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Mahinda Siriwardana
School of Economics,
University of New England, Armidale
and
Center for Contemporary Asian Studies
Doshisha University
asiriwar@une.edu.au

and

Jinmei Yang
School of Economics,
University of New England, Armidale
jmyang@une.edu.au



Center for Contemporary Asian Studies
Doshisha University

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Mahinda Siriwardana
School of Economics, University of New England,
Armidale, NSW 2351, Australia
and
Center for Contemporary Asian Studies, Doshisha University, Kyoto, Japan
Email: asiriwar@une.edu.au

and

Jinmei Yang
School of Economics, University of New England,
Armidale, NSW 2351, Australia
Email: jmyang@une.edu.au

Abstract

The negotiations for the Australia-China Free Trade Agreement (ACFTA) have made a significant progress. This paper applies the Computable General Equilibrium (CGE) model using Global Trade Analysis Project (GTAP) database version 6 for a quantitative analysis of the economic effects of proposed ACFTA. Four scenarios are examined in this paper focusing on flexible and fixed current account positions within short run and long run. Equivalent variation (EV) and real consumption are used to measure the welfare effects resulting from the formation of the ACFTA. The results from the GTAP simulations show positive welfare effects for both Australia and China in all cases. The different magnitudes of changes in the two countries represent the relative significance and size of bilateral trade to each country. The modeling results also indicate that the ACFTA has a negligible impact on rest of the world's real GDP and welfare, and would generate trade creation greater than trade diversion for the world as a whole. Specifically, the two economies will obtain gains according to their comparative advantages. In the case of Australia, primary commodities such as grains, sugar and mining products dominate exports to China whereas in the case of China, manufactures such as wearing apparels, textiles and miscellaneous manufacturing benefit most. Labour force is estimated to move from declining sectors to growing sectors in most cases in the two economies. The sectoral adjustments of trade balance, output and demand for primary factors exhibit similar directions of changes. It is evident that an Australia-China FTA would have not only bilateral but global benefits.

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I. Introduction

The global trading system has seen a very substantial increase in preferential trading arrangements (PTAs) over the past decade. The number of agreement had grown from 30 in 1991 to 188 in 2005. World Trade Organization (WTO) statistics show that by 1 March 2006, 193 Regional Trade Agreements (RTAs) had been notified to the WTO (WTO 2006a) and are currently in force. This increase in RTAs raises the potential for diverse and overlapping agreements with various types of preferential Rules of Origin (RoO) (Productivity Commission 2004).

Free trade agreements (FTAs), which improve market access and strengthen trade flows, are an important vehicle for enhancing bilateral trading relationships. With the worldwide proliferation of regional trade agreements, Australia shows its positive attitude to join the world trend and focuses on negotiating FTAs with selected partners where these offer the prospect of significant gains ahead of what will be achievable in the WTO process. So far, Australia has signed WTO-consistent FTAs with some major trading partners, such as the U.S. and Singapore. These bilateral trade agreements deliver great benefits where the parties are willing to move faster and undertake more profound liberalisation than can be achieved by the WTO multilateral trading system.

Australia and China commenced negotiations on an FTA following consideration of the joint FTA Feasibility Study completed in March 2005. This study concluded that there would be significant economic benefits for both Australia and China through the Australia-China FTA (ACFTA). Independent research has predicted that under full liberalisation from 2006, Australia's real GDP would rise by an additional AU\$ 24.4 billion over 10 years (Mai et al. 2005). The Australian government has stressed that any FTA with China must deliver real gains for Australia businesses. Four rounds of ACFTA negotiations held so far have provided a solid basis for substantive discussions on virtually all possible provisions of the text of the FTA. The Australian side reiterated that the negotiations will be complex and challenging but Australia will approach them constructively. As Australian Deputy Prime Minister Hon Mark Vaile said, "An FTA will

enable us to set the terms of our future trade with the world's fastest-growing major economy, for the benefit of all Australians" (DFAT 2006a).

This paper applies the Computable General Equilibrium (CGE) modelling approach using the Global Trade Analysis Project (GTAP) model and its database version 6 for a quantitative analysis of the economic effects of proposed ACFTA. Four scenarios with full merchandise trade liberalisation are examined in this paper focusing on flexible and fixed current account positions within short run and long run respectively.

The paper proceeds as follows. Section II reviews the Australia-China bilateral economic relations. Section III presents a brief description of the main features and database of the GTAP model used in this paper. Section IV defines simulation scenarios. The simulation results are reported and interpreted in section V. Some concluding remarks end the paper in section VI.

II. Bilateral Economic Relations between Australia and China

Australia and China have a longstanding relationship with a high level of interaction on trade, investment, education and tourism. China is of great significance to Australia as a bilateral, regional and multilateral partner; it is a significant member of the WTO, a major player in APEC, Australia's second-largest trading partner in 2005, and a major source of migrants, students and tourists. Australia is also of great importance to China; in 2005 Australia was China's 11th largest merchandise trade partner. As to the two-way investment relations, China was Australia's 22nd largest investment destination (AU\$ 1.2 billion in 2004), focusing on manufacturing, mineral exploration, legal, banking and education services. China also was the 17th largest investor in Australia (AU\$ 2.0 billion in 2004), primarily in the resources and property sectors (DFAT 2006b).

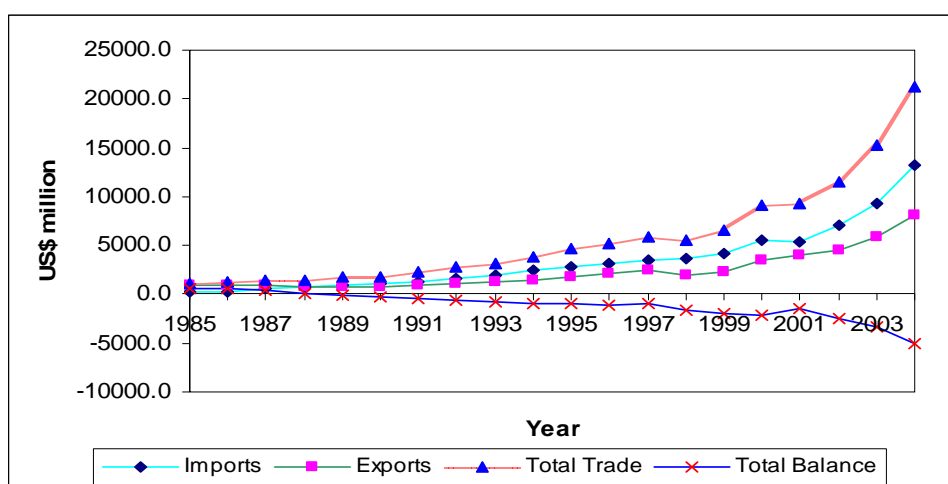
The economies of Australia and China are of significantly different sizes, and at different stages of economic and social development. Yet the Australian and Chinese economies

have already shared mutually-beneficial trade and investment relationships largely over the last two decades.

Trends in Two-Way Merchandise Trade

Figure 1 shows the trend of total trade between Australia and China. From 1985 to 2004, the average annual increasing rate of bilateral merchandise trade was 88.8 percent. In 2004, total trade in goods and services between Australia and China reached US\$ 21.2 billion, rising by 1775.7 per cent from the value of US\$ 1.1 billion in 1985. The trade deficit began for Australia in 1989 and widened until the first peak of US\$ 2.1 billion in 2000. Then in 2001 the deficits reached its lowest point in the last seven years (1998-2004) of the same period, at US\$ 5.1 billion in 2004. The trend of trade deficit appears to be further broadening.

