The Effects of China's Tariff Reductions on EU Agricultural Exports

Abstract. China's accession to the WTO means significant increases in export opportunities for China's trading partners. This study attempts to identify and measure quantitatively the effects of changing economic environment and trade policies on China's agricultural imports from the European Union (EU). The approach is to estimate demand functions for China's agri-food imports from the EU using semi-annual data from 1980 to 2000. The demand functions are used to measure the impacts of relative-price and trade policy changes on EU agricultural exports to China. The results suggest that in China, there is a relatively strong demand response for agri-food imports to changes in income and prices. Furthermore, the results indicate that relative-price variations affect significantly the export market shares of the EU. Trade liberalisation in the form of tariff reductions is found to be relatively significant in changing the quantity of agri-food imports demand from China.

Key words: China, WTO, agricultural trade, tariffs, demand functions, estimation

1. Introduction

China's huge potential agri-food market has long had a mesmerising effect on western exporters. As the incomes of China's 1.3 billion people continue to rise, demand for more and higher quality agri-food products will grow. Domestic production will be unable to meet all of this demand, and in the future, China will be a key market for agri-food exports. China has made a major effort to open up to world trade over recent years - by cutting tariffs, reforming its currency and developing its legal system. China's entry into the World Trade Organisation (WTO) in December 2001 will further improve market access in one of the world's largest and most rapidly expanding markets. China will have to change and clarify its stringent agricultural policy being a member of the WTO. Under the framework of the WTO, China has committed to make vast reforms on its agricultural trade policy. China agreed to improve market access, eliminate non-tariff barriers, and also not to maintain or introduce any export subsidies on agricultural products. The impact of these reforms on EU agricultural trade with China will be significant, affecting mostly EU agricultural exports to China.

Currently, the EU is not a significant player in the Chinese agri-food market, accounting for less than 4% of China's total agri-food imports. Nevertheless, China is considered as one of the most dynamic and promising of all markets for EU agri-food products. The sheer size of China's agri-food market is one factor. The first prognoses (Zhi Wang 1997, Colby et al. 2000) published about the impacts of China's WTO accession indicate that freer trade would substantially accelerate Chinese demand for agri-food products. Schmidhuber (2001) has recently argued that with sharp tariff reduction, EU export products will become competitive in China's market not only on quality but also in price, thus stimulating the consumer demand for imported goods. Therefore, EU exports of these products are expected to grow rapidly.

This paper attempts to examine EU agri-food exports to China in regard to China's trade liberalisation in the form of tariff reductions due to China's WTO commitments. More

specifically, it attempts to model behavioural relationships in the agri-food trade between China and the EU by considering three issues in detail. The first is the long-term relationship between the growth rate of agri-food imports and the rate of economic growth in China. The second issue concerns the capacity of the EU suppliers to influence their export market shares. This depends on product heterogeneity, which would suggest that EU can alter the demand for exports through relative-price changes. The third issue concerns the magnitude of the effect that China's tariff reductions could have on EU exports.

The paper is divided into three main parts. First, the general trends and patterns of the agri-food trade between China and the EU countries are examined. This is followed by an investigation of the major Chinese trade policy changes influencing EU's agri-food exports. Then, given a sample of semi-annual data that cover the EU exports to China for selected agri-food products from 1980 to 2000, demand functions for China's agri-food imports from the EU are estimated by applying a theory-based, dynamic econometric modelling framework. These demand functions relate the level of imports to real income, price, and exchange rate. Finally, the estimated functions are used to examine the impacts of China's tariff reductions on agri-food trade between the EU and China.

2. Agricultural trade relations between China and the EU

China has been an increasingly important destination for EU agri-food exporters. In 2000, the EU agri-food exports reached € 584 million (USD 540 million), up more than € 217 million or 60% more compared to the 1990 level. Growth in EU exports to China averaged 4.6% per year in the period 1990-2000. Booming middle class income levels have fuelled most of the country's increased appetite for imported food products. The product composition of EU agri-food exports to China has stayed more or less the same over the same period. The seven leading products exported are barley, rape seed, meat products, whey, milk powder, beer and wine. These seven products together account for about 50% of EU agri-food exports to China (Figure 1).

