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Trade flows between Australia and China

An opportunity for a free trade agreement

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The seemingly high degree of trade complementarity between Australia and China indicates that freer trade between these two countries is likely to lead to mutual trade gains. In this paper, this complementarity was assessed based on the use of revealed comparative advantage (RCA) indices. It is likely that trade gains could be achieved by Australia and China by adopting a bilateral free trade agreement.

General equilibrium models – such as ABARE's global trade and environment model (GTEM) – have been used by many researchers to quantify the economic effects of free trade agreements in recent times. This paper discusses some of the key issues involved in analysing the economic benefits of an Australia–China free trade agreement using GTEM.

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Introduction

China has one of the world's largest economies. It has an increasing role in shaping the world economy, accounting for a third of the increase in the world's gross domestic product and imports for the period 2000 to 2003 (*The Economist* 2004a). It is also home to a population of 1.3 billion inhabitants, consuming a variety of goods from food items to luxury commodities. China's gross domestic product has been growing annually at 7 per cent on average over the past five years, reaching US$6.4 trillion (in purchasing power parity index) in 2003. China's integration into the world economy through trade was one of the key drivers of this strong economic growth.

China has adopted measures to transform its economy from a centrally planned system to a more market oriented one. These measures included the opening of China's economy to world trade. China became the 143rd member of the World Trade Organisation (WTO) on 11 December 2001. As part of its accession requirements to the WTO, China is committed to adopting a trade liberalisation program. For example, it has pledged to reduce the average tariff rate on agricultural imports from 31.5 per cent to 17.4 per cent. Also, export subsidies would be abolished while volumes of tariff-rate quotas would be increased.

Being Australia's third largest merchandise trading partner and seventh largest service export market in 2003, China might significantly affect the Australian economy through any changes made to its trade policies. A more liberal Chinese trade policy could increase Australia's income in part through greater market access for its exports.

While China has pursued significant trade reforms, barriers to freer trade in goods, in particular agricultural commodities and services, persist. For example, the above-quota tariff rate on its grain imports is still high at 65 per cent. State trading enterprises still retain a significant influence on imports of agricultural goods such as wheat, corn and rice. For instance, in 2004 state trading enterprises were allocated 90 per cent of the wheat quota (Huang and Tongeren 2004). Trade in services is still severely restricted through various policies such as geographical restrictions, meaning only selected zones and cities are open to foreign investment (Fukasaku, Ma and Yang 1999).

This paper has four major sections. The first presents the key characteristics of trade between Australia and China. In the second, the trade data are used to establish the revealed comparative advantage indices for traded commodities for both Australia and China, highlighting each country's important export industries. In the third the principal barriers that restrict trade between the two nations are discussed. The crucial role of a global model in analysing the economic effects from a free trade agreement and the

issues involved in developing and using a global model are examined in the final section.

Trade between Australia and China

Australia's total bilateral merchandise trade with China grew from A$10.1 billion in 1998-99 to A$22.6 billion in 2002-03, an avereage annual growth of 22 per cent (DFAT 2004). For the same period, Australia's total merchandise exports to China rose from A$3.9 billion to A$8.8 billion while its merchandise imports from China increased from A$6.1 billion to A$13.8 billion.

Table 1 highlights bilateral merchandise trade between the two countries, both in absolute terms (in US$ million) and as a share of the country's total exports of each commodity. Australia's main exports to China are agricultural, mineral and energy products. Exports to China account for a significant proportion of total exports of many agricultural commodities. Most notable of these is wool, of which 45 per cent was exported to China in 2003. China is also a significant market for other agricultural products, such as coarse grains and animal products (particularly skins and hides), and for resource commodities, particularly minerals and crude petroleum, as well as renewable resources like forestry.

In contrast, Chinese merchandise exports to Australia are mainly labor intensive manufactures, with the major categories being textile, clothing and footwear products, as well as machinery and electronics. Together these items amounted to US$4 billion in 2003, around 70 per cent of China's exports to Australia.

International competitiveness of goods traded between China and Australia

A key issue in the existing bilateral trade between Australia and China is whether it is consistent with the comparative advantage principle. This principle states that a country would export goods and services that employ resources where it enjoys relative abundance and, conversely, import goods and services produced with resources where it has relative scarcity (Heckscher 1919; Ohlin 1933). For example, if Australia enjoys an abundance of agricultural land and mineral and energy resources per person relative to other countries, then this is where its comparative advantage lies (Anderson 1995).