Figure 1 Total trade between Australia and China, 1985-2004



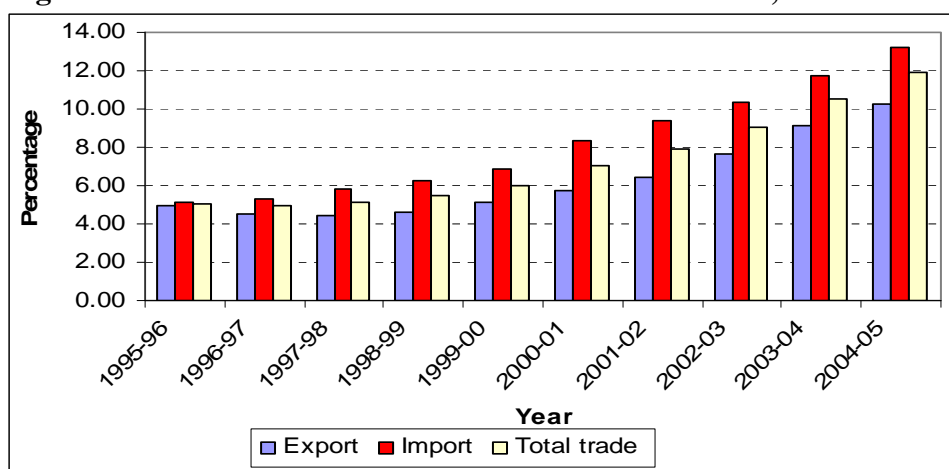
Note: Reporter: Australia; Partner: China.
Source: Comtrade database 2006.

In 2005, Australia's trade deficit with China reached AU\$ 6.8 billion, an increase of AU\$ 1.4 billion on the previous year's deficit due to an AU\$ 4.5 billion rise in imports partially offset by an AU\$ 3.0 billion increase in exports. The main commodities contributing to the increase in imports were: Office machines and automatic data processing machines (up AU\$ 0.9 billion); and Telecommunications and sound recording and reproducing

apparatus and equipment (up AU\$ 0.7 billion). The main increase in exports was mainly due to Metalliferous ores and metal scrap which were up AU\$ 2.4 billion (Year Book Australia 2006). The sectors which contributed most to the increased deficit were: Mineral fuels, lubricants and related materials; Commodities and transactions n.e.s in the SITC; and Animal and vegetable oils, fats and waxes.

Figure 2 shows China's share in Australian merchandise exports and imports from 1996 to 2005. During the ten-year period, Australia's imports sourced from China increased substantially from 5.15 percent in 1996 to 13.25 percent in 2005, whereas its exports to China rose from 4.97 percent to 10.24 percent. In 2005, China's share in Australia's total merchandise trade was 11.87 percent, valued at AU\$ 32.8 billion, whereas the total value of Australia's merchandise trade with the rest of the world was AU\$ 243.4 billion. Australian merchandise imports from China increased far quicker than its exports to China; and China was Australia's 2nd largest trading partner whereas Japan ranked 1st and U.S. in 3rd in 2005.

Figure 2 China's share in Australian merchandise trade, 1996-2005

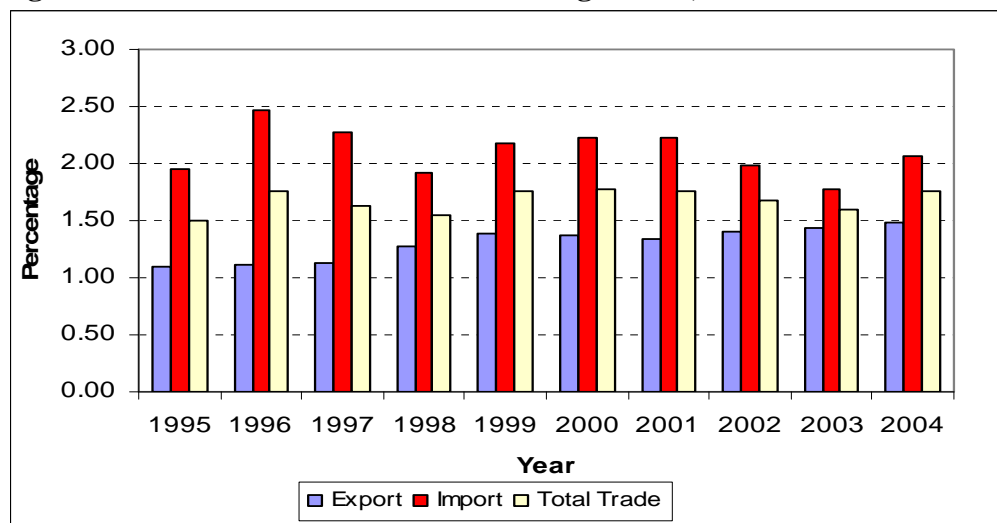


Note: Data are on a fiscal year basis, years ending 30 June.
Source: Year Book Australia (various years), ABS.

On the other hand, Figure 3 demonstrates that Australia's share in China's foreign trade from 1995 to 2004 fluctuated narrowly between 1.5 and 1.77 percent and finally reached its highest at the end of the period. In sharp contrast to Figure 2, Figure 3 indicates that Australia's position in China's merchandise trade is quite stable and modest. China's

imports sourced from Australia increased by 347 percent from US\$ 2.58 billion in 1995 to US\$ 11.55 billion in 2004, meanwhile China's exports to Australia kept rising by 443 percent from US\$ 1.6 billion to US\$ 8.8 billion during the same period. In 2004, there was a significant increase in both China's imports from and exports to Australia over the previous year at 58.25 percent and 41.1 percent respectively.

Figure 3 Australia's share in China's foreign trade, 1995-2004



Source: China Statistical Yearbook 2005c (various years).

Combining Figures 2 and 3, it is evident that Australia's merchandise imports from China increased faster than its exports to China whereas its own share in China's total foreign trade shows a slight fluctuation during the same period. It is not surprising therefore that China is becoming Australia's second largest merchandise trading partner with AU\$ 32.8 billion in 2005. China is playing an increasingly important role in Australia's merchandise trade compared with the role which Australia plays in China, this is probably due to the huge size of the economy China has in comparison to Australia and their different comparative advantage.

Australia imports a wide variety of goods from China. While traditional manufactured products like textile, clothing and footwear (TCF) and toys continue to grow solidly and still account for a significant share of its imports, Australia increasingly imports higher value added products from China, such as computers, telecommunication equipment,

electrical machinery and sound and video recorders, which China employs its relatively abundant factor of labour to produce.

Australian imports from China rose to total AU\$ 13.3 billion in 2003, up by 25.1 percent from the previous year, while Australian imports from many other major trading partners such as the U.S. and Japan fell during the same period. Chinese products have competed strongly in the Australian market, ranking the 2nd largest import source for Australia in 2004. Imports from China contribute to the Australian economy by lowering costs and offering greater choices to consumers. From 2002 to 2003, except Crude materials (inedible, except fuels), all sectors have seen increases in Australian imports from China.

The traditional trade pattern of Australia exporting primary products in exchange for manufactured goods (inter-industry trade) has increasingly given way to the exchange of goods which are differentiated products and very close substitutes. The statistics of exports and imports between Australia and China in 2002 and 2003 indicate that trade in similar products (intra-industry trade) is increasing heavily between Australia and China. It signals that international trade is playing a changing role of filling gaps in products not produced within the country (inter-industry trade).

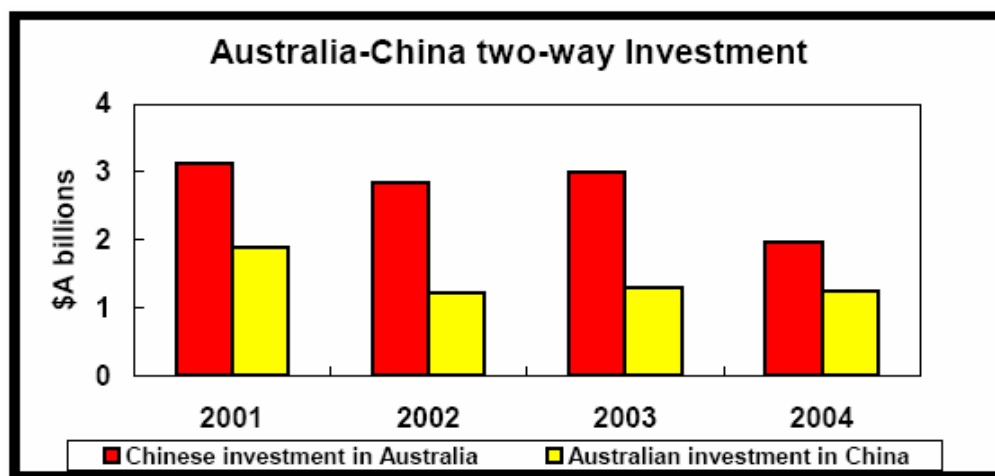
Bilateral investment between Australia and China

With economic strengths, cultural diversity and stability, Australia is a very attractive business investment destination. This can be seen from the numbers: in 2005, total foreign direct investment (FDI) in Australia reached AU\$ 1214 billion whereas Australian investment abroad with AU\$ 653.8 billion. Meanwhile, Australia is the gateway to the world's fastest growing region — the Asia Pacific. Therefore, Australia has a particular geographic advantage to participate and play an important role in the regional economic development.