Overall, China is a € 17 billion (USD 16 billion) market for agri-food products, with the EU holding a 3.5% share only. EU's market share in China has been growing slow, but steady over the recent years. Currently, the EU holds a commanding market share in China's alcoholic beverage imports, and a sizeable share of dairy and meat products imports as well. The EU market share of China's alcoholic beverage imports has held steady at around 70% range, while at the same time the size of the market, especially in wines, has grown substantially.

EU's marketing advantage has been price with the aid of production and export subsidies. France is the largest agri-food exporter to the Chinese market out of the EU-15 member states. France holds a 32.6% share of the total EU agri-food exports to China, followed by descending order the Netherlands (24.7%), Germany (9.8%) and Spain (9.7%). Foreign competitors confronting the EU exporters in the Chinese food market are intensifying. Numerous countries are entering the Chinese market for processed and intermediate food products. Products that compete with the EU food products originate from the USA, Australia, New Zealand, Canada, Japan, Argentina and Chile.

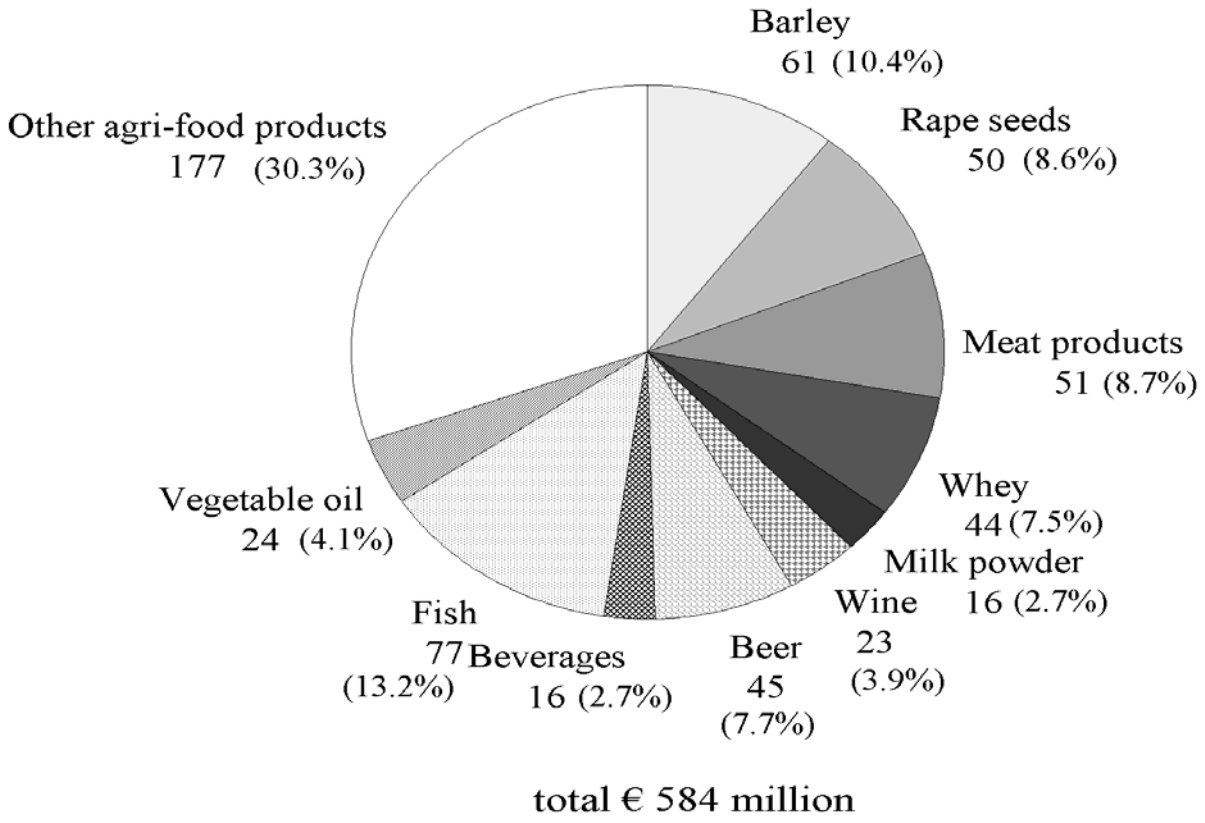

Figure 1. Year 2000 commodity composition of EU agri-food exports to China in millions of euros (and as a percentage share of total EU agri-food exports to China).

