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The Initial Impact of WTO Membership on China's Trade Performance in Primary Agricultural And Processed Food Products

Liu Xue[1] , Brian J Revell[2] , Fu Zetian[1]

[1] China Agriculture University, Beijing P.R. China, (liusnowcau@yahoo.com.cn)
[2] Harper Adams University College, Newport, Shropshire, UK (bjrevell@harper-adams.ac.uk)

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Abstract

There has been much analysis of the potential impact of China's membership of the WTO on world trade in agricultural products but few studies of the actual effects thus far on China's trade performance. This paper compares changes in the competitiveness of China's trade in primary agricultural food and processed food products over the period 1998 to 2003 through a range of comparative advantage measures, the preferred being Revealed Symmetric Comparative Advantage. It also decomposes changes in China's export market share of these products over the period into structural and performance components and identifies where shifts in the global regional distribution of its exports have contributed to changes in its overall market share.

Key words: China, agricultural, processed foods, exports, competitiveness.

JEL Codes:- Q17, O13

1 Introduction

A number of studies attempted ex ante predictions analyses of the impact of China's WTO membership in December 2001 on world trade in agricultural products, though little has been written about processed food products in this context. Precise comparisons and more general conclusions from such modelling simulations are problematic for a number of reasons. First the underlying assumptions differ regarding both the degree and stage of implementation of China's initial commitments under the URAA bound tariffs, and under any subsequent final Doha Round agreement the WTO reaches, and are often presented as a number of scenarios.

Second, prediction baselines are often different. Third, model structures and methodologies differ, with some models giving dynamic adjustment paths whilst others present comparative static long run CGE solutions.

Fuller et al (2001), using the FAPRI model, suggested a small initial rise in China's net cereals imports (by volume) subsequently increasing until 2009-10; net imports of soyabeans increasing by over 50% during the same period; increases in net imports of soyabean and rapeseed oils; a small increase in net exports of vegetables; beef net exports would rise immediately post WTO and then fall back; net imports of poultry would increase and those of pork remain relatively stable. Yu and Frandsen (2002), using the GTAP model, similarly predicted a significant increase in Chinese grain imports, and a small deterioration in net trade for many other agricultural commodities. Gilbert and Wahl's (2001) CGE modelling suggested a 4 percent increase in wheat imports and 10 percent for other grains, a 5 percent increase in beef and 20 percent increase in other meat imports. Huang and Rozelle (2002) pointed to a significant immediate impact on maize import levels, and to a longer run deterioration in net trade in soyabeans and sugar, but improved net trade for products where China has a comparative advantage such as rice, fruit, vegetables, and some meats. More recent GTAP modelling by Conforti and Salvatici (2004) suggested that as a baseline small net cereals exporter, China would become a net cereals importer (excluding rice) under strong liberalization and only a marginal net exporter under weak liberalization. As a baseline net importer of oilseeds, imports were predicted to rise marginally under weak liberalization, and more under strong liberalization, with similar tendencies for vegetable oils and sugar.

Whilst most of the above studies implicitly suggest that China has a comparative trade disadvantage in those products which are labour extensive, and a comparative advantage in those products for which there is relatively high labour intensity in production, a point emphasised by Lin (2000), none, however, has attempted to measure it directly. Given their longer-term trade focus, they clearly shed little light on more immediate and contemporaneous developments in China's comparative advantage and trade competitiveness since its WTO accession. Nor do they examine changes in the balance between unprocessed and processed products, and in the structure and direction of China's trade. As Rae and Josling (2003) observed, trade in processed products could represent significant gains for developing and emerging economy countries under trade liberalisation. This paper therefore attempts to fill some of this gap and explores how China's comparative advantage and trade performance has developed over the more recent period 1998-2003, embracing the crucial years before and after its WTO membership. This is a period over which Johnson (2000) expressed the view that the short run trade effects would be modest at best.