However, due to the empirical difficulties in measuring comparative advantage directly, Balassa (1965) indicated that *revealed* comparative advantage could be imputed from observed trade patterns to the extent that the goods and services traded reflect both relative costs and differences in factor intensities.

1 Australia–China trade, 2003

Aggregated commodities a	Australian exports to China	Share of Australian exports of that commodity	Chinese exports to Australia	Share of China's exports of that commodity
	US$m	%	US$m	%
Wheat	0.7	0.0	0.0	0.0
Cereal grains nec	93.4	24.4	0.0	0.0
Vegetables, fruits and nuts	2.0	0.3	9.1	0.5
Oilseeds	0.6	0.2	3.4	0.6
Plant based fibres	44.4	7.5	0.0	0.0
Crops nec	4.2	1.5	5.3	0.4
Bovine cattle, sheep and goats, horses	57.3	9.2	0.0	0.0
Animal products nec	123.8	24.1	4.7	0.4
Wool, silk-worm cocoons	527.6	45.0	0.0	0.4
Forestry	17.5	23.5	0.8	1.0
Fish	5.2	1.3	0.9	0.1
Brown, coking and steaming coal, oil, gas	752.3	5.4	214.1	2.1
Bauxite, minerals nec	1790.7	10.7	13.2	0.3
Bovine meat products, meat products nec	96.6	2.9	0.0	0.0
Meat products	6.6	2.2	0.7	0.1
Vegetable oil and fats	3.8	4.8	1.1	0.3
Dairy products	42.9	3.1	2.3	3.5
Processed rice	0.0	0.0	1.1	0.2
Sugar	0.3	0.9	0.1	0.2
Food products nec	53.3	2.9	0.0	0.0
Beverage and tobacco products	3.7	0.2	16.1	1.8
Textiles	103.1	12.3	687.2	1.8
Wearing apparel	1.5	0.8	888.3	2.1
Leather	26.0	6.8	234.9	1.2
Wood products	35.5	4.6	225.0	1.9
Paper products, publishing	60.6	8.2	79.8	2.6
Chemical, rubber and plastic products	240.0	6.2	586.2	1.9
Ferrous metals	206.8	27.6	0.0	0.0
Mineral products	13.9	1.9	462.1	2.1
Motor vehicles and parts	35.9	1.3	65.0	0.9
Transport, electronic and other machinery equipment	244.7	3.7	2152.3	1.1
Manufactures nec	3.9	0.5	297.3	1.4
	4599.0	100.0	5951.1	100.0

a Commodities have been grouped to align with GTAP commodity aggregations. nec Not elsewhere classified.
Source: United Nations (2004).

Following Balassa, revealed comparative advantage indices were estimated for the principal merchandise exports of both countries. The revealed comparative advantage index is the ratio of the share of a particular product in a country's total exports to the share of world exports of this product in the world's total exports. For example, the

Australian revealed comparative advantage for wheat equals (total Australian wheat exports / total Australian exports) / (total world wheat exports / total world exports). Hence the index implies that the absolute benchmark used in assessing comparative advantage would be the world export share of a particular product. Any share below that would indicate a comparative disadvantage.

Numerically, the revealed comparative advantage index ranges between zero and infinity. Values greater than or equal to one indicate that the particular country has an international competitiveness or comparative advantage in its exports of the product – that is, the country's export share exceeds or equals the corresponding world export share.

Furthermore, Hillman (1980) indicated that the revealed comparative advantage would still be a valid measure of competitiveness when the resource endowments of a country change provided that the elasticity of the revealed comparative advantage with respect to a particular export change is positive. In this paper, this condition was met for all the merchandise exports and services considered.

The revealed comparative advantage indices of the selected exports of Australia and China were estimated from 2000 to 2003 based on the COMTRADE data base.

The estimates of the revealed comparative advantage indices illustrate where the comparative advantage of Australia or China lies (tables 2 and 3). The revealed comparative advantage indices for the major agricultural and mineral exports of Australia such as wheat and coal exceed one, indicating the abundance of the land and mineral endowments in producing these products. In the case of China where labor is abundant, the revealed comparative advantage indices are greater than or equal to one for its exports of labor intensive light manufactures such as footwear and textile products. Hence, overall the observed bilateral merchandise trade pattern between Australia and China seems to be consistent with the relative resource endowments of each country – that is, each country tends to specialise in the production of goods that uses its relatively abundant endowment.

