International Trade In Dairy Products: Processors Market Power

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Abstract

In the past two decades there has been a considerable amount of research conducted into the international price and trade effects of government intervention in the dairy industries of several countries. Recently, the conclusions of those studies have been questioned owing to the rising concentration in the processor sector. Since processors are increasingly multinational in nature and a few of them are operating around the globe, there is a possibility that the processors will influence both the farm and retail prices through their having market power.

Key words: Multinational, Processor market power, Dairy products

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Introduction

In the past two decades there has been a considerable amount of research conducted into the international price and trade effects of government intervention in the dairy industries of several countries. Recently, the conclusions of those studies have been questioned owing to the rising concentration in the processor sector. Since processors are increasingly multinational in nature and a few of them are operating around the globe, there is a possibility that the processors will influence both the farm and retail prices through their having market power. The objectives of this paper are

- to analyse some alternative possibilities for market power in both input and product markets
- to show who benefits from trade liberalization under different assumptions of market structure.

In the next sections the structural changes in the international market will be presented followed by previous studies in world dairy market and analytical models to show the different possibilities of market power in both input and output market will be discussed.

Structural Changes in the International Dairy Industry

To understand the world dairy market it is important to know the structure of the industry. Market structure usually refers to industry concentration, the extent of product differentiation, and the ease with which new firms can enter an industry Sheldon and Sperling (2001). Market structure determines the conduct of firms and industry, notably pricing policy. Conduct in turn determines economic performance, which typically is measured by profits or price cost margins. The global food processing market is dominated by big companies in the US, Europe and Japan. As the prospect for further trade liberalisation of the world dairy market is gloomy, foreign direct investment in growth markets is a potential attractive alternative to exporting. The protectionist policies of most dairy importing and exporting regions are the driving force for most multinationals in the dairy industry Dobson (2001).

Dobson also argues that multinationals want to increase economies scale in processing, to capitalise on economies associated with extended shelf life products and to gear up to serve large supermarkets effectively. They must also spread the costs of products developments and branding.

The distinguishing characteristics of an international company in contrast to a national or regional company are the ability to maximise the operations of a total system that is dominant over any set of regional systems. The economic imperatives for multinational companies are the fundamental costs and benefits of doing business.

The benefits include:

1. Flexibility in the exploitation of economic resources;
2. Increasing oligopoly power by utilising scale (size), scope (product range), and experience effects beyond the limits of national boundaries;
3. Flexibility in the exploitation of different government policies e.g., tax rates and subsidies.

The costs include:

1. Difficulties in managing and controlling far-flung operations;
2. The necessity of controlling for additional, uniquely international, variables, e.g., exchange rate fluctuations. Besides these there are also political and social constraints faced by corporations.

The dairy industry is characterised by the pursuit of an active role in international trade by big dairy companies and multinational corporations. Recently there have been rapid structural changes in the dairy industry. The industry is moving from being strictly local to becoming international.

Manchester and Blayney (1997) reviewed the market structure of the US dairy market and concluded that a major means of growth of companies in the dairy industry has been merger or acquisition. Additional capacity and volume were usually available at lower cost by acquisition than by building new capacity and competing for sales.

Tozanli (1998) indicated that as the result of mergers and acquisitions the number of European dairy firms is getting smaller and this concentration process is ubiquitous in the European dairy industry where the major tendency is toward an undeniably oligopolistic market structure.

Many of the world's key dairy businesses have been involved in major mergers and acquisitions in the past decades. Between May 2000 and June 2001 there were 150 mergers and acquisitions throughout the world in big dairy companies (Rabobank, 2001). These mergers include companies such as Dairy Farmers of America in US, Friesland Coberco in the Netherlands, Humnan Milchunion and the new Nordmilch in Germany, Swiss Dairy Food in Switzerland, Glanbia in Ireland, Arla Foods in Scandinivia and the New Zealand Dairy Group and Kiwi Business merged to form Fonterra Cooperative Group in New Zealand. Consolidation has been also dominated the international dairy market. Jackson (2001) indicated that as local dairy industries became national, other regional companies consolidated globally. Italy's Parmalat has made more than 25 acquisitions outside Europe in the last five years. Danone has moved aggressively into both Asia and South America with acquisitions in countries such as China, India and Argentina. In some product categories globalisation has already taken place: Nestle and Unilever dominate ice cream. Danone, Yoplait and Nestle dominate yoghurt and Kraft focuses primarily on cheese. Table 1 summarises the top 20 dairy companies in the world.

