

**New Zealand-China Intra-Industry Trade: Current  
Trends and Future Potential**

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## List of Abbreviations

ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CTC	Change of Tariff Classification
CER	Closer Economic Relations
CERA	Closer Economic Relations Agreement
C.A.G.R	Compound Annual Growth Rate
CIIF	Costs Including Insurance and Freight
FDI	Foreign Direct Investment
FOB	Free on Board
FTA	Free Trade Agreement
GTAP	Global Trade Analysis Projects
GDP	Gross Domestic Product
GL index	Grubel and Lloyd index
HS	Harmonised System
IIT	Intra-Industry Trade
MFN	Most Favoured Nation
NZ	New Zealand
NAFTA	North American Free Trade Agreement
OECD	Organization for Economic Co-operation and Development
PTA	Preferential Trade Agreement
RVC	Regional Value Content
ROO	Rules of Origin
SITC	Standard International Trade Classification
TII	Trade Intensity Index
UNCTSD	United Nations Commodity Trade Statistics Database
US	United States
WTO	World Trade Organization



WTOSD

World Trade Organization Statistics Database

## **Attestations of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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## **Abstract**

Intra-industry trade (IIT) that involves exports and imports within the same industry has become more and more important in international trade in recent years. Developed countries (e.g. Germany, Japan and the United States) have experienced great benefits from such trade. However, there has been very little research on New Zealand's IIT with its trading partners except for Bano's (2002) study of analyzing IIT between New Zealand, Australia, and the selected Asia-Pacific countries; with no specific literature analyzing the New Zealand-China bilateral trade relationship in recent years, even though China has become New Zealand's second-largest trading partner on both exports and imports in the year 2010 (New Zealand Ministry of Foreign Affairs & Trade, 2010d). Therefore, this research analyzes the emerging trends in New Zealand-China trade and further analyzes the current trends over the period 2000-2009 and future potential of IIT between these two countries.

This research first analyzes the emerging trends in New Zealand-China bilateral trade. Results has shown that the two countries have strengthened bilateral trade over the observed period, with New Zealand importing more than exporting to China, thereby recording a merchandise trade deficit. New Zealand exports mainly agricultural products to and imports manufacturing products from China, indicating more inter-industry trade, involving exchange of different products. The research also discusses the importance of the New Zealand-China Free Trade Agreement (FTA) that is expected to liberalize and facilitate trade by removing trade barriers on goods, services and investment flows in the future.

Second, both past theoretical and empirical literature on IIT have been reviewed with emphasis on those specifically involving analysis of IIT between New Zealand and China. The country specific determinants are summarized in detail. In this research, two measures (Grubel and Lloyd index and Rajan's index) are employed

to examine IIT between New Zealand and China. These indices are used to estimate both the level and degree of IIT and product classification level at two-digit Harmonised System (HS) is used, as the level of IIT is hypothesized to be low after analyzing the determinants.

The research confirms that New Zealand currently has a very low level of IIT with China and the number of industries which have IIT with China are very few and primarily concentrated in the manufacturing sector. Results show that product categories HS 29 (organic chemicals) and HS 48 (paper products) seem to involve relatively higher levels of IIT than other product categories. Further, the research also confirms that potentially there are no product categories involving both higher level of IIT with increasing degree of IIT between these two countries. Another important finding is that trade imbalance problem has not influenced New Zealand-China IIT significantly.

However, since the FTA was only signed in 2008, the impact of the FTA on IIT is yet not clear, therefore, future trends of New Zealand-China bilateral trade should be watched to evaluate the influence of the FTA on IIT in the near future.

# Chapter 1: Introduction

Intra-industry trade (IIT) has gained considerable attention in international trade as the rapid growth of simultaneous export and import of similar goods produced in the same industry emerged not only within developed countries but also between developing countries. The trade of similar products or substitutes is driven by consumer demand for different tastes and preferences among trading partners. These products, however, are not homogeneous but are differentiated by style, design and functional attributes.

Over recent decades, there has been extensive interest in the area of IIT, which seems to have become more important over time (Menon & Dixon, 1996; Hu & Ma, 1999; Blanes & Martin, 2000; Ekanayake, 2001; Martin-Montaner & Rios, 2002; Turkcan, 2005; Bergstrand & Egger, 2006; Caetano & Galego, 2007). Many studies suggest that developed countries with more specialized trade structures have higher IIT shares (Menon, 1994; Sharma, 2000; Bano, 2002). High shares of IIT allow a high level of international trade. Furthermore, IIT has some important implications for adjusting economies (Krugman, 1981; Davis, 1995; Brulhart & Thorpe, 1999; Caetano & Galego, 2007), it insures less resource movement between sectors and/or countries, and thus fewer adjustment problems occur.

Since there has been very little study on New Zealand's IIT in the past (except Bano's study of analyzing IIT between New Zealand, Australia, and the selected Asia-Pacific countries, 2002) that estimate the potential impacts on New Zealand economy, it is meaningful to investigate the current trends and future IIT of New Zealand with its important trading partners (e.g. China). Since there is no specific literature published on IIT between New Zealand and China so far, and China has become New Zealand's second-largest trading partner on both exports and imports in the year 2010 (New Zealand Ministry of Foreign Affairs & Trade, 2010d), hence,

there is a special need of further work concentrated on New Zealand-China IIT.

The following sections of this chapter will present the objectives of this research, motivations of this research and the structure of this research.

## **1.1 Objectives**

Due to the rising interest in IIT and the important trading relationship with China, especially as New Zealand signed the Free Trade Agreement (FTA)<sup>1</sup> with China in 2008 and China becomes New Zealand's second largest trading partner in 2010, it is necessary to investigate IIT between New Zealand and China, and in particular the early impact of the FTA signed in 2008. Further, very few literature have studied New Zealand IIT except for Bano (2002) with no specific literature available on New Zealand IIT with China. Therefore, it is an area of limited research. The findings would be valuable for policy makers in future bilateral trade decision making and in the development of a dynamic trading environment.

The main objectives are first, to analyze the current trends and future potential of IIT between New Zealand and China. This research has chosen the recent 10 year period of 2000 to 2009, because this will provide the most accurate and recent information of emerging trends in New Zealand-China bilateral trade and consider the early impact of the FTA. The two-digit aggregated Harmonised System (HS) product classification has been chosen to investigate New Zealand's trade patterns and IIT with China at industry level.

China has advanced from the sixth-largest exports market and fourth-largest source of imports for New Zealand in 2000 to become the second-largest trading partner

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<sup>1</sup> A Free Trade Agreement (FTA) is defined as an agreement between member countries wherein trade barriers are mutually reduced or eliminated while maintaining them for non-member countries. The term FTA is preferred by policymakers while economists prefer to use the term Preferential Trade Agreement (PTA) since these agreements provide preferential treatment to member countries and more often than not, do not completely remove all trade barriers.

for both exports and imports in 2010 (New Zealand Ministry of Foreign Affairs & Trade, 2010b & d). This is a dramatic change as China is now becoming a more important country to trade with from the New Zealand perspective and the future is likely to see these two countries develop even closer economic linkages that result in sound sustainable development.

Secondly, this research aims to measure the extent of IIT, and to identify the determinants that would influence IIT between New Zealand and China. Thus, this research will reveal the central question of whether New Zealand's trade with China involves significant level or amount of IIT and to what extent the trends have changed over the past decade.

Determinants are important factors which influence a country's level of IIT, and moreover, for New Zealand, what determinants will have the most significant effects on economy and international trade should be identified. Moreover, for measuring the extent of IIT, two indices (Grubel and Lloyd index and Rajan's index) are adopted for comparing the degree of IIT as trade imbalance problem can create serious biases. The preference for these two indices is due to the fact that the GL index is widely used to measure IIT, while Rajan's index has the advantage over GL index as it minimizes the downward bias due to trade imbalance. Thus, the two indices have been chosen in order to compare the results of the degree of IIT. The level of IIT between the two countries is also analyzed to compare the degree of IIT accurately.

## **1.2 Motivations**

Since most of the existing IIT literature has only focused on developed countries, there are very few studies involving developing countries and/or between developed and developing countries (e.g. Hu & Ma, 1999; Ekanayake, 2001; Turkan, 2005; Zhang, Witteloostuijn & Zhou, 2005). Some empirical evidences



indicate that IIT is high among developed countries but low among developing countries (Grubel & Lloyd, 1975; Balassa, 1986; Menon, 1994; Hu & Ma, 1999; Sharma, 2000; Bano, 2002). This would lead one to believe that New Zealand-China trade would be largely based on inter-industry trade<sup>2</sup>. However, given the increasing volume of bilateral trade between New Zealand and China in recent years, there is a special need to analyze the current trends and future potential of IIT between the two countries.

New Zealand signed the FTA with China in year 2008; China is now New Zealand's second-largest trading partner. This FTA has key ramifications to both New Zealand and China. As the two countries are largely reliant on international trade, it can provide some insurance in that each has preferential access to the other's market. China is an important large market now open to New Zealand, so New Zealand can benefit much from the FTA and should therefore not take this opportunity lightly, especially as China has also been negotiating with other countries (e.g. Australia).

The New Zealand-China FTA will result in a remarkable increase in trade creation, Gross Domestic Product (GDP), welfare and investment for both countries, especially for New Zealand (Tan & Cai, 2010). Both countries can benefit from their natural factor endowments based on different comparative advantages. Moreover, and perhaps most importantly, as the Chinese economy continues to grow at a remarkable rate, through this FTA New Zealand businesses have the opportunity to take the early advantage over other foreign competitors by having preferential access. Therefore, it is interesting to take a close look at whether the FTA has any influences on stimulating New Zealand-China IIT. In Chapter 2, this research analyzes the emerging trends in New Zealand-China trade and discusses the importance of the FTA in stimulating IIT.

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<sup>2</sup> According to the Heckscher–Ohlin theorem, a land abundant country will export its land intensive goods; on the contrary, the labor abundant country will export the labor intensive goods. Therefore, New Zealand should export land intensive goods and import labor intensive goods from China in exchange, which is often categorized as inter-industry trade (Appleyard, Field & Cobb, 2010, Chapter 8).

In addition, a large number of theoretical and empirical studies have focused on investigating the determinants of IIT and its trade patterns in many countries (Bergstrand, 1990; Hu & Ma, 1999; Sharma, 2000; Ekanayake, 2001; Turkcan, 2005; Caetano & Galego, 2007), but none of them have systematically included for New Zealand. Besides, determinants are significant and can influence IIT among bilateral trading partners. This research should not ignore such important factors especially when considering a hypothesis of New Zealand-China IIT. In this research, Chapter 3 provides a review of understanding the patterns and determinants that hold for IIT between countries.

By analyzing IIT between New Zealand and China, it is also important to distinguish the degree of IIT from the level of IIT. This is because a higher degree of IIT may incorrectly indicate a high level of IIT if countries exchange products from the same industry contains insignificantly proportion of total trade. Earlier studies (e.g. Hu & Ma, 1999; Bano, 2002) have not addressed this problem but only measured IIT at country level between New Zealand and China. Hence, this research of New Zealand-China IIT will improve upon those studies by estimating the level and degree of IIT for the top 20 product categories<sup>3</sup> in order to correctly estimate the potential of IIT among the two countries. Thus, distinguishing between the degree of IIT and the level of IIT will provide more accurate results than other previous studies involving New Zealand and China.

### **1.3 Structure**

Chapter 1 first introduces the objectives and motivations for analysing IIT between New Zealand and China. Then, the following chapters focus on analysing past research and using the alternative measures proposed to estimate the major trends of IIT between the two countries.

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<sup>3</sup> Chapter 5 will present summary tables of analysis for the top 10 product categories and detail all results for the top 20 product categories in Appendices B & C.

The remainder of this research is organized as follows: Chapter 2 provides an analysis of emerging trends in New Zealand-China bilateral trade. It also discusses the New Zealand-China FTA and its implications for future bilateral trade and IIT. Chapter 3 reviews the theoretical and empirical literature on IIT and summarizes the determinants that influence a country's IIT. Alternative measures of IIT and methodological issues will be discussed in Chapter 4, as well as the aggregation problem which can result in serious biases. Chapter 5 estimates the level and degree of New Zealand-China IIT, focusing on the top 20 product categories. These estimates are then compared with theoretical predictions from standard theories of IIT to check whether they are consistent with the hypothesis suggested. Chapter 6 concludes this research highlighting the main findings, limitations and directions for future research.

# **Chapter 2: Emerging Trends in New Zealand-China Bilateral Merchandise Trade**

## **2.1 Introduction**

New Zealand's trade with China can be traced back to the early 19<sup>th</sup> century, so it has been happening for generations. The two nations are continually seeking to enhance their longstanding close relationship and to always respect each other's cultural values. Both countries are members of the World Trade Organization (WTO) and the Asia-Pacific Economic Cooperation (APEC)<sup>4</sup>. Their very close partnership means both look forward to continual mutual prosperity. From the 1990s China opened its door further in trade policies, experiencing high positive economic growth and searching for strategies to maintain its future growth. Bilateral trade plays a significant role in this, not just to facilitate trade and pursue economic growth but also with some political spinoffs. New Zealand was the first developed country to recognize China's status as a market economy (New Zealand Ministry of Foreign Affairs & Trade, 2010a). Hence, it is necessary to take a close look at the two countries' bilateral merchandise trade relationship<sup>5</sup>.

This chapter is organized as follows. Section 2.2 discusses the historical developments in the trade relationship. Section 2.3 analyzes the emerging trends in the value, trade share and growth of New Zealand's trade with China over the years 2000 to 2009 period. The primary data is obtained from Statistics New Zealand (2010a & b). Section 2.4 presents the trends in bilateral trade intensity between the two countries highlighting the relative importance of China in New Zealand's total trade over the chosen time period. Section 2.5 analyzes the commodity composition

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<sup>4</sup> New Zealand has been a WTO member since 1 January 1995 and a member of APEC since November 1989; China has been a member of WTO since 11 December 2001 and a member of APEC since November 1991 (World Trade Organization, 2010b; Asia-Pacific Economic Cooperation, 2010).

<sup>5</sup> Bilateral data on trade in services is not published, and hence the analysis in this research is limited to merchandise trade.

of bilateral trade between the two countries. The New Zealand-China FTA is introduced and key outcomes are presented in Section 2.6. Section 2.7 analyzes the implications of the New Zealand-China FTA for bilateral trade and IIT. Section 2.8 summarizes the key issues discussed.

## **2.2 New Zealand-China Historical Trade Developments**

New Zealand has had longstanding trading relationship with China and it is now New Zealand's second-largest trading partner overtaking the United States. China is also a major source of migrants, students and tourists to New Zealand (New Zealand Ministry of Foreign Affairs & Trade, 2010d). As the members of WTO and APEC, the two countries have attempted to move towards a free trade that not just liberalizes and facilitates trade but also builds a close economic partnership.

New Zealand exported NZ\$4.11 billion to China and imported NZ\$6.12 billion from in year to June 2010 (New Zealand Ministry of Foreign Affairs & Trade, 2010d). China remains New Zealand's largest market for international students in the education sector and the fourth largest market for tourism in New Zealand. New Zealand's main exports to China are dairy products, wood, wool and other agricultural products; main imports include machinery, electrical machinery and equipment, knit apparel and other manufactured products. With a remarkable increases in trade, especially exports, such as dairy products (NZ\$1.43 billion, up 75% year to June 2010) and wood (NZ\$827 million, up 48% year to June 2010), New Zealand has strengthened the bilateral relationship with China as it is New Zealand's one of the most important foreign markets (New Zealand Ministry of Foreign Affairs & Trade, 2010d).

As New Zealand Ministry of Foreign Affairs & Trade states:

“The China-New Zealand relationship is characterized by regular high-level contacts, an expanding range of official dialogues - both formal and informal, healthy and diversifying trade and economic flows in both directions, and strengthening people-to-people contacts”. (2010d)

New Zealand and China have a longstanding trading history; the two nations wish to build up a long term stable relationship to enhance trade cooperation and economic growth. In 2004, the two countries launched first round of negotiations of the FTA, followed by a Joint Feasibility Study. After over 15 rounds, the FTA was ultimately signed in Beijing in April 2008 (New Zealand Ministry of Foreign Affairs & Trade, 2010a). Over time the FTA provides for the removal of tariffs on 96% of New Zealand exports to China. This will result in a saving of NZ\$115.5 million in annual duties based on current trade levels. It is expected that in the first year of implementation New Zealand exports to China could increase by NZ\$1 billion to \$3.5 billion (New Zealand Ministry of Foreign Affairs & Trade, 2010c & d).