Meanwhile, as the fastest growing economy in the world, China has a stronger economic relationship with Australia. This strength is reflected through the continued growth in

merchandise trade and bilateral investment. China was Australia's 22nd largest investment destination (AU\$ 1.2 billion) and 17th largest investor (AU\$ 2.0 billion) in 2004 (DFAT 2006b). China's investment in Australia focuses on resources and property sectors while Australia's investment in China focuses on manufacturing, mineral exploration, legal, banking and education services. A recent survey of Australia companies operating in China indicated that Australian investors in China have broadened away from manufacturing and evenly-split between the areas of manufacturing, property and business services, and other sectors including wholesale and retail trade, mining, finance and insurance, education, information services and energy supply (Maitland and Nicholas 1999).

Figure 4 Australia-China two-way investment, 2001-2004



Source: DFAT 2006c.

Figure 4 demonstrates the two-way investment between Australia and China from 2001 to 2004. Table 1 further shows that Australian share in China's FDI inflows and in Australian FDI outflows during the period of 1997 to 2004. During the period, the total value of FDI in China rose by 33.97 percent from US\$ 45.26 billion to US\$ 60.63 billion whereas FDI from Australia went up by 111.2 percent with the total value of US\$ 662.63 million in 2004. Although the share of FDI from Australia accounted for a small proportion of the total FDI in China, it does not signify a lack of real interest in the Chinese economy. On the other hand, the relatively low level of Australian direct

investment in China may reflect the complementary nature of Australia and China's production patterns and resource endowments (DFAT 2002).

During the same period, Chinese investment in Australia shows a strong growth trend. According to Chinese statistics, Australia is one of the most popular destinations for Chinese investment abroad (Editorial Board of the Almanac of China's Foreign Economic Relations and Trade 2001). In the fiscal year of 2005, China invested AU\$ 2.0 billion in Australia, ranking the 17th largest investor in Australia (DFAT 2006c). China's largest and highest profile Australian investments are in the resources sector. Real estate, including hotels in major metropolitan centres, farming and agricultural processing ventures and a variety of general manufacturing plants are other destinations for Chinese investment in Australia (Invest Australia 2002).

Table 1 Australia's share in China's FDI inflows and in Australia's outflows, 1997-2004, US\$ million

Year	FDI from Australia	Total FDI in China	Percent in China's inflows (%)	Australia FDI abroad	Percent in Australia's outflows (%)
1997	313.74	45257.04	0.69	6431.00	4.88
1998	271.97	45462.75	0.60	3346.00	8.13
1999	263.31	40318.71	0.65	-421.00	-62.54
2000	308.88	40714.81	0.76	3162.00	9.77
2001	335.60	46877.59	0.72	12084.00	2.78
2002	380.70	52742.86	0.72	7876.00	4.83
2003	592.53	53504.67	1.11	15277.00	3.88
2004	662.63	60629.98	1.09	16288.00	4.07

Source: China Statistical Yearbook (various years) and UNCTAD database.

Over the long run, foreign investment may constitute an increasingly important part of the Australia-China economic relationship, but currently two-way FDI is quite modest.

III. Outlines of the Model and Database

The standard GTAP model applied in this paper is a type of CGE model for comparative static analysis. Full documentation of the theoretical structure of GTAP is available in

Hertel (1997). The contents of this section are largely drawn from those parts of Hertel (1997) which provide an overview of GTAP.

In GTAP model, all markets are assumed to be perfectly competitive. Demand and supply are balanced in all markets, which imply the price received by the producer the same as the producer's marginal cost. By imposing taxes and subsidies on commodities and primary factors, regional government can drive wedges between prices paid by purchasers and prices received by producers. In markets for traded commodities, buyers differentiate between domestically produced and imported products. Product differentiation is also allowed between imports by region of origin. This makes two-way trade across regions possible for each tradable product.

There are two types of inputs — intermediate inputs and primary factors used for production. In each region, each sector is assumed to mix the inputs to minimize total cost at a given output level. A three-level nested production technology constrains the sectors' inputs choice. At the first level, intermediate input bundles and primary-factor bundles are used in fixed proportions according to a Leontief function. At the second level, intermediate input bundles are formed as combinations of imported bundles and domestic goods with the same input-output name, and primary-factor bundles are obtained as combinations of labour, capital and land. In both cases, the aggregator function has a Constant Elasticity of Substitution (CES) function. At the third level, imported bundles are formed as CES composites of imported goods with the same name from each region.

Each region has a single representative household. Aggregate household expenditure is determined as a constant share of total regional income (household consumption plus government expenditure and national savings). The household buys bundles of commodities to maximize utility subject to its expenditure constraint. The bundles are CES combinations of domestic goods and import bundles, with the import bundles being CES aggregations of imports from each region.

The share of aggregate government expenditure in each region's income is held fixed. Government expenditure is allocated across commodities by a Cobb-Douglas distribution. The allocation of total expenditure on each good to domestically produced and imported versions is based on the same nesting scheme used to allocate total household expenditure on each good.

Investment in each region is financed from a global pool of savings. Each region contributes a fixed proportion of its income to the savings pool. In standard GTAP, two ways are used to allocate savings in each region. The first is to allocate according to a fixed proportion of the pool. The second is to allocate investment according to the prevalent relative rates of return.

The GTAP model captures world economic activity in 57 different industries of 87 regions (database version 6). For the purpose of analysis, we have aggregated these to 10 regions and 20 sectors (see Appendix A.1).

IV. Simulation Design

Table 2 shows bilateral import tariffs estimated from the GTAP database version 6. In Australia, the highest import tariffs on imports from China are recorded for Beverages and tobacco (19.0 percent), Wearing apparels (18.3 percent) and Textiles (18.1 percent). In China, the tariff level is relatively high compared with Australia. The highest import tariffs on Chinese imports from Australia are noted in Grains (89.9 percent), Beverages and tobacco (57.3 percent), Textiles (24.8 percent) and Other food products (23.2 percent). Australia's tariff rates for imports from China are almost below 5 percent whereas China's tariff rates, 15 out of 20, are above 10 percent.

The simulation scenarios examined in this paper are assumed with the full liberalisation on goods trade — that is: the removal of all bilateral tariffs on goods trade between Australia and China from the base year 2001 — while holding all other distortion levels in the system constant. As shown in Table 3, four simulations (short-run and long-run with

Table 2 Existing bilateral tariffs of Australia-China merchandise trade (%)

Sector	Australia ^a	China ^b
Grains	0.0	89.9
Other crops	0.6	8.3
Animal products	0.0	3.3
Forestry and fishing	1.2	6.0
Mining and energy	2.4	0.4
Meat products	3.1	12.4
Other food products	3.1	23.2
Dairy	3.7	22.1
Sugar	0.0	19.5
Beverages and tobacco	19.0	57.3
Textiles	18.1	24.8
Wearing apparels	18.3	13.9
Wood and paper products, publishing	4.6	13.4
Chemicals, rubber and plastic	4.5	16.6
Ferrous metals	3.8	11.4
Metal products	5.7	12.0
Motor vehicles and parts	4.9	12.4
Machinery and equipment	2.6	13.3
Miscellaneous manufactures	3.7	18.8
Services	0.0	0.0

Note: a: Australian tariffs on imports from China;

b: Chinese tariffs on imports from Australia.