Table 1Top 20 Dairy Companies in the World

Ranking	Company	Country	Sales USD billion
1	Nestle	Switzerland	13
2	Dean Food	US	9
3	Dairy Farmers of America	US	6.7
4	Phillip Morris(Kraft)	US	6.1
5	Danone	France	6.0
6	Parmalat	Italy	5.7
7	Snow Brand Milk Product	Japan	5.5
8	Lactallis	France	5.1
9	Fonterra	New Zealand	5.0
10	Unilever	UK/Netherlands	5.0
11	Arla Foods	UK	4.4
12	Friesland Coberco Dairy Foods	Netherlands	4.2
13	Campina Melkunie	Netherlands	3.6
14	Bongrain	France	3.6
15	Land O'Lakes	US	3.5
16	Meiji Milk Products	Japan	3.2
17	Morinaga Milk Industry	Japan	2.9
18	Sodiaal	France	2.8
19	Dairy Crest	UK	2.5
20	Nordmilch	Germany*	2.4

Source: Rabobank International, 2001

According to Handy and Henderson (1994) most dairy manufacturing relies more on foreign investment than on exports as their major strategy to access foreign markets. This might be due to the slow trade liberalisation on dairy products, so processors overcome the barriers to foreign markets by being involved in direct investment in that market.

Despite the fact that the dairy industry has gone through structural change as discussed above, most previous international dairy trade studies have assumed perfect competition in the international/ domestic marketing channels. Those studies will be reviewed in the next section.

Previous Studies

In recent years there has been a substantial amount of literature on the effect that trade liberalisation has had on agricultural markets. Liberalisation of agricultural trade has been studied using both partial and general equilibrium models. Many partial equilibrium studies have focused on single commodities. Others are multi-product. General equilibrium analyses are usually conducted at a high level of aggregation with a small number of broadly defined commodity groups. Buckwell and Medland (1991) reviewed many of these models and discussed the problems in those studies of modelling of the effects of liberalising agricultural trade and the difficulties of using them as guides for policy action. They argued that the difficulties on interpretation of the output from such analyses arise from three sources: "technical problems of economic analysis, data and statistical problems and problems of policy relevance". In most trade liberalisation studies farmers are modelled as perfectly competitive profit maximisers and the possible oligopolistic structure of upstream input suppliers and/or downstream food processors and distributors is not acknowledged. The agricultural sector produces such a large number of individual products within a large number of individual firms that there are immense data problems when large-scale sector models are constructed.

The dairy industry has been the focus of attention in many liberalisation studies, and attempts have been made to show with different scenarios the significant impact dairy liberalisation might have on the world dairy market. Regarding the policy variables, a careful representation of policies is an essential component of global models to be applied to practical dairy trade issues. According to Tongeren, et al. (2001) modelling policy instruments in global models takes two forms. The first one consists of developing a direct structural representation of the policy instrument through the incorporation of its mechanism. The second approach is more indirect and measures

the policy-induced distortion through a price transmission relationship linking international and domestic prices. Depending on the values taken by this relationship, it is flexible enough to capture a wide array of trade and domestic dairy policy regimes ranging from a perfect transmission of world prices to perfect insulation. Measures of distortion captured by price wedges and/or tariff equivalents are incorporated into this policy response function. In most global dairy models these two forms of representing policies are being used extensively. Concerning the price transmission specification, the common form of modelling policy instruments is the perfect transmission case with price wedges and or tariff equivalent. In the next section we will discuss some of the applied models in dairy trade liberalisation.

There are a large number of studies of the dairy industry exploring the impact of different policies on the industry's competitiveness in the international market and on types of modelling approach (Table 2). The most commonly used model in the dairy industry is a partial equilibrium model. This is because the dairy sector doesn't have such a strong link with the rest of the economy. Most of the studies use the modelling approach, of which examples of world models include the AGLINK model at OECD, the Food and Agricultural Policy Institute (FAPRI) model FAPRI (1998), the Centre for Agriculture and Rural Development(CARD) model CARD (1999), and the dairy model from the University of Wisconsin, Zhu, et al. (1998). Griffith, et al. (1993) constructed a dairy model which incorporated the EU, US, New Zealand, Australia and the rest of the world's dairy industry. Most of the above models assume that dairy farmers sell directly to consumers or their analysis focuses on the raw milk and the processed commodity. These might not have a significant impact in their policy analysis since most of them assume perfect competition. However, in imperfectly competitive markets, ignoring the marketing channel one would face a fundamental question of price transmission Cotterill (2002). The dairy industry is represented by a vertical structure that includes the supply of raw milk, a transformation stage and the demand for the processed commodities. Any dairy modelling should take into consideration this industry structure.