Moreover, New Zealand itself is important to China, as the two have created three “firsts” from the milestone arrangements between them. New Zealand was the first developed country to conclude a bilateral agreement with China on its accession to the WTO; New Zealand was the first developed country to recognize China’s status as a market economy; New Zealand was the first developed country to enter into FTA negotiations and conclude an FTA with China (New Zealand Ministry of Foreign Affairs & Trade, 2010a). On the other hand, signing an FTA with New Zealand will to China be a window into a distant land to show it the foreign world, and that China’s development can better take advantages offered when negotiating with other developed countries.

The FTA covers trade in goods as well as services and investment, the details of the

FTA will be discussed in Section 2.6.

## **2.3 Trends in New Zealand-China Bilateral Trade: 2000-2009**

As shown in Appendix A, there has been significant growth in both trade value and share of total exports and imports over the period 2000 to 2009. Exports to China have more than trebled in value terms and nearly trebled in percentage of total exports. On the other hand, imports from China have more than trebled as well and the share of total imports has doubled. However, the growth rate of exports and imports have fluctuated over the observed period, while some years have even witnessed small contractions.

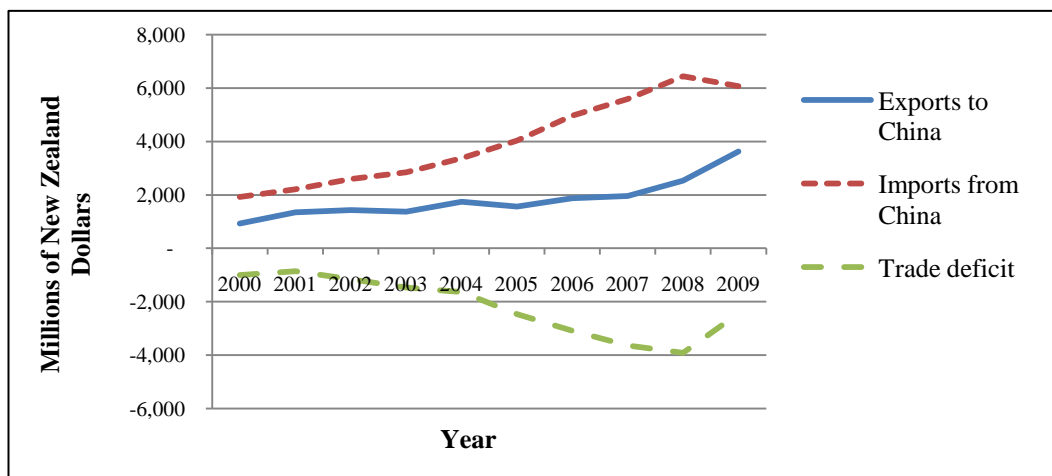
### **2.3.1 Value of exports, imports and trade balance**

Over the observed years, exports to China rose from NZ\$929.62 million in 2000 to NZ\$3,627.53 million in 2009, more than trebled; while imports from China increased to NZ\$6,065.55 million in 2009 from NZ\$1,924.49 million. The two countries increased bilateral trade in value terms over the ten years. Both exports and imports have consistently increasing trends over 2000-2009 except when exports dropped a little bit in 2003 and 2005, while imports decreased in 2009.

However, with respect to New Zealand, there is trade deficit with China as shown in Figure 1. This deficit increased in value over the period 2000 to 2008 and then slightly reduced in year 2009, indicating imports from China have dominated over its exports to China. Whereas, since the FTA signed in year 2008, exports to China expanded quite significantly since then as China's increased demand for New Zealand agriculture products. This is consistent with the expectation that in the first year of implementation New Zealand exports to China would increase by NZ\$1 billion to \$3.5 billion which was stated in Section 2.2. The biggest contributor is the dairy products, according to Infoshare, Statistics New Zealand (2010c).

In addition, due to the impacts of financial crisis which started at the end of the year 2008, New Zealand exported fewer goods to the world but more to China in 2009. However, imports from the world, as well as from China have decreased. Imports from China dropped a bit from NZ\$6,443.74 million (2008) to NZ\$6,065.66 million (2009) (see Appendix A). In a word, these can be the reasons why New Zealand's trade deficit has decreased since 2008 but the future trend is not clear yet.

**Figure 1: New Zealand exports, imports and trade deficit with China: 2000-2009**



Source: Author's calculations, based on Statistics New Zealand (2010a & b).

### 2.3.2 Trade shares

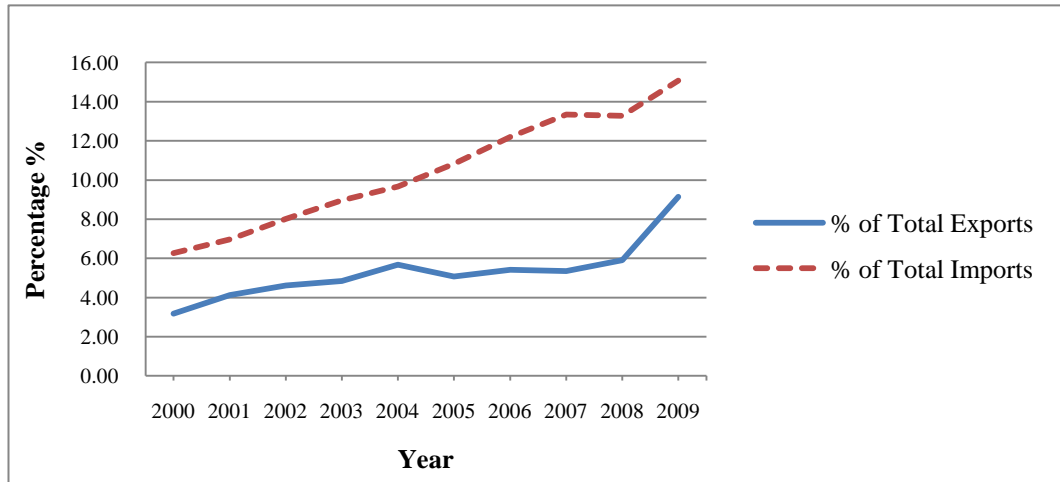
As is observable in Appendix A, the shares of exports to and imports from China with respect to the total New Zealand exports to and imports from the world are overall increasing even though there were some downward movements within the selected period. It can be seen from Figure 2 that the share of total imports from China is significantly higher than share of total exports to China. In numerical terms imports nearly are twice as much as exports in some years. This could be due to increased demand for Chinese imports into New Zealand.

It is expected that the FTA will cause the two countries to increase bilateral trade. Therefore, share of total exports and imports could grow in the near future. New



Zealand will use this FTA to facilitate trade and strengthen bilateral linkages with China, and furthermore, expands its exports to China.

**Figure 2: Share of New Zealand’s total exports to and imports from China: 2000-2009**



Source: Author’s calculations, based on Statistics New Zealand (2010a & b).

### 2.3.3 Growth of bilateral trade

As can be observed in Appendix A, both exports and imports have increased significantly over the ten years, and the growth rates can be used to forecast future bilateral trade. However, according to Figure 3, the export growth rates rose and fell quite erratically. For instance, from a 45.15% increase in 2001 export growth rates plunged to negative 3.76% in 2003 then rose again. The fluctuation of import growth rates is similar to that of exports. This means that growth has not been stable or sustained.

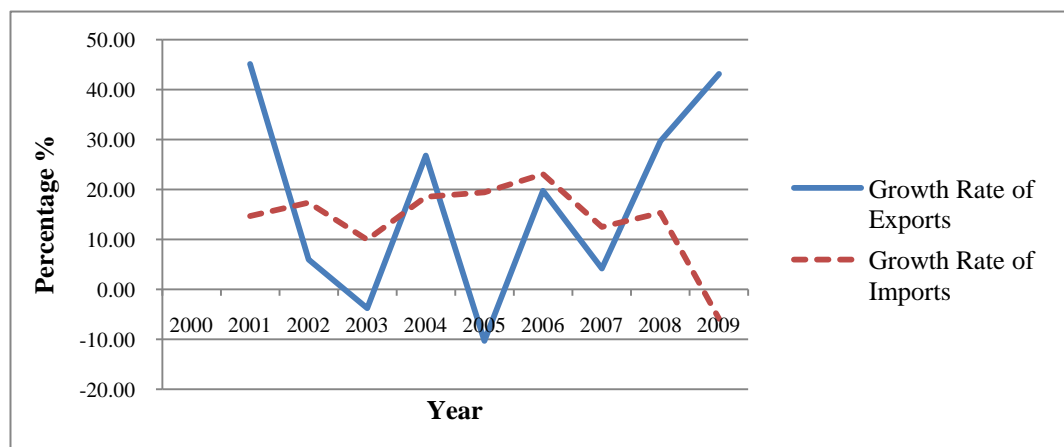
Thereby, a special formula is needed to calculate the overall growth rates. By using the Compound Annual Growth Rate (C.A.G.R) the time period is broken into two parts: 2000-2004 and 2005-2009. C.A.G.R is often used for the year by year growth rate of a business or investment over a given period of time. This can be used to interpret the overall growth rate of New Zealand exports to and imports from China. The formula is presented as:

$$C. A. G. R = \left\{ \left[ \left( \frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{\text{Number of Years}}} \right] - 1 \right\} * 100\%$$

Over the period of 2000-2004, exports to China increased by 13.43% and for the period 2005-2009, exports to China also increased by 18.3%. On the other hand, when looking at imports from China, the two time periods have the same increasing trends of 11.9% (2000-2004) and 8.5% (2005-2009). However, during the time of the financial crisis, exports to China still had strong growth over previous years but this was not the case for imports from China. Hence, it can be concluded that, over the observed period, both exports to and imports from China have increasing trends of growth rate indicating the New Zealand expanded its bilateral trade with China.

Nevertheless, it is important to point out that in year 2009, the first year of implementation of the FTA, imports growth rate has had a negative value of 5.87%; imports have contracted not just from China but all over the world<sup>6</sup>, as explained earlier. While, exports to China have actually grown at a rate of 43.18%, which is higher than the previous year, under the time of financial crisis. This is consistent with the expectation of New Zealand Ministry of Foreign Affairs & Trade that New Zealand exports to China would increase by NZ\$1 billion.

**Figure 3: Growth rate of New Zealand’s exports to and imports from China: 2000-2009**



Source: Author’s calculations, based on Statistics New Zealand (2010a & b).

<sup>6</sup> Total New Zealand imports decreased from NZ\$48,514.06 million in 2008 to NZ\$40,220.79 million in 2009, equivalent to a rate of 17.9%.

## 2.4 Trade Intensity Trends

The previous section shows the trends of New Zealand-China bilateral trade over the selected period and that the two countries have strengthened their trade relationships. However, the preceding trends are absolute in nature and do not provide an estimate of the relative importance of China in New Zealand's trade. Even though the total trade value between the two countries have risen significantly, the proportion of increase in trade might not be as great as that of other New Zealand trading partners or the world. Hence trade intensity needs to be estimated.

The Trade Intensity Index (TII) is used to measure whether the bilateral trade between two countries is strengthened or weakened as expected, given their importance in world trade. This is to understand the nature of the trading relationship between partners and to properly analyze the importance of factors of variation over time (Bano, 2002). The index interprets whether a country exports more to its trading partner than the world does across countries.

Some empirical studies have suggested that the stronger the trade intensity, the higher the IIT that will exist (Ekanayake, 2001; Bano, 2002). As trade between trading partners expand, IIT is more likely to occur since more differentiated products may be demanded. Therefore, it is important to account for trade intensity before measuring IIT between the two countries.

According to the Asian Development Bank (ADB) (2010a), TII is the proportion of trade share of a country ( $i$ ) divided by the share of world trade with a partner ( $j$ ). It is calculated as:

$$TII_{ij} = (t_{ij}/T_{iw}) / (t_{wj}/T_{ww})$$

Where  $t_{ij}$  is the total trade of home country  $i$  with its trading partner country  $j$ ,  $T_{iw}$  is

the total trade of home country  $i$  with the world,  $t_{wj}$  is the world trade with country  $j$ , and  $T_{ww}$  is the total world trade. The results take values between 0 and  $+\infty$ . A value more than one indicates that trade flow between trading partners is greater than expected. By contrast, a value less than 1 means lower trade intensity exists.

The results in Table 1 were obtained from the ADB, Asia Regional Integration Center–Integration Indicators database for New Zealand and China, for the years 2000 to 2008. However, the results for year 2009 is not available, therefore, TII is calculated separately for the year 2009 using data collected from United Nations Commodity Trade Statistics Database (UNCTSD) (2010b) and World Trade Organization Statistics Database (WTOSD) (2010a). The use of the trade intensity index is to indicate whether the bilateral trading relationship of New Zealand and China is strengthened.

**Table 1: Trade intensity between New Zealand and China**

Home Country	Trading Partner Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*
China	New Zealand	1.05	1.03	1.01	0.94	0.95	0.86	0.85	0.88	0.89	1.03
New Zealand	China	0.99	1.08	1.10	1.09	1.12	1.10	1.16	1.16	1.18	1.39

Source: ADB, Integration Indicators Database (2010b); \*Year 2009 data are author’s calculations, based on United Nations (2010b) and World Trade Organization (2010a).

From Table 1 it can be seen that the trade intensity results show an increasing trend for New Zealand-China trade. The values of the trade intensity index presented above are all greater than 1 over the observing years except in year 2000, which was just below (0.99). This indicates that trade flow between New Zealand and China is higher relative to New Zealand’s trade with rest of the world and the bilateral trade between the two countries has strengthened relatively to rest of the world over the last decade.

In contrast, the China-New Zealand trade intensity index shows a decreasing trend from year 2000 to 2006, although increases in relatively small values occurred in years 2007 and 2009. The values have reduced from 1.05 (year 2000) to 0.89 (year 2008), which indicates bilateral trade flow is smaller than expected. This may be because, as the Chinese economy expands, trade share with New Zealand increases as not great as other countries even though trade volume did significantly increase.

Over the observed period, the results for year 2009 is calculated separately, while it still can be concluded that bilateral trading relationship of New Zealand is intensified indicating a higher degree of integration with China. Overall, China is a more important trading partner for New Zealand relative to rest of the world, compared to New Zealand for China.

## **2.5 Commodity Composition of New Zealand-China Trade**

Table 2 and Table 3 show New Zealand's top 10 exports to and imports from China in the year 2000 and 2009, this reveals the composition of the major products traded with China over the observing time and the importance of those products in total trade. Industries or categories are classified in the two-digit aggregated Harmonised System product classification level for New Zealand<sup>7</sup>.

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<sup>7</sup> See Appendix D for a list of product description of HS 2 digit product categories used in this research.

**Table 2: Top 10 New Zealand's exports to China: 2000 and 2009**

Year 2000			Year 2009		
HS Code	Amount (\$million)	Share in total %	HS Code	Amount (\$million)	Share in total %
51	150.50	16.19%	04	977.76	26.95%
04	114.56	12.32%	44	703.06	19.38%
44	88.02	9.47%	19	281.14	7.75%
29	87.59	9.42%	51	239.62	6.61%
47	65.62	7.06%	02	140.52	3.87%
41	59.87	6.44%	05	139.35	3.84%
15	44.65	4.80%	03	136.39	3.76%
23	40.70	4.38%	47	129.52	3.57%
03	37.94	4.08%	15	97.79	2.70%
05	36.15	3.89%	98	85.97	2.37%
<b>Total</b>	<b>725.60</b>	<b>78.05%</b>	<b>Total</b>	<b>2931.12</b>	<b>80.80%</b>
<b>Top 10</b>			<b>Top 10</b>		

Source: Author's calculations, based on Statistics New Zealand infoshare (2010c).