2 Methodology

Huang and Rozelle (2002), indicated that the determination of representative internal market prices in estimating protection rates in China was not straightforward. By extension, estimates of its domestic resource costs (DRC) would be complex and data demanding, though we note some pre-WTO membership accession estimates by Tuan and Tingjun (2001). They concluded that pigs, beef and poultry meat had a degree of comparative advantage whilst wheat and maize

were at a comparative disadvantage. We therefore opt for a number of trade-based measures deriving from Balassa's (1965) ***revealed comparative advantage*** (RCA:-

$$RCA_{is} = \left(\frac{X_{is}}{X_{it}}\right) \cdot \left(\frac{X_{ws}}{X_{wt}}\right)^{-1} \tag{1}$$

where

$$X_{it} = \sum_{s=1}^{m} X_{is} \quad , \quad X_{ws} = \sum_{i=1}^{n} X_{is} \quad \text{and} \quad X_{wt} = \sum_{s=1}^{m} X_{ws}$$

and X represents exports, i is a specific country (i=1…n), s is a commodity group (s=1…m), t is the set of m commodities, and w is the world and sum of n countries. Country i has a comparative advantage in trade in s if RCA>1 and a comparative disadvantage where RCA<1.

However, as the RCA measure is not symmetric about unity Laursen (1998) argued that ***revealed symmetric comparative advantage*** (RSCA) is generally a preferable measure, where

$$RSCA_{is} = \left(RCA_{is} - 1\right) \cdot \left(RCA_{is} + 1\right)^{-1} \tag{2}$$

A number of other measures have been proposed including ***relative trade advantage*** (RTA)**,** Vollrath (1991), ***relative comparative advantage*** measure, defined as the ratio of a country's product export share of its exports to the corresponding product import share of its total imports and the ***export specialisation index*** (XSP) which eliminates the bias arising where the

own-country may make a significant contribution to commodity and total world trade.

The range of RCA measures, however, reveal little about the underlying determinants of changes in comparative advantage in a country's trade, nor whether such changes are due to changes in the country market composition shares of world trade as opposed to the exporter's intrinsic competitiveness. Trade shares accounting and decomposition developed by Gehlhar and Vollrath (1997) enables us to identify these elements and also the bi-lateral changes in aggregate market shares for the exporting country.

Dropping the s subscript for a specific commodity or commodity group.

Define exporting country i share of country j's market for s as

$$p_{ij} = \frac{X_{ij}}{X_{wj}} \quad . \tag{3}$$

Define P_j as the ***structural share*** of importing country j, i.e. its share of world trade in s.

$$P_j = \frac{X_{wj}}{X_{ww}} \tag{4}$$

by definition $\sum_j P_j = 1$

Let country i's ***aggregate market share*** (AMS) of total world trade in s be :-

$$AMS_{iw} = \left(\sum_j X_{ij} \right) \cdot X_{ww}^{-1} \qquad \frac{X_{iw}}{X_{ww}}$$

$$= \qquad (5)$$

i.e. :-

$$AMS_{iw} = \sum_j p_{ij} \cdot P_j \qquad (6)$$

and if for simplicity, if we let $AMS_{ij} = p_{ij}P_j$. then (6) can be expressed as:-

$$AMS_{iw} = \sum_j AMS_{ij} \qquad (7)$$

Over a period of time τ between a base period $\tau = \beta$ and final period $\tau = \Phi$, the ***total effect*** (TE) of a change in i's AMS can be decomposed into its individual country shares as follows:-

$$TE_{iw}^{\tau} = \sum_j E_{ij}^{\tau} \qquad (8)$$

where $_{ij} = AMS$ and $\Delta AMS_{ij}^{\tau} = AMS_{ij}^{\phi} - AMS_{ij}^{\beta}$ (9)

The change in AMS can also be decomposed into the sum of two effects, a ***structural effect*** (SE) reflecting changes in structural shares of world trade (i.e. within the share mix of importing countries) relative to the base period, and a ***performance effect*** (PE), reflecting the changes in i's country shares of trade. Three separate measures of the AMS are needed: what the AMS would have been with fixed base-period country shares and final period structural shares (Eq.10), together with the base and final period AMS. Equations 10-12 define them:-

$$AMS_{iw}^{f\beta} = \sum_j p_{ij}^{\beta} \cdot P_j^{\phi} \quad (10)$$

$$AMS_{iw}^{\beta} = \sum_j p_{ij}^{\beta} \cdot P_j^{\beta} \quad (11)$$

$$AMS_{iw}^{\phi} = \sum_j p_{ij}^{\phi} \cdot P_j^{\phi} \quad (12)$$

The structural effect is given by:-

$$SE_{iw}^{\tau} = AMS_{iw}^{f\beta} - AMS_{iw}^{\beta} \quad (13)$$

the performance effect by:-

$$PE_{iw}^{\tau} = AMS_{iw}^{\phi} - AMS_{iw}^{f\beta} \quad (14)$$

and the total effect by

$$TE_{iw}^{\tau} = SE_{iw}^{\tau} + PE_{iw}^{\tau} \quad (15).$$

Equations (9) and (15) represent alternative views of the changes in the AMS, with Equation (15) reflecting both changes in the composition of global trade and changes in i's export market shares adjusted for compositional global trade share change.