Source: Purdue University 2005, GTAP database version 6.

flexible current account and fixed current account respectively) are performed to examine the proposed economic effects of the ACFTA. Different closures could have different impacts on the model results.

Table 3 Simulation design with zero tariff for the ACFTA in GTAP

Scenario	Full liberalisation	
	Flexible Current Account	Fixed Current Account
Scenario 1	Short run	
Scenario 2		Long run
Scenario 3		Short run
Scenario 4		Long run

In scenario 1, capital, natural resources and land are fixed exogenously and their prices are endogenous. Meanwhile, skilled labour and unskilled labour are endogenous and their prices (real wage) are fixed exogenously. In scenario 2, skilled labour, unskilled labour, land and natural resources are fixed exogenously and their prices endogenous. On the other hand, capital is endogenous with its price (real rental) fixed exogenously. Scenarios 1 and 2 are both examined with the flexible current account. In scenarios 3 and 4, the current account is fixed by setting the trade balance fixed exogenously and assuming that there are no capital flows as trade is liberalised. Scenarios 3 and 4 are different from scenarios 1 and 2 respectively with the fixed current account.

V. Simulation Results

This section reports the results from the GTAP simulation of the ACFTA; that is: macroeconomic effects, sectoral effects and effects on trade patterns. The results will provide evidence as to whether there is trade creation and/ or trade diversion following the formation of the ACFTA and what is the estimated impact on trade flows in the international trade content due to the formation of ACFTA.

Macroeconomic effects

Results of the macroeconomic effects of the ACFTA are reported in Table 4. Firstly, both Australia and China are expected to increase their real GDP in all four scenarios while Australia experiences a greater increase in the range of 1.04 to 1.67 percent, compared with China's from 0.15 to 0.22 percent. This finding indicates that the ACFTA has positive effects for both countries in terms of real GDP. Meanwhile, there is little change in real GDP for any other region in all four scenarios. Generally, the increases in real GDP with the flexible current account are slightly greater than those with the fixed current account for the two countries.

Secondly, the ACFTA affects trade performance in Australia more than in China. Australia experiences export expansion ranging from 1.33 to 2.19 percent and import

Table 4 Macroeconomic effects of ACFTA under four scenarios

	Real GDP (%)	Export Volume (%)	Import Volume (%)	Terms of Trade (%)	Trade Balance (US\$ million)	Equivalent Variation (EV) (US\$ million)	Real Consumption Expenditure (%)
Scenario 1							
AUS	1.67	1.33	3.69	0.99	-963.19	3919.75	0.68
CHI	0.22	0.85	1.20	-0.06	-288.78	3562.42	0.51
USA	-0.01	0.00	-0.01	0.00	200.73	-459.08	0.01
ASEAN	-0.04	-0.04	-0.07	-0.02	35.78	-213.05	-0.05
JPA	-0.05	0.08	-0.09	-0.04	537.07	-1262.58	-0.01
KOR	-0.04	-0.03	-0.09	-0.03	27.32	-69.62	0.00
TWN	-0.06	-0.04	-0.07	-0.02	-2.58	-118.50	-0.02
HKG	0.01	0.00	0.02	0.01	-4.45	34.58	0.03
EU	-0.02	0.00	-0.02	0.00	201.71	-564.89	0.00
ROW	-0.02	-0.02	-0.04	-0.01	256.38	-770.52	-0.01
Scenario 2							
AUS	1.04	2.00	2.93	0.88	5.85	1608.75	0.04
CHI	0.16	0.84	1.16	-0.06	-189.83	2092.41	0.36
USA	-0.01	0.00	-0.01	0.00	180.60	-148.03	0.01
ASEAN	-0.07	-0.08	-0.09	-0.01	-51.45	-289.32	-0.07
JPA	-0.03	-0.03	-0.04	-0.02	-70.23	-412.79	0.00
KOR	-0.04	-0.05	-0.09	-0.03	4.85	-50.45	0.01
TWN	-0.05	-0.03	-0.06	-0.03	-8.45	-66.92	-0.01
HKG	0.01	0.00	0.01	0.01	2.28	24.93	0.02
EU	-0.02	0.00	-0.01	0.00	104.24	-231.87	0.01
ROW	-0.02	-0.03	-0.04	-0.01	22.14	-523.14	0.00
Scenario 3							
AUS	1.31	2.19	3.09	0.84	0.00	3256.35	0.65
CHI	0.20	0.92	1.17	-0.07	0.00	3481.40	0.52
USA	-0.01	-0.01	0.00	0.00	0.00	-322.01	0.01
ASEAN	-0.04	-0.04	-0.06	-0.02	0.00	-201.34	-0.05
JPA	-0.03	-0.01	-0.04	-0.02	0.00	-916.66	-0.01
KOR	-0.03	-0.04	-0.08	-0.03	0.00	-48.11	0.01
TWN	-0.06	-0.03	-0.06	-0.02	0.00	-116.12	-0.02
HKG	0.01	0.00	0.02	0.01	0.00	36.82	0.03
EU	-0.01	-0.01	-0.01	0.00	0.00	-440.95	0.00
ROW	-0.02	-0.03	-0.03	-0.01	0.00	-645.35	-0.01
Scenario 4							
AUS	1.04	1.99	2.93	0.88	0.00	1610.49	0.04
CHI	0.15	0.88	1.14	-0.07	0.00	2060.02	0.36
USA	-0.01	-0.01	0.00	0.00	0.00	-93.53	0.01
ASEAN	-0.07	-0.07	-0.10	-0.01	0.00	-302.36	-0.07
JPA	-0.03	-0.01	-0.04	-0.03	0.00	-428.59	0.00
KOR	-0.04	-0.05	-0.09	-0.03	0.00	-48.71	0.01
TWN	-0.05	-0.03	-0.06	-0.03	0.00	-68.69	-0.01
HKG	0.01	0.00	0.01	0.01	0.00	28.95	0.03
EU	-0.01	-0.01	-0.01	0.00	0.00	-195.09	0.01
ROW	-0.02	-0.03	-0.04	-0.01	0.00	-521.31	0.00

Note: All projections are percentage deviations from the base period except the trade balance and the equivalent variation (EV) which are in US\$ million.

Source: Model simulation.

expansion from 2.93 to 3.69 percent. The impact on export and import volumes in China is relatively smaller (ranging from 0.84 to 0.92 percent and from 1.14 to 1.20 percent respectively) in all four scenarios. Percentage changes in trade volume show that Australia and China will experience a greater expansion in imports than exports in all cases. Moreover, in scenarios 3 and 4 with fixed current account, exports are projected to expand slightly greater than those (scenarios 1 and 2) with flexible current account. Due to the formation of the ACFTA, tariffs are reduced in a sector and domestic buyers (both final and intermediate) substitute toward imports; the domestic competing industry contracts production while foreign exporters expand. There is a trade creation resulting from the ACFTA as the two economies replace high-cost domestic products by importing more from the low-cost free trade union member.

Thirdly, the changes in the trade balance indicate that both Australia's and China's current account positions worsen in the short run (scenario 1) and improve in the long run (scenario 2). Trade balance appears to be negative with a broader deficit in Australia in the short-run (scenario 1) than in China, but this situation is changed in the long-run (scenario 2) where Australia appears to be in a trade surplus and China is still in a reduced trade deficit. There are improvements of between 0.84 and 0.99 percent in the terms of trade for Australia in all four scenarios whereas the terms of trade for China are deteriorated slightly by around 0.6 percent. It can be seen that there are negligible effects on the terms of trade on other regions with the bilateral removal of the tariffs between Australia and China.