Furthermore, the wide differences in the relative factor endowments between Australia (exporting agricultural, capital and mineral intensive products) and China (exporting labor intensive products) would increase the trade between the two countries and the net welfare gains under a bilateral free trade agreement (Baier and Bergstrand 2004).

The revealed comparative advantage indices could indicate trade complementarity relationships if one of the trading countries had a revealed comparative advantage index exceeding one while the other less than one for a particular tradable good (Kalirajan and

Shand 1998). This case is illustrated for manufactured textiles where Australia had a revealed comparative advantage less than one while China's index exceeded one. With these differences in revealed comparative advantage it is apparent that Australia and China enjoy a complementary trade relationship.

2 Australia's revealed comparative advantage indices

GSC	Description	2000	2001	2002	2003
2	Wheat	15.41	14.85	14.50	10.24
3	Cereal grains	3.21	2.40	4.08	2.53
10	Animal products nec	3.18	3.46	3.00	3.40
12	Wool, silk worm cocoons	67.48	70.96	70.72	63.57
16	Petroleum oil	1.50	1.46	1.39	1.55
18	Minerals	8.70	8.29	8.70	9.46
19	Bovine meat products	14.43	16.80	15.06	16.23
22	Dairy products	5.86	5.22	5.41	4.58
27	Textiles	0.51	0.47	0.43	0.37
35	Iron/steel products	0.54	0.34	0.34	0.43
36	Metal products (powder)	6.99	6.99	7.01	6.66
41	Machinery	0.35	0.36	0.35	0.34

At times, the particular commodity aggregation might affect the estimates of revealed comparative advantage indices and, consequently, mask the competitive edge enjoyed by a particular country, which could become apparent in finer commodity disaggregations. This issue might be important for some manufacturing industries such as the textile and clothing industries in Australia that could face more intense competition from China under a free trade agreement. Havrila and Gwardana (2003, p.110) estimated the Australian revealed comparative indices for a disaggregated textile and clothing groupings from 1965 to 1996 and found that it is greater than one for fur clothing and special textile products, indicating that Australia is competitive in these products. A similar approach was adopted in this paper for the Australian GTAP (Global and Trade Analysis Project) textile and wearing apparel grouping. Based on table 2, the revealed comparative advantage index for textiles ranged from 0.37 to 0.51, indicating that Australia is not competitive in these products. The same index was re-

3 China's revealed comparative advantage indices

GSC	Description	2000	2001	2002	2003
27	Textiles	2.81	2.73	2.67	2.57
28	Wearing apparel	4.81	4.41	4.06	3.95
29	Leather products	4.34	4.04	3.83	3.39
30	Wood products	1.25	1.27	1.33	1.21
40	Electronics	1.05	1.29	1.58	1.93
41	Machinery	0.87	0.88	0.89	0.85

estimated for a finer textile grouping to assess where the comparative advantage of Australia lies in the manufacture of textile products. Table 4 shows that except for some wool products that have a revealed comparative advantage index ranging from 4.85 to 6.75, Australia has no comparative advantage on the other textile and wearing apparel products.

4 Australia's revealed comparative advantage indices for the disaggregated GTAP textiles and wearing apparel groupings

Description	2000	2001	2002	2003
Silk	0.03	0.04	0.03	0.04
Wool, animal hair, horsehair yarn and fabric thereof	6.75	6.34	6.86	4.85
Cotton	0.26	0.18	0.18	0.13
Vegetable textile fibres nec, paper yarn, woven fabric	0.21	0.01	0.01	0.01
Manmade filaments	0.08	0.08	0.09	0.08
Manmade staple fibres	0.16	0.12	0.15	0.09
Wadding, felt, nonwovens, yarns, twine, cordage, etc	0.29	0.29	0.21	0.22
Carpets and other textile floor coverings	0.47	0.45	0.64	0.49
Special woven or tufted fabric, lace, tapestry etc	0.12	0.10	0.09	0.07
Impregnated, coated or laminated textile fabric	0.38	0.33	0.39	0.37
Knitted or crocheted fabric	0.21	0.19	0.11	0.09
Articles of apparel, accessories, knit or crochet	0.09	0.10	0.05	0.05
Other made textile articles, sets, worn clothing etc	0.29	0.26	0.24	0.16
Aircraft, spacecraft, and parts thereof	0.13	0.14	0.13	0.29
Furniture, lighting, signs, prefabricated buildings	0.32	0.28	0.29	0.17
Articles of leather, animal gut, harness, travel goods	0.14	0.09	0.07	0.04
Furskins and artificial fur, manufactures thereof	0.48	0.43	0.39	0.17
Articles of apparel, accessories, knit or crochet	0.12	0.15	0.19	0.19
Articles of apparel, accessories, not knit or crochet	0.09	0.07	0.07	0.06
Headgear and parts thereof	0.61	0.42	0.41	0.31