3 Data

This study uses the HS system 2 digit commodity trade categories (by value) from the UN Comstat database over the period 1998-2003. These categories we define as broadly relating to

primary or unprocessed agricultural food products (***pafps***)[2], and processed food products (***prfps***), although the distinctions within the 2 digit level categories between unprocessed, semi- and processed/prepared foods is not perfect[3]. ***Pafps*** are:-

- HS 02 Meat and edible meat offal
- HS 04 Dairy products, eggs, honey, other edible animal products
- HS 07 Edible vegetables and certain roots and tubers
- HS 08 Edible fruit, nuts, citrus peel and melons
- HS 10 Cereals
- HS 12 Oilseeds, oleagic fruits, other grains, seeds and fruits.

And ***prfps*** are:-

- HS 11 Milling products
- HS 16 Meat, fish and seafood[4]
- HS 17 Sugar and sugar confectionary
- HS 19 Cereals, flour and milk preparations
- HS 20 Vegetable, fruit and nut preparations
- HS 21 Miscellaneous edible products

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[2] Hence we exclude fibres, animal fats etc and by-product categories for non-food uses

[3] a more complete analysis would require analysis and re-aggregation from 6 digit code categories.

[4] We recognise a problem in that meat products comprise only 36% and 30% respectively of world and China's trade in HS 16 .

China's exports have been measured as third country imports from China, and world trade as world imports.

Changes in China's regional trade in ***pafps*** and ***prfps*** were also analysed. Regional aggregates[5] were identified which together accounted for 85 percent of China's exports of ***pafps*** and 94 percent of its ***prfps***. These were:-

- East Asia
- S E Asia
- EU15
- N America
- Russian Federation

A catch-all Rest of World (ROW) region was also defined. The world trade total was adjusted for China's exports to eliminate own-country bias.

4 China's Trade in Agricultural and Food Products

Table 1 shows trend growth in world trade in ***pafps*** and ***prfps*** rising by some 3.4 to 4.4 percent annually, and China's exports of these products rising by 4.4 percent and 11.3 percent respectively. The share of ***prfps*** in total trade rose by around 1 percentage point over the period. However, in contrast, there was a sharp increase in the share of ***prfps*** in China's total agricultural and food exports.

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[5] Details can be supplied by the authors on request

China's share of world export markets in Table 2 is relatively small for meat and dairy products, but significant for vegetables (Liu et al (2003, 2004)), with an 8.1percent share of the world total. Its shares in oilseeds, and cereals accounted for around 3.6 and 4.2 percent of world exports of ***pafps*** in 1998. China's export shares for meat, dairy and vegetables have declined since its WTO membership, whilst that of cereals has risen sharply. For ***prfps***, China's world market share for meat fish and seafood and vegetable fruits and nuts are significant (the former largely reflecting marine food products), though overall, for both ***pafps*** and ***prfps***, China's share of world trade in 2003, post WTO membership, was higher than in 1998.

The regional distribution of China's trade (Table 3) in ***pafps*** and ***prfps*** in 1998 and 2003 reveals a relative decline in China's traditional and largest r E Asian regional market with compensating shift in ***pafps*** exports to the ROW , and some shift in China's share of ***prfps*** between E Asia into N America over the period.

5 Changes in China's Comparative Advantage

The range of comparative advantage measures outlined in Section 2 of the paper were all highly correlated[6] over the study period. Hence we present below only those results for the RSCA index of competitiveness as a preferred measure.