Table 2 presents the top 10 New Zealand's exports to China in 2000 and 2009. The major exports are agriculture products such as dairy products, wood, and wool. However, it should be pointed out that in the year 2000, HS 29 has relatively significant share in total exports, which is 9.42% (NZ\$87.59 million), but in 2009, HS 29 is not included in list of the top 10 exports categories and may indicate that HS 29 becomes less important when compared with the year 2000.

On the other hand, HS 04 and HS 44 have increased dramatically to be the first and second exports in 2009. Trade values have risen as much as 8 times and shares in total have increased over twice than that in the year 2000 (NZ\$977.76 million for HS 04 and NZ\$703.06 million for HS 44 in 2009). This phenomenon indicates that China continues to demand New Zealand's agriculture products to meet its growing demand for high quality life (Tang, 2007).

Overall, New Zealand's top 10 exports to China in 2000 valued NZ\$725.60 million and contained 78.05% of New Zealand total exports. While in 2009, exports to China increased to NZ\$2,931.12 million, over three times than that of 2000 and

share in total exports remains the similar level of 80%, indicating that New Zealand mainly exported agriculture products which concentrated on several industries.

**Table 3: Top 10 New Zealand’s imports from China: 2000 and 2009**

Year 2000			Year 2009		
HS Code	Amount (\$million)	Share in total %	HS Code	Amount (\$million)	Share in total %
61	280.66	14.58%	85	1,210.28	19.95%
85	261.46	13.59%	84	1,025.47	16.91%
62	246.20	12.79%	61	516.59	8.52%
95	137.31	7.13%	62	435.51	7.18%
84	133.64	6.94%	94	272.91	4.50%
64	110.71	5.75%	95	239.66	3.95%
94	65.18	3.39%	64	218.27	3.60%
39	57.30	2.98%	73	214.67	3.54%
42	55.91	2.91%	39	211.44	3.49%
63	52.33	2.72%	63	143.90	2.37%
<b>Total</b>	<b>1400.70</b>	<b>72.78%</b>	<b>Total</b>	<b>4488.70</b>	<b>74.00%</b>
<b>Top 10</b>			<b>Top 10</b>		

Source: Author’s calculations, based on Statistics New Zealand infoshare (2010c).

To look at the top 10 New Zealand’s imports from China, Table 3 provides a comparison between the year 2000 and 2009. Within Table 3, the majority of imports product categories are identical except HS 42 in 2000 and HS 73 in 2009. These top ten product categories, however, are by and large manufacturing products (e.g. machinery, electrical machinery and equipment, and apparel).

In addition, when comparing the product categories of imports, HS 84 and HS 85 have increased the most in 2009 (NZ\$1,210.28 million and NZ\$1,025.47 million), while share in total imports has not risen by a large amount but it is still more than 10 percent (a twofold increase for HS 84). Other categories have also increased by a significant level in values (more than as twice as much). This indicates that New Zealand imports more products than before.

When looking at the total imports for the top 10 product categories, even though the

values have more than trebled during the 10 years, the share in total imports remains at the same level (just over 70%). It indicates that New Zealand imports similar products from the same industries over the observed years. Therefore, it can be concluded that New Zealand-China trade is highly concentrated in inter-industry trade involving exports and imports of products across different industries. New Zealand's export of agriculture products to China is a kind of exchange for imports of manufacturing products from there, so it is a complementary trading relationship. Trade creation is mainly derived from comparative advantage but other industries will benefit from it as well as from reducing costs. This is confirmed by comparing Tables 2 and Tables 3 wherein there is no product category that is among New Zealand's top 10 product category exports to and imports from China.

As New Zealand diversifies from exporting agriculture products to China to manufacturing products in the near future, bilateral IIT could emerge. However, this commodity composition indicates insignificant potential for New Zealand-China IIT over 2000-2009, which will need to be investigated by estimating the level and the degree of IIT in Chapter 5.

Furthermore, the high quality of New Zealand products will meet the growing demand that is driven by the increasing average income of Chinese people searching for a quality lifestyle (Tang, 2007). Hence, it is a great opportunity for New Zealand to expand and capture much of this market, which matches Chinese people's rising demand for overseas products. It is also strategically important that New Zealand is gaining from access to cheaper suppliers as inputs. Therefore, it is special need for an FTA that will liberalize and facilitate trade as well as to satisfy the consumers' demand of the two countries and enhance economic growth. The following sections will discuss the New Zealand-China FTA and its importance for future bilateral trade, also the impacts on IIT.



## **2.6 The New Zealand-China Free Trade Agreement**

The FTA is a treaty between countries to eliminate tariffs on goods and services that aims to liberalize and facilitate trade while maintaining tariffs with non-member countries. New Zealand and China signed the FTA in Beijing in April, 2008, the fruit of negotiations that had carried on for over 15 rounds since 2004. This FTA has extensively covered goods, services and investment. The intent of this agreement, as expected by the New Zealand government, is to expected, to strengthen economic development and growth by:

- improving market access opportunities for New Zealand and Chinese exporters
- reducing compliance costs for New Zealand exporters
- facilitating trade in goods and services and investment
- encouraging productive commercial partnerships
- improving access to a wider range of products and services for consumers in New Zealand and China. (New Zealand Ministry of Foreign Affairs & Trade, 2010e)

The FTA also intends to reduce non-trade barriers, and minimize transaction costs on goods and services. Moreover, the agreement has provided an opportunity to establish a framework to negotiate and solve future trading issues, ensuring better development of both national economies and increased competitiveness internationally (Tang, 2007; New Zealand Ministry of Foreign Affairs & Trade, 2010c).

According to New Zealand Ministry of Foreign Affairs & Trade (2010c), there are some key outcomes that need to be stressed on trade in goods, services and investment and moreover, the importance of Rules of Origin (ROO), particular for trade in goods.

### **2.6.1 Trade in goods**

About 96 percent of New Zealand's current exports to China will benefit from the FTA as a result of tariff elimination. New Zealand will save an annual duty of NZ\$115.5 million based on current trade. All the tariff reductions are progressively undertaken over the phase-out period up to the date of 1<sup>st</sup> January 2019. At the end of this period, only NZ\$80 million of current trade with China will attract tariffs (New Zealand Ministry of Foreign Affairs & Trade, 2010c).

### **2.6.2 Rules of origin**

Moreover, it is important to elaborate on the ROO that products must meet the criteria that to be qualified for preferential tariff treatment under the FTA. According to New Zealand Ministry of Foreign Affairs & Trade (2010c), the ROO is based primarily on a Change of Tariff Classification (CTC) approach and moreover, supplementary Regional Value Content (RVC) is also applied to some products. In addition, certification of origin for exports to China needs to be issued by authorized bodies approved by the New Zealand government and notified to China in order for New Zealand exporters to enjoy the tariff benefits of the FTA. However, New Zealand does not require the certification of origin on Chinese imports (New Zealand Ministry of Foreign Affairs & Trade, 2010c). This ROO is particularly important for trade in goods and have to be complied with, in order for New Zealand exporters to gain from this FTA.

### **2.6.3 Trade in services**

In the services sector, New Zealand's trade with China has increased rapidly in recent years. The two countries will benefit from the FTA in expanding trade in services in many areas such as education, tourism and air services. According to New Zealand Ministry of Foreign Affairs & Trade (2010c, p. 4), "the FTA subject to specific reservations, establishes general obligations of 'market access' and 'national treatment', which entitles New Zealand's service suppliers to access the

Chinese market without being subject to quotas and be able to operate in China on the same basis as domestic suppliers”.

A reciprocal Most Favoured Nation (MFN) has been included in this FTA. This will give New Zealand suppliers, within some specified sectors<sup>8</sup>, at least the same treatment if China makes any commitments in future FTAs which are more liberal than the New Zealand-China FTA has committed to (New Zealand Ministry of Foreign Affairs & Trade, 2010c).

#### **2.6.4 Investment**

For investment, both countries welcome each other’s investors as well as all others over the world. They attempt to use the advantage of natural resources, human resources and industry integration of others to boost economic growth. They have also committed to treat investors of each other as domestic investors. The key outcomes of this FTA deal with national treatment and MFN status without discrimination; establishing investment protection mechanisms and provisions for investor recourse to arbitration procedures. China will also provide New Zealand investments that have been approved and established in China the same treatment and protection as it provides domestic investors investing in China (New Zealand Ministry of Foreign Affairs & Trade, 2010c).

The FTA has also included obligations in many other sectors, opening up economic opportunities for New Zealand business in China. As the New Zealand Ministry of Foreign Affairs & Trade (2010e) emphasizes, the FTA has an important objective, which is to develop closer commercial linkages that facilitate trade in goods as well as in services and investment between the two countries.

This FTA is expected to deliver positive impacts for both countries. It has ensured

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<sup>8</sup> MFN will apply to those specified sectors: environmental services, construction, agriculture and forestry, engineering, integrated engineering, computer and related services, and tourism (New Zealand Ministry of Foreign Affairs & Trade, 2010c).

New Zealand has preferential access to the world's fastest developing nation and became the first country to recognize China's status as a market economy (New Zealand Ministry of Foreign Affairs & Trade, 2010a). Moreover, the FTA will strengthen the relationship of the two countries and establish a framework of cooperation and the solving of any forward trading issues. The FTA supports New Zealand as a country in its purpose of widening the options of having close relationships with other Asian countries and in strengthening regional trade and economic integration (Ministry of Foreign Affairs & Trade, 2010a).

The following section will discuss implications of New Zealand-China FTA for future bilateral trade and potential for IIT.

## **2.7 New Zealand-China Free Trade Agreement: Implications for Future Bilateral and Intra-Industry Trade**

International trade has been widely recognized in the trade theory literature as something that will benefit all trading partners<sup>9</sup>. Therefore, free trade has been favored by many countries. Bilateral trade between New Zealand and China will grow substantially and experience positive gains in many sectors. Since exports play an important role in the economy of both countries, their FTA removes trade barriers such as tariffs. Bilateral trade has thus become liberalized not only for the benefit of existing businesses but will also create new opportunities for other businesses in the goods trade, and services and investment sectors. As Wacziarg and Welch (2008) have emphasized, countries that liberalize trade regimes can increase their average annual growth at higher rates than those that do not.

The economic impact of the FTA on New Zealand is greater than it is on China, especially in the agriculture sector (Tang, 2007). New Zealand agricultural products

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<sup>9</sup> Ricardo, Heckscher, Ohlin and Krugman (as cited in Appleyard, et al., 2010, Chapters 3, 8 & 10) have argued using both country and firm-based theories that trade openness leads to mutual gains for all countries involved.

have comparative advantage and are complementary to those in China. Therefore, China is becoming to be a very important market for New Zealand agriculture products. Such products as dairy, live animals, meat and wool, are particularly favored in China as it has a growing demand that cannot be met by domestic producers. In addition, the high quality of New Zealand products is welcomed by Chinese consumers and they are priced lower than other imports.

On the other hand, China will take more advantage from the FTA in the manufacturing sector. China is more advanced in industries such as textiles, clothing and footwear. New Zealand businesses that use Chinese imports as inputs of their products and New Zealand manufacturing exporters will benefit from the tariff elimination. Therefore, under this FTA, the manufacturing sectors are diverse enough with respect to their interests that the two countries can actually benefit mutually and simultaneously. The situation is that China has competitive advantage in labor intensive production sectors; while New Zealand is not able to compete in such industries but can shift its resources into innovative high value added and highly skilled productions in order to maintain its advantages (Tang, 2007). In addition, products must meet the ROO criteria under the FTA. New Zealand exports to China are required for certification of origin to access the tariff benefits of the FTA but not for Chinese imports, this gives the imports from China a preferential access to the New Zealand market.

Moreover, both countries are searching to expand trade on not just merchandise but also in service and investment sectors. They will also seek to strengthen comprehensive cooperation on further economic development through research and innovation; New Zealand has offered to help China with training and technological cooperation in many areas (Antkiewicz & Whalley, 2005). In the services and investment sectors, the FTA removes non-tariff barriers as well as tariffs. Such non-tariff barriers include restriction on market access and restriction on wholly foreign-owned businesses (New Zealand Ministry of Foreign Affairs & Trade,

2004). For both countries, eliminating those restrictions will create new opportunities and bring potential gains through exchange of technologies and skills, and investment in a fresh environment.

Eliminating trade barriers should ensure both countries can enter each other's markets with less effort, which will expand the two-way trading (both importing and exporting of products). Hence, there is no surprise that the FTA will facilitate bilateral trade and capital flows.

A joint study was prepared by the Chinese Ministry of Commerce and New Zealand Ministry of Foreign Affairs & Trade on a free trade agreement between China and New Zealand. It has provided an overview of recent trends in bilateral trade and New Zealand-China economic relations and identified a range of outcomes that will potentially facilitate bilateral trade in goods as well as in services and investment (New Zealand Ministry of Foreign Affairs & Trade, 2004).

The study suggests that the bilateral trade between the two countries will arise remarkably, and production and welfare will also experience positive growth. From the years of 2007 to 2027, imports from China are expected to increase by US\$40–70 million (growth rate is at 5 to 11 percent above baseline) per year. On the other side, New Zealand exports to China are expected to grow US\$180–280 million (growth rate is at 20 to 39 percent above baseline) per year. Furthermore, the FTA is expected, however, to contribute US\$24.7 billion of total welfare gains to China while New Zealand will gain US\$2.3 billion. Therefore, an FTA between New Zealand and China would benefit both the people and the economies (New Zealand Ministry of Foreign Affairs & Trade, 2004).

While, a recent study has been carried by Tan and Cai (2010) on quantitative analysis on the impacts of New Zealand-China FTA. This study employs the Global Trade Analysis Projects (GTAP) model to analyze the impacts of the FTA on the

New Zealand and China economies in 2015. This investigation found that the potential impacts of the FTA on welfare are likely to be positive for both countries, bilateral trade will grow significantly and welfare gains will be generated substantially through the implementation of this agreement. China would experience a gain of economic welfare equal to US\$53.22 million by 2015; meanwhile, New Zealand could enjoy an increase in net welfare of US\$299.67 million. This indicates that New Zealand would benefit from a FTA with China at a higher degree.

Therefore, the New Zealand–China FTA is of vital significance to New Zealand. As Gillmore and Briggs (2010) pointed out, New Zealand’s growth is already largely dependent on China and its demand for New Zealand products. The future is likely to see these two countries develop even closer economic linkages and result in sound sustainable development. Hence, it has a special place in the subsequent investigation on IIT even though New Zealand-China bilateral trade has always been recognized as inter-industry trade.

Moreover, as stated earlier, New Zealand would not only concentrate on exporting agriculture products to China but also manufacturing products, therefore IIT could occur in the manufacturing sector. Given the expectation of the FTA that would increase bilateral trade, special attention needs to be paid to manufacturing sector to see if any significant levels of IIT emerge.

## **2.8 Summary**

Chapter 2 has evaluated the trends of New Zealand-China bilateral trade over the chosen years 2000 to 2009. China is now New Zealand’s second-largest trading partner. New Zealand exports mainly agricultural products to and imports manufacturing products from China. The two countries signed a FTA in 2008 which aims to liberalize and facilitate trade as well as to strengthen economic relationship

by removing trade barriers on goods, services and investment. This FTA is expected to deliver positive impacts for both countries over the long run. It has ensured New Zealand has preferential access to the world's fastest developing nation and became the first country to recognize China's status as a market economy.

Over the observed period, there have been significant growths in both trade value and share of total exports and imports. The two countries experienced great increases in bilateral trade and strengthened trade extensively. In the first year of implementation of the FTA, New Zealand exports to China increased significantly in 2009 than 2008; while, imports from China decreased about 6%.

In addition, trade intensity has been measured to evaluate whether the bilateral trade between New Zealand and China is strengthened or weakened as expected. It indicates that trade flows between New Zealand and China are greater than expected relative to rest of the world and that New Zealand regards China as a more important trading partner than China does for New Zealand.

The top 10 New Zealand's exports to and imports from China in the years 2000 and 2009, confirm that New Zealand exports agriculture products to China in exchange for imports of manufacturing products. This indicates a high proportion of inter-industry trade compared to IIT.

