ASSESSING POLICY OPTIONS
FOR THE AUSTRALIAN DAIRY INDUSTRY[1]

Chris Wilcox and Peter Bardsley
Department of Agriculture and
Rural Affairs, Victoria

Abstract

Alternative policy options for the Australian dairy industry are assessed. The methodology used is static and partial in nature, with the Australian market represented by a system of simultaneous non-linear equations. Equations defining the demand and supply from each State and New Zealand are developed and linked to allow for trade between regions. The method relies on market clearing conditions so that the demand price equals supply price, given transport costs, marketing margins and policy constraints. Equations defining policy options are defined explicitly and are included as taxes and subsidies or constraints on production or supply (flows), hence allowing the impact of each policy to be simulated.

The Nonlinear Simultaneous Equations (NLSYS) routines of GAUSS (a mathematical programming tool) have been used to solve the model. Several modifications and additions to NLSYS have been made to accommodate the particular features and the policies of the model. The flexibility of the approach allows for any number of policies to be considered at the same time. As well, a wide range of functional forms for the supply and demand functions may be used.

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1.   INTRODUCTION

The current marketing arrangements for the manufacturing (dairy products) sector of the Australian dairy industry (the Kerin Plan) place pressure on the industry to become oriented more to the export price of dairy products. New marketing arrangements for the manufacturing milk sector are required by 1992 to replace the Kerin Plan. This means there is a need for the Commonwealth Government, State governments and the dairy industry to develop and agree on these new arrangements. Before this is done an assessment of the range of alternative policies is appropriate. There is an even more pressing need for policy assessment, however. Greater New Zealand trade in dairy products, as a result of the Closer Economic Relations agreement between Australia and New Zealand, can be expected, perhaps beginning in July 1990. This will place further pressure on the marketing arrangements for both manufacturing milk and market (fresh) milk in Australia.

The requirements for policy advice and assessment of alternatives are not restricted to the manufacturing sector. In fact, it is difficult to divorce consideration of the market milk sector from consideration of the manufacturing sector. The arrangements for market milk in each State have major implications for the production of manufacturing milk and *vice versa*.

In addition, the Public Bodies Review Committee (PBRC) of the Victorian Parliament has delivered a report on the operation of the Victorian market milk system and has recommended wide ranging changes to the system. The Victorian Government is at present considering the report as part of a review of the Victorian Dairy Industry Act. It is planned that new legislation will be introduced in the Spring 1990 session. If some or all the PBRC recommendations are introduced, interstate trade in market milk, which to date has been limited, is likely to increase significantly. Pressure on the manufacturing sector will further encourage deregulation and rationalisation of the market milk sector, both in Victoria and in other States. Therefore, any assessment must include the market milk sector to be complete.

These issues mean that several important policy questions arise. In general the questions relate to:-

> (i)   the effect interstate trade in market milk will have on the Australian dairy industry, and sections of the industry;

> (ii)   the likely effect of the gradual move towards import parity with New Zealand (now due in July 1990), both on market milk States and manufacturing milk States;

> (iii)   the effect of various alternative arrangements that might follow the Kerin Plan;

(iv)   the effect of alternative arrangements that may replace the State market milk arrangements; and

(v)   selecting the best policy option for each State.

The objective in this paper is to present the methodology and present work in progress on a larger project. The primary objective of the project is to provide an economic analysis of alternative policy scenarios. A selected and limited set of these alternative policies have been evaluated and are presented for illustrative purposes in this paper. Only Victoria and New South Wales are modelled in this evaluation. The information from the simulations will assist in the policy making process. As the industry is facing challenges in and changes to both the manufacturing and market milk sectors, a list of the most likely alternative arrangements for both sectors has been prepared. The project has been driven by the need of the Victorian Department of Agriculture and Rural Affairs and the Victorian dairy industry for answers to these types of policy questions. It is these and any other policies that arise that will be evaluated on the basis of price, production, consumption, farm revenues, economic surplus and price support levels. The methodology outlined in this paper was chosen on this basis.

The current marketing arrangements for both manufacturing milk and market milk are outlined in the following section. Alternative policies evaluated in this paper are indicated. Section 3 details the model used, the solution procedure and the data requirements. The fourth section presents the results of an assessment of a limited number of policy alternatives. In addition, the milk export supply curves for Victoria and NSW in aggregate are derived, with and without the current dairy arrangements. Conclusions and future work are presented in the final section.

2.   THE ARRANGEMENTS AND ALTERNATIVES

The Australian dairy industry produces around 6,200 million litres (Ml) of raw milk each year (in 1988/89 total Australian production was 6,291 Ml). Around 60 percent of this production comes from Victoria (3,792 Ml in 1988/89) and 15 percent from NSW (923 Ml in 1988/89). Of this national production, about 27 percent is used for the premium market (drinking) milk market; around 48 percent is used for the domestic dairy product market, and the remainder is exported as butter, cheese, skim milk powder, whole milk powder, and so on (Greenwood and Weinstein, 1990). Some 50 percent of Australian dairy farm revenue, however, is gained from the market milk market.

This proportion of milk going to each sector varies between states. For example, only 12 percent of Victorian milk production goes to market milk, and around 25 percent of revenue comes from market milk sales. Victoria also exports around 40 percent of its milk as dairy products and makes up around 90 percent of Australian exports. On the other hand, 60 percent

of NSW milk goes to market milk and around 75 percent of revenue is from market milk sales. Very little NSW milk is exported.

The impact of alternative arrangements for dairy products and for market milk will therefore vary between states. A brief outline of the current Commonwealth arrangements for dairy products and State arrangements for market milk, and some alternatives to these, is presented in this section.