[6] $r \geq 0.99$

Figure 1 shows China's positive but declining comparative advantage for vegetables since WTO membership, despite an *a priori* advantage in labour intensive products.. It reveals a sharply rising comparative advantage in cereal exports and a small comparative advantage, though diminishing, for oilseed products. The relative trade disadvantage in meat was sharply exacerbated, ameliorated marginally for fruit ,and weakened for dairy products. However, there is little evidence for fruit and dairy products that this is due to a WTO-specific effect, as both have exhibited gentle consistent trends since 1998. There is no clear sign of any significant changes in the RSCA for most of China's ***prfps*** exports, except sugar and confectionery products. Nevertheless, the changes between pre and post WTO membership appear relatively small (Figure 2). Overall, China has a comparative advantage only for processed meat and fish (primarily due to fish) and vegetable and fruit products.

6 Decomposition of China's Trade and Competitive Performance

We now examine the underlying determinants of change in China's trade performance since its WTO membership. The definition of a common base period year can be problematic if there are differing trends amongst the various commodity groups and atypical years. The study therefore decomposes and compares the changes in China's AMS over two periods, between 1998 and 2001, and between 2001 and 2003. Table 4a summarises the structural and performance and effects over these two time periods as well as the individual regional contributions to changse in China's AMS for ***pafps***. Table 4b presents the comparable analysis for ***prfps***..

In general the pre-to post WTO effects for ***pafps*** have been quite small[7], with China's AMS increasing for the ***pafp*** group of products as a whole by only one third of a point since WTO membership, compared with an overall decline pre-WTO. The increase in AMS post WTO has been entirely due to an improved trade performance effect, offsetting a negative structural effect[8]. It is clear that there has been some re-alignment of its market share growth between E Asia and SE Asia.

For meats and offal, WTO membership has accelerated the decline in its AMS in which the negative performance effect was both dominant and deteriorated after 2001. Contrary to expectations that the WTO would exert a major effect on China's dairy sector, there is little short-term evidence that China's trade competitiveness has deteriorated significantly since 2001. Although the pre-WTO accession upward trend in China's AMS for vegetables has reversed since WTO membership, this is largely due to negative structural changes in world trade in vegetables, offsetting a positive (though weakening) performance effect. Much of the decline has been located within the E Asian (particularly the Japanese) market where there has been a continuing trade dispute over Chinese vegetable exports. China's export performance in fruit products has improved post WTO membership despite a small adverse structural shift in world trade. China's cereal exports increased their AMS by 4 percentage points since 2001,

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[7] Supporting Johnson (2000) op cit.

[8] and dominated by changes in cereals exports.

performance led, and strongly focused into its regional E Asian and ROW markets. Finally, whilst China's AMS in oilseeds has declined since 2001, this has been primarily due to negative changes in the structural composition of world trade and a slight weakening in China's competitiveness in specific markets.

Table 4b presents the decomposition of changes in China's AMS for ***prfps***. Since WTO membership, there is evidence of an overall slowing in its AMS growth. Although the performance effect improved for the ***prfps*** group as a whole, for some key product areas such as meat and fish, vegetable and fruit products, China's performance weakened relative to the four preceding years. Again, this reflects a deterioration in export penetration into its traditional E Asian markets.

7 Discussion and Conclusions.

Despite the relative short period since China has become a member of the WTO, it is possible to discern some changes in its trade performance in both ***pafps and prfps***. In virtually all of the product groups examined, between 2001 and 2003, the structural changes in trade in these markets were exerting an adverse effect on China's AMS. It suggests that China may need in future to seek to shift the balance in its regional export markets over time, given that its labour-cost advantages reflected in the positive performance contribution to AMS change are barely keeping ahead of the impact of structural changes in world trade. With the exception of meat products, the performance effects for ***pafps*** have been positive both before and after 2001,

whereas in general, they have deteriorated for most individual ***prfps*** except sugar and confectionery. Although China's cereal exports have become significantly more competitive since WTO membership, there has otherwise been a weakening in trade performance in meat, vegetables, fruit and oilseeds. Furthermore, China's export penetration of ***pafps*** (with the exception of cereals) has fallen in its largest regional market of E. Asia. with no clear pattern of realignment into other markets. It would require further disaggregated analysis of the cereals product group to identify whether the performance gains there have been in the more labour intensive rice, or in the more labour extensive wheat, maize and coarse grains. Moreover, there is no strong evidence of significant contributions to the AMS gains for ***prfps*** overall that derive from developed country markets of the EU and N America. The best that can e said is that the negative contribution to change has been halted since China became a WTO member.