Furthermore, Section 2.6 presented the key outcomes of the New Zealand-China FTA covering trade in goods as well as in services and investment. It shows that the economic impact of the FTA on New Zealand is greater than it is on China, especially in the agriculture sector; while China will take more advantage in the manufacturing sector. Empirical studies such as New Zealand Ministry of Foreign Affairs & Trade (2004) and Tan and Cai (2010) show both countries will experience positive welfare gains from the FTA. However, it is important to note that while the FTA is expected to increase bilateral merchandise trade through tariff reductions, it



is very likely going to increase trade of the inter-industry variety given the differences in resources and levels of development between the two countries.

In the next Chapter, the literature and the key determinants of IIT will be reviewed and summarized. Those determinants will be estimated and applied to New Zealand with respect to the purpose of analyzing the actual level of IIT between New Zealand and China.

# Chapter 3: Literature Review

## 3.1 Introduction

Chapter 2 evaluated the trends of New Zealand-China bilateral trade over the chosen years 2000 to 2009, trade between the two countries has strengthened for this period. New Zealand exports mainly agricultural products to while imports manufacturing products from China. Signing a FTA would expect to have significant impacts on trade in goods as well as in services and investment in the long run, provided the FTA is adequately utilized by businesses and ROO complied with.

Within this chapter, both theoretical and empirical literature on IIT will be reviewed. IIT is the simultaneous trade in which a single country both imports and exports products in the same industry. For instance, Japan exports cars to United States and simultaneously imports cars from them<sup>10</sup>. Such trade is different from inter-industry trade which involves exchanges of products between different industries and can be explained from traditional theories of international trade based on the concept of comparative advantage. For instance, China is exporting clothing in exchanges for importing agricultural products from New Zealand between different industries.

There has been extensive interest over recent decades in the area of IIT, which seems to have become more important over time (Menon & Dixon, 1996; Hu & Ma, 1999; Blanes & Martin, 2000; Ekanayake, 2001; Martin-Montaner & Rios, 2002; Turkcan, 2005; Bergstrand & Egger, 2006; Caetano & Galego, 2007)). These trade products, however, are not homogeneous but differentiated by style, design and functional attributes, and distinguished into two different types: horizontal and vertical IIT. Horizontal IIT takes place where products are identified by different

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<sup>10</sup> As an example, Japan exports Toyota to and imports Ford from United States.

attributes or characteristics, and vertical IIT is where products are differentiated by different qualities.

An increasing demand by consumers who prefer different variety of products results in IIT in many countries. Empirical studies show its volume varies inversely with the level of trade restrictions (Falvey, 1981; Menon, 1994; Sharma, 2000; Bano, 2002; Martin-Montaner & Rios, 2002; Zhang, et al., 2005). This type of trade grew rapidly after World War 2 and now makes up about a quarter of merchandise trade. It has contributed significantly to total trade and economic growth.

The remainder of this chapter is organized as follows. Section 3.2 presents the theoretical literature on IIT. Section 3.3 and Section 3.4 present the empirical literature on IIT, focusing on its determinants, and highlighting the contributions made by important studies in the New Zealand-China context. Section 3.5 summarizes the literature review and concludes this chapter.

## **3.2 Theoretical and Empirical Literature on Intra-Industry**

### **Trade**

Early studies which focused on explanation of the growing importance of IIT, attributed it to increasing returns and imperfect competition (e.g. Krugman, 1979, 1980; Helpman & Krugman, 1985). In other words, IIT gains from trade arise from increasing returns to scale. That is, as trade leads countries to specialize on a limited number of productions and eventually expand their output without large adjusting costs (e.g. reallocation of resources and efficiency use resources) (Davis, 1995). Thus, IIT reaps the advantages of increasing returns from specializing in differentiated products.

Krugman (1979) developed a general equilibrium model and argued that trade is

driven by economics of scale and markets are imperfectly competitive, gains from trade will occur even though countries have similar tastes, technology development and factor endowments. IIT has also, on the other hand, expanded and derived from scale economies and consumers' diversified tastes for differentiated products. Krugman (1981, p. 959) demonstrated the phenomenon of this type of trade into two aspects. First, if countries became more similar, trade between them would extensively become IIT. Second, if trade is dominated by IIT, the advantages of extending the market will be greater than the distributional effects, and the abundant factors of a country will benefit.

In terms of economic policy, it is important to examine IIT when making trade decisions and it has been useful to identify industries that have significant advantages in a new trade environment. Furthermore, IIT has some important implications for adjusting economies. They insure less resource movement between sectors and/or countries, which means there are fewer adjustment problems (Krugman, 1981; Brulhart & Thorpe, 1999). This is different to inter-industry trade, in which resources will shift to the other sectors or locations. Such adjustment cost (new industrial costs and labor reallocation) will be lower if IIT is large enough. Labor mobility becomes less possible because workers move within industries rather than between, and since the differences in quality of differentiated products are derived from the "differences in skill content" (Caetano & Galego, 2007, p. 164). As Greenaway (1982), Harris (1984) and Sharma (2000) have emphasized, associated with a rising share of IIT, the short-term adjustment costs are likely to be lower if trade liberalization occurs.

Developed countries have experienced and benefited extraordinarily from low adjustment costs, while, developing countries can also take advantage of trade openness. Sharma (2000) examined Australian manufacturing products over the period from 1979 to 1992 and found that, a rising trend in IIT can be attributed to the lower short-term adjustment costs associated with trade liberalization. On the

other hand, Brulhart and Thorpe (1999) analyzed the structure of trade flows for East-Asian countries (Korea, Malaysia, Indonesia and Philippines) during the period 1970 to 1996. They observed that, over time the changing structure of East Asian trade patterns, less labour adjustment costs have occurred both domestically and between partners.

IIT has significantly increased in many countries, especially in developed countries over recent decades. Many studies suggest that developed countries with more specialized trade structures have higher IIT shares. A study was carried by Caetano and Galego (2007) to investigate the dynamics of the intra-industry specialization pattern among Central and Eastern European Countries and the European Union. They applied several methodologies to analyze the type of trade during the time 1993 to 2001. First, they used the Grubel-Lloyd index (1975) to evaluate the type of trade followed by Abd-El-Rahman methodology (1991, cited in Caetano & Galego, 2007, p. 168) which distinguishes three types of trade: one-way trade, horizontal two-way trade and vertical two-way trade. The study identifies a significant decrease in inter-industry trade and a rising trend of specialization in vertical IIT due to positive effects of country size, Foreign Direct Investment (FDI), and human capital but negative impacts of geographical distance.

Moreover, Menon (1994) focuses on the trends of Australia's IIT (132 industries) in the 1980s when trade liberalization took place and it established a Closer Economic Relations (CER) with New Zealand. The results show a remarkable increase in the share of IIT. Industries which have reduced the protection most, experienced a higher increase of IIT. Similar results were obtained by Sharma (2000), over the late 1970s to the early 1990s, who observed that the IIT of Australian manufacturing has increased sharply as a result of trade liberalization in the 1980s.

High shares of IIT are accompanied by a high level of international trade. Most Organization for Economic Co-operation and Development (OECD) countries

have had notable growth in IIT since the 1980s (OECD, 2002). Some empirical evidence indicate that IIT is high among developed countries but low among developing countries, with a few focused on developing countries in general even though there are strong trends in the growth of IIT between developed and developing countries.

Zhang, et al. (2005) examined China's IIT for the transition period of 1992 to 2001 for its 50 trading partners. The findings show that China's IIT increased significantly over this period, particularly in vertical IIT mainly due to FDI. They have also argued that since income inequality exists in many countries (in this case, China and its 50 trading partners), consumers prefer different quality products; therefore, IIT occurs. This is an improvement over an early empirical research carried by Hu and Ma (1999) who have measured and analyzed the extent of China's IIT with its 45 major trading partners and found that, China has actually low levels of IIT over the period 1979-1996, but slightly higher vertical than horizontal IIT. It is due to the determinants such as FDI and human capital which played a significant role on IIT.

Developing countries, often labor-abundant, tend to produce low quality low value-added products. On the other hand, developed countries, often capital-abundant, tend to specialize in high quality high value-added products. Hence, by exchanging quality differentiated products, both developing and developed countries can satisfy all customers' preferences and provide the opportunities for IIT. Trade patterns can therefore be interpreted by differences between the economic structures (factor endowments and difference in income per capita) and technologies of countries (Caetano & Galego, 2007). That explains the existence of IIT and why developed countries export high quality products and import low quality products from developing countries<sup>11</sup>.

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<sup>11</sup> For example, China is exporting to and importing clothing from Italy.

The determinants of IIT are significant and can influence trade among bilateral trading partners. The next section summarizes the literature on determinants that might influence New Zealand-China IIT, which is also a part of the existing theoretical and empirical literature on the subject.

### **3.3 Determinants of Intra-Industry Trade**

Research suggests that a country's IIT is influenced by both country specific determinants (income per capita, economic size, openness, and foreign investment) and industry specific determinants (differentiated manufacturing products and economies of scale). Country specific determinants explain a country's IIT at a widely macroeconomic level. Industry specific determinants interpret an industry's IIT through an industrial structure level. These determinants are important considerations in relation to the level of IIT between New Zealand and China. This research, will mainly focus on country specific determinants as the two countries have different economic structures. In Chapter 5, a hypothesis will be proposed based on those determinants which influences New Zealand-China IIT the most.

#### **3.3.1 Income per capita difference**

IIT tends to be higher if trading partners' income per capita is high. That is, with higher income per capita, consumers will demand more of either high and/or low differentiated products in their bilateral trade, and thus production variety occurs. As Ekanayake (2001) has emphasized, if the stage of development is measured by income per capita, the higher income per capita will then create a higher IIT.

The opposite can also apply, as the larger the difference in income per capita the lower the IIT. This is because the greater difference in income per capita implies that consumers will demand less differentiated products and therefore, inter-industry trade could dominate the trade structure. If the incomes per capita of trading partners are nearly equal, consumers' demand structures (tastes and

preferences) will become similar. Thus the lower the difference of income per capita, the higher the amount of IIT will be. This phenomenon was first propounded by Linder (1961) that international trade in manufactured products will be more likely to appear if trading partners have similar per capita income levels rather than those whose per capita income levels are dissimilar. As IIT is particularly high for manufactured products, high IIT is often associated with less difference in income per capita within trading partners. Hence, the greater the difference of countries' income per capita, the lower the share of bilateral IIT is (Linder, 1961; Bergstrand, 1990).

In addition, bilateral IIT between countries will be higher. This is mostly true for developed countries with similar economic structures, such as similar factor endowments and income per capita. Countries that are capital intensive tend to produce relatively more differentiated goods, which suggest that industries with more specialized trade structures will have higher IIT shares (Bergstrand, 1990). Moreover, countries with similar income levels and less inequality per capita will demand more extensively differentiated products, and consequently higher levels of IIT (e.g. European Union countries).

Caetano and Galego (2007) tested the determinants of IIT between Central and Eastern European Countries and the European Union and found strong evidence that IIT is positively correlated with countries' similarity and lower difference in income per capita. Bergstrand (1990) reconsidered the Heckscher-Ohlin-Samuelson model and the Linder hypothesis and tested the proposition of inequality between countries' income per capital on IIT and concluded results consistent with Linder (1961).



### **3.3.2 Economic size**

IIT is higher for large economies but negatively correlated with the difference in the economic size of trading partners. Nilsson (1997) stresses that a country's economic size does matter and is an important determinant for measuring IIT. A large economy, often of a developed country, tends to have higher trade volumes. On the other hand, a small economy, often of a developing country, tends to have lower trade volumes and therefore, a lower level of IIT and in fewer industries compared with large developed countries. Furthermore, large economies can more easily make use of advantages derived from their large domestic market since they can effortlessly capture economies of scale and consequently, have higher levels of IIT (Turkcan, 2005; Sawyer, Sprinkle & Tochkov, 2010). However, a country with only a small domestic market has more difficulty because it does not have the advantages of economies of scale from producing differentiated products; therefore it has a lower level of IIT.

The smaller the difference in economic size between trading partners the larger the IIT will be (Helpman & Krugman, 1985; Bergstrand, 1990). This is because more differentiated products will be demanded and produced. Therefore, it can be concluded that there is a negative correlation between IIT and the difference in the economic size of trading partners.

A recent research focusing on the IIT of 22 Asian countries in year 2003 by Sawyer, et al. (2010) examined the level of IIT and investigated the determinants that affect a country's trade pattern. The results indicate that, the larger the difference in economic size of trading partners, the smaller share of IIT will be. This is consistent with another empirical study by Caetano and Galego (2007) who have drawn a similar conclusion.

### **3.3.3 Openness**

IIT is particularly high for very open countries. IIT reduces demand for protection. Bano (2002) has examined IIT between New Zealand and Australia and also other selected trading partners over the period 1990 to 2000. The author is convinced that trade liberalization facilitates the development of IIT, but also that removal of trade barriers does help IIT and has a positive impact on trade intensity. Zhang, et al. (2005) points that liberalization policies improve the development of IIT by relaxing regulations on foreign investors. It has had a remarkable influence in determining IIT and development of China's economy.

Menon (1994) believes that trade liberalization and regional trade agreements can be a powerful instrument in encouraging IIT. This idea is consistent with the opinion of Sharma (2000), Bano (2002), and Zhang, et al. (2005). Liberalization and trade protection reduction can increase the share of IIT, and such growth suggests the short-term adjustment costs are likely to be lower. Martin-Montaner and Rios (2002, p. 341) take a similar view and opine that "a higher degree of openness should not imply large adjustment costs as long as the likely changes in the allocation of resources take place within industries".

Therefore, openness has been positively associated with IIT. This has often been interpreted as international trade being high in manufactured products due to "product differentiation and the international fragmentation of production" facilitated from lower barriers and greater openness (Sawyer, et al., 2010, p. 488). The study indicates that lower levels of protection and openness encourage IIT in the Association of Southeast Asian Nations (ASEAN) and in the high income countries of East Asia. Moreover, from the empirical analysis by Sharma (2000) who focused Australian manufacturing IIT, the findings show industries which enjoyed higher levels of IIT are those that have experienced a sharp fall in protection. The same conclusion was drawn by Zhang, et al. (2005), when studying

the bilateral trade of China and its 50 trade partners over the period of 1992 to 2001. Both China's horizontal IIT and vertical IIT are positively associated with trade openness.

### **3.3.4 Manufactured products**

IIT is particularly high for manufactured products. Manufactured products are much more highly differentiated than primary products, and therefore appear to have a high level of IIT, particularly for the more sophisticated manufactured products such as chemicals, machinery and transport equipment (OECD, 2002). The reason is that highly differentiated manufacturing products can better match the varied tastes of consumers and are more likely to experience the increasing returns to scale that are benefited from differentiated production. Empirical research has revealed an increase in the simultaneous trade of both imports and exports that are grouped in the same industry in different quality ranges (Ekanayake, 2001; OECD, 2002; Sawyer, et al., 2010).

Moreover, manufacturing products tend to have lower barriers when they are traded internationally and therefore, many OECD countries experience a high share of IIT (e.g. United States, France and Germany) (Sharma, 2000; OECD, 2002; Turkcan, 2005). Furthermore, IIT facilitates trade of products in more complex manufacturing situations that are based on different components processed between trading partners.

In addition, high share of manufactured products does not only appear within developed countries' IIT but also in developing countries. Hu and Ma (1999) have investigated the extent of the international IIT of China. As China developed, the composition of the trade tended to move away from labour intensive products to capital intensive products, which resulted in an increase in the degree of IIT. They analyzed the factors that influence China's IIT pattern and examined various

determinants that hold for trade between China and its trading partners. They found that the share of manufactured products in exports is one of the most significant factors which is positively affected China's IIT.

### **3.3.5 Foreign direct investment**

The degree of IIT increases as FDI inflows increase. Zhang, et al. (2005) point out that FDI has had an important role in determining IIT in China's international trade with its 50 trade partners. They have found and stressed that international trade increased significantly for the period 1992-2001 in China, and that FDI has a remarkable influence in determining IIT, particular on vertical IIT. Therefore, foreign investment is expected to have a positive effect on IIT; that is, countries characterized with sharp rises of FDI inflows will experience high growth of IIT (Ratnayake & Athukorala, 1992; OECD, 2002). As Caetano and Galego (2007, p. 164) point out, "the political and economical opening up has spurred FDI flows, thus stimulating economic restructuring and industrial modernization". They have found FDI has positive and significant impacts on IIT.