2.1 Arrangements for dairy products

The latest in a long line of national dairy marketing arrangements was introduced in July 1986 and is called the Kerin Plan. The Kerin Plan is a tax-subsidy arrangement where a tax (the All Milk Levy) is imposed on all milk produced in Australia and the proceeds are paid as a subsidy (the Market Support Payment) on exports. By raising the return from exports, the domestic price for dairy products is raised. By gradual reductions in the export subsidies to reflect more closely export parity, the Kerin Plan exerts pressure initially on those States that produce milk mostly destined for export as manufacturing milk products. This in turn places pressure on the domestic market for manufactured milk products. While the Kerin Plan does not address the market milk sector, it is anticipated that pressure on the manufacturing milk sector will encourage individual State governments to deregulate and rationalise the market milk sector.

While it is interesting from an academic viewpoint to consider the impact the Kerin Plan has had on the Australian and Victorian dairy industries, it provides little in the way of assistance in deciding on future arrangements. Such an assessment is of little relevance to the policy questions raised in the current situation. As a replacement for the Kerin Plan may be required, an assessment of potential alternatives is of greater interest. Of course, one alternative could be a continuation or some variation of the Kerin Plan. Comparisons of the Kerin Plan with free trade (no dairy product or market milk arrangements) and with no dairy product arrangements are presented in this paper.

2.2 Market milk arrangements

Each state in Australia operates and manages some form of marketing arrangement for market milk. These marketing arrangements rely on monopoly control of intrastate production and sales of market milk by a State-run statutory marketing authority. Milk for market milk purposes is differentiated from other milk and as a result, premium prices for market milk are paid to farmers and others in the marketing chain. Supplies to the market milk sector are restricted, forcing up the price for market milk. This means higher prices to the consumer, with a transfer of consumer surplus to the producers, distributors and processors, and some deadweight loss.

The statutory marketing authority responsible for the marketing of market milk in Victoria is the Victorian Dairy Industry Authority (VDIA), which is responsible to the Minister for Agriculture and Rural Affairs. The authority responsible for the market milk arrangements in NSW is the New South Wales Dairy Corporation (NSWDC).

Historically, the individual state arrangements have not been linked with one another and have ostensibly developed due to geographical, quality and hygiene factors. In spite of Section 92 of the Constitution, a number of elements have ensured that only a minor trade in market milk between states has taken place, permitting the various state dairy marketing boards to raise market milk prices above import parity for each state.

Each state in Australia tries to ensure that adequate supplies of milk are produced from its own dairyfarmers to meet its market milk demand. To do this, either pooling of market milk returns or market milk quotas are used. For example, under a pooling (or blend pricing) arrangement, as in Victoria, returns from the sale of market milk are distributed as a market milk premium to all dairy farmers each month equitably in proportion to their individual production. The proportion of each farmer's production which attracts the premium is determined according to the percentage of milk produced in Victoria which is required for market milk in that month. As well, payment of a predetermined price incentive (known as the winter milk incentive) ensures adequate supplies of milk in the low production months of April, May and June.

On the other hand, for example, NSW relies on quotas or entitlements to supply a fixed volume of milk for market milk year round. These quotas are non-negotiable and non-transferable, although they are expropriable. For example, if a producer consistently under-supplies milk relative to his market milk entitlement, then he is liable to have some of the quota taken away, without compensation. The quota has considerable value to the dairyfarmers of the State, and erosion of this value is not taken lightly. The NSWDC also has the power to release additional quota, reducing the value of existing quota.

In both cases the dairy marketing board fixes all prices and margins from farm gate to retail, and regulation covers production, processing, transport, distribution and retailing. Both the VDIA and NSWDC license all dairy farms, factories, milk processors and distributors. In addition the NSWDC licenses a number of Victorian milk processors who sell milk into the Border areas of NSW.

These market milk arrangements have been subject to attack, mostly through increased interstate trade by commercial interest, particularly from Victoria to NSW (see Wilcox, 1988). State Governments have also begun to address the issue of deregulating the market milk arrangements. The Department of Agriculture and Rural Affairs is conducting a major review of the Victorian Dairy Industry Act at the request of the Minister. New legislation will be developed as a result of this review and will involve significant reform of this regulated industry. As part of this review the Department is considering the recommendations of the Public Bodies Review Committee (PBRC) of the Victorian Parliament on the operations of the Victorian Dairy Industry Authority (PBRC, 1989). It has identified major deficiencies of the system which insulate the dairy industry from the competitive forces that would prevail in a less regulated environment. The PBRC recommends sweeping changes to the existing system of market milk marketing in Victoria. The New South Wales Government has also begun deregulating sections of its market milk industry.

The effects of a limited number of alternative arrangements for the market milk industry are considered in this paper. The impact of removing blend pricing in Victoria (keep quotas in NSW), of removing the restrictions on interstate trade, introducing blend pricing in both States, introducing quotas in both states, and removing quotas in NSW (keeping blend pricing in Victoria) were all considered.

The development of the model used to assess these policy changes is presented in the following section.

3. MODEL DEVELOPMENT

The model used in this study needs to allow for the arrangements in both the market milk and manufacturing milk sectors, permit interaction between the two sectors in terms of supply, allow for trade between States of Australia (at least for market milk), and for trade between Australia and the rest of the world in dairy products. It should also be easily extended to include New Zealand. The model development outlined below provides details of the approach taken in this project and that satisfies the requirements mentioned above.

3.1 Overview

The methodology is a static, partial equilibrium model, with the market represented by a system of simultaneous non-linear equations. These equations permit policy simulations and allow for trade between States and New Zealand. Equations defining the demand and supply from each State and New Zealand are developed and linked by market clearing conditions. The method does not optimize *per se*, but relies on the market clearing conditions so that the demand price equals the supply price, given transport costs, marketing