Thus far, China's brief WTO membership appears not to have significantly favoured its export performance in relatively labour intensive unprocessed products, for which it would ostensibly appear to possess a comparative advantage, nor has it made significant gains in market share for exports of many processed food products (where lower labour costs would be a relatively smaller, yet still significant component of the overall product cost). So whilst the share of China's agricultural and food export earnings from processed products has increased over the period 1998-2003, as has its share of world trade in processed products, most of this growth took place prior to its WTO membership.

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TABLES

Table 1 Trade in Primary Agricultural and Processed Food products 1998-2003

	1998	2003	trend %p.a.
World Trade Total	$ m US		
Unprocessed	176,397	214,340	3.4%
Processed	87,294	111,569	4.4%
Processed share	33.1%	34.2%	
World Imports from China			
Unprocessed	5,617	7,496	4.4%
Processed	3,262	5,878	11.3%
Processed share	36.7%	44.0%	

Table 2 China's Share (%) of World Trade in Primary and Processed Food Products

	1998	2003	Change[a] 98-03
HS 02 Meat	2.3%	1.2%	-1.1%
HS 04 Dairy	0.8%	0.7%	-0.1%
HS 07 Vegetables	8.1%	8.1%	0.0%
HS 08 Fruit	1.7%	2.1%	0.4%
HS 10 Cereals	3.6%	6.2%	2.6%
HS 12 Oilseeds	4.2%	4.5%	0.3%
TOTAL PAFPs	3.2%	3.5%	0.3%
HS 11 Milling products	1.8%	2.2%	0.4%
HS 16 Meat, fish, seafood	9.4%	12.3%	2.9%
HS 17 Sugars, confect.	1.0%	1.7%	0.7%
HS 19 Cereal, flour etc	1.9%	2.7%	0.8%
HS 20 Veg, fruit nuts etc	5.6%	8.4%	2.8%
HS 21 Misc. prods	1.5%	2.2%	0.7%
TOTAL PRFPs	3.7%	5.3%	1.5%

[a] in percentage points. NB rounding to nearest decimal point.

Table 3 Regional Distribution of China's Trade

	Primary agricultural products			Processed food products		
	98	03	change[a]	98	03	change
N Amer.	4.7%	6.0%	1.4%	9.4%	16.0%	6.5%
Russ Fdn	4.8%	3.5%	-1.3%	1.0%	1.2%	0.3%
EU	10.0%	9.8%	-0.2%	9.7%	10.3%	0.6%
SE Asia	18.7%	15.5%	-3.2%	5.0%	5.3%	0.3%
E Asia	54.9%	50.9%	-4.0%	69.1%	61.4%	-7.7%
ROW	6.9%	14.2%	7.3%	5.9%	5.9%	0.0%

[a] in percentage points. NB rounding to nearest decimal point.

Table 4a Decomposition of Changes in China's AMS in PAFPS in percentage points

HS Category	Period	Structural Effect	Performance Effect	Total AMS Effect	E ASIA	S.E.ASIA	N AMERICA	EU	RUSSIAN FDN	ROW
Meat HS 02	98-01	0.17%	-0.44%	-0.27%	-0.13%	0.09%	0.01%	0.07%	-0.46%	0.15%
	01-03	-0.11%	-0.81%	-0.93%	-0.72%	-0.08%	0.00%	-0.13%	0.12%	-0.12%
Dairy HS 04	98-01	0.02%	-0.04%	-0.03%	0.06%	0.01%	0.00%	-0.13%	0.00%	0.04%
	01-03	-0.07%	0.02%	-0.05%	0.02%	0.00%	0.05%	-0.13%	0.00%	0.01%
Vegetables HS 07	98-01	-0.91%	2.07%	1.16%	0.48%	0.16%	0.04%	0.09%	0.01%	0.37%
	01-03	-1.66%	0.53%	-1.13%	-1.52%	0.11%	0.14%	-0.06%	0.11%	0.09%
Fruit HS 08	98-01	0.18%	0.05%	0.23%	-0.01%	0.19%	0.05%	0.00%	0.01%	-0.02%
	01-03	-0.23%	0.42%	0.19%	-0.19%	0.05%	0.03%	0.18%	0.07%	0.05%
Cereals HS 10	98-01	-0.53%	-0.61%	-1.14%	0.11%	-1.48%	0.00%	-0.01%	-0.01%	0.23%
	01-03	-0.16%	4.14%	3.98%	2.13%	0.97%	0.11%	0.03%	0.07%	0.68%
Oilseeds HS 12	98-01	-0.23%	0.75%	0.52%	0.11%	0.05%	-0.05%	0.12%	0.02%	0.26%
	01-03	-0.29%	0.08%	-0.21%	-0.30%	-0.05%	0.04%	0.06%	0.01%	0.04%
All of the above	98-01	0.06%	-0.10%	-0.04%	0.08%	-0.22%	0.01%	0.10%	-0.10%	0.09%
	01-03	-0.22%	0.60%	0.38%	-0.04%	0.17%	0.05%	-0.07%	0.07%	0.20%