The recent study by ABARE (2001) used the AGLINK model to estimate the impact of market access and export subsidy. It concluded that increasing market access and reducing export subsidies are seen as complementary, in that the increase in world

demand that would result from improved market access may absorb some of the dairy exports that were subsidised. Zhu, et al. (1998) argued that despite AGLINK being a typical sectoral model, when it comes to modelling the world dairy market it has several shortcomings. First it lacks commodity and regional details about the world dairy sector. Some dairy products are left out of the model because the demand side of the dairy market consists only of the three product categories –butter/skim milk powder, cheeses and fresh dairy products. The consequence of this omission could be significant due to the disparities of resource endowment and consumption patterns across countries. Second most of the non-OECD countries have been treated as a single region (rest of the world) with little consideration of the geographic aspects of these countries. Zhu, et al. (1998) used the UW-Madison spatial equilibrium world dairy model with twenty-one regions and eight dairy product markets and analysed the market equilibrium impact of the full WTO Agreement on Agriculture. The authors concluded that the implementation of the Uruguay Round Agreement on Agriculture to 2000 would provide only a small step toward free trade in dairy markets. The conclusion and implications drawn from world dairy models indicate the prospect of little or no price gain for US dairy farmers from freer trade in dairy products. This partially explains the lack of strong interest on the part of most US dairy industries in dairy trade liberalization. Again, in a similar scenario, given the price reduction in store for EU milk producers, it is not surprising that many EU dairy farmers show little eagerness for additional dairy trade liberalization. Meilke, et al. (2001) quoted the speech by the EU representative in the 2000 Ontario dairy farmers annual meeting: “since most countries in the world are happy supplying their domestic markets with dairy products and have no interest in trade, there was no reason to change this generally happy state of affairs just to appease New Zealand”. This would summarise the lack of interest in the US and the EU each of whom has a large domestic market to open to the rest of the world.

Perfectly competitive markets have been assumed in a number of models of global dairy trade but the appropriateness of the assumption has been questioned by some researchers so the findings of this study may be of interest to those involved in the world modelling of the dairy sector.

Table 2 Summary of Empirical Work on Dairy

Author	Policy Variable	Assumptions	Model	Products	Countries
Griffith, et al. (1993)	Domestic policies	Perfect competition Homogeneous product	Time series Econometric	Milk equivalents	EU, US, New Zealand, Australia, ROW
MacAulay and Owen (1999)	Australian deregulation	Perfect Competition Homogeneous product	Synthetic, Quadratic programming	All dairy products	Australia's states, ROW
Zhu, et al. (1998)	Import quotas Tariff Export subsidies Price support	Perfect competition Perfect price transmission Homogeneous product	Synthetic, Spatial equilibrium	All dairy products	21 countries
Meilke, et al. (2001)	Export Competition Market access Domestic support	Perfect competition Perfect price transmission Homogeneous product	Synthetic, econometric	Butter, cheese, skim milk powder	EU, Australia, New Zealand, US, ROW
ABARE (2001)	Market access Export subsidies	Perfect competition Perfect price transmission Homogeneous Product	Synthetic, econometric	Skim milk powder, full cream milk powder cheese, butter	Most countries

Analytical Model

An analytical model is developed to illustrate how important market structure is in determination of equilibrium prices and quantity. The main objective of the analytical model is to show the determination of equilibrium price and quantity when different market structures are assumed and also the impact of trade policies on market structure. To make the model as simple as possible it is assumed that there are two countries producing one farm product and two retail products. Initially, zero transport costs and no trade barriers are assumed. Assumptions about trade/no trade, market

power of processor and regional product heterogeneity give rise to 8 possible scenarios. These are identified in Table 3. The base model is constructed under the assumption of perfectly competitive behaviour on the part of all participants. All other scenarios are identified by the change in specification from the base model and consequently comparisons are undertaken on the equilibrium prices and quantities.

How the model is constructed is shown for Scenarios from 1 to 3 in Table 4 and the equilibrium prices determined as the result of the model specification listed in Table 4, are shown in Table 5, which is further extended by numerical example in Table 6.

As a basis of comparison in the two countries' free trade scenarios, one region's equilibrium price for one product is identified because, given free trade, the two regional prices are equal and the regional farm prices are identified.