Despite the success in penetrating to the Chinese market in some specific product markets such as rape seed, cereals, dairy products and meat products over the recent years, EU's market penetration has been obstructed by the protection practised in the agricultural policy of China. Among the major irritants in the EU-China agricultural trade relations have been high tariffs and non-tariff barriers (e.g. price controls, discriminatory registration requirements, and arbitrary sanitary standards). Problems have also arise from the lack of transparency in China's legal system. China's time-consuming and cumbersome licensing and registration procedures, in particular, have delayed the entry of new products into the Chinese market.

Particularly, in the view of the importance of China in the world food economy, the EU has taken a special interest in encouraging China to liberalise its trade in agriculture. Therefore, the EU has been very supportive in China's accession to the WTO. The bilateral EU-China Trade Agreement signed in Beijing on May, 2000 marked a major step forward in the EU-China relations. Together with the US-China Trade Agreement signed in 1999, the agreements had virtually paved the way for China's accession to the WTO. These agreements secured firm commitments on the reduction and binding of tariffs, the liberalisation of services, the elimination of quantitative restrictions, and the improvement of Sanitary and Phytosanitary agreements (SPS).

In the WTO negotiations with the EU, China agreed to bound tariffs for all agri-food imports,

reduce tariffs and to accept Tariff Rate Quotas (TRQs). As a result, all Chinese agricultural tariffs will be bounded and all tariff cuts will be implemented by 2004, which is the end of the phase-in period for developing countries to implement their Uruguay Round tariff reductions. Most importantly, the EU obtained an additional reduction in the EU priority agri-food products not covered by China's previous bilateral trade agreements (such as US-Sino protocol). The average tariff is falling from 31% in 1998 to 10,9% by January 2004, with steeper drops in tariffs for oilseeds, milk powder, butter and barley.

Rape seed oil and barley are foreseen to benefit the most from the tariff reductions among the EU key export products. The tariff for rape seed oil will drop sharply from 85% to 9% and for barley from 91% to 9% (Table 1). The tariff of dairy products and meat products will also reduce considerably. The tariff for dairy products will go down from average 40% to 15%, and meat products will fall from 32,5% to 15%. Improvements have also been made on the tariff rate quotas for wine (down from 65% to 14%), olives (down from 25% to 10%) and wheat gluten (down from 30% to 18%).

Another major commitment by China is to reduce non-tariff barriers to trade. Two of the most important barriers are import quotas or licences and state trading enterprises. Compared to tariff barriers, non-tariff barriers are much more complex forms of intervention and are closely linked to China's agricultural policies and institutional system in general (Colby et al. 2001). They are part of an agricultural policy structure in China geared towards protecting domestic agriculture in order to maintain self-sufficiency in agricultural supply, especially in the food grain production.

Table 1. Selected Tariff Cuts in China's WTO Commitments (Average pre- and post-Accession tariff rates on selected commodities in China).

Commodity	Pre-Accession Rate	Post-Accession rate
Barley	91	9
Rape oil	85	9
Meat products	33	15
Whey	0	0
Milk powder	25	10
Beer	65	20
Wine	65	20

Source: The Sino-EU Agreement on China's Accession to the WTO, 1999

The import quota quantities for major agricultural commodities (including corn, wheat, cotton, rice and soybean oil) will increase annually from 2000 through 2004. "In-quota" tariff rate will meanwhile decrease significantly (for example, 1% for the grain, no more than 10% for partially processed grain products). In addition, China has committed to eliminate quotas on a variety of oilseeds and oilseed products such as cottonseed, sunflower, safflower, peanut and corn oil and replace them with a 10% tariff on the imports of these products. China also agreed to improve the import quota for rape oil. This together with further reduction in tariffs for rape seed and rape seed oil, EU exports of oilseeds and oilseed products to China will grow rapidly and substantially.

3. Theoretical and methodological framework of the study

Imperfect competition arising from product differentiation underlies the modelling framework of the study. The estimation of demand systems is derived from the Armington's (1969) model, where it is assumed that the same goods of different origins are imperfect substitutes within an importing country's commodity market. Furthermore, in order to reduce to number of parameters to be estimated, the model assumes a constant elasticity of substitution (CES) for each product pair. Following the model, the importing decision is split into two stages. The solution to the utility maximisation problem for the first level of decision yields the overall demand schedules for agri-food imports M of importer j, given a import price P and a level of constant dollar income Y, and is expressed as

$$M_j^d = k_1 Y_j \left(\frac{P_j}{D_j} \right)^{\in_m^p} \tag{1}$$

where k_1 is a constant with expected sign $k_1 > 0$; D is the deflator; and $\in_m^p$ is the price elasticity of import demand for good M. The income elasticity is equal to unity, a hypothesis that will later be tested.