Countries with high growth in IIT often seem to be characterized by their large inflows of FDI, especially when foreign investors take the advantage of the factor endowments in the host country and then export goods back to their home countries (Sawyer, et al., 2010).

Nevertheless, the growth of FDI inflows into developing countries has played a significant role in transferring technologies, research and development, and is also reflected in the trends toward the increasing importance of IIT created by intra-firm trade.

### **3.3.6 Intra-firm trade**

IIT is large if intra-firm trade is large. Trade between multinational companies and their affiliates is recognized as intra-firm trade. That situation occurs when multinational companies are located in less developed countries, often to produce manufactured goods for other countries and parent countries. This phenomenon of increasing intra-firm trade appears to result in a higher level of IIT between developed and developing countries.

As OECD (2002) indicates that, in the case of some middle income countries, intra-firm trade increases bilateral trade with developed countries. Such a high degree of intra-firm trade is often attributed to manufactured products that come about when multinational companies have reallocated their factories in these countries; hence this results in a high level of IIT across trading partners.

### **3.3.7 Preferential trade agreements**

IIT is positively correlated with preferential trade agreements (PTA). Grubel and Lloyd (1975) believe PTA can foster IIT between member countries due to the reduction of protection. As a consequence, PTA is more likely to be sustained as governments face fewer pressures in less competitive industries (Menon & Dixon, 1996).

An empirical study by Bano (2002) shows that IIT has increased between New Zealand and Australia in the period of 1964- 2000, due to the Closer Economic Relations Agreement (CERA). The share of IIT increased from 11 percent to nearly 50 percent. These results also suggest bilateral trade flows between New Zealand and some trading partners have become stronger and more intense over the period of 1990-2000<sup>12</sup>. Hence, there is an expectation that New Zealand would have a greater level of bilateral trade with China with a potential for IIT as the FTA has

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<sup>12</sup> Trade intensity shows New Zealand's index values are greater than 1 for most selected trading partners indicating that trading relations are strengthened between them.

now been signed. Another recent investigation carried out by Sawyer, et al. (2010) reported that regional trade agreements within Asian countries in 2003 (e.g. ASEAN, China, Japan and Korea) have a positive effect and encourage IIT across many categories.

Moreover, Ekanayake (2001) has researched Mexico's determinants of IIT for the years of 1996-1998 with 56 major trading partners. The results strongly support the idea that North American Free Trade Agreement (NAFTA) has had a positive impact on increasing Mexico's IIT with Canada and the United States.

### **3.3.8 Geographical distance**

Geographical distance is also an important determinant of IIT. Trade costs have an economically significant impact on trade across countries and industries. As Anderson and Wincoop (2004, cited in Bergstrand & Egger, 2006) remind us, trade costs are large and do matter. Some empirical literature on the determinants of IIT, while lacking in information, does however indicate that distance can eventually reduce IIT. Further, there is a convincingly strong negative correlation between distance and the share of IIT (Grubel & Lloyd, 1975). Differences in trade costs between differentiated goods and homogeneous goods have also had a huge impact on IIT.

Geographical distance, if considerable, is seen to be an important determinant of IIT (Loertscher & Wolter, 1980; Balassa, 1986; Blanes & Martin, 2000; Bergstrand & Egger, 2006). There are some explanations for this: distance can cause the costs to increase, not just of transportation and insurance, but also the costs of information on intra-industry goods. These costs will rise proportionally higher than that of inter-industry goods, due to the variances between differentiated products. Therefore, transaction costs will increase as well as opportunity costs, so this is a case where distance can be recognized as a nontrade barrier (Balassa &

Bauwens, 1987; Zhang et al., 2005). According to the study by Caetano and Galego (2007), distance is negatively correlated and significant for horizontal IIT but not too significantly correlated for vertical IIT between Central and Eastern European Countries and the European Union.

Investigation by Turkcan (2005), who evaluated IIT between Turkey and other selected OECD countries for the period 1985 to 2000, shows that IIT is negatively affected by the distance in both final goods and intermediate goods. A similar result was found by Sawyer, et al. (2010, p. 492) showing geographical distance to be statistically significant and this suggests that transportation costs are often more enhanced on primary products than on manufactured products.

Moreover, many neighboring countries share similar production and demand patterns as well as economic structures. Thereby, they experience much more IIT than distant countries (Zhang et al., 2005). Hence, it can be concluded that IIT is negatively correlated with distance (higher transportation costs) but positively correlated with similar cultures and customer preferences.

### **3.4 The Determinants of New Zealand-China Intra-Industry Trade**

To measure whether or not New Zealand has a high share of IIT with China, the determinants summarized in above have significant applications. The New Zealand trade pattern of IIT differs from that of other developed countries. It seems that New Zealand has actually a very low share of IIT within OECD countries<sup>13</sup>, and it may be similar with China.

By considering the determinants summarized in Section 3.3, the potential for New Zealand-China IIT can be predicted. As country specific determinants have

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<sup>13</sup> OECD (2002) shows that New Zealand has low and stable intra-industry trade from 1988 to 2000.

indicated, the higher the income per capita, and the less the difference of income per capita, the higher the IIT. The study of Hu and Ma (1999) found that China's IIT is positively related to income per capita of its trading partners, which includes New Zealand. However, since the result was obtained from aggregate data of all China's partner countries, the conclusion may not be as accurate for New Zealand. Moreover, the fact that the level of income per capita in China is significantly lower than that in New Zealand indicates that the difference of income per capita between the two countries is considerably large<sup>14</sup>. This implies New Zealand-China trade is unlikely to involve very high IIT.

Larger economies tend to have more IIT. In addition, the smaller the difference of the economic size between trading partners means they will experience a larger share of IIT. In fact, the economy of China is much larger than that of New Zealand, and thus, high IIT might not happen according to the theoretical studies (Helpman & Krugman, 1985; Nilsson, 1997).

Both China and New Zealand participate in international trade. The two countries have recently signed the FTA with an expectation of growing bilateral trade in the near future. Grubel and Lloyd (1975) stress, as do Menon (1994), Bano (2002), Martin-Montaner and Rios (2002), Zhang, et al. (2005) and Sawyer, et al. (2010), that openness and preferential trade agreements can facilitate bilateral trade and therefore, IIT can potentially occur and be strengthened, if the FTA is properly utilized.

Moreover, IIT is particularly high when there are more manufactured products, high foreign direct investment inflows, and large intra-firm trade. Unfortunately, these factors are not strong enough in the case of New Zealand. This is because New Zealand's main exports to China are dairy and other agricultural products;

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<sup>14</sup> GDP per capita of China in 2009 is US\$3,769 and GDP per capita of New Zealand in 2009 is US\$ 27,384 (United Nations, 2010a).



main imports include textiles, clothing, footwear, electronic goods, and other manufactured products; with very few manufactured products being traded both ways. Besides, the two countries are experiencing high foreign direct investment inflows but not from each other (NZ Herald, 2010); hence, intra-firm trade may not be large.

New Zealand has relatively low IIT among industrial countries. It also has to factor in the large geographical distance between New Zealand and her major trading partners other than Australia, i.e. the United States, Japan, and China. Therefore, a high IIT with China may not be likely due to this disadvantage. Here are some explanations for this; distance can cause costs to increase, not just of transportation but also information on intra-industry goods; as Balassa & Bauwens (1987) emphasize, distance can be recognized as a nontrade barrier. Thus, there is a convincingly strong negative correlation between distance and the share of IIT (Grubel & Lloyd, 1975). This is quite accurate in the case of New Zealand-China bilateral trade.

Overall, the determinants of New Zealand-China IIT elaborated above suggest that New Zealand's bilateral trade with China is unlikely to involve a high degree or level of IIT. Hence, a hypothesis by concerning those determinants is developed in Chapter 5, which is then tested by estimating IIT indices and values as explained in the literature.

### **3.5 Summary**

To sum up, IIT has expanded rapidly in recent years and now makes up about a quarter of merchandise trade and has contributed significantly to total trade and economic growth. Thus, it is important to examine IIT when making trade decisions and it has thus been useful to indentify industries that have significant advantages in a new trade environment.

The above analysis reviews both theoretical and empirical literature. Early studies argue the growing importance of IIT is attributable to economies of scale and imperfect competition (e.g. Krugman, 1979, 1980; Helpman & Krugman, 1985). Besides, IIT has some important implications for adjusting economies such as less resource movement between sectors and/or countries. Moreover, this research observes that such determinants are significant and can influence IIT among bilateral trading partners (e.g. economic size, openness and geographical distance). In the context of New Zealand-China bilateral trade, none of these determinants can significantly influence IIT between the two countries.

In the following chapter, the methodology will be discussed and the aggregation problem will be pointed out as one of the problem of estimating.

# Chapter 4: Methodology

## 4.1 Introduction

The previous chapter analyzed the existing theoretical and empirical literature and observed that the determinants of IIT have some important implications concerning New Zealand-China bilateral trade and the influences on IIT between them.

In this chapter, quantitative methods are used to estimate IIT between New Zealand and China. The most widely used measure has been the Grubel and Lloyd (GL) index, whose modified version was suggested by Aquino (1978). However, these measures have some drawbacks which were addressed thereafter in the literature, with a recent alternative measure proposed by Rajan (1996). This chapter will analyze the measurement issues involving IIT, and discuss the problem of aggregation that has been a common point of criticism for measuring IIT. The problem occurs because the size of the trade imbalance has an effect; the greater the imbalance and share of net trade, the smaller the share of IIT (Ekanayake, 2001).

The remainder of this chapter is as follows. Section 4.2 analyzes the GL index and points out the problem of downwards bias which fails to measure aggregate trade imbalances. Section 4.3 presents alternative measures proposed by Aquino (1978) and Rajan (1996). The aggregation problem and the data will be discussed in Section 4.4 followed by the summary of this chapter in Section 4.5.

## 4.2 The Grubel and Lloyd (GL) Index

There are several indices that have been developed to measure IIT. One that is widely used for measuring IIT is the GL index. Grubel and Lloyd (1975) have provided substantive empirical study on the importance of IIT and its measurement.

They proposed a measurement of the extent of the amount of commodity exports and imports in a particular industry ( $i$ ); in this the IIT is presented as:

$$GL = [(X_i + M_i) - |X_i - M_i|] / (X_i + M_i) * 100$$

Where  $X_i$  and  $M_i$  are the exports and imports of a particular industry  $i$  or a commodity group during a particular time period (normally 1 year), and this measure takes value between 0 to 100, in which 0 indicates that trade is entirely inter-industry trade, whereas 100 indicates that trade is entirely IIT. Therefore, higher values represent higher levels of IIT.

Grubel and Lloyd (1975) devised a further measurement to compare the average levels of IIT on an economy. This was a weighted average of the value of GL across a number of industries ( $n$ ), and is calculated as:

$$\text{Weighted Average } GL = [\sum (X_i + M_i) - \sum |X_i - M_i|] / \sum (X_i + M_i) * 100$$

However, Aquino (1978), Rajan (1996), and Nilsson (1997) have argued that the GL index has failed to measure aggregate trade imbalances due to the problem of downwards bias. Egger, Egger and Greenaway (2007, p. 1960) discussed the GL index bias associated with repatriated profit flows of multinational firms and pointed out that, “The widely used GL index has to be adjusted to reflect the IIT share in a narrow sense”. The larger the trade imbalances, the smaller the results will be.

Since there is downward bias of the GL index due to aggregate trade imbalances, the results obtained may not be accurate. The following section analyzes the alternative measures of IIT proposed in the literature and their advantages and shortcomings over the GL index.

### 4.3 Alternative Measures of Intra-Industry Trade

Because of trade imbalances of the GL index, alternative measures are presented for the purpose of correcting this problem.

#### 4.3.1 Aquino index

Aquino (1978) suggests an adjustment measure is needed for GL index in a more disaggregated level. He argues that “one cannot possibly maintain that the overall imbalance has not an imbalancing effect on the single commodities trade flows and then recognize that the imbalancing effect appears at a highest level of industry-aggregation” (1978, p. 280).

The Aquino (1978) adjusted measure is presented below:

$$X_i^e = [X_i 0.5 \Sigma (X_i + M_i)] / \Sigma X_i \quad M_i^e = [M_i 0.5 \Sigma (X_i + M_i)] / \Sigma M_i$$

Where  $X_i$  and  $M_i$  are the exports and imports of a particular industry  $i$ . The derived values of  $X_i^e$  and  $M_i^e$  then are applied to the GL measures. The Aquino measure for total trade is as follows:

$$\text{Aquino} = [\Sigma (X_i + M_i) - \Sigma (X_i^e - M_i^e)] * 100 / \Sigma (X_i + M_i)$$

This index has avoided the problem of imbalance over GL index. However, Aquino’s index may not be an appropriate measurement for calculating IIT as Vona (1991, p. 686) emphasizes, the index dose “presents some logical inconsistencies and practical shortcomings”. This is because the Aquino’s index is basically used for comparing trade composition: the share of a particular industry’s exports in total exports and the share of this industry’s imports in total imports. This indicates Aquino’s index is not really related to the trade pattern suggested by Vona (1991).

### 4.3.2 Rajan's reformulated index

An empirical study was undertaken by Rajan (1996) to investigate Singapore's bilateral trade with Japan and the United States for year 1994. This author shows the importance of difference between the degree and the level of IIT, and proposed an alternative measure of the degree of IIT. Such measurement can mitigate the trade imbalance problem, and a further advantage is that unlike the GL index, it is desirable for econometric studies (Rajan, 1996).

Rajan (1996) redefined index at an industry level ( $R_i$ ) can be formulated as follows:

$$R_i = \{[\min(X_i, M_i)/2M_i] + [\min(X_i, M_i)/2X_i]\} * 100$$

The reformulated index at a macro level ( $R$ ) is:

$$R = \sum \{[(X_i + M_i)/(X + M)] * R_i\}$$

The reformulated index takes value from 50 to 100, unlike the GL index that takes value between 0 and 100. The higher the value of the index represents the higher IIT, and conversely, the lower the value of the index, the closer the IIT is to 50. In this study, Rajan (1996) shows the importance of how GL index has failed to distinguish between the degree and the level of IIT between Singapore-Japan and Singapore-United States bilateral trade. Such a failure in the GL index incorrectly reflects the degree of IIT due to trade imbalance when measuring. The study has found that by using this newly developed  $R_i$  measurement, the difference of share of IIT between Singapore-Japan and Singapore-United States has reduced when compared with the results of the GL index. This indicates that the trade imbalance problem has been mitigated.

However, this index also has a problem, which is that when there is no IIT between

trading partners, the index has an infinite value since one of the divisors is zero. This problem can be easily fixed by replacing the value of the index to zero in such cases. This “reformulated index has a very desirable property, in that it ensures that more or less equal weight is given to non-zero IIT regardless of the actual volume of trade” (Rajan, 1996, p. 383). This is particularly important while estimating IIT for a pair of countries likely to involve a low volume of IIT such as New Zealand and China.

#### **4.3.3 Level and degree of intra-industry trade**

Because of aggregate trade imbalances, GL index has actually raised the problem of downward bias not just the inadequacy of measurement but also due to the failure to distinguish between the level and degree of IIT (Rajan, 1996). This is because a higher degree of IIT observed by a high GL index can be associated with low level or volume of IIT, indicating insignificant potential for expansion of IIT. According to Rajan (1996), the level of IIT is either of minimal exports or import then times two, and can be formulated as:

$$2\min (X_i, M_i)$$

Where  $X_i$  and  $M_i$  are the exports and imports of a particular industry  $i$ .

As Nilsson (1997, p. 555) points out, “the GL index is a measure of the degree of IIT rather than of the absolute amount of IIT”. The author also argues that the failure of GL index is that it incorrectly reflects the actual level of IIT perhaps because of the difference in IIT volume is large among the trading partners for a given size of trade imbalance (p. 556). Thereby, an alternative measure of the degree of IIT is required. According to Rajan (1996), the reformulated index reduces the trade imbalance problem of measuring the degree of IIT, and moreover, minimizes the gap in the share of IIT.