Services are more important to the Australian economy than to the Chinese economy. In 2003, the service sector accounted for 72 per cent of the Australian gross domestic product while it was only about 34 per cent of the Chinese gross domestic product (Huang and Tongeren 2004).

5 Revealed comparative advantage indices for services

Country	2000	2001	2002	2003
Australia	1.19	1.07	1.06	1.02
China	0.50	0.49	0.49	0.76

The revealed comparative advantage indices for services based on the OECD trade data for Australia and China confirms the competitiveness of Australian service providers but the noncompetitiveness of the Chinese service producers. The indices were greater than one for Australia but less than one for China (table 5). Trade barriers such as ownership requirements retard the growth of China's service sectors and could be contributing to its comparative disadvantage (Schneider et al. 2000).

For Australia and China to achieve the maximum trade benefits arising from their comparative advantage on particular goods and services, free trade conditions must prevail. However, there are considerable obstacles to achieving free trade. The next section presents the nature and structure of trade barriers facing Australia and China.

Trade barriers

There are potentially large mutual benefits for countries engaging in free trade. For example, the United States could gain US$450 billion to US$1.3 trillion a year through free trade agreements with all its trading partners (The Economist 2004b). China could gain similarly from free trade. Yansheng, Zhongxin and Shuguang (1998) estimated long term benefits of trade liberalisation for China at US$35 billion. Duncan, Rees and Tyers (2003) showed that using trade barriers to achieve self sufficiency in agricultural products would retard the growth of the modern sectors in China and have a negative redistributive effect by imposing undue burden on worker households.

The adoption of freer trade practices in China could open substantial opportunities for other countries in terms of greater market access. For example, the reduction in tariffs influenced partly the rise in Chinese imports between 1982 and 2001. In 1982 the average tariff was 57 per cent and the total value of imports was approximately US$25 billion. In 2001 the average tariff declined to 15.3 per cent and total imports increased to US$220 billion.

Following its accession to the WTO, China has pursued further trade reforms. Tariffs on computer products such as semiconductors are to be totally eliminated in 2005. Despite the recent trade liberalisation measures adopted by China, barriers limiting imports persist.

Estimated average tariff rates (for 2004) on agricultural and manufacturing goods traded between Australia and China are provided in table 6. However, as part of China's accession to the WTO in 2001, it has adopted tariff quotas on some agricultural imports. These are detailed in table 7.

There are several points to note. For agricultural products, Australian tariffs are close to or equal to zero. Chinese import tariffs on agricultural products average around 10 per cent. The processed food and beverages and tobacco categories face higher tariffs, at around 17 per cent and 24 per cent respectively. Meat products also face comparatively high tariffs, averaging 16 or 17 per cent. Most of the other agricultural commodities face tariffs below these levels.