Once the level of expenditures Y_j for the imported product M has been determined, the solution to the utility maximisation problem of how much of the product to purchase from alternative suppliers - let say an exporter of interest i and its competitors k, which refer each of the n-1 other foreign supplying countries, to market j whose corresponding export prices are P_{ij} and P_{kj} - may be expressed as

$$X_{ij}^d = k_2 M_j \left(\frac{P_{ij}}{P_j} \right)^{\in_x^p} \tag{2}$$

where X_{ij}^d is the quantity of the product exported from country i to country j, k_2 is a constant; P_{ij} is the price of the good imported from country i to country j; P_j is the average price of the product imported to country j; and $\in_x^p$ is the relative-price elasticity of export demand.

Consider now the introduction of a tariff whose per-unit value is a specified amount into the import demand equation (1). The tariff raises the price of the product to (1+t) P in the geographic market j. The resulting import demand schedule is

$$M_j^d = k_1 Y_j \left(\frac{(1+t)P_j}{D_j} \right)^{\in_m^p} \tag{3}$$

If export demand is proportional to the change in import demand in the geographic market and relative prices remain unaltered: that of the country of interest i and its competitor k is (1+t) P_i/(1+t)P_k, the export demand schedules for the country i in the long-run dynamic equilibrium relationship implicit in equation (2) is

$$X_{ij}^{d} = \mathring{a}_{2}^{*} M_{j} \left(\frac{(1+t)P_{ij}}{(1+t)P_{j}} \right)^{\in_{x}^{p}} \tag{4}$$

In other words, a change in the quantity demanded of the product as a result of tariff would cause a proportional change in the demand for the product supplied from foreign sources.

Empirical analysis of the study is based on econometric models that capture the dynamics underlying trade and price formation in agri-food markets, and it is conducted by means of recently developed econometric concepts. Among these, the so-called 'general to specific' approach' advocated by Hendry (1986) is applied in the context of data series whose (non-) stationary properties are investigated. Furthermore, the notion of cointegration (Engle and Granger, 1987) of a set of variables is analysed. The approach follows closely the modelling strategy developed in a series of papers by Davidson et al. (1978), Hendry (1986), Lord (1991), Urbain (1992), and Carone (1996).

For the purpose of the study, long-run elasticities of Chinese demand are of particular interest. However, estimating such long-run relationships is likely to pose some problems because the variables used in the analysis typically exhibit multicollinearity and non-stationarity. The problems are often dealt with by taking first differences of all the variables before any estimations are done. Nonetheless, taking first differences is a major drawback because the low frequency (long-run) variation of the data is removed. Thereby, only short-run effects are explained by the model (Bentzen and Engsted, 1992).

In this paper it is argued that since time series data used in trade analysis are often non-stationary unit root processes, econometric modelling of demand should be based on methods, which explicitly take this feature of the data into account, namely cointegration techniques and error-correction model (ECM). There are several main advantages in using an ECM. First, it is possible to clearly distinguish between short-run and long-run effects since both first differences and levels of the variables enter the ECM. Second, the speed of adjustment toward the long-run relationship can be directly estimated. Finally, the ECM has a sound statistical foundation in the theory of cointegration developed by Engle and Granger (1987).

4. Empirical analysis of EU-China agricultural trade

4.1. Data, unit roots and cointegration

The empirical analysis of this study will be conducted with a sample of semi-annual data that cover China's agri-food imports for selected products from the EU and the rest-of-world from 1980 to 2000. In 2000, these products together accounted for about 50% of China's agri-food imports from the EU Volume and value data on trade flows over the period are obtained from EUROSTAT and FAOSTAT. Volume data is compiled in metric tons, and value data in thousands of euros. The transaction value is the value at which goods were sold by the exporter, and includes the cost of transportation and insurance to the frontier of the exporting country

(free-on-board (f.o.b) valuation). The unit prices of China's imports(P_C), and unit prices of exports by the EU (P_{EU}),are derived by dividing value by volume. The gross domestic product (GDP) index and the consumer price index (CPI) are used as a measure of economic activity (Y_C) and price deflator (D_C) of China, respectively. The source of the data is the International Financial statistics data base of the International Monetary Fund (IMF).