Table 4b Decomposition of Changes in China's AMS For PAFPS

HS Category		Structural Effect	Performance Effect	Total AMS Effect	E ASIA	S.E.ASIA	N AMERICA	EU	RUSSIAN FDN	ROW
Milling Products HS11	98-01	-0.02%	0.53%	0.50%	0.07%	0.38%	-0.01%	0.02%	-0.03%	0.07%
	01-03	-0.18%	0.30%	0.12%	-0.09%	0.01%	0.14%	0.01%	0.12%	-0.06%
Meat, Fish, Seafood HS 16	98-01	1.55%	2.59%	4.14%	3.11%	0.19%	0.64%	0.25%	-0.06%	0.01%
	01-03	-1.93%	1.43%	-0.50%	-1.04%	-0.08%	0.80%	-0.13%	0.03%	-0.07%
Sugar, confectionary HS17	98-01	-0.03%	0.36%	0.34%	0.11%	-0.06%	0.10%	0.08%	0.00%	0.10%
	01-03	-0.09%	0.46%	0.38%	0.08%	0.13%	0.18%	0.04%	0.00%	-0.07%
Cereal, flour, etc HS 19	98-01	0.03%	0.75%	0.79%	0.59%	0.01%	0.05%	0.10%	-0.03%	0.06%
	01-03	0.33%	-0.31%	0.02%	-0.05%	0.03%	0.03%	-0.02%	0.00%	0.03%
Veg, fruit, nut prods. HS 20	98-01	0.39%	2.28%	2.67%	1.60%	0.15%	0.34%	0.37%	0.04%	0.16%
	01-03	-1.07%	1.62%	0.55%	-0.63%	-0.01%	0.67%	0.29%	0.09%	0.13%
Misc. Edible Pros. HS 21	98-01	0.14%	0.38%	0.53%	0.33%	0.05%	0.05%	-0.03%	0.01%	0.10%
	01-03	-0.24%	0.40%	0.16%	0.05%	0.02%	0.01%	0.03%	0.02%	0.03%
All of above	98-01	5.35%	-3.82%	1.53%	-2.67%	-0.18%	-0.29%	-0.38%	-0.06%	0.02%
	01-03	-0.51%	0.67%	0.15%	-0.29%	0.02%	0.32%	0.06%	0.04%	0.01%