The net welfare gains from the ACFTA are measured by equivalent variation (EV) and real consumption expenditure in this study. The EV measures the amount of income that would have to be given or taken away from an economy before trade liberalisation so as to leave the economy as well off as it would be after the policy has been changed (Brown et al. 2005 and Siriwardana 2007). Table 4 shows that there is an obvious contrast with regard to the effect on the EV. In all four cases, both Australia and China appear to experience positive EVs which indicate an improvement in economic welfare due to the trade creation resulting from the ACFTA. However, the projection suggests that the

ACFTA has negative EVs for all non-member economies except Hong Kong, indicating a trade diversion effect resulting from the ACFTA. The scale is larger in the short-run scenarios (scenarios 1 and 3) than in the long-run scenarios (scenarios 2 and 4). Both Australia and China are projected to have increases in real consumption expenditure, with consumers generally benefiting more in the short-run than in the long-run. In the short-run cases (scenarios 1 and 3), the real consumption expenditure in Australia (0.68 and 0.65 percent) increases slightly more than in China (0.51 and 0.52 percent), but in the long-run cases (scenarios 2 and 4), China's real consumption expenditure increase of 0.36 percent is heavier than Australia's 0.04 percent.

Table 5 Decomposition of estimated equivalent variation on Australia/China under various scenarios (US \$ million)

	Allocative efficiency effect	Endowment effect	Change in terms of trade	Change in capital stock	Total
Australia					
Scenario 1	1193.3	1992.8	736.7	-3.1	3919.7
Scenario 2	409.3	548.5	656.0	-5.0	1608.7
Scenario 3	973.7	1660.9	626.2	-4.5	3256.4
Scenario 4	409.9	549.0	656.7	-5.2	1610.5
China					
Scenario 1	1073.0	2692.7	-219.9	16.6	3562.4
Scenario 2	928.1	1373.6	-205.2	-4.1	2092.4
Scenario 3	1060.2	2653.9	-258.5	25.8	3481.4
Scenario 4	924.4	1364.8	-230.4	1.2	2060.0

Source: Model simulation.

The welfare decomposition reported in Table 5 shows that in the short-run cases (scenarios 1 and 3), allocative efficiency and endowment effects contribute to the EV more than they do in the long-run scenarios 2 and 4. The terms of trade effect contributes to the EV positively for Australia, but negatively for China. Capital stock effect appears positive in all of Australia's cases, whereas for China there is positive change only in short-run scenarios 1 and 3.

Sectoral effects

A significant effect of trade liberalisation is that it causes reallocation of resources such as labour, capital and land which further lead to structural adjustments to some extent in the factor markets. On average, the world would gain from multilateral liberalisation since resources are reallocated to sectors in each country where there is a comparative advantage (Brown et al. 2006). The results of the sectoral effects resulting from the ACFTA are reported in Table 6, Table 7, Table 8 and Table 9.

Table 6 shows estimated changes by sector in Australia's and China's trade balance under various scenarios. In Australia, Grains and Ferrous metals show the largest improvement in trade balance followed by Chemicals, rubber and plastic, Sugar and Dairy in all scenarios. All other sectors show deteriorations in all scenarios except Machinery in scenario 3. In China, the improvement in the Wearing apparels sector is substantially large, followed by Textiles and Metal products. On the other hand, there is a large deterioration in Grains and Ferrous metals. Some other sectors, such as Meat products, Chemicals, rubber and plastic, Dairy and Animal products also show deteriorations.

Output effects by sector in Australia and China are presented in Table 7 as a percentage change in output volumes relative to initial output levels under various scenarios. The directions of change are almost the same as those in Table 6 for the trade balance by sector. However, there are some exceptions. For example, in Australia, Dairy grows faster for the trade balance, but it becomes worse for the output. On the other hand, Machinery performs worse for the trade balance, but shows positive output. In China, Animal products and Motor vehicles and parts are worse for the trade balance but become positive in output. The key reason for this contrast is that with the removal of bilateral tariffs, the two economies adjust their sectoral structures according to their comparative advantage. In some sectors, both imports and domestic production increase at the same time. Generally, Table 7 indicates that in sector Grains, both economies have greater structural adjustments whereas Australia at above 24 percent and China negatively at about 4 percent. Australia also has a relatively greater decrease in production in Wearing apparels

Table 6 Estimated change in Australia/China trade balance by sector under various scenarios (US \$ million)

Sector	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Australia				
Grains	953.2	958.3	957.8	958.2
Other crops	-158.6	-150.6	-151.2	-150.6
Animal products	-49.3	-43.5	-43.6	-43.6
Forestry and fishing	-3.8	-2.1	-2.8	-2.2
Mining and energy	-627.7	-398	-514.1	-398.8
Meat products	-31.4	-33	2.6	-33.2
Other food products	-24.4	-8.9	-6.7	-9
Dairy	4.1	17.5	18.2	17.5
Sugar	33	34.9	36.9	34.9
Beverages and tobacco	-19.9	-12.9	-15.4	-12.9
Textiles	-102	-91.2	-92.1	-91.3
Wearing apparels	-451.1	-438.8	-434.4	-439.1
Wood and paper products, publishing	-50.5	-16.4	-17.9	-16.7
Chemicals, rubber and plastic	61	133.3	117.1	133.1
Ferrous metals	740	854.9	858	853.9
Metal products	-90	-80	-75.1	-80.2
Motor vehicles and parts	-256.3	-157.6	-152.8	-158.1
Machinery and equipment	-188.7	-2.2	36.3	-3.5
Miscellaneous manufacturing	-61.5	-48	-39	-48.2
Services	-639.4	-509.9	-481.8	-510.3
China				
Grains	-1100.2	-1104.2	-1100.6	-1103.8
Other crops	6.6	-5.9	8.4	-4.5
Animal products	-21.7	-25.6	-21.8	-25
Forestry and fishing	-16.4	-17.4	-15.4	-16.9
Mining and energy	4.9	6.2	15.5	18.6
Meat products	-90.1	-93.2	-90.9	-92.2
Other food products	18.2	20.5	20.6	22.2
Dairy	-53.8	-53.8	-54.1	-53.8
Sugar	-17.6	-17.2	-17.6	-17.2
Beverages and tobacco	3.1	3.4	3.3	3.5
Textiles	501.3	517.7	513.9	524.9
Wearing apparels	1107.6	1014.3	1136.8	1034
Wood and paper products, publishing	13.1	-4.5	22.5	2.6
Chemicals, rubber and plastic	-88.2	-59.4	-69.8	-47.3
Ferrous metals	-543.3	-561.6	-546	-556.3
Metal products	134.8	117.4	142.7	123.1
Motor vehicles and parts	-15.6	-7	-0.9	1.6
Machinery and equipment	-37.7	58.1	103.1	134.6
Miscellaneous manufacturing	37.2	157.5	60	172.6
Services	-131.1	-135.1	-109.7	-120.7

Source: Model simulation.

Table 7 Estimated change (%) in output by sector in Australia and China under various scenarios

Sector	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Australia				
Grains	24.55	24.70	24.77	24.70
Other crops	-2.11	-2.20	-2.02	-2.20
Animal products	-1.51	-1.63	-1.31	-1.63
Forestry and fishing	0.27	0.01	0.25	0.01
Mining and energy	-1.07	-0.58	-0.73	-0.58
Meat products	-0.83	-1.11	-0.38	-1.11
Other food products	0.05	-0.17	0.14	-0.17
Dairy	-0.09	0.00	0.20	0.00
Sugar	1.92	1.92	2.24	1.91
Beverages and tobacco	-0.19	-0.30	-0.16	-0.30
Textiles	-6.66	-7.09	-6.33	-7.10
Wearing apparels	-9.70	-10.21	-9.43	-10.22
Wood and paper products, publishing	0.44	-0.01	0.46	-0.01
Chemicals, rubber and plastic	1.43	1.40	1.83	1.40
Ferrous metals	4.15	4.72	5.00	4.72
Metal products	-0.28	-0.76	-0.28	-0.76
Motor vehicles and parts	-0.50	-0.87	-0.52	-0.87
Machinery and equipment	1.06	0.65	1.44	0.65
Miscellaneous manufacturing	0.09	-0.57	-0.08	-0.57
Services	0.98	0.27	0.71	0.28
China				
Grains	-3.94	-4.06	-3.94	-4.06
Other crops	0.35	0.26	0.36	0.27
Animal products	0.53	0.38	0.52	0.38
Forestry and fishing	0.27	0.16	0.27	0.16
Mining and energy	0.26	0.17	0.25	0.17
Meat products	0.29	0.12	0.29	0.13
Other food products	0.33	0.24	0.33	0.24
Dairy	-3.86	-4.05	-3.90	-4.03
Sugar	-3.35	-3.45	-3.39	-3.44
Beverages and tobacco	0.33	0.23	0.32	0.23
Textiles	1.26	1.19	1.30	1.22
Wearing apparels	1.25	1.10	1.28	1.12
Wood and paper products, publishing	0.31	0.22	0.32	0.23
Chemicals, rubber and plastic	0.19	0.14	0.21	0.15
Ferrous metals	-0.18	-0.25	-0.17	-0.24
Metal products	0.47	0.39	0.47	0.39
Motor vehicles and parts	0.35	0.30	0.33	0.29
Machinery and equipment	0.30	0.28	0.33	0.29
Miscellaneous manufacturing	0.19	0.32	0.22	0.34
Services	0.33	0.24	0.30	0.23