Tests for unit roots are performed using the augmented Dickey-Fuller (1981) tests. Having established that certain series of the variables are integrated of order I(1), the augmented Dickey-Fuller (1981) and Phillips and Ouliaris (1990) cointegration tests are undertaken, and the nature of any cointegrating vectors explored.

4.2. Modelling import demand functions

The first-order stochastic difference equation as a logarithmic function of the theoretical relationship in (1) is expressed as

$$\ln M_{jt} = \alpha_0 + \alpha_1 \ln Y_{jt} + \alpha_2 \ln Y_{j,t-1} + \alpha_3 \ln\left(P_j / D_j\right)_t + \alpha_4 \ln\left(P_j / D_j\right)_{t-1} + \alpha_5 \ln M_{j,t-1} + v_{1t} \qquad (5)$$

where the expected signs are α_1, $\alpha_2 > 0$; α_3, $\alpha_4 < 0$; and $0 < \alpha_5 < 1$.

The results of the cointegrating regressions show that demand for imports in Chinese market ($\ln M_C^d$) has a steady-state response to the domestic economic activity ($\ln Y_C$), and a transient response to the constant dollar price of imports (*P*/*D*). Transformation of the equation (5) to incorporate an ECM driven by economic activity, and with a 'differences' formulation of the constant dollar price term - nested in the levels form of the equation - results in the following import demand specification:

$$\Delta \ln M_{jt} = \alpha_0 + \alpha_1 \Delta \ln Y_{jt} + \delta_2 \ln Y_{j,t-1} + \alpha_3 \Delta \ln\left(\frac{P_j}{D_j}\right)_t + \delta_4 \left(\frac{P_j}{D_j}\right)_{t-1} + \delta_5 \ln\left(\frac{M_j}{Y_j}\right)_{t-1} + v_{1t} \qquad (6)$$

where $\delta_2 = (\alpha_1 + \alpha_2 + \alpha_5 - 1)$, $\delta_4 = (\alpha_3 + \alpha_4)$, and $\delta_5 = (\alpha_5 - 1)$. The expected signs of the coefficients are $\alpha_1 > 0$, $\delta_2 > \delta_5$, $-1 < \delta_5 < 0$, and α_3, $\delta_4 < 0$. The fifth term of the equation, $\delta_5 \ln (M_j/Y_j)_{t-1}$, is the mechanism for adjusting any disequilibrium in the previous period.

The long-run dynamic solution of a single-equation system generates a steady-state response in which growth occurs at a constant rate, say g, and all transient responses have disappeared (Currie, 1981, Lord, 1992). With growth rates of domestic economic activity and import demand, $\Delta \ln Y_{jt} = g_1$ and $\Delta \ln M_{jt} = g_2$, respectively, the long-run dynamic equilibrium solution of equation (6), in terms of the original (anti-logarithmic) values of the variable, is

$$M_j = k_1 Y_j^{1-(\delta_2/\delta_5)} \left(P_j / D_j\right)^{-\delta_4/\delta_5} \qquad (7)$$

where $k_1 = \exp\{[-\alpha_0 + (1-\alpha_1)g_1]/\delta_5\}$. Equation (7) encompasses the static equilibrium solution when $g_1 = 0$. The income elasticity of import demand is expressed as $\in_m^y = 1 - (\delta_2/\delta_5)$. The price elasticity of import demand is $\in_m^p = -\delta_4/\delta_5$. The third response is stimulated by a change in the rate of growth of economic activity, and is expressed as

$$\varepsilon^{YG} = \frac{\partial M_j}{\partial g_1}\frac{1}{M_j} = \frac{1-\alpha_1}{\delta_5}$$

4.3. Modelling export demand functions

In terms of the general stochastic difference specification, the export demand relationship in (2) is expressed as

$$\ln X_{ijt}^d = \beta_0 + \beta_1 \ln M_{jt} + \beta_2 \ln M_{j,t-1} + \beta_3 \ln\left(P_{ij} / P_j\right)_t + \beta_4 \ln\left(P_{ij} / P_j\right)_{t-1} + \beta_5 \ln X_{ij,t-1}^d + v_{2t} \quad (8)^1$$

