealand with China, which started relatively low, has also increased after integration in 2008, indicating positive effects from the integration. Trade reciprocity indicates that bilateral trade is not yet balanced, suggesting room for further improvement. Intra-industry trade has developed in selected industries, with about 20 industries across SITC product groups showing high degrees of IIT, with tendencies for further increase.

Three observations concerning the three intra-industry indices are that: (a) they move in the same direction; (b) their values vary during different years and the variations are substantial during some years; and (c) the Aquino adjusted measure is higher than the Grubel-Lloyd average measure in most of the cases. Whereas trade intensity and intra-industry trade indices move in opposite directions, trade-reciprocity and trade intensity seem to move in the same direction.

An interesting observation is that before 2000 all three IIT indices kept increasing; but after China joined the WTO in 2001, the IIT began to increase moderately until 2007, but then started decreasing, with the decrease even intensifying after the signing of the NZ-China FTA in 2008. This however, may not lead to the conclusion that economic integration between New Zealand and China is actually negatively related to intra-industry trade. The relation between economic integration and intra-industry trade remains, in our view, positive. The observed negative relation may be explained by the fact that the number of tradable categories also expanded rapidly after integration. As a result, along with the rapid increase of intra-industry trade, new tradable industries arose which made inter-industry trade grow even faster than previously. This has the effect of reducing the IIT indices, since intra-industry trade and inter-industry trade move in opposite directions.

One concern expressed during the FTA negotiations was that the larger partner would dominate the smaller one. This analysis suggests that has not been the case and that, moreover, there is a possible way out, which is for the smaller country (in this case, New Zealand) to adopt as an industrial strategy, a narrower type of specialization. Thus, economies of scale in production can still be realized. Intra-industry trade is likely to play an important role in strengthening trade relations between integrated countries.

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**Table 1.** New Zealand Intra-Industry Trade (IIT) with China by Industry,  
High and Low IIT Side by Side, 1990 and 2012

1990			2012		
SITC	Description	IITBi	SITC	Description	IITBi
	<b>High IITBi</b>			<b>High IITBi</b>	
061	sugars, molasses, and honey	75.6	061	sugars, molasses, and honey	98.5
	<b>Low IITBi</b>			<b>Low IITBi</b>	
058	fruit preserved, and fruit preparations	1.0	024	cheese and curd	0.0
	<b>Low IITBi</b>			<b>Low IITBi</b>	
112	alcoholic beverages	22.8	111	Non-alcoholic beverages, n.e.s.	39.3
			112	alcoholic beverages	7.6
	<b>High IITBi</b>			<b>High IITBi</b>	
278	crude minerals, n.e.s.	60.3	292	crude vegetable materials, n.e.s.	98.9
	<b>Low IITBi</b>			<b>Low IITBi</b>	
211	hides and skins (except furskins), raw	5.0	287	ores and concentrates of base metals, n.e.s.	15.3
268	wool and other animal hair (including wool tops)	2.9	248	wood, simply worked and railway sleepers of wood	4.5
	<b>High IITBi</b>			<b>High IITBi</b>	
592	starches, inulin and wheat gluten; albuminoidal substances; glues	51.3	542	medicaments (including veterinary medicaments)	63.6
	<b>Low IITBi</b>			<b>Low IITBi</b>	
541	medicinal and pharmaceutical products, other than medicaments (of group 542)	17.9	554	soap, cleansing and polishing preparations	3.4
554	soap, cleansing and polishing preparations	6.1	581	tubes, pipes and hoses of plastics	1.9
593	explosives and pyrotechnic products	4.1	531	synthetic organic coloring matter and color lakes and preparations based thereon	1.7
575	plastics, n.e.s., in primary forms	3.2	551	essential oils, perfume and flavor materials	1.5
553	perfumery, cosmetics, or toilet preparations, excluding soaps	2.3	553	perfumery, cosmetics, or toilet preparations, excluding soaps	1.3
	<b>High IITBi</b>			<b>High IITBi</b>	
693	wire products (excluding insulated electrical wiring) and fencing grills	85.3	613	furskins, tanned or dressed	44.2
	<b>Low IITBi</b>			<b>Low IITBi</b>	
611	leather	8.3	658	made-up articles, wholly or chiefly of textile materials, n.e.s.	0.7
651	textile yarn	7.5	662	clay construction materials and refractory construction materials	0.4
641	paper and paperboard	4.7	665	glassware	0.4
699	manufactures of base metal, n.e.s.	3.6	679	iron and steel tubes, pipes and hollow	0.3