Source: Model simulation.

(about 10 percent) and Textiles (above 6.3 percent) in all four scenarios. In China, the sectors of Grain, Dairy and Sugar appear to be hit most due to the creation of an ACFTA.

Tables 8 and 9 report the estimated changes for Australia and China in demand for the key primary factors of land, labour (including unskilled labour and skilled labour) and capital by sector under various scenarios. Once again, the directions of change are similar to the trade balance and output by sector in Table 6 and Table 7. Therefore, those results further suggest a potential need for reallocations of the primary factors among sectors. In the case of Australia, all sectors decrease the use of land except Grain in all four cases, which indicates that Grain is a relatively land-intensive sector. In the case of China, most sectors appear to increase their use of land, labour and capital except the three sectors of Grains, Dairy and Sugar, where the use of all factors appear to experience negative adjustments. In both economies, labour force is expected to move from declining sectors to growing sectors in most cases. These changes in sectoral outputs are reflected in employment impacts. For Australia, there are employment declines of above 9 percent in Wearing apparels and above 6 percent in Textiles in all four scenarios; on the other hand, there is increased employment of above 26 percent in Grains. For China, there is increased employment in almost all of the sectors except Grains, Dairy, Sugar and Beverages. The effects on China's sectoral employment, however, are comparatively negligible.

Effects on trade patterns

Changes in bilateral trade flows associated with the ACFTA under four scenarios are presented in Table 10. The results demonstrate that bilateral trade would expand, with Australia's imports from China growing by around US\$ 2.7 billion, and Australia's exports to China increasing by about US\$ 4.3 billion (see Table 11) in all four scenarios. The results also project that all sectors except services will receive benefits from the formation of the ACFTA. The sectors benefiting most in Australia are: Grains (above 610 percent), Textiles (above 410 percent), Miscellaneous manufacturing (above 240 percent), Wearing apparels (above 205 percent) and Dairy (above 200 percent). On the other hand, China's sectors obtain smaller gains from the ACFTA with the most benefited sectors

Table 8 Estimated change (%) in demand for key primary factors by sector in Australia

Sector	Scenario 1				Scenario 2				Scenario 3				Scenario 4			
	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital
Grains	17.84	26.70	26.70	26.39	18.02	26.66	26.68	26.86	17.88	26.97	26.97	26.70	18.01	26.65	26.68	26.85
Other crops	-3.92	-1.51	-1.51	-1.76	-3.95	-1.76	-1.74	-1.61	-3.98	-1.40	-1.40	-1.61	-3.95	-1.77	-1.75	-1.61
Animal products	-3.43	-0.89	-0.89	-1.14	-3.48	-1.17	-1.15	-1.01	-3.39	-0.65	-0.65	-0.86	-3.48	-1.17	-1.15	-1.01
Forestry and fishing	-1.96	0.49	0.49	0.28	-2.23	-0.02	0.00	0.11	-2.12	0.45	0.45	0.27	-2.23	-0.02	-0.01	0.11
Mining and energy	-6.00	-0.98	-0.98	-1.64	-5.73	-1.08	-1.02	-0.65	-6.06	-0.59	-0.59	-1.16	-5.73	-1.08	-1.03	-0.66
Meat products	-7.59	-0.61	-0.61	-1.77	-7.43	-1.26	-1.17	-0.52	-7.78	-0.20	-0.20	-1.20	-7.43	-1.27	-1.17	-0.52
Other food products	-7.06	0.58	0.58	-0.59	-7.09	-0.52	-0.42	0.24	-7.43	0.59	0.59	-0.42	-7.09	-0.52	-0.42	0.24
Dairy	-7.08	0.53	0.53	-0.63	-7.05	-0.42	-0.32	0.34	-7.37	0.74	0.74	-0.27	-7.05	-0.42	-0.32	0.34
Sugar	-6.26	2.42	2.42	1.23	-6.18	1.58	1.68	2.35	-6.53	2.68	2.68	1.65	-6.17	1.58	1.67	2.34
Beverages and tobacco	-7.04	0.63	0.63	-0.54	-7.23	-0.83	-0.73	-0.08	-7.45	0.54	0.54	-0.46	-7.23	-0.83	-0.73	-0.08
Textiles	-10.32	-6.31	-6.31	-7.53	-10.31	-7.34	-7.24	-6.55	-10.58	-6.02	-6.02	-7.08	-10.31	-7.35	-7.25	-6.56
Wearing apparels	-11.68	-9.47	-9.47	-10.65	-11.63	-10.38	-10.28	-9.62	-11.95	-9.23	-9.23	-10.25	-11.63	-10.39	-10.29	-9.63
Wood and paper products, publishing	-7.29	1.00	1.00	-0.32	-7.39	-0.39	-0.28	0.46	-7.71	0.94	0.94	-0.19	-7.39	-0.39	-0.28	0.46
Chemicals, rubber and plastic	-6.87	2.05	2.05	0.72	-6.83	0.98	1.09	1.84	-7.13	2.37	2.37	1.22	-6.83	0.98	1.09	1.84
Ferrous metals	-5.75	4.85	4.85	3.48	-5.50	4.26	4.37	5.14	-5.84	5.61	5.61	4.42	-5.50	4.25	4.36	5.13
Metal products	-7.65	0.12	0.12	-1.19	-7.66	-1.03	-0.93	-0.19	-8.07	0.07	0.07	-1.05	-7.66	-1.04	-0.93	-0.19
Motor vehicles and parts	-7.67	0.08	0.08	-1.23	-7.75	-1.25	-1.14	-0.41	-8.10	-0.02	-0.02	-1.15	-7.74	-1.25	-1.14	-0.41
Machinery and equipment	-7.10	1.48	1.48	0.16	-7.09	0.35	0.46	1.21	-7.36	1.80	1.80	0.66	-7.08	0.35	0.46	1.20
Miscellaneous manufacturing	-7.49	0.52	0.52	-0.79	-7.59	-0.86	-0.75	-0.02	-7.97	0.30	0.30	-0.83	-7.58	-0.86	-0.76	-0.02
Services	-7.41	1.52	1.52	0.06	-7.55	-0.10	0.01	0.83	-7.95	1.17	1.17	-0.07	-7.54	-0.10	0.01	0.83

Source: Model simulation.