where the expected signs of the coefficients are $\beta_1, \beta_2 > 0$; $\beta_3, \beta_4 < 0$; and $0 < \beta_5 < 1$. The results of the cointegrating regressions suggest that China's demand for exports from the EU ($\ln X_{EU}^d$) has a steady-state response to the import demand of China ($\ln M_C^d$), and a transient response to the relative price of the Chinese market ($\ln P_{EU}/\ln P_C$). The following transformation of (8) incorporates an ECM driven by import demand M_j:

$$\Delta \ln X_{ijt}^d = \beta_0 + \beta_1 \Delta \ln M_{jt} + \gamma_2 \Delta \ln\left(P_{ij} / P_j\right)_t + \gamma_3 \ln\left(P_{ij} / P_j\right)_{t-1} + \gamma_4 \ln\left(X_i^d / M_j\right)_{t-1} + v_{2t} \quad (9)$$

where $\gamma_2 = b_3$, $\gamma_3 = (\beta_3 + \beta_4)$, and $\gamma_4 = (\beta_5 - 1)$. The expected signs of the coefficients are $\beta_1, \gamma_2 > 0$, $\gamma_3 < 0$, and $-1 < \gamma_4 < 0$. The relative price term in the foregoing specification have been so transformed as to nest the 'differences' formulations of the variable in the levels form of the equation. The disequilibrium adjustment mechanism in the fourth term, $\gamma_4 \ln (X_{ij}/M_j)_{t-1}$, measures 'errors' (divergences) from the long-run equilibrium and corrects for previous non-proportional responses in the long-run dynamic growth of export demand. Since in dynamic equilibrium $\Delta\ln M_{jt} = g_2$, $\Delta\ln X = g_3$ and $\Delta\ln (P_{ij}/P_j)_t = 0$, it follows that the solution of (9), in terms of the original values of the variable, is

$$X_{ij}^d = k_2 M\left(P_{ij} / P_j\right)^{-\gamma_3/\gamma_4} \quad (10)$$

where $k_2 = \exp\{[-\beta_0 + (1-\beta_1)g_2]/\gamma_4\}$. Therefore, export demand is assumed to have a unitary elasticity with respect to the level of import demand in the geographic market[2]. The price

[1] The dynamics for the export demand relationship is assumed to be of relatively small order, and can therefore be restricted to cases where the lagged values of the variables are of one year. The Lagrange multiplier (LM) tests are again performed for omitted higher lagged variables.

elasticity of export demand is expressed as $\epsilon_x^p = -\gamma_3/\gamma_4$. The import growth elasticity, denoted ε^{MG}, is defined as a percentage change in export demand brought about by a 1 per cent change in the growth rate of import demand, and is expressed as

$$\varepsilon^{MG} = \frac{\partial X_{ij}^d}{\partial g_2}\frac{1}{X_{ij}^d} = \frac{1-\beta_1}{\gamma_4}$$

5. Regression results of model equations

5.1. The import demand functions

The estimated equations of import demand show, as expected, that income is statistically significant in explaining the level of demand for agri-food imports in China. The estimated long-run income elasticities of import demand range from significantly less than unity (0.45) for rape seed to 3.68 for wine (Table 2). The income elasticity for whey is near unity. These large differences have important implications for sales by exporters. Wine exports have a considerably stronger growth potential in China than other products, because of a strong response of buyers in China to improvements in their real income. At the same token, wine exports will also be susceptible to larger swings of demand during business cycles. Overall, the results suggest a relatively strong growth potential for the selected products in the Chinese market.

The adjustment of import demand from one level of income to another is determined by the error correction term. Regarding whey and milk powder, for example, the coefficients of the error correction terms in the import demand relationships are, in general, close to unity in absolute terms. This fact reflects the relatively quick response of Chinese importers to changes in income and prices, i.e. it does not take a great deal of time for import demand to resume its long-term equilibrium growth path when a short-run disequilibrium arises between import demand and income. In case of barley the situation is slightly different. The error correction term in the import demand relationship is clearly less than unity (-0.23) in absolute terms. This fact reflects the relatively slow response of Chinese barley importers to changes in income and prices.

The price elasticities of import demand by China range from -0.16 to -0.84 in the short-run, and from -0.21 to -1.61 in the long run. The results confirm the expectation that demand for agricultural imports in China is relatively elastic. The policy implication of this fact is that exchange rate policies and commercial policy intervention measures in the form of tariff and non-tariff barriers to trade could be relatively effective in changing the quantity of imports demanded.

Table 2. Short-run and long-run elasticities of import demand in China for selected commodities.