Hence, within this research, the choice of measures of IIT will be GL index and Rajan's reformulated index. Since GL index is the most widely used measure, and Rajan's reformulated index has successfully reduced the trade imbalance problem of measuring the degree of IIT, this can, therefore, the results of these two indices can be compared to check if a trade imbalance problem occurs. While, Aquino index will not be used because of logical inconsistencies and practical shortcomings which are stated earlier. In the next chapter, this research will estimate both degree and level of IIT between New Zealand and China and analyze the results measured.

#### **4.4 Aggregation Problem and the Data**

The aggregation problem is important when measuring IIT. This is because of the definition of industry, which means that there is incorrect aggregation of goods grouped into industries and the level of data disaggregation (Vona, 1991). That is, different factor intensity products are classified together or, an industry contains both final and intermediate products (Gullstrand, 2002). The problem can result in serious biases due to insufficient disaggregation. Therefore, adopting trade classifications and industry data under the same category is important as it can reduce bias from regrouped industry data into trade classification (Sharma, 2000) (e.g. Standard International Trade Classification (SITC) data).

As Gullstrand (2002, p. 321) stressed that, "The industrial dimension of the aggregation problem underscores the importance of calculating IIT at a rather low aggregation level". That is, the more products are aggregated as a single industry, the more IIT occurs (Fontagné & Freudenberg, 1997).

This is because the size of trade imbalance does matter and if the signs of trade imbalance are opposite (deficit or surplus) at a lower aggregation level (Sharma,



2000; Gullstrand, 2002). Moreover, a problem has also risen if an industry contains both final and intermediate products; therefore, the results of the IIT index may just reflect an exchange between final products and intermediates when measuring a high aggregation level (Fontagné & Freudenberg, 1997; Gullstrand, 2002).

To minimize the aggregation problem and for a meaningful analysis of IIT, the measure of IIT needs to be built on the basis of even more disaggregated trade data (Gullstrand, 2002; Calderon, Chong & Stein, 2007; Egger, et al., 2007). This is due to the fact that less disaggregated trade data is more recognized and indicated as an industry level, and therefore it is not appropriate to measure the level of IIT at some stages.

However, since this study aims to analyze and evaluate potential of IIT between New Zealand and China at the industry level, a finer disaggregated trade data is somehow too narrow. Also, for some industries there was no or very few trade between the two countries over the observed periods (e.g. HS 06 and HS 11, see Statistics New Zealand, 2010c), and makes no sense to measure the finer disaggregated trade data. The preference is therefore to estimate New Zealand-China's IIT in the classification of the two-digit aggregated HS product classification level for the period from 2000 to 2009, and identify the top 20 product categories involving IIT. Such data is available at New Zealand Statistics Infoshare database, from which values of exports and imports are obtained. Free on board (FOB) and Costs including insurance and freight (CIIF) values are used as a part of the price differentials between exports and imports.

## **4.5 Summary**

This chapter evaluated several measures to examine IIT between New Zealand and China. The GL index is most widely used but fails to measure aggregate trade imbalances, therefore, creates a downwards bias problem occurs. Hence, this index

needs to be adjusted in a narrow sense. Aquino (1978) then suggested a modified version which has avoided the problem of imbalance over GL index. However, Aquino's index may not be an appropriate measurement for calculating IIT as this index is basically used for comparing trade composition.

Thereafter, an empirical study carried by Rajan (1996) investigated Singapore's bilateral trade with Japan and the United States and proposed an alternative measure of the degree of IIT. This study demonstrates the importance of difference between the level and the degree of IIT and the reformulated index can mitigate the trade imbalance problem as well. By considering the level and degree of IIT, this research will only use GL index and Rajan's reformulated index for comparing the results as higher degree of IIT may be associated with low level or volume of IIT, indicating insignificant potential for expansion of IIT.

The aggregation problem plays an important role when measuring IIT. This problem can be attributed to incorrect definition of the industry or insufficient disaggregation. Thus, to minimize the aggregation problem, the measure of IIT should build on the basis of even more disaggregated trade data. While, within this research, a finer disaggregated trade data is somehow too narrow when evaluating IIT between New Zealand and China, the preference is therefore made for the two-digit aggregated HS product classification level.

Chapter 5 aims to analyze New Zealand-China IIT. A hypothesis is presented based on the determinants of New Zealand-China IIT summarized in Chapter 3. This chapter will also estimate both level and degree of IIT and analyze the top 20 product categories which will provide a clear view of bilateral IIT between the two countries.

# Chapter 5: Data Analysis and Results

## 5.1 Introduction

The previous chapter analyzed the methodologies for estimating IIT. It concluded that the GL index and Rajan's reformulated index are preferred measures to estimate both level and degree of New Zealand-China IIT. Since there is a downward bias in the GL index due to aggregate trade imbalances, Rajan (1996) proposed an alternative measure of IIT that can mitigate the trade imbalance problem. It was also observed that the issue of distinguishing between level and degree of IIT is significant for this research as a high degree of IIT as shown by high values of GL index or Rajan's reformulated index may not accurately reflect the actual level of IIT. Furthermore, aggregation problem and the data have also been stressed in the previous chapter.

In this chapter, the IIT statistics between New Zealand and China are estimated to find whether or not these two countries' bilateral trade currently involves high level of IIT, and if not, what could be the potential product categories that may involve IIT in the near future. The product categories with highest degree and highest level of IIT between the two countries are evaluated to see if any of them indicate a significant proportion of IIT. Before estimating whether or not New Zealand has a high level of IIT with China, the determinants summarized in Chapter 3 hold significance and a hypothesis can be now presented concerning those determinants, which would be as follow:

New Zealand would have very low level of IIT with China and the numbers of product categories which have IIT with China would be very few.

This is because according to Chapter 3, only the determinants of openness and preferential trade agreements would have significant impact on New

Zealand-China IIT. But such influences are limited, as New Zealand signed the FTA with China only a few years ago, and the effects on the pattern of IIT are not yet clear. On the contrary, it can be said that other determinants are likely to have an insignificant impact, which impairs IIT between the two countries.

This chapter is further organized as follows. Section 5.2 analyzes the IIT between New Zealand and China. The overall estimates of New Zealand IIT with China for the period 2000 to 2009 are presented first followed by the degree and level of IIT of the top 20 products categories, then possible explanations of current trends and future potential will be given. Section 5.3 summarizes this chapter.

## **5.2 Analysis of Intra-Industry Trade between New Zealand and China**

The intent here is to measure the overall degree of IIT between New Zealand and China, and to find whether or not they have involved a significant level of IIT among any product categories. This is done by first looking at the country level measured by the GL weighted average index and R index. Then analysis is carried out on the 20 product categories with highest degree between the two countries. Thereafter, the 20 product categories with highest level of IIT are evaluated to see if any of them have a significant level of IIT. Detailed results for the top 20 products are presented in Appendix B (by highest degree of IIT) and Appendix C (by highest level of IIT) respectively. Summary tables involving results from estimation of the top 10 product categories are presented in Table 5 and Table 6.

### 5.2.1 Overall intra-industry trade estimates

**Table 4: New Zealand intra-industry trade with China: 2000-2009**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>GL Index</b>	7.64	10.75	9.10	9.67	9.63	9.46	10.07	8.92	9.08	8.25
<b>R Index</b>	43.65	44.25	45.22	49.44	44.55	47.60	51.31	49.55	51.35	51.52

**Source: Author's calculations, based on Statistics New Zealand (2010c). Note that the R index can have values lower than 50 if bilateral trade is inter-industry dominated (Nilsson, 1997).**

Table 4 shows New Zealand's overall IIT with China for selected years at the country level measured by the GL weighted average index and R index. This indicates the degree of IIT over the selected years has been particularly low for both the measures and this result is consistent with Hu and Ma (1999, p. 87), who observed that the IIT between New Zealand and China was 10.6 in 1995. That means New Zealand's IIT with China has not been strengthened over the past two decades. These results are consistent with the hypothesis stated earlier in which, New Zealand was expected to have a very low level of IIT with China at a country level.

The GL index presents how the New Zealand-China IIT varies from 7.64 (2000) to 8.25 (2009) over the observed period. The index values fluctuate at around 10, which indicate that the degree of New Zealand-China IIT is very low and gives no evidence to prove that New Zealand could potentially increase its IIT with China in the near future.

On the other hand, the R index identifies even lower IIT. Numerical results are fewer than 50 for the years 2000-2005 and 2007, with other years having values just over 50. According to Rajan (1996), this index varies from 50 to 100; the higher the IIT, the closer to 100, the lower the IIT, the lower the value of the index closer to 50. These misleading values below 50 have been interpreted by Nilsson (1997, p. 561)

in the following way: “if a larger share of the trade between two countries is of inter-industry nature, Rajan’s index can be shown to fall outside the stipulated bounds between 50 and 100”. This is when  $X_i$  or  $M_i$  equals zero, the index ( $R_i$ ) at industry level has infinite values which need to be replaced by zeroes as suggested by Rajan (1996). Nilsson (1997) argues this adjustment is not suitable as the country level of R index contains industry level of  $R_i$  index.

The reason for the low level of IIT between New Zealand and China is that the two countries exchange different industry products, and therefore inter-industry trade is dominant (see Table 2 and Table 3 of comparison imports and exports for the year 2000 and 2009). New Zealand exports agricultural products and imports manufactured products, and those products capture a large share of total trade within the bilateral trade.

## 5.2.2 Industry estimates of degree of intra-industry trade

**Table 5: Estimates of the top 10 product categories with highest degree of intra-industry trade between New Zealand and China: 2000 and 2009**

Year 2000				Year 2009			
HS Code	GL Index	Ri Index	Share in total trade %	HS Code	GL Index	Ri Index	Share in total trade %
86	100.00	100.00	0.00	21	98.91	98.93	0.33
57	99.50	99.50	0.07	76	92.63	93.13	0.77
74	98.73	98.74	0.17	29	92.20	92.77	1.27
43	94.42	94.72	0.08	18	84.57	86.63	0.02
07	91.50	92.16	0.21	72	65.02	74.09	0.45
16	86.84	88.37	0.03	12	65.02	74.08	0.14
21	77.07	81.35	0.11	74	54.35	68.66	0.57
22	68.57	76.09	0.01	48	51.70	67.43	1.27
48	61.99	72.46	1.71	43	42.13	63.34	0.04
08	56.70	69.78	0.38	27	40.10	62.54	0.47
<b>Overall</b>	<b>Average:</b>	<b>Average:</b>	<b>Total:</b>	<b>Overall</b>	<b>Average:</b>	<b>Average:</b>	<b>Total:</b>
	<b>83.53</b>	<b>87.32</b>	<b>2.77</b>		<b>68.66</b>	<b>78.16</b>	<b>5.33</b>

Source: Author’s calculations, based on Statistics New Zealand (2010c).

The summary table of which estimates the top 10 product categories with highest

degree of IIT between the two countries for years 2000 and 2009 is shown in Table 5. It is evident from the product categories that are measured higher degrees of IIT are likely to involve a relatively small part of total trade.

The general results presented in Table 5 are that these categories account for only a minimal share in total trade<sup>15</sup>; with most of them being less than one percent. However, by measuring the significance of IIT, all indices, GL and  $R_i$ , have identified exactly the same top 10 product categories that have the highest index values. As Rajan (1996, p. 384) explains, this phenomenon is “in turn a reflection of the relatively balanced bilateral trade”. It is similar to the study Rajan (1996) carried out in the case of Singapore-US IIT. The author found that the top 10 product groups remained unchanged even though all three different indices were employed. This is because, as Rajan (1996) pointed out, the trade imbalance problem has less serious influences on measuring IIT in such cases. Therefore, from the results in Table 5, the indication is that the trade imbalance problem is not a significant influence in New Zealand-China bilateral IIT.

By comparing the results for year 2000 and 2009, the shares in total trade is 2.77% for year 2000 and 5.33% for year 2009. Out of 10 product categories, the 4 with the highest degrees are consistent in both years in terms of high values of GL and  $R_i$  index. This indicates that over the years New Zealand has not changed the degree of low share IIT with China. It is also necessary to point out the importance of distinguishing between the level and degree of IIT as a higher degree of IIT observed by high indices values can be associated with low level or volume of IIT, indicating insignificant potential for expansion of IIT. As observed in Table 5, the top 10 industry categories with a high degree of IIT are indeed associated with a low share (even volume) of total trade for year 2000 and 2009 that implies the indices are inaccurate in reflecting the true level of IIT between New Zealand and

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<sup>15</sup> Share in total trade is exports plus imports of a particular product category traded proportional to total goods traded (exports and imports) with a trading partner in that year.

China.

Table 5 further shows that there are few categories which are weighted over one percent for the share in total trade, HS 29 for year 2009 and HS 48 for both years<sup>16</sup>. This indicates that the two categories have relatively significant degrees of IIT compared to other categories over the observed period.

For the entire period (see Appendix B), the 20 product categories that show the highest degree of IIT have a low share of total trade (most have less than 1 percent), it is observed that similar trends exist as explained for Table 5. However, product categories HS 29 and HS 48 might have relatively significant degrees of IIT compared to others even though they have not appeared consistently throughout the entire period. Other product categories do appear to have higher degree of IIT and the shares in total trade are more than one percent, but only temporarily. Therefore, this needs to be compared with Appendix C.

### **5.2.3 Industry estimates of level of intra-industry trade**

The next stage is to analyze the product categories with highest levels of IIT to see if any significant level of IIT was involved in any single product category between New Zealand and China over the years 2000 to 2009. The 20 categories with highest level of IIT constitute about 50 percent of total trade over the observed years (see Appendix C). These results provide valuable information for comparisons with if anyone only looks at the index values for analyzing the level of IIT within the two countries other than the degree of IIT. According to Rajan (1996), the level of IIT is obtained by either the minimal of imports or export then times two to reflect the actual levels.

A summary table estimating the top 10 product categories with highest level of IIT

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<sup>16</sup> See Appendix D for a list of product description of HS 2 digit product categories used in this research.



between the two countries for year 2000 and 2009 is shown in Table 6.

**Table 6: Estimates of the top 10 product categories with highest level of intra-industry trade between New Zealand and China: 2000 and 2009**

2000			2009		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
29	42.50	3.82	29	113.28	1.27
85	30.36	9.70	76	68.86	0.77
48	30.24	1.71	85	65.10	12.84
44	16.24	3.37	48	63.66	1.27
84	10.84	4.88	84	63.34	10.92
51	9.88	5.45	44	43.00	7.49
76	7.58	0.80	19	33.64	3.08
27	6.56	1.18	03	32.92	1.58
08	6.18	0.38	98	32.88	1.06
03	6.08	1.44	21	31.88	0.33
<b>Overall</b>	<b>Total:</b>	<b>Total:</b>	<b>Overall</b>	<b>Total:</b>	<b>Total:</b>
	<b>166.46</b>	<b>32.72</b>		<b>548.56</b>	<b>40.61</b>

Source: Author's calculations, based on Statistics New Zealand (2010c).

It can be seen in Table 6, that the level of IIT in total for the top 10 product categories has increased significantly from NZ\$166.46 million in 2000 to NZ\$548.56 million in 2009, a compound annual growth rate of 15%, while share in total trade has increased by 8%. However, when just looking at the individual product categories, the level of IIT has increased as well (e.g. HS 29 grew up from NZ\$42.5 million in 2000 to NZ\$113.28 million in 2009). But it is still not high for most product categories that are less than NZ\$50 million. On the other hand, those categories which have a higher share in total trade (more than 5 percent) do not appear to have a higher level of IIT respectively. For example, HS 85 appeared in both years and contains more than 9 percent of total trade, but the level of IIT is just NZ\$30.36 million (2000) and NZ\$65.10 million (2009). This indicates that for those product categories, bilateral trade is more inter-industry in nature.

For the entire period, the top 20 product categories with highest level of IIT are

presented in Appendix C that shows similar trends as explained for Table 6. Therefore, it can be determined by taking degree and level of IIT and share in total trade into account to see if any significant degree and level of IIT was involved in any single product category between New Zealand and China over the years 2000 to 2009.