Scenario one is the base model for the homogeneous traded good specification. Under this specification, there are two stage of production, zero transportation costs, no market power, no trade barriers and free trade in retail products and no trade in farm product due to logistics. In scenario 2, the change from the base model is the existence of only one processing firm per country. The combinations of trade/no trade in retail and farm products and different single processing firm in each country gives rise to a particular configuration of market power. Free trade at the retail level (homogeneous products) removes a processors' power to monopoly price while no trade at the farm level presents the processors with the ability to monopsony price in each market. Retail prices will be identical across the two countries, farm prices will differ. As it shown in Table 5 the regional equilibrium retail prices increase over the base model while the farm price decreases in each country as compared to the perfect competition model. In Scenario 3 with no trade in farm product and with free trade in retail products and a few firms involved in domestic dairy processing, then the processors may have the ability to oligopsony but not oligopoly price. Scenario 3 is developed with the assumptions of a few but different processors in each country, free trade in retail products, no trade barriers and no trade in farm products. An oligopsony is modeled by starting from a competitive equilibrium and driving a market power wedge into the equations. This wedge is a price transformation based

on a market power component (ξ). In this scenario the retail prices increase and the farm prices decline over the base model but the size of the difference from the base model is smaller in the case of this scenario as compared to scenario 2.

The activities of the big dairy companies outside their home countries have been increasing in recent years. This takes the form of transfer of know-how, joint ventures or direct financial investment in foreign countries. The dairy industry has shown itself increasingly venturesome in its expansion; consequently the market may be less competitive and reflect the possibility of more market power. These activities beyond national borders are stimulated partly by existing cross-border barriers and partly by the desire to join forces with regionally based companies and staff to manufacture dairy products that may meet wider acceptance. Therefore a model needs to incorporate the processors' behaviour in a way that captures some of those features. With the presence of multinational dairy companies, the world market is aggregated rather than segmented. For example Nestlé, which has plants in most countries has more alternatives than a national company: what to produce and where, which products have domestic and export subsidies from their government, in which countries are there advantages for producing which products. The company can observe the prices and all other necessary information through its subsidiaries and can maximise its overall profit based on the aggregated demand and supply it faces. A company dealing only in one country might not have all those choices and also might have difficulty in influencing the market in the same way as a multinational.

The growing presence of multinational dairy processing firms suggests the extreme possibility of a single processor operating across multiple countries. If the market contains free trade in both retail and farm products, the same processor operating across two markets and homogeneous products then the processor will operate as a monopoly/monopsony across multiple markets.

In Scenario 4 the market operates with monopsony/monopoly power across the two markets, free trade in retail products and farm products and one processing firm operating in both countries. Price and quantity decisions made by the processor will relate to the aggregate consumer demand and farm supply across the two markets

rather than at individual regional levels. Since no trade barriers are assumed the two regions' prices are equal. In Scenario 5 the market operates as an Oligopsony/Oligopoly market across countries. In this scenario it is assumed that everything is the same as that of Scenario 4 with the exception that there are the same few processing firms operating across the two markets.

The relationship between retail prices(P^r) and operational prices(ORP), in the case of an oligopolist is as follows $ORP = P^r(1+\theta/\eta)$ which is calculated from the oligopoly's profit maximization equation. This will occur for each of the two retail products.

The algebraic model is supported with a numerical example, in this case it is assumed that two countries producing one farm product and one retail products to make the comparison as simple as possible. The aim of the numerical example is to show the equilibrium price under different market structures which are listed in Table 6. It is attempted to show what impact trade policies have under different market structures. For example, the impact of an export subsidy has been looked at with the assumption of free trade at farm and retail level and homogenous product under perfect competition and oligopsony market structure. We found that an export subsidy reduces the importing country's retail price and consequently the producer price. However, the impact of the export subsidy in reducing the importing country's producer price is made worse with already reduced producer price due to market power as compared to a scenario which assumes a perfectly competitive market. However, the price paid by consumers in the exporting country is higher than what they would pay in a perfectly competitive market. The main conclusion from this is the impact of trade liberalization has on the producer price and consumer price varies based on the market structure.

Table 3 Scenarios for Analytical Model

Scenarios	Product classification	Trade	Competition	No of processors Per region
1	Homogeneous Farm and Retail products	Free trade in farm and retail products	Perfect competition At processor and farm level	Many
2	Homogeneous Farm and Retail products	Free trade in retail products and no trade in farm products	Monopsony power at processor level and different in each country, perfect competition at farm level	One
3	Homogeneous Farm and Retail products	Free trade in retail products and no trade in farm products	Oligopsony power at processor level and different in each country, perfect competition at farm level	Small number of processors
4	Homogeneous Farm and Retail products	Free trade in retail products and free trade in farm products	Monopoly/monopsony power same across countries at the processor level and perfect competition at farm level	One across two regions
5	Homogeneous Farm and Retail products	Free trade in retail products and free trade in farm products	Oligopoly/oligopsony power the same across region at the processor level and perfect competition at farm level	Small number of processors across two regions