Commodity	Income elasticity	Price elasticity	Income growth

[2] Where the long-run response between the export demand of a country *i* and imports of its trading partner *j* is not necessarily proportional, an additional term (explanatory variable for imports of a country *j* lagged by one period) is introduced into the equation (8).

	Short-run	Long-run	Short-run	Long-run	elasticity
Barley	1.06	2.39	-0.53	-0.87	-2.96
Rape seed	-	0.45	-0.16	-0.21	-2.04
Rape oil	-	2.92	-0.46	-0.76	-5.19
Meat	0.34	2.21	-	-1.61	0.02
Whey	0.67	0.87	-0.84	-1.42	-1.18
Milk powder	-	1.72	-0.30	-0.61	-0.35
Beer	1.23	2.16	-	-0.67	-0.29
Wine	1.35	3.68	-0.42	-0.86	1.37

5.2. The export demand functions

As expected, relative price movements affect significantly China's demand for the EU exports, implying that EU's market share is influenced by price competitiveness (Table 3). In other words, the EU exporters confront a downward-sloping demand schedule in China. For the combined agri-food exports of the selected products, the trade-weighted average price elasticity for China's export demand from the EU (which is equivalent to the elasticity of substitution for market share in China) is equal to –0.97 in the short run and –3.43 in the long run. These results can be contrasted with those for exports from the rest-of-world to China, where the price elasticity is equal to –0.74 in the short run and –2.91 in the long run. According to Lord (1991) exporters with high price elasticities have more developed marketing and trading practices than exporters with low elasticities. Hence, one could conclude that the EU exporters in these selected products have been slightly more flexible in their trading practices than the rest-of-world.

Table 3. Dynamic equilibrium solutions of export demand functions for selected agri-food products from the EU into China.

Product	Relative price elasticity of export demand		Response to changes in the level of EU import		Import growth elasticity
Exporter	Short-run	Long-run	Short-run	Long-run	
Barley	-1.36	-3.64	0.85	1.00	1.02
Rape seed	-0.34	-	0.45	0.62	-0.76
Rape oil	-0.82	-3.90	0.50	1.00	1.45
Meat	-1.52	-3.20	0.50	1.00	-1.33
Whey	-0.77	-2.32	0.75	1.00	0.74
Milk powder	-0.86	-2.39	1.05	1.00	2.45
Beer	-0.44	-	0.98	1.00	-0.12
Wine	-	-1.22	1.06	1.00	1.18

Export demand generally takes several periods to adjust to the relative-price change. Exports of beer and rape seed reflect relatively quickly to changes in relative-prices. It takes only one period for beer exports of the EU to adjust to 90 per cent of the new steady state solution. However, exports of meat and milk powder seed adjust to price changes slowly, a characteristic that is reflected in near-zero coefficient of the error-correcting term. For example, it takes five periods

for EU meat exports, and it takes four periods for EU milk powder exports to China to adjust to 90 per cent of their new steady-state solutions.

Another influence on the export demand, or market share, of an exporter is the dynamic effect originating from changes in the rate of growth of imports. The estimated import growth elasticities of export demand range from –1.33 for meat to 2.45 for milk powder. Therefore, at given import quantity and relative-price levels, a 1 per cent increase in the rate of growth of Chinese milk powder imports leads to a 2.45 per cent increase in the average ratio of milk powder exports from the EU.

6. The effects of trade liberalisation on EU agricultural exports to China

Since China's WTO Accession means significant tariff cuts for selected agricultural products, it is of interest to see what would happen to China's imports from EU when China removes import protection. Equation (3) shows that the effect of a tariff depend on the price elasticity of import demand, $\in_m^p$, and the tariff-equivalent rate, *t*, in the importing country. In addition feedback effects can occur between domestic prices and the world market price of a commodity when tariff removal take place either in a large importing country or in several countries at the same time, and these effects will influence production and consumption decisions in both exporting and importing countries (Lord 1991).

The empirical findings presented here are analysed without the feedback effects between domestic prices and the world market price. The analysis simply examines the effects of tariff reductions by China on its agri-food imports from the EU. Import demand generally takes several periods to adjust to the price change. Therefore, of interest here are both the short-run effects and the long-run effects after the full adjustment has taken place. The first can be obtained using the short-run elasticity of import demand. The second is derived using the long-run static equilibrium.