6 Estimated tariff rates for agricultural and manufacturing goods between Australia and China in 2004

Aggregated commodities	Australia tariff rate	China tariff rate
	%	%
Wheat	0.00	1.00 **a**
Cereal grains nec	0.00	3.00 **a**
Vegetables, fruits and nuts	0.76	7.13
Oil seeds	0.62	8.00
Plant-based fibres	0.00	8.89 **a**
Crops nec	0.16	8.92
Bovine cattle, sheep and goats, horses	0.00	4.55
Animal products nec	0.00	11.43
Wool, silk-worm cocoons	0.83	1.00 **a**
Forestry	0.40	8.35
Fish	0.12	10.67
Brown, coking and steaming coal, oil, gas	0.02	4.89
Bauxite, minerals nec	1.27	4.34
Bovine meat products, meat products nec	0.00	15.81
Meat products	0.81	17.24
Vegetable oil and fats	1.70	10.70 **a**
Dairy products	0.86	12.21
Processed rice	0.00	1.00 **a**
Sugar	1.25	15.00 **a**
Food products nec	1.95	16.70
Beverage and tobacco products	2.61	23.91
Textiles	10.00	10.08
Wearing apparel	17.50	16.29
Leather	8.43	15.52
Wood products	4.28	4.95
Paper products, publishing	3.48	5.46
Chemical, rubber, and plastic products	2.60	7.41
Ferrous metals	4.38	5.19
Mineral products	4.51	11.72
Motor vehicles and parts	7.88	13.79
Transport, electronic and other machinery equipment	2.87	7.96
Manufactures nec	3.20	14.91

a Commodities within this grouping subject to a tariff quota (see table 7 for further details). nec: not elsewhere classified.

Imports of most agricultural items subject to tariff quotas are well below the quota level and only face the in-quota tariff, which in most cases is negligible. The main exception is sugar, where the in-quota tariff rate is 15 per cent.

Chinese trade barriers on wool are of significant interest for a number of reasons. First, Australia is the world's largest exporter, with China being Australia's largest export destination. Second, the out of quota tariff is high at 38 per cent. Third, there is a discrepancy in trade figures, and while the import volumes under quota reported by China (table 7) are well within quota, Australian trade figures suggest that Chinese imports are actually much higher, creating uncertainty over the likelihood of the quota being filled.

7 Tariff quotas on Chinese agricultural imports

	Final within tariff quota rate	Final bound rate	Final commitment date	Final tariff quota quantity	Actual imports 2002	Actual imports 2003
	%	%		kt	kt	kt
Wheat	1	65	2004	9 636	632	450
Maize	1	65	2004	7 200	10	<5
Rice	1	65	2004	5 320	237	260
Soybean oil **a**	9	9	2005	3 587	870	1 880
Canola oil **a**	9	9	2005	1 243	78	150
Palm oil **a**	9	9	2005	3 168	1 695	2 330
Sugar	15	50	2004	1 945	1 183	780
Wool	1	38	2004	287	191	170
Cotton	1	40	2004	894	177	870

a tariff quota phased out from 1 January 2006. *Source:* WTO.

For nonagricultural goods, Australian import tariffs are generally low. The most notable exceptions are on motor vehicles and textiles, clothing and footwear imports. However, Australia has undertaken to unilaterally reduce these tariffs over time, with tariffs on motor vehicles, textiles and footwear scheduled to decline to 5 per cent by 2010, while tariffs on clothing will be reduced to 10 per cent by 2010 and to 5 per cent by 2015. Chinese tariffs on nonagricultural goods are typically higher than those for Australia. Notable is that China has high tariffs on textiles and clothing.

China also has trade barriers on services. These trade barriers come from the presence of strict screening and approval requirements, and management and operational restrictions that are likely to restrict Chinese imports of services (Schneider et al. 2000). The estimated tariff on the services sector as a whole in China is 9 per cent (Huang and Tongeran 2004).

Apart from tariffs, value added taxes (VAT), ranging from 13 to 17 per cent, are sometimes imposed on the import cif price. The VAT could have accounted for as much as 24 per cent of the implicit tariff for some agricultural products in 2001 (Huang and Tongeren 2004).

State trading enterprises tend to regulate the nature and volume of trade between China and its trading partners. In China, such enterprises include all marketing organisations at the central and provincial levels that handle domestic and international marketing. State trading enterprises are particularly active in grain trading. Crook (1999) reported that from 1992 to 1997, China's state trading system managed an average of 16.1 million tonnes of wheat, rice and corn a year. Huang and Tongeren (2004) estimated that between 70 and 87 per cent of the tariff equivalent for oilseeds (20 per cent) and coarse grains (30 per cent) in 2001 could be attributed to the monopolistic rent of the state trading enterprises.

Prospects for gains

Overall, the highlighted trade barriers imply that if bilateral tariff cuts under a free trade agreement between Australia and China are pursued, the gains of each country are likely to be affected by the existing tariff levels on its principal exports where it has a comparative advantage. For Australia, these gains could be realised from its agricultural, mineral and services exports, while in the case of China, they would be from its textile exports. However, given the relatively low tariff rates, the impacts of eliminating bilateral tariffs are expected to be relatively small.