Table 9 Estimated change (%) in demand for key primary factors by sector in China

Sector	Scenario 1				Scenario 2				Scenario 3				Scenario 4			
	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital	Land	Unskilled labor	Skilled labor	Capital
Grains	-3.27	-4.18	-4.18	-4.31	-3.29	-4.39	-4.40	-4.30	-3.27	-4.19	-4.19	-4.31	-3.29	-4.39	-4.40	-4.30
Other crops	0.41	0.35	0.35	0.23	0.43	0.18	0.17	0.28	0.41	0.36	0.36	0.23	0.43	0.18	0.18	0.28
Animal products	0.56	0.53	0.53	0.41	0.53	0.31	0.30	0.41	0.55	0.53	0.53	0.40	0.53	0.31	0.30	0.41
Forestry and fishing	0.44	0.40	0.40	0.29	0.42	0.21	0.21	0.29	0.43	0.39	0.39	0.28	0.42	0.21	0.20	0.29
Mining and energy	0.53	0.45	0.45	0.12	0.61	0.07	0.05	0.33	0.53	0.45	0.45	0.11	0.61	0.08	0.05	0.33
Meat products	0.62	0.58	0.58	-0.01	0.72	-0.10	-0.15	0.35	0.62	0.58	0.58	-0.01	0.72	-0.09	-0.13	0.36
Other food products	0.67	0.70	0.70	0.11	0.75	-0.04	-0.09	0.42	0.67	0.69	0.69	0.11	0.75	-0.04	-0.08	0.41
Dairy	-1.36	-3.57	-3.57	-4.14	-1.28	-4.27	-4.32	-3.84	-1.38	-3.61	-3.61	-4.17	-1.28	-4.25	-4.29	-3.82
Sugar	-1.09	-3.00	-3.00	-3.57	-1.01	-3.70	-3.75	-3.27	-1.11	-3.05	-3.05	-3.61	-1.01	-3.70	-3.74	-3.26
Beverages and tobacco	0.65	0.66	0.66	0.07	0.76	-0.02	-0.07	0.43	0.65	0.65	0.65	0.07	0.76	-0.02	-0.06	0.43
Textiles	1.07	1.61	1.61	0.94	1.23	0.93	0.88	1.44	1.09	1.64	1.64	0.98	1.23	0.95	0.91	1.46
Wearing apparels	1.02	1.50	1.50	0.83	1.22	0.91	0.86	1.43	1.04	1.53	1.53	0.87	1.22	0.93	0.89	1.45
Wood and paper products, publishing	0.62	0.59	0.59	-0.07	0.82	0.01	-0.04	0.52	0.63	0.60	0.60	-0.06	0.82	0.02	-0.02	0.53
Chemicals, rubber and plastic	0.60	0.54	0.54	-0.12	0.76	-0.12	-0.18	0.39	0.61	0.56	0.56	-0.10	0.76	-0.11	-0.16	0.40
Ferrous metals	0.39	0.08	0.08	-0.58	0.62	-0.44	-0.49	0.07	0.40	0.08	0.08	-0.58	0.62	-0.43	-0.48	0.07
Metal products	0.69	0.74	0.74	0.08	0.89	0.18	0.13	0.69	0.70	0.75	0.75	0.09	0.89	0.19	0.14	0.70
Motor vehicles and parts	0.66	0.68	0.68	0.02	0.84	0.05	0.00	0.56	0.66	0.66	0.66	0.00	0.83	0.04	-0.01	0.55
Machinery and equipment	0.64	0.64	0.64	-0.03	0.83	0.03	-0.02	0.54	0.66	0.66	0.66	0.00	0.83	0.04	0.00	0.55
Miscellaneous manufacturing	0.64	0.63	0.63	-0.03	0.81	-0.02	-0.07	0.50	0.66	0.66	0.66	0.00	0.81	0.01	-0.04	0.51
Services	0.64	0.62	0.62	-0.11	0.86	0.03	-0.03	0.59	0.63	0.59	0.59	-0.13	0.85	0.02	-0.03	0.57

Source: Model simulation.

Table 10 Estimated change of bilateral export volumes between Australia and China under various scenarios (%)

Sector	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	EAC	ECA	EAC	ECA	EAC	ECA	EAC	ECA
Grains	613.64	29.04	614.78	28.24	614.37	29.02	614.71	28.28
Other crops	33.28	8.73	33.80	7.95	33.78	8.57	33.79	7.98
Animal products	4.25	5.36	4.51	4.62	4.53	5.27	4.50	4.65
Forestry and fishing	22.11	5.85	23.35	4.70	22.87	5.45	23.32	4.74
Mining and energy	0.03	25.47	1.51	24.90	0.81	25.42	1.49	24.96
Meat products	112.15	39.36	111.95	38.40	114.16	38.64	111.90	38.48
Other food products	132.72	17.83	133.45	17.17	134.29	17.41	133.41	17.20
Dairy	199.74	37.90	201.71	36.71	202.13	37.20	201.68	36.78
Sugar	103.68	4.54	104.07	4.03	104.84	4.16	104.04	4.07
Beverages and tobacco	173.01	50.77	174.31	49.84	174.08	50.36	174.28	49.87
Textiles	414.32	117.72	413.93	116.62	419.71	117.29	413.85	116.66
Wearing apparels	207.14	73.67	205.92	72.71	209.88	73.08	205.86	72.74
Wood and paper products, publishing	111.85	33.39	113.03	32.18	114.02	32.70	112.98	32.24
Chemicals, rubber and plastic	163.42	34.66	165.10	33.96	166.09	34.40	165.06	34.01
Ferrous metals	97.75	33.86	99.70	32.86	99.90	33.62	99.66	32.92
Metal products	124.57	47.40	124.99	46.29	127.24	46.49	124.92	46.35
Motor vehicles and parts	104.79	37.99	105.79	36.76	106.60	36.92	105.69	36.82
Machinery and equipment	173.92	24.78	174.22	23.81	177.17	23.91	174.13	23.87
Miscellaneous manufacturing	246.66	25.64	246.40	25.17	250.53	24.86	246.30	25.22
Services	-2.61	2.51	-2.44	1.56	-1.90	1.95	-2.47	1.59

Note: EAC: Exports from Australia to China; ECA: Exports from China to Australia.

Source: Model simulation.

being Textiles (about 117 percent) followed by Wearing apparels (around 73 percent) and Beverages (around 50 percent). The results also show increased opportunities for two-way trade in these sectors.

The magnitude of difference between changes in Australia's and China's bilateral export volume shows the relative significance and size of bilateral trade to each country. These differences are attributable to a combination of the relative market shares of both countries and the relative protection in both economies.

Effects on trade flows in the international trade content are presented in Table 11. It can be seen that there are pervasive indications of trade diversion as shown by the reductions to a small extent in the bilateral trade flows for most other regions. For example, Australia's imports from ASEAN, KOR, TWN and ROW would all decrease. Among non-member countries or country groups, Japan, U.S. and ASEAN (6) are most adversely

Table 11 Effects on trade flows of Australia-China FTA (US \$ million)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Australia's exports to				
China	4303.6	4356.9	4373.3	4355.2
World	971.2	1463.5	1605.5	1459.6
Australia's imports from				
USA	84.1	-16.2	0.8	-17.8
ASEAN	-76.4	-134.6	-117.9	-133.8
CHI	2752.2	2699.9	2716.7	2702.7
JPA	72.7	0.0	8.4	1.3
KOR	-23.1	-42.3	-38.4	-42.3
TWN	-37.8	-49.6	-47.9	-49.5
HKG	14.7	6.2	8.4	6.2
EU	9.1	-134.8	-105.6	-135.6
ROW	-219.7	-288.4	-269.5	-288.7
Total	2575.7	2040.1	2154.9	2042.7

Source: Model simulation.

affected by the ACFTA in all four scenarios. The total volume of world imports increases, however, due to the formation of the ACFTA, although there is some evidence of minor

trade diversion. Since trade creation is greater than the trade diversion resulting from the agreement, the ACFTA is trade creating for the world as a whole.

VI. Concluding Remarks

In summarising the bilateral economic relations between Australia and China, it is evident that there is a robust and continuing growth trend between the two economies based on a strongly complementary trading relationship. The relative importance of one to the other is stronger and more significant, especially China's significance to Australia. Primary commodities dominate Australian exports, with China demanding increasing amounts of resource commodities to fuel its industrial expansion. On the other hand, China's manufactured goods occupy a large proportion of Australian imports. The bilateral investment relationship appears relatively less developed.