By comparing Table 5 and Table 6 of the top 10 product categories, there are some product categories which have relatively higher degrees and levels of IIT. These product categories are HS 08 and HS 48 for year 2000, and HS 21, HS 29, HS 48, and HS 76 for year 2009. However, when considering the share in total trade (more than one percent), only HS 29 and HS 48 have relatively higher degree and level of IIT between New Zealand and China. Similar results can be obtained from comparing Appendix B and Appendix C for the entire selected period (2000-2009). Therefore, it can be concluded that New Zealand only has fewer numbers of product categories that have a relatively significant level of IIT with China.

Moreover, by comparing Appendix B and Appendix C, product category HS 85 seems to have both a higher degree and level of IIT in year 2001. This implies that both New Zealand and China imported and exported from the same industry and suggests that HS 85 has relatively significant level of IIT, but only in the year 2001. Nevertheless, both product categories HS 84 and HS 85 have increasing trends for levels of IIT and share in total trade<sup>17</sup>, however the degree of IIT of these two product categories are too low<sup>18</sup>. Therefore, it is difficult to potentially see these two product categories involving a significant degree of IIT in the future.

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<sup>17</sup> The level of intra-industry trade for these two product categories reached NZ\$50 million and the shares in total trade contained more than 10% over the observed period.

<sup>18</sup> It is observed that in 2009, categories HS 84 and 85 were estimated to have a GL index of 5.99 and 5.24, and for *Ri* index, the values are 51.54 and 51.34 respectively (Author's calculation, based on Statistics New Zealand, 2010c).

#### **5.2.4 Possible explanations of current trends and future potential**

Overall, New Zealand bilateral trade with China is dominated by inter-industry trade (see Section 2.5), both countries import and export products from different industries, and IIT appears to have very little impact on total trade. Those few product categories that do have IIT are not really explained by some of the determinants summarized before but are consistent with the hypothesis listed earlier. Furthermore, by comparing Table 5 and Table 6, even though for some product categories (e.g. HS 84 and HS 85) have higher levels of IIT but low degrees of IIT still mean that the actual level of IIT is not significantly high.

Such product categories exist (HS 29 and HS 48) with relatively higher degrees and levels of IIT may be because consumers of both countries have similar tastes, and shipping costs have reduced as a result of transportation technologies developed in recent years. Other product categories do have IIT but that only appeared in certain years or they have contributed either only a small amount to total trade (e.g. HS 08) or had a low volume of IIT compared with its total trade (e.g. HS 85). Hence, the current level of IIT between New Zealand and China is low and future potential for its expansion is not significant.

From the hypothesis presented above, the number of determinants that negatively correlated to New Zealand-China IIT has provided some explanations for the results of low level of IIT obtained in this chapter. Since the level of income per capita of China is significantly lower than New Zealand, the difference of income per capita between the two countries is considerably large. And moreover, according to the Linder theory, consumers will demand products regarding to their income level, that is, countries with similar income level will trade more. Besides, the economy of China is much larger than that of New Zealand and a large geographical distance exists, thus high IIT might not happen as expected.

IIT is particularly high when there are more manufactured products, high FDI inflows, and large intra-firm trade. In reality, those factors with large quantities do not exist as New Zealand's main exports to China are agricultural products and main imports include textiles, electronic goods, and other manufactured products; with very few manufactured products being traded both ways. In addition, the two countries are experiencing high foreign direct investment inflows but not high from each other (NZ Herald, 2010); hence, intra-firm trade may not be large.

All the factors listed above explain the low level and degree of IIT between New Zealand and China. On the other hand, since the two countries signed the FTA in year 2008, it is possible that IIT as well as total trade might increase in the not too distant future. Therefore, it is important to watch the trends of trade after the FTA and its impact on IIT between the two countries in a further study.

### **5.3 Summary**

This chapter analyzed the IIT between New Zealand and China. New Zealand was hypothesized to have very low level of IIT with China at country level and the number of product categories which have IIT with China would be very few. Empirical results showed that New Zealand's overall IIT with China for selected years at the country level measured by the GL weighted average index and R index is at very low level and concentrated in the manufacturing sector. It has been once again confirmed that New Zealand's bilateral trade with China is inter-industry trade dominated.

By comparing the top 20 categories with highest degree of IIT between New Zealand and China, the general result show that those product categories account for only a small amount share in total trade and most of them are less than one percent. However, by measuring the significance of IIT, both GL index and  $R_i$  index have identified exactly the same categories that are with highest index values. This

indicates that the trade imbalance problem has less serious influence on measuring IIT between New Zealand and China. Table 5 compared the degrees of IIT for years 2000 and 2009 and showed only HS 29 and HS 48 have higher degrees of IIT and these categories are weighted over one percent in the share in total trade .

Overall, analyzing only index values does not accurately reflect the level of IIT between New Zealand and China but only estimates the degree of IIT. Hence, distinguishing between the level and degree of IIT is particularly important when measuring countries' IIT with their partners.

According to Table 6, the results of the top 10 product categories with highest level of IIT between New Zealand and China indicate that the top 10 product categories appear to have a very low volume of IIT. When considering the degree and level of IIT and share in total trade by comparing Table 5 and Table 6, it seems that product categories HS 29 and HS 48 have relatively significant level of IIT than other product categories.

For the entire period, Appendix B and Appendix C show similar trends to Table 5 & 6. Even if the top 20 product categories are included, only HS 29 and HS 48 have relatively higher degrees and increased levels of IIT. However, these product categories have declining shares in total trade through almost all the years. This implies that there is no single product category in New Zealand-China IIT that is in higher degree and accompanies by increasing level and has a high share in bilateral trade, indicating insignificant potential for expansion of the same.

The following chapter concludes this research, states the contributions to the literature, and identifies the limitations and directions for future research.

## Chapter 6: Concluding Remarks

This research has analyzed the current trends and future potential of IIT between New Zealand and China over the period of 2000-2009. The results are consistent with the hypothesis proposed and the study by Hu and Ma (1999) that New Zealand has very low level of IIT with China and the number of industries which have IIT with China are very few.

In this research, the emerging trends in New Zealand-China trade have first been analyzed in Chapter 2. New Zealand exports mainly agricultural products to and imports manufacturing products from China. The two countries signed an FTA in 2008 which aims to liberalize and facilitate trade by removing trade barriers on goods, services and investments. Over the observed period, there has been significant growth in both trade value and share of total exports and imports. Moreover, bilateral trade between the two countries has also been strengthened with most of the trade being of the inter-industry variety.

The next step has been to review past literature in Chapter 3. Both theoretical and empirical literature on IIT has been reviewed and more importantly, the country specific determinants concerning New Zealand have been summarized. These determinants include openness, preferential trade agreements and geographical distance.

In Chapter 4, it contains the choice of measures which are employed to examine in order to measure the importance of IIT between New Zealand and China. The preference has been made for GL index and Rajan's index. This chapter has also stressed the distinction between the level and degree of IIT. The aggregation problem as a source of serious biased has been discussed.

Last, analysis of IIT between New Zealand and China is conducted in Chapter 5. The results suggest that New Zealand has very low level of IIT with China and the number of industries which have IIT with China are very few. While, the impact of the FTA on IIT is not clear as the two countries signed this agreement only few years ago.

The remainder of this chapter is organized as: Section 6.1 summarize the main findings from this research. Section 6.2 states the contributions to the literature. Limitations of this research are discussed in Section 6.3 followed by directions for future research in Section 6.4.

## **6.1 Main Findings**

This research briefly introduced the New Zealand-China trading relationship and shows that New Zealand continues to experience increasing trade deficit over the selected period. However, with an FTA in place, both parties expect to benefit from trade creation. Moreover, the economic impact of the FTA on New Zealand is greater than it is on China. As a result of the FTA, New Zealand might eventually reduce the gap in the trade deficit subject to the FTA being utilized and ROO compliance not being too costly.

In addition, New Zealand-China trade intensity shows the bilateral trade flows between the two countries have become more intense, indicating a close trading relationship from the New Zealand perspective. According to these results, it can be concluded that bilateral trading relationship of New Zealand-China has intensified over the last decade, indicating that a higher degree of integration of New Zealand with China. However, it is important to note that while the FTA is expected to increase bilateral merchandise trade through tariff reductions, it is very likely going to increase trade of the inter-industry variety given the differences in resources and levels of development between the two countries.

Research also suggests that a country's IIT is influenced by both country specific determinants and industry specific determinants. Those determinants are important considerations in relation to the level of IIT. In this research, it has summarized only country specific determinants which are particularly applicable to New Zealand as the two countries have different economic structures. According to these determinants, openness and preferential trade agreements seem to have positively impact in promoting IIT between New Zealand and China. Other determinants such as difference in income per capita, economic size, exporting of manufactured products, FDI, intra-firm trade and geographical distance may have an adverse effect. Therefore, the hypothesis analyzed has been that New Zealand is likely to have very low level of IIT with China and the number of industries which have IIT with China would be very few.

Empirical results have proved the hypothesis proposed based on measurements of GL index and Rajan's index. The two indices indicate that New Zealand has very low levels and degrees of IIT with China. By comparing the top 20 products categories with highest levels and degrees of IIT, only product categories HS 29 and HS 48 have relatively higher IIT than other categories within some of the observed years.

There is no single product category that involved both a high level and degree of IIT. This is consistency with the hypothesis presented, that New Zealand only has fewer numbers of categories that have a relatively higher level of IIT with China majorly in manufacturing sector. However, HS 84 and HS 85 have increasing trends for the level of IIT but the degree of IIT is very low, potentially it is difficult to see these two product categories accompanied with increasing degree of IIT in the future.

Another important finding is that, according to Table 5, both GL index and  $R_i$  index identified exactly the same top 10 product categories indicating that the trade



imbalance problem has not significantly influenced New Zealand-China IIT. Overall, the research has observed that New Zealand–China IIT has not been very significant over the past decade but may potentially increase if New Zealand diversifies its exports to Chinese market in the manufacturing sector.

## **6.2 Contributions to the Literature by This Research**

The research of IIT between New Zealand and China contributes to the economic analysis concerning the two countries bilateral trade. It also fills the gaps in the area of IIT between the two countries. It is particularly important to New Zealand since China has become the second largest trading partner and an FTA has been signed with China recently. Therefore, IIT can be another source of gain from free trade even though inter-industry trade is found to have dominated bilateral trade so far.

Moreover, this research contains several contributions that can be considered as an improvement over earlier studies. First, this research focuses on IIT between New Zealand and China over recent years apart from early studies (Hu & Ma, 1999; Bano, 2002). Second, this research evaluates emerging trends in New Zealand-China bilateral trade and involves consideration of the impacts of New Zealand-China FTA on IIT. And last, this research summarizes the determinants of IIT with greater concern on New Zealand.

## **6.3 Limitations of This Research**

It is noticeable that within this research, several limitations need to be pointed out. The aggregation problem has already been explained in an earlier section. This problem can result in serious biases due to insufficient disaggregation. To minimize this problem, the measure of IIT needs to be built on the basis of even more disaggregated trade data. Hence, further study can focus on those industry groups which do have IIT between New Zealand and China at a finer disaggregated

trade data, viz at HS 6 digit level.

Moreover, country size is an important determinant when measuring IIT. As Nilsson (1997, p. 557) points out, if the developing country has low level IIT with a developed country due to a low total trade, the measuring of GL index may still imply that “IIT between the two countries is substantial and important”. The author also argues that the failure of inaccurate GL index identifying the level of IIT is due to the relative size of trade imbalances.

On the other hand, at country level, Table 4 shows the values of Rajan’s index fall below the stipulated bounds of 50 within some of observed years, this is because of a large share of trade between New Zealand and China is inter-industry trade dominated. Therefore, Rajan’s index has not successfully reflected the level of IIT correctly for countries with large differences in economic size due to trade imbalances. Thus, the development of measurement methods of IIT is particularly desirable in the sense of eliminating trade imbalances for countries with large differences in economic size.

Furthermore, this research is limited only to merchandise or goods trade as bilateral data for trade in commercial services remains unpublished. The FTA has only been in force for just over 2 years, so it may still be a few years before one can analyze the actual impact on bilateral merchandise and IIT. While the FTA is expected to increase bilateral merchandise trade through tariff reductions, it is very likely going to increase trade of the inter-industry variety given the differences in resources and levels of development between the two countries.

## **6.4 Directions for Future Research**

Further study focusing on New Zealand-China IIT will examine the determinants (both country specific determinants and industry specific determinants) of IIT in an

econometric framework to explain the low levels of IIT in a more detailed manner. It will also apply alternative measures with the capability to accurately reflect the level of IIT by avoiding the trade imbalances problem for countries with large disparity in economic size, in this case, the focus is again on IIT between New Zealand and China. Moreover, further study will also include the services sector when data becomes available.

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# Appendices

**Appendix A: New Zealand's bilateral trade with China (Millions of New Zealand Dollars)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Total New Zealand Exports</b>	29,257.14	32,669.98	31,033.74	28,397.24	30,711.91	30,817.30	34,633.55	36,556.72	42,900.22	39,672.19
<b>Exports to China</b>	929.62	1,349.35	1,430.07	1,376.35	1,745.44	1,565.54	1,874.90	1,953.35	2,533.58	3,627.53
<b>% of Total Exports</b>	3.18%	4.13%	4.61%	4.85%	5.68%	5.08%	5.41%	5.34%	5.91%	9.14%
<b>Growth Rate of Exports</b>		45.15%	5.98%	-3.76%	26.82%	-10.31%	19.76%	4.18%	29.70%	43.18%
<b>Total New Zealand Imports</b>	30,735.65	31,682.16	32,337.37	31,781.70	34,915.47	37,278.77	40,715.70	41,868.50	48,514.06	40,220.79
<b>Imports from China</b>	1,924.49	2,207.39	2,590.63	2,847.87	3,376.10	4,033.42	4,964.19	5,586.64	6,443.74	6,065.66
<b>% of Total Imports</b>	6.26%	6.97%	8.01%	8.96%	9.67%	10.82%	12.19%	13.34%	13.28%	15.08%
<b>Growth Rate of Imports</b>		14.70%	17.36%	9.93%	18.55%	19.47%	23.08%	12.54%	15.34%	-5.87%
<b>Trade Deficit</b>	994.87	858.04	1,160.56	1,471.52	1,630.66	2,467.88	3,089.29	3,633.29	3,910.16	2,438.13

Source: Author's calculations, based on Statistics New Zealand (2010a & b).