For commodities covered by tariff quotas, while Chinese imports remain within quota, the potential benefits to Australia from a free trade agreement for these products consist of administrative benefits and reduced uncertainty. However, if China's imports were to exceed the quota in the future, then there may be significant benefits from bilateral liberalisation given the high out of quota tariffs. An increase in China's imports of the agricultural products covered by tariff quotas may occur because of reduced domestic supply, due to drought for example, or from increased demand, caused by rising incomes. Future policy changes may also boost demand. For instance, the phasing out of the multifibre arrangement may increase Chinese demand for wool and cotton to boost textile production.

Estimating the gains for a rapidly growing economy like China is a complex task. In the next section, the critical aspects of estimating the gains from freer trade, for example, identifying the key sectors that would expand under freer trade, are discussed.

Modeling Issues

In general, a free trade agreement between Australia and China might result in two main economic effects. First, domestic production would be replaced by lower cost imports from the partner country (trade creation). Second, due to the preferential tariffs applied to the goods and service traded between the two countries, the possibilities exist that low cost import suppliers might be replaced by higher cost import suppliers in the partner country. Hence, a comprehensive economic analysis of a bilateral trade agreement requires an estimate of the two components. Kowalcyzk (2000) noted that a complete assessment of a proposed preferential trading arrangement would require estimates of the trade and price changes in a fully specified general equilibrium model of the world economy.

There are a number of issues that arise in implementing an empirical analysis of a free trade agreement through a global model. First, the key features of the base economy to be modeled must be adequately represented. For example, in the case of the Chinese economy, shares of the agricultural, manufacturing and service sectors must be specified correctly to be consistent with envisioned economic growth patterns. Second, current policy changes, particularly in the area of tariffs, such as the unilateral motor vehicle reform undertaken by Australia, need to be part of the reference case. Third, accounting for uncertainties in the reference case, such as climatic events, would entail additional information. Fourth, identifying the actual trade restricting barriers is a difficult task. As mentioned earlier with the case of the wool tariff quota in China, the available trade data pose a challenge to analysis of the appropriate wool tariff rate to use in the reference case. Finally, commodity aggregation may obscure features specific to narrowly defined commodities, such as the variation in tariffs across tariff lines within the same aggregate grouping.

Constructing a reference case in a global model for an Australia–China free trade agreement: an illustration using GTEM

GTEM (global trade and environment model) is a dynamic, multiregion, multisector, computable general equilibrium model of the world economy. ABARE has developed the model to specifically address policy issues with global dimensions. GTEM has been developed from ABARE's MEGABARE model and the static GTAP model, with a number of enhancements carried out to broaden ABARE's modeling capacity. GTEM simulates the impact of policy issues or specific events on a large number of economic variables of a particular national/regional economy, including gross domestic product, consumption, production, trade, investment and greenhouse gas emissions. GTEM has the capability to address gradual trade liberalisation schemes, such as preferential bilateral trade agreements.

The general approach to analysis using GTEM is to determine a reference case of expected values for the relevant variables under the assumption that no policy changes occur over the period of time that is considered. Policy scenarios are then simulated. The difference between the reference case values and those from the policy simulations for the relevant variables indicates the impact of the policy change.

Developing a reference case for a free trade agreement between Australia and China involves focusing critically on four key areas: macroeconomic variables; trade flows; protection levels, both current and future; and elasticity parameters.

Justifiable assumptions have to be made about the growth in the gross national product and aggregate investment in Australia, China and the other countries represented in the model. Over or underestimating such growth rates could either result in severe resource constraints or an understatement of the supply capacity in the Australian and Chinese economies. Assuming an analysis period of 1997 to 2014, for China the standard macroeconomic assumption is that real gross domestic product will grow on average at 7.8 per cent a year with real investment growing on average at 7.7 a cent per year. Huang and Tongeren (2004) similarly estimated the growth of gross domestic product to be 7.1 per cent, the likely sustainable rate given Chinese resource constraints.

Trade flows in the reference case could normally be replicated through the availability of trade information from published sources and from commodity specialists' opinions. A numerical process that could establish the consistency of the trade flows in the reference case with historical data would be to use the entropy method (see Robinson, Catteneo and El-Said 2000). A simpler alternative of replicating the trade flows would be to use the targeting method suggested by Buetre and Ahmadi-Esfahani (2000).