Table 4 Specification Model Scenarios for Analytical Model with Homogeneous Products

Base specification **Scenario 1**		**Scenario 2**	**Scenario 3**
Region 1	Region 2		
RD_{11}=a-bP_{11} RD_{12}=c-dP_{12} DF_{11}=e-fPf_1+gP_{11} DF_{12}=h-jPf_1 +kP_{12} $RS_{11}=\alpha_1 DF_{11}$ $RS_{12}=\alpha_2 DF_{12}$ FS_1=DF_{11} + DF_{12} +FT FS_1= l+mPf_1 RS_{11} = RD_{11}+NT_1 RS_{12} = RD_{11}+NT_1 a,b,c,d,e,f,g,h,j,k parameters	RD_{21}=A-BP_{21} RD_{22} =C-DP_{22} DF_{21} =E-FPf_2+GP_{21} DF_{22} =H-JPf_2+KP_{22} $RS_{21}=\beta_1 DF_{21}$ $RS_{22}=\beta_2 DF_{22}$ FS_2 =DF_{21} + DF_{22} -FT FS_2= L+MPf_2 RS_{21} = RD_{21}– NT_1 RS_{22} = RD_{22}– NT_2 A,B,C,D,E,F,G,H,J,K parameters	Region 1 Additional equation FS_1=1/2(mFME+l) Changed equation from the base DF_{11} =e-fFME$_1$+gP_{11} DF_{12} =h-jFME$_1$ +kP_{11} Region 2 Additional equation FS_2=1/2(MFME$_2$+L) Changed equation from the base DF_{21} =E-FFME$_2$+GP_{21} DF_{22} =H-JFME$_2$ +KP_{22}	Region 1 Changed equation from the base DF_{11} =e-fOFP$_1$ +gP_{11} DF_{12} =h-jOFP$_1$ +kP_{12} Additional equation $OFP_1 = Pf_1(1+(\xi_1/\varepsilon_1)$ Region 2 Changed equation from the base DF_{21} =E-FOFP$_2$ +GP_{21} DF_{22} =H-JOFP$_2$ +KP_{22} Additional equation $OFP_2 = Pf_2(1+\xi_2/\varepsilon_2)$

Table 5 Equilibrium Price under Different Scenarios

Scenario 1	**Scenario 2**	**Scenario 3**
$P_{11}=\frac{a-\alpha_1 e+NT_1+\alpha_1 fPf_1}{b+\alpha_1 g}$	$P_{11}=\frac{a-\alpha_1 e+NT_1+\alpha_1 fFME_1}{b+\alpha_1 g}$	$P_{11}=\frac{a-\alpha_1 e+NT_1+\alpha_1 fPf_1+\alpha_1 f\xi_1(l+mPf_1)/m}{\alpha_1 g+b}$
$P_{12}=\frac{c-\alpha_2 h+NT_2+\alpha_2 jPf_1}{d+\alpha_2 k}$	$P_{12}=\frac{c-\alpha_2 h+NT_2+\alpha_2 jFME_1}{d+\alpha_2 k}$	$P_{12}=\frac{c-\alpha_2 h+NT_2+\alpha_2 jPf_1+\alpha_2 f\xi_1(l+mPf_1)/m}{\alpha_2 k+d}$
$Pf_1=\frac{e+h-l+gP_{11}+kP_{12}}{m+f+j}$	$Pf_1=m(\frac{(e+h+gP_{11}+kP_{12})-1/2l}{m+2f+2j})-1/2l$	$Pf_1=\frac{e-l+h-((f+j)\xi_1 l/m)+gP_{11}+P_{12}k)}{m+(1+\xi_1)(j+f)}$

Table 6 The impact of export subsidy on farm and retail prices under different market structure

Region		Perfect competition	Oligopsony
Region 1	Farm price	5.7563	5.1158
	Retail price	14.492	15.63
Region 2	Farm price	5.7563	5.1158
	Retail price	14.492	15.63
Region* 1	Farm price	5.7647	5.1499
	Retail price	14.895	16.045
Region* 2	Farm price	4.283	5.1146
	Retail price	13.895	15.045

Conclusions

The international market in dairy products departs substantially from the assumptions necessary to define a perfectly competitive market. There are firms with market power which operate across markets. In summary, it has been shown in the Tables that the algebraic model can be solved for the equilibrium prices and quantities in the case of processors' market power. The inclusion of the conjectural variation parameters allows for the testing of the presence of market power on both sides of the processors' market. The international market for dairy products currently is far from having a single multinational processing firm. The scenario that is likely of most relevance for a study with a current market structure is the scenario with oligopoly/oligopsony power across markets.

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