**Appendix B: Comparison of the top 20 product categories with highest degree of intra-industry trade between New Zealand and China**

Year 2000				Year 2001			
HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %	HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %
86	100.00	100.00	0.00	16	97.22	97.30	0.04
57	99.50	99.50	0.07	74	93.79	94.15	0.18
74	98.73	98.74	0.17	72	91.44	92.11	0.32
43	94.42	94.72	0.08	19	86.34	87.98	0.27
07	91.50	92.16	0.21	20	84.95	86.92	0.20
16	86.84	88.37	0.03	57	83.33	85.71	0.10
21	77.07	81.35	0.11	17	83.11	85.55	0.06
22	68.57	76.09	0.01	07	77.15	81.40	0.35
48	61.99	72.46	1.71	22	76.92	81.25	0.03
08	56.70	69.78	0.38	08	71.04	77.54	0.29
17	51.61	67.39	0.05	06	66.67	75.00	0.00
29	39.05	62.13	3.82	29	61.07	71.98	2.30
76	33.42	60.03	0.80	48	54.69	68.82	2.81
12	31.93	59.50	0.34	43	53.13	68.09	0.09
20	31.82	59.46	0.27	03	47.69	65.66	1.69
72	30.36	58.95	0.22	12	38.14	61.78	0.27
27	19.51	55.40	1.18	38	33.76	60.15	0.20
32	18.06	54.96	0.26	76	30.99	59.17	0.79
44	16.89	54.61	3.37	21	29.86	58.77	0.10
97	16.67	54.55	0.03	85	25.20	57.21	9.54
<b>Overall</b>	<b>Average:</b> <b>56.23</b>	<b>Average:</b> <b>73.01</b>	<b>Total:</b> <b>13.10</b>	<b>Overall</b>	<b>Average:</b> <b>64.32</b>	<b>Average:</b> <b>75.83</b>	<b>Total:</b> <b>19.64</b>
Year 2002				Year 2003			
HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %	HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %
22	99.36	99.37	0.04	48	97.83	97.88	1.61
19	98.90	98.91	0.29	57	91.93	92.53	0.11
74	98.43	98.46	0.21	72	91.49	92.16	0.41
07	92.21	92.77	0.26	16	88.64	89.80	0.08
20	91.33	92.02	0.35	08	88.10	89.36	0.25
11	87.72	89.06	0.01	07	84.17	86.34	0.20
08	84.97	86.93	0.24	19	81.65	84.49	0.39
17	83.19	85.61	0.12	74	77.42	81.58	0.36
48	63.03	73.01	2.23	21	76.04	80.67	0.27
57	54.55	68.75	0.17	22	75.38	80.25	0.03
38	54.09	68.54	0.17	18	70.00	76.92	0.01
72	50.47	66.88	0.32	29	67.20	75.30	1.72
43	47.35	65.51	0.15	27	66.32	74.81	0.64
76	45.45	64.70	0.82	76	64.71	73.92	0.80
29	41.39	63.05	3.22	06	62.07	72.50	0.01
16	39.44	62.28	0.04	20	58.33	70.59	0.47
03	38.48	61.91	1.79	43	56.59	69.73	0.15
21	36.27	61.08	0.14	17	51.48	67.33	0.11
79	33.33	60.00	0.00	38	38.75	62.01	0.17
27	29.79	58.75	0.58	79	33.33	60.00	0.00
<b>Overall</b>	<b>Average:</b> <b>63.49</b>	<b>Average:</b> <b>75.88</b>	<b>Total:</b> <b>11.14</b>	<b>Overall</b>	<b>Average:</b> <b>71.07</b>	<b>Average:</b> <b>78.91</b>	<b>Total:</b> <b>7.80</b>

**Appendix B (continued)**

Year 2004				Year 2005			
HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %	HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %
48	95.51	95.70	1.44	17	98.08	98.12	0.31
81	91.62	92.27	0.08	76	95.05	95.28	0.75
08	86.84	88.37	0.20	22	93.15	93.59	0.05
27	86.03	87.74	0.28	43	92.56	93.07	0.10
43	82.70	85.25	0.11	81	84.73	86.75	0.07
21	82.16	84.86	0.27	79	82.76	85.29	0.01
07	76.84	81.20	0.22	08	82.58	85.17	0.29
76	75.75	80.48	0.87	72	81.92	84.69	0.45
74	74.67	79.79	0.40	29	78.98	82.63	1.25
16	72.43	78.39	0.05	78	75.00	80.00	0.00
57	68.08	75.80	0.11	48	73.68	79.16	1.61
72	67.37	75.40	0.38	06	72.25	78.28	0.03
22	65.22	74.19	0.03	21	65.34	74.26	0.20
29	62.85	72.91	2.05	12	61.86	72.39	0.16
80	62.69	72.83	0.01	07	60.53	71.70	0.23
17	60.36	71.61	0.15	74	46.48	65.14	0.58
19	55.47	69.19	0.56	38	44.33	64.24	0.22
78	50.00	66.67	0.00	80	34.41	60.39	0.02
60	44.09	64.14	0.08	57	31.31	59.28	0.09
20	36.31	61.09	0.43	98	30.51	59.00	0.10
<b>Overall</b>	<b>Average:</b> <b>69.85</b>	<b>Average:</b> <b>77.89</b>	<b>Total:</b> <b>7.73</b>	<b>Overall</b>	<b>Average:</b> <b>69.28</b>	<b>Average:</b> <b>78.42</b>	<b>Total:</b> <b>6.52</b>
Year 2006				Year 2007			
HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %	HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %
06	100.00	100.00	0.01	22	91.29	91.99	0.06
76	96.74	96.85	0.90	98	86.41	88.03	0.23
29	95.78	95.95	1.23	43	82.91	85.40	0.06
12	91.16	91.88	0.18	76	79.93	83.29	0.85
22	89.88	90.81	0.05	21	77.02	81.31	0.23
43	84.39	86.50	0.06	12	73.17	78.85	0.16
72	81.96	84.72	0.64	78	71.43	77.78	0.00
78	80.00	83.33	0.00	29	67.49	75.47	1.14
81	71.88	78.05	0.05	74	66.29	74.79	0.79
21	68.50	76.04	0.21	72	62.77	72.87	0.63
88	65.31	74.24	0.01	08	62.27	72.61	0.37
48	60.84	71.86	1.67	48	53.06	68.06	1.68
08	58.77	70.81	0.37	81	37.82	61.66	0.05
79	53.23	68.13	0.02	03	30.35	58.95	1.45
74	45.06	64.54	0.83	38	28.32	58.25	0.18
27	44.56	64.33	0.37	88	26.67	57.69	0.00
13	38.71	62.00	0.02	79	25.00	57.14	0.01
57	36.15	61.03	0.10	19	23.60	56.69	1.29
03	33.36	60.01	1.72	32	20.84	55.81	0.27
17	33.11	59.92	0.19	44	19.19	55.31	3.45
<b>Overall</b>	<b>Average:</b> <b>66.47</b>	<b>Average:</b> <b>77.05</b>	<b>Total:</b> <b>8.63</b>	<b>Overall</b>	<b>Average:</b> <b>54.29</b>	<b>Average:</b> <b>70.60</b>	<b>Total:</b> <b>12.93</b>

**Appendix B (continued)**

Year 2008				Year 2009			
HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %	HS Code	GL Index	R <sub>i</sub> Index	Share in total trade %
43	85.13	87.06	0.06	21	98.91	98.93	0.33
21	80.22	83.49	0.26	76	92.63	93.13	0.77
29	73.84	79.26	1.53	29	92.20	92.77	1.27
76	69.02	76.35	0.79	18	84.57	86.63	0.02
78	68.97	76.32	0.00	72	65.02	74.09	0.45
12	68.05	75.79	0.11	12	65.02	74.08	0.14
72	66.49	74.90	0.81	74	54.35	68.66	0.57
74	60.68	71.77	0.69	48	51.70	67.43	1.27
18	54.55	68.75	0.01	43	42.13	63.34	0.04
48	48.80	66.14	1.52	27	40.10	62.54	0.47
22	47.36	65.51	0.09	98	32.11	59.56	1.06
75	43.48	63.89	0.00	17	29.12	58.52	0.20
98	37.00	61.35	0.86	22	25.25	57.23	0.17
08	35.26	60.70	0.55	03	21.54	56.03	1.58
03	34.29	60.35	1.72	08	19.10	55.28	0.77
06	32.79	59.80	0.02	38	18.34	55.05	0.22
60	24.18	56.88	0.10	32	18.13	54.99	0.15
30	21.74	56.10	0.22	06	17.87	54.91	0.04
38	19.78	55.49	0.24	90	17.23	54.71	1.06
33	19.26	55.33	0.31	97	14.06	53.78	0.01
<b>Overall</b>	<b>Average:</b>	<b>Average:</b>	<b>Total:</b>	<b>Overall</b>	<b>Average:</b>	<b>Average:</b>	<b>Total:</b>
	<b>49.54</b>	<b>67.76</b>	<b>9.90</b>		<b>44.97</b>	<b>67.08</b>	<b>10.60</b>

Source: Author's calculations, based on Statistics New Zealand (2010c).

**Appendix C: Comparison of the top 20 categories with highest level of intra-industry trade between New Zealand and China**

Year 2000			Year 2001		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
29	42.50	3.82	85	85.44	9.54
85	30.36	9.70	48	54.62	2.81
48	30.24	1.71	29	49.80	2.30
44	16.24	3.37	03	28.70	1.69
84	10.84	4.88	84	27.26	5.68
51	9.88	5.45	44	15.14	4.41
76	7.58	0.80	72	10.36	0.32
27	6.56	1.18	39	9.72	2.11
08	6.18	0.38	07	9.62	0.35
03	6.08	1.44	76	8.66	0.79
39	5.82	2.11	19	8.28	0.27
07	5.38	0.21	27	8.24	1.14
74	4.66	0.17	08	7.26	0.29
05	3.56	1.33	20	6.04	0.20
12	3.12	0.34	74	6.04	0.18
20	2.46	0.27	51	3.88	6.06
21	2.42	0.11	12	3.70	0.27
25	2.40	1.08	05	3.44	1.52
43	2.20	0.08	35	3.12	0.63
95	2.12	4.85	57	3.10	0.10
<b>Total:</b>	<b>200.60</b>	<b>43.27</b>	<b>Total:</b>	<b>352.42</b>	<b>40.66</b>
Year 2002			Year 2003		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
48	56.28	2.23	48	66.38	1.61
29	53.52	3.22	85	51.04	10.92
85	48.34	9.89	29	48.74	1.72
03	27.62	1.79	84	23.54	8.56
84	22.84	7.89	76	21.86	0.80
44	19.68	5.81	44	20.24	4.82
76	14.92	0.82	27	17.82	0.64
20	12.74	0.35	03	16.80	1.28
19	11.70	0.29	72	15.92	0.41
07	9.70	0.26	19	13.30	0.39
74	8.16	0.21	74	11.86	0.36
08	8.14	0.24	20	11.62	0.47
27	6.98	0.58	08	9.40	0.25
72	6.38	0.32	39	8.62	1.95
39	5.72	2.00	21	8.60	0.27
05	4.08	1.67	07	7.18	0.20
17	3.86	0.12	51	6.06	3.50
57	3.72	0.17	73	4.46	1.92
38	3.70	0.17	57	4.10	0.11
25	3.28	0.77	43	3.52	0.15
<b>Total:</b>	<b>331.36</b>	<b>38.78</b>	<b>Total:</b>	<b>371.06</b>	<b>40.34</b>

**Appendix C (continued)**

Year 2004			Year 2005		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
48	69.70	1.44	48	66.40	1.61
29	65.20	2.05	85	58.16	12.41
85	57.92	11.21	29	55.36	1.25
84	49.36	10.06	76	39.92	0.75
76	33.42	0.87	44	33.74	3.03
44	29.70	3.50	84	33.48	12.78
19	15.82	0.56	03	33.24	2.31
74	14.92	0.40	72	20.66	0.45
03	14.46	1.94	17	16.86	0.31
72	12.80	0.38	19	16.56	1.14
27	12.38	0.28	74	15.18	0.53
21	11.10	0.27	51	13.44	2.99
08	8.78	0.20	08	13.18	0.29
07	8.66	0.22	73	10.78	2.50
39	8.54	2.01	39	9.52	2.17
20	7.96	0.43	27	8.06	0.49
73	7.34	2.35	07	7.76	0.23
51	6.50	3.12	21	7.22	0.20
17	4.66	0.15	12	5.66	0.16
43	4.54	0.11	20	5.62	0.45
<b>Total:</b>	<b>443.76</b>	<b>41.57</b>	<b>Total:</b>	<b>470.80</b>	<b>46.05</b>
Year 2006			Year 2007		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
85	100.76	12.65	85	91.98	14.14
29	80.62	1.23	48	66.88	1.68
48	69.22	1.67	29	57.92	1.14
76	59.44	0.90	76	51.30	0.85
84	50.78	13.36	44	49.82	3.45
44	48.32	3.93	84	40.92	13.48
03	39.24	1.72	74	39.50	0.79
72	35.98	0.64	03	33.14	1.45
74	25.58	0.83	72	29.84	0.63
19	21.70	1.24	51	28.70	2.50
51	21.28	2.88	39	25.24	2.48
08	14.84	0.37	19	22.98	1.29
39	13.88	2.38	08	17.10	0.37
12	11.34	0.18	98	14.94	0.23
27	11.14	0.37	21	13.54	0.02
21	9.74	0.21	73	11.62	2.74
73	7.22	2.52	12	9.00	0.16
17	4.38	0.19	90	6.46	1.00
07	4.32	0.24	15	5.86	1.20
38	4.20	0.32	33	4.28	0.33
<b>Total:</b>	<b>633.98</b>	<b>47.82</b>	<b>Total:</b>	<b>621.02</b>	<b>49.95</b>

**Appendix C (continued)**

Year 2008			Year 2009		
HS Code	Level of intra-industry trade (\$million)	Share in total trade %	HS Code	Level of intra-industry trade (\$million)	Share in total trade %
29	101.06	1.53	29	113.28	1.27
85	82.66	13.45	76	68.86	0.77
48	66.54	1.52	85	65.10	12.84
84	63.40	12.14	48	63.66	1.27
03	52.72	1.72	84	63.34	10.92
76	48.98	0.79	44	43.00	7.49
44	48.60	4.14	19	33.64	3.08
72	48.38	0.81	03	32.92	1.58
74	37.74	0.69	98	32.88	1.06
51	30.94	2.29	21	31.88	0.33
39	29.80	2.59	51	30.24	2.63
98	28.48	0.86	74	29.78	0.57
19	26.06	1.98	72	28.50	0.45
21	18.78	0.26	39	25.68	2.32
08	17.42	0.55	27	18.30	0.47
73	13.80	3.14	90	17.72	1.06
90	12.50	1.02	08	14.32	0.77
15	7.90	1.53	12	8.68	0.14
35	7.18	0.46	15	7.92	1.05
12	6.54	0.11	73	7.56	2.26
<b>Total:</b>	<b>749.48</b>	<b>51.60</b>	<b>Total:</b>	<b>737.26</b>	<b>52.33</b>

Source: Author's calculations, based on Statistics New Zealand (2010c).



**Appendix D: Product description of HS 2 digit product categories chosen for this research**

<b>HS Code</b>	<b>Product Description</b>
02	Meat and edible meat offal
03	Fish and crustaceans, molluscs and other aquatic invertebrates
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included
05	Animal originated products; not elsewhere specified or included
06	Trees and other plants, live; bulbs, roots and the like; cut flowers and ornamental foliage
07	Vegetables and certain roots and tubers; edible
08	Fruit and nuts, edible; peel of citrus fruit or melons
11	Products of the milling industry; malt, starches, inulin, wheat gluten
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants; straw and fodder
13	Lac; gums, resins and other vegetable saps and extracts
15	Animal or vegetable fats and oils and their cleavage products; prepared animal fats; animal or vegetable waxes
16	Meat, fish or crustaceans, molluscs or other aquatic invertebrates; preparations thereof
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
19	Preparations of cereals, flour, starch or milk; pastrycooks' products
20	Preparations of vegetables, fruit, nuts or other parts of plants
21	Miscellaneous edible preparations
22	Beverages, spirits and vinegar
23	Food industries, residues and wastes thereof; prepared animal fodder
25	Salt; sulphur; earths, stone; plastering materials, lime and cement
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes
29	Organic chemicals
30	Pharmaceutical products
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints, varnishes; putty, other mastics; inks
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations
35	Soap, organic surface-active agents; washing, lubricating, polishing or scouring preparations; artificial or prepared waxes, candles and similar articles, modelling pastes, dental waxes and dental preparations with a basis of plaster
38	Chemical products n.e.c.
39	Plastics and articles thereof
41	Raw hides and skins (other than furskins) and leather
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)
43	Furskins and artificial fur; manufactures thereof
44	Wood and articles of wood; wood charcoal

**Appendix D (continued)**

47	Pulp of wood or other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard
48	Paper and paperboard; articles of paper pulp, of paper or paperboard
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric
57	Carpets and other textile floor coverings
60	Fabrics; knitted or crocheted
61	Apparel and clothing accessories; knitted or crocheted
62	Apparel and clothing accessories; not knitted or crocheted
63	Textiles, made up articles; sets; worn clothing and worn textile articles; rags
64	Footwear; gaiters and the like; parts of such articles
72	Iron and steel
73	Iron or steel articles
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin; articles thereof
81	Metals; n.e.c., cermets and articles thereof
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers, parts and accessories of such articles
86	Railway, tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds
88	Aircraft, spacecraft and parts thereof
90	Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts and accessories
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, n.e.c.; illuminated signs, illuminated name-plates and the like; prefabricated buildings
95	Toys, games and sports requisites; parts and accessories thereof
97	Works of art; collectors' pieces and antiques
98	New Zealand miscellaneous provisions

Source: Statistics New Zealand (2010c).