The reference case also needs to incorporate the latest available tariff rates (see table 6) that reflect China's commitments to its WTO accession. Failure to incorporate this could then overstate tariff levels and consequently benefits from trade liberalisation. The reference case must also be modified to include the unilateral tariff reforms being undertaken by Australia in the case of the motor vehicles and textile industries to reflect the most recent information on trade barriers to be applied during the analysis period.

Model parameters need to be recalibrated to approximate the key features of the base Chinese and Australian economies. For example, an important modification is the parameters of the consumer demand system for China. The standard GTAP parameters indicate that the income elasticities of demand for meat products in China are elastic and for most other agricultural products, are close to unity. These high elasticities induce much larger growth in consumption of meat and agricultural products in China in the reference case than is indicated by widely cited projections. These consumption

changes have the potential to induce large structural changes in Chinese agriculture over time that can bias the results.

The parameters of the constant difference elasticity (CDE) demand function for China should therefore be revised to ensure that the estimated growth in per person consumption in the reference case is consistent with published estimates and that appropriate gross domestic product shares for agriculture, manufacturing and services are maintained. In particular, the income elasticities of demand must be scaled down so that per person consumption of agricultural products aligns with projected growth rates in consumption that have been published by FAPRI (2004b) and IFPRI (Rosegrant et al. 1995, 2001). The approach by Hertel (1997) to calibrate the CDE demand function can be used to make these adjustments. The resulting elasticities that could be used in the model, along with the standard GTAP counterparts, are provided in table 8.

8 Income elasticities of selected agricultural products used in the model

	GTAP	ABARE-revised	FAPRI / IFPRI **a**
Oilseeds	0.87	0.35	na
Wheat and other coarse grains	0.41	0.11	–0.3 to 0.2
Cattle meat	1.12	0.28	0.35 to 0.5
Pig and poultry meat	1.12	0.43	0.2 to 0.65
Dairy	0.78	0.40	na
Vegetable oil	0.87	0.35	na
Rice	0.41	0.11	–0.04 to 0.03
Sugar	0.87	0.27	na

a Rosegrant et al. (1995) on cereals and FAPRI (2004a) on meat products. na Not available

9 Estimated yearly per person consumption growth rates of selected agricultural products

	Growth using GTAP income elasticity	Growth using ABARE-revised elasticity	FAPRI / IFPRI growth rates **a**
	%	%	%
Oilseeds	6.4	2.7	Not available
Wheat and other coarse grains	2.8	0.8	0.9 **b**
Cattle meat	8.6	2.3	3.7
Pig and poultry meat	8.3	3.3	2.0-2.9
Dairy	5.6	2.8	3.0 – 3.1 **c**
Vegetable oil	7.0	3.0	0.5 – 9.9 **d**
Rice	3.0	0.7	1.0
Sugar	6.0	2.1	1.8

a FAPRI (2004b); Rosegrant et al. (2001). **b** Average of cereals. **c** Butter and cheese. **d** Sunflower oil, soybean oil, rapeseed oil and peanut oil. na Not available.

The revised income elasticities for food and agricultural products in China resulted in growth rates in per person consumption that conforms with the growth rates projected by FAPRI and IFPRI as indicated in table 9.

Conclusions

There are two key factors that favor a free trade agreement between Australia and China. First, the relative endowments of each country are different. Australia enjoys a surplus in agricultural and mineral endowments while China has a labor surplus. Consequently, each country would specialise in the production of goods and services where they enjoy a resource advantage. Second, the geographic proximity between the two countries offers opportunities to reduce transport costs. This is particularly important for Australia as it would be exporting bulky agricultural and mineral products.

In terms of producing sectors, the agricultural, mineral and service industries in Australia would likely reap higher revenues through greater exports to China. In contrast, Chinese textile exports would expand significantly through greater access to the Australian market.

When undertaking quantitative modeling of a bilateral trade agreement such as a potential Australia–China free trade agreement, there are a number of issues that need to be addressed, particularly in developing a representative reference case. It is imperative that an accurate reference case underpin any analysis, since distortions in protection levels or trade flows can significantly misrepresent the impacts that may be precipitated by a free trade agreement.

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