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			profiles, fittings for tubes and pipes		
	<b>High IITBi</b>		<b>High IITBi</b>		
724	textile and leather machinery, and parts thereof, n.e.s.	94.9	776	thermionic, cold cathode or photocathode valve	99.4
771	electric power machinery	85.0	733	machine tools for working metal, sintered metal carbides or cermets	86.0
742	pumps for liquids	76.3	728	machinery and equipment specialized for particular industries	56.7
741	heating and cooling equipment	63.1	718	power generating machinery and parts thereof, n.e.s.	51.0
	<b>Low IITBi</b>		<b>Low IITBi</b>		
745	nonelectrical machinery, tools and mechanical apparatus	30.2	764	telecommunications equipment	1.1
751	office machines	14.4	785	motorcycles	0.5
759	parts and accessories	8.9	752	automatic data processing machines and units thereof	0.4
728	machinery and equipment specialized for particular industries	7.3	761	tv receivers	0.2
778	electrical machinery and apparatus, n.e.s.	3.6	775	household type electrical and nonelectrical equipment, n.e.s.	0.2
752	automatic data processing machines and units thereof	1.4	751	office machines	0.2
	<b>High IITBi</b>		<b>High IITBi</b>		
			872	instruments and appliances	94.6
			896	works of art, collectors' pieces and antiques	90.1
	<b>Low IITBi</b>		<b>Low IITBi</b>		
874	Measuring, Checking, Analysing and Controlling Instruments and Apparatus, N.E.S.	35.8	874	Measuring, Checking, Analysing And Controlling Instruments And Apparatus, N.E.S.	25.0
873	Meters And Counters, N.E.S.	26.7	896	Works Of Art, Collectors' Pieces And Antiques	24.0
898	Musical Instruments	5.4	873	Meters And Counters, N.E.S.	19.0
844	Women's Or Girls' Coats, Capes, Jackets, Suits, Trousers, Dresses, Underwear, Etc.	3.7	891	Arms And Ammunition	14.0
892	Printed Matter	0.9	893	Articles, N.E.S. Of Plastics	4.0
841	Men's Or Boys' Coats, Jackets, Suits, Trousers, Shirts, Underwear Etc.	0.8	848	Articles Of Apparel And Clothing Accessories	2.0
842	Women's Or Girls' Coats, Capes, Jackets, Suits, Trousers, Dresses, Skirts, Underwear, Etc.	0.6	899	Miscellaneous Manufactured Articles, N.E.S.	2.0

**Table 2.** NZ-China IIT by Industry 3-Digit Summary Values in 2012

Industry		Av-IITB	Av-IITC	Av-IITQ
0	Food and Live Animals	3.8	43.1	18.4
1	Beverage and Tobacco	11.5	38.6	25.9
2	Crude materials inedible except fuels	1.8	32.6	13.2
3	Mineral Fuels Lubricants and related materials	0.0	0.0	0.0
4	Animal and Vegetable Oils and fats	2.8	22.3	12.2
5	Chemicals	8.0	15.0	12.4
6	Manufactured Goods Classified chiefly by materials	10.2	67.8	23.8
7	Machinery and Transport equipment	6.8	99.9	26.7
8	Miscellaneous Manufactured Articles	2.3	100.0	29.4
9	Commodities and Transactions not classified	63.2	100.0	100.0

**Table 3.** NZ-China IIT by Industry 3-Digit Summary Values 2000

Industry		Av-IITB	Av-IITC	Av-IITQ
0	Food and Live Animals	20.15	50.67	23.52
1	Beverage and Tobacco	85.27	100.00	93.91
2	Crude materials inedible except fuels	6.68	24.87	11.44
5	Chemicals	7.69	7.84	7.73
6	Manufactured Goods Classified chiefly by materials	6.58	9.92	6.39
7	Machinery and Transport equipment	13.31	94.71	37.90
8	Miscellaneous Manufactured Articles	0.48	98.52	28.96

**Table 4.** NZ-China IIT by Industry 3-Digit Summary Values 1990

Industry		Av-IITB	Av-IITC	Av-IITQ
0	Food and Live Animals	15.66	77.65	16.99
1	Beverage and Tobacco	23.73	100.00	100.00
2	Crude materials inedible except fuels	5.78	62.36	28.94
5	Chemicals	31.24	40.13	37.78
6	Manufactured Goods Classified chiefly by materials	15.93	25.00	15.63
7	Machinery and Transport equipment	42.48	46.42	40.16
8	Miscellaneous Manufactured Articles	1.08	50.00	22.89

**Data Sources:** UN ComTrade Database; Author's Calculations