In summarising the results from the simulations, it is evident that both Australia and China are projected to benefit from the ACFTA with Australia gaining more. The ACFTA generates a greater trade creation effect than trade diversion. In macroeconomic effects, there are some gains in terms of real GDP, EV and real consumption. Sectoral effects are mixed. The results show that bilateral trade would expand, with Australia's exports to China growing faster than China's exports to Australia. The bilateral removal of tariffs would cause more significant structural adjustments in the Australian economy than in the Chinese economy. The sectors that benefit most from the ACFTA are: Australia's agricultural and resource-based sectors such as Grains and Sugar; and China's manufacturing industries, especially Wearing apparels and Textiles and Miscellaneous manufactures. Consequently, this will lead to the corresponding adjustments in primary factor market in both countries.

Given these results from the GTAP model simulations, the ACFTA would benefit both economies with the abolishment of tariffs on bilateral merchandise trade. Each economy will move more closely to the sectors where they have comparative advantage. While considering the domestic income and employment impacts on each sector, the net result

would be that consumers and producers have increased options of goods and inputs while importers and exporters face improved market access.

There are some limitations of this paper due to the GTAP model itself and other factors. First, the GTAP model is a comparative static model, thus it is hard to capture some dynamic effects of trade liberalisation, the simulations conducted in this paper may not reflect the true outcome. In addition, service trade liberalization and investment liberalisation have been omitted in this paper since there is very little empirical evidence available on barriers to investment and services trade. Another limitation is that only import protection liberalization is considered in this paper. The removal of export restraints may be expected to generate additional benefits for both economies and the world as a whole (Lee et al. 1997). This can be another avenue for future research.

References:

- ABS (Australia Bureau Statistics) 1998, 'International merchandise trade', Cat. No. 5422.0, Australia.
- ABS (Australia Bureau Statistics) 2000, 'International merchandise trade', Cat. No. 5422.0, Australia.
- ABS (Australia Bureau Statistics) 2004, 'International merchandise trade', Cat. No. 5422.0, Australia.
- ABS (Australia Bureau Statistics) 2006, 'International merchandise trade', Cat. No. 5422.0, Australia.
- Brown, D. K., Kiyota, K. and Stern, R. M. 2005, 'Computational analysis of the US FTAs with central America, Australia and Morocco', *World Economy*, Vol. 28, Issue.10, pp. 1441-1490, Blackwell Publishing Ltd.
- Brown, D. K., Kiyota, K. and Stern, R. M. 2006, 'Computational analysis of the menu of US-Japan trade policies', *Blackwell Publishing Ltd*, pp. 805-855.
- China Statistical Yearbook 2005c, various years (96, 99, 01, 03, 05), 'Volume of Imports and Exports by Countries and Regions (Customs Statistics)', *National Bureau of Statistical of China*, China Statistics Press, Beijing.
- Comtrade database (United Nations Statistics Division) 2006, *UN Commodity Trade Statistics Database*, <http://unstats.un.org/unsd/comtrade/>, accessed March 2006.
- DFAT (Department of Foreign Affairs and Trade) 2002, 'China embraces the world market', *Commonwealth of Australia*, www.dfat.gov.au/eau, accessed March 2006.
- DFAT (Department of Foreign Affairs and Trade) 2006a, *Free Trade Agreements under Negotiation/Consideration*, URL: www.dfat.gov.au/trade/, accessed May 2006.
- DFAT (Department of Foreign Affairs and Trade) 2006b, *Country, Economy and Regional Information*, URL: www.dfat.gov.au/geo/, accessed May 2006.
- Editorial Board of the Almanac of China's Foreign Economic Relations and Trade. 2001, *2001 Almanac of China's Foreign Economic Relations and Trade*, China Foreign
- Hertel, T. W. (Editor), 1997, *Global Trade Analysis: Modeling and Applications*, Cambridge University Press.
- Invest Australia, 2002, Information supplied to Economic Analytical Unit, Hongkong, April.

Lee, H., Roland-Holst, D. and Mensbrugghe, D. 1997, 'APEC trade liberalization and structural adjustments: Policy assessments', *GSID APEC discussion paper series*, No. 11.

Mai, Y., Adams, P., Fan, M., Li, R. and Zheng, Z. 2005, 'Modelling the potential benefits of an Australia-China free trade agreement', *Department of Foreign Affairs and Trade*, Australia.

Maitland, E. and Nicholas, S. 1999, 'Australian multinational enterprises in China: Motivations, technology transfer and operations', Australian Centre for International Business, University of Melbourne, Melbourne.

National Bureau of Statistics of China (NBS) 2005, URL: www.stats.gov.cn/english/statisticaldata/yearlydata, accessed April 2006.

Productivity Commission 2004, *Rules of Origin under the Australia-New Zealand Closer Economic Relations Trade Agreement*, Research Report, Canberra.

Purdue University 2005, 'GTAP database version 6', *Center for Global Trade Analysis*, URL: www.gtap.agecon.purdue.edu/databases/v6/, accessed June 2006.

Siriwardana, M. (2007), 'The Australia-United States free trade agreement: An economic evaluation', *North American Journal of Economics and Finance*, 18; pp.117-133.

WTO (World Trade Organization) 2006a, *Regional Trade Agreements Notified to the GATT/WTO and in Force*, WTO, Geneva, URL: www.wto.org/english/tratop_e/region_e/eif_e.xls, accessed June 2006.

Year Book Australia 2006, 'Merchandise exports and imports by country and country group', *Australian Bureau of Statistics (ABS)*, Australia.

Appendix A.1 Aggregation of regions and commodities

Aggregated Region	GTAP Region	Aggregated Commodity	GTAP Commodity
1. Australia (AUS)	Australia	1. Grains	Paddy rice; wheat; cereal grains nec
2. Unites States (US)	United States	2. Other crops	Vegetables, fruits, nuts; Oil seeds; Plant-based fibers; Crops nec Sugar cane, sugar beet,
3. ASEAN (6)	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam	3. Animal products	Cattle, sheep, goat, horses; Animal products nec; Wool, silk-worm cocoons, Raw milk
4. China (CHI)	China	4. Forestry and fishing	Forestry, fishing
5. Japan (JPA)	Japan	5. Mining and energy	Coal; Oil; Gas; Minerals nec; petroleum and coal products
6. Korea (KOR)	Korea	6. Meat products	Meat: cattle, sheep, goats, horse; Meat products nec,
7. Taiwan (TWN)	Taiwan	7. Other food products	Vegetable oil and fats; processed rice; food products nec
8. Hong Kong (HKG)	Hong Kong	8. Dairy	Dairy products
		9. Sugar	Sugar
		10. Beverages and tobacco	Beverages and tobacco products
9. European Union (EU)	United Kingdom, Germany, Denmark, Sweden, Finland, Austria, Belgium, France, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Cyprus, Czech Republic, Hungary, Malta, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania	11. Textiles	Textiles
		12. Wearing apparels	Wwearing apparel; leather products
		13. Wood and paper products, publishing	Wood products; Paper products, publishing
10. Rest of Europe (RU)	All other regions	14. Chemicals, rubber and plastic	Chemical, rubber, plastic prods
		15. Ferrous metals	Ferrous metals; Metals nec
		16. Metal products	Metal products
		17. Motor vehicles and parts	Motor vehicles and parts; Transport equipment nec
		18. Machinery and equipment	Electronic equipment; Machinery and equipment nec
		19. Miscellaneous manufacturing	Manufacturing nec
		20. Services	Electricity; Gas manufacture and distribution; Water; construction; PublicAdministration/Defence/Health/Education; Dwellings; Trade, Sea transport, Air transport, Communication; Financial services nec, Insurance, Business services nec, Recreation and other services

Source: Purdue University 2005, GTAP database version 6.

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**Center for Contemporary Asian Studies
Doshisha University**

Kamigyo-ku, Kyoto 602-8580 JAPAN

Tel: +81-75-251-4695

Fax: +81-75-251-3036

E-mail: rc-ccas@mail.doshisha.ac.jp

URL: <http://ccas.doshisha.ac.jp>