The effect of a tariff removal on the level of EU exports is proportional to the change in the total imports of China. Recall equation (4) in chapter 3, which shows that when relative prices remain unchanged, the change in export demand is proportional to the change in import demand in the geographic market. Since relative price would be unaffected by the tariff removal, the market shares of the exporting countries in China would remain unaltered.

The effects of a one-time change in imports tariffs are summarised in Table 4, from which a number of points can be made. The removal of the tariffs will have a price-decreasing effect on the Chinese market. As a result, an increase in China's imports would take place. The effects of tariff reductions on import volumes are quite large in some products. The largest percentage increase in import volumes is shown by barley. China increases its barley imports by 68%, i.e., of which 330,000 metric tons represents additional export quantities sold by the EU. The case is similar in rape oil, where the China would increase its imports by 54%. Over ten percent (or 130,000 metric tons) of this additional imports is supplied by the EU.

All other products show somewhat smaller changes. Lower tariff cuts or low price elasticities in these products result in small changes in import volumes. The estimated increases in import volumes range in the long-run from around 8% for milk powder to 37% for wine.

Table 4. Effects of tariff reductions on China's agri-food imports for selected products.

Commodity	Initial effect		Long-term effect	
	Import price	Import volume	Import price	Import volume
Barley	-45.1	37.35	-45.1	68.33
Rape oil	-43.2	29.70	-43.2	53.63
Meat	-15.3	7.91	-15.3	30.47
Whey	-	-	-	-
Milk powder	-13.9	4.28	-13.9	8.94
Beer	-31.0	-	-31.0	28.11
Wine	-31.0	16.89	-31.0	37.41

The findings of the analysis also demonstrates the extent of the time lag between the initial reduction in import prices after tariff removal and the time required for imports to adjust fully to the new price level in the market area. Imports of whey and milk powder reflect relatively quickly to changes in prices. It takes only one period for whey imports of China to adjust to 90 per cent of the new steady state solution. However, imports of barley adjust to price changes slowly, a characteristic that is reflected in near-zero coefficient of the error-correcting term. It takes four periods for barley imports of China to adjust to 90 per cent of their new steady-state solution.

An important limitation of the analysis above is that it focuses on tariff reductions and does not take into account China's pervasive non-tariff barriers, such as import quotas, and state trading behaviour.

7. Conclusions

This paper attempts to quantify the short-run and long-run effects of changes in economic growth, relative-prices, and tariff levels on China's agri-food imports from the EU. The approach is to estimate demand functions for EU's agri-food exports to China using semi-annual data from 1980 to 2000. The demand functions are used to measure the impacts of China's tariff liberalisation. A reasonably flexible data determines the modelling approach based on the error correction mechanism (ECM) was applied in order to emphasise the importance of dynamics of trade functions. Prior to the measurement, several econometric issues relating to specification, pre-estimation testing and dynamic specification tests have to be considered.

The overall results for the estimated import demand functions for the selected agri-food products covered by this study suggest that there is a relatively strong demand response to income changes in China. The results also demonstrate the relatively elastic nature of price responses to China's demand for imported agri-food products. The policy implication of this fact is that policy intervention measures in the form of tariff and non-tariff barriers to trade could be significant in changing the quantity of imports demanded.

The export demand functions indicate that relative-price variations affect significantly the export market share of the EU. Therefore, the findings supports the theory of trade dealing with product differentiation and imperfect competition. In other words, EU exporters confronts a downward-sloping demand schedule in the Chinese markets. The average price elasticity of EU exporters to these markets is equal to –0.97 in the short run and –3.43 in the long run. These results can be contrasted with those for exports from the rest-of-world to China, where the price elasticity is equal to –0.74 in the short run and –2.91 in the long run. Hence, one could conclude that the EU has been more flexible in its trading practices than the rest-of-world (in case of the products covered by this study).

The estimated models of this study are used to assess the results of China's WTO accession on agri-food trade between the EU and China. Accession to the WTO means a transformation of all China's existing non-tariff barriers to bounded tariffs and tariff rate quotas, and it is expected that this will greatly improve market access for EU agri-food exports to the Chinese market. As tariff and non-tariff restrictions are sharply reduced, the costs of exporting to China will be less. The results confirm that China's tariff reductions could eventually increase EU agri-food exports to China quite substantially, with barley and rape oil exports gaining the most. The path to a new steady-state solution was found to depend on the dynamics underlying the production and consumption responses to the price changes.

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