FIGURES

Figure 1 Revealed Symmetric Comparative Advantage For China's Pafps Exports

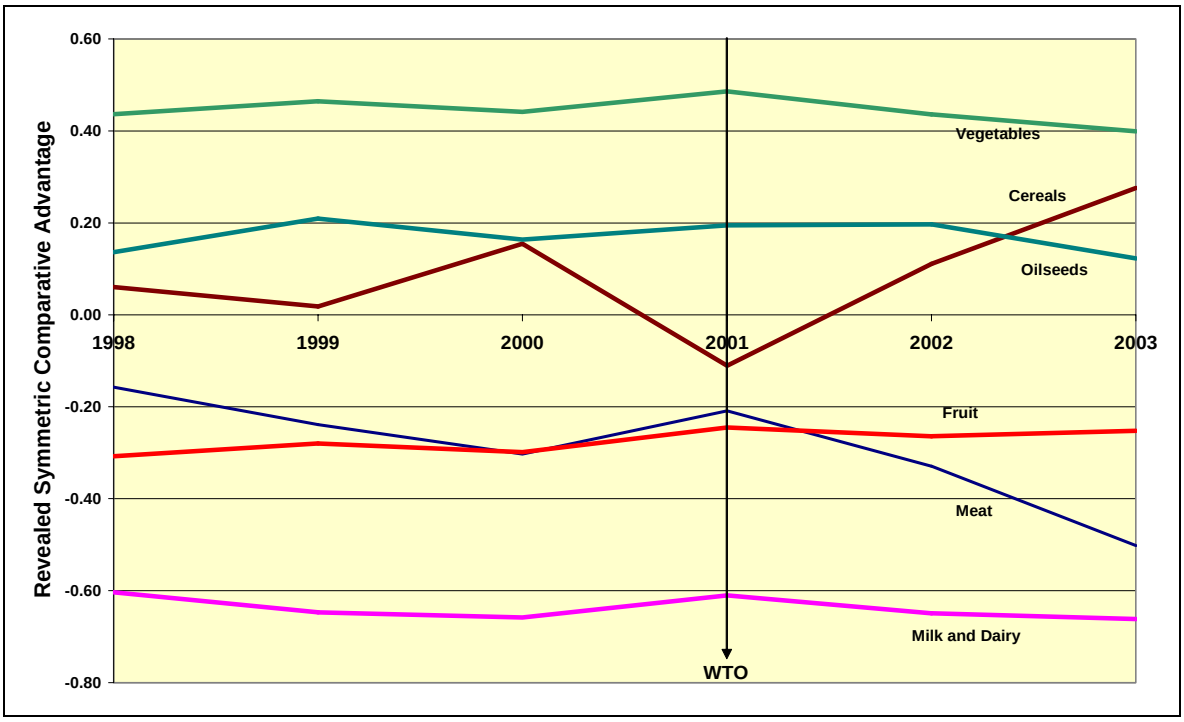
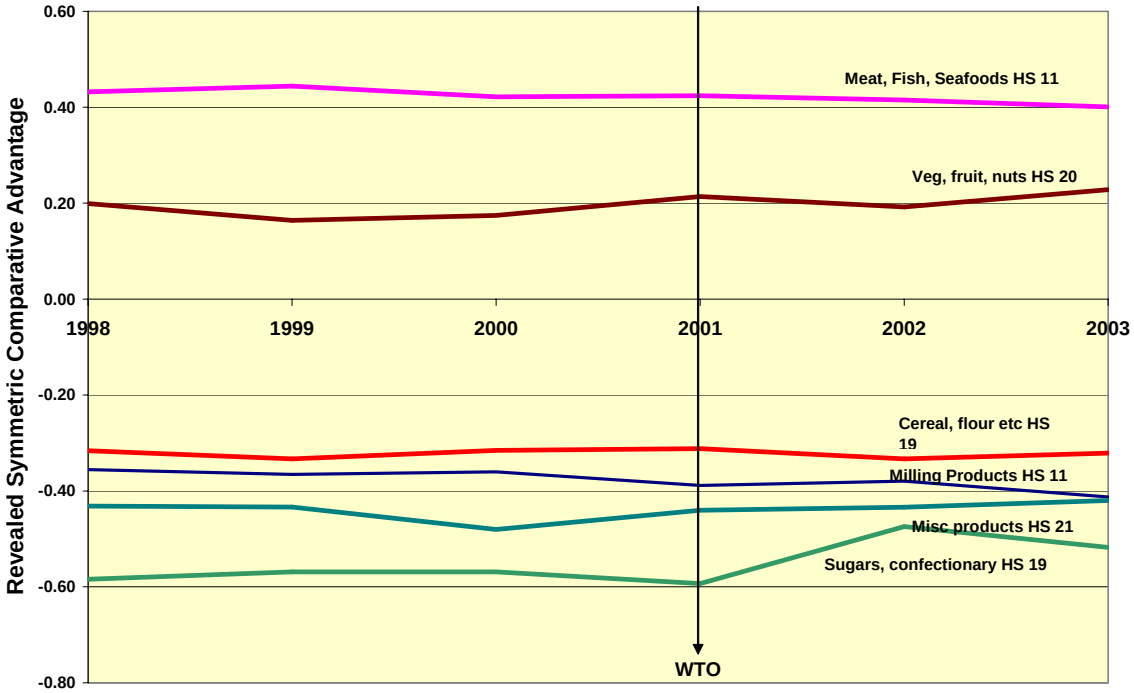
Figure 2 Revealed Symmetric Comparative Advantage For China's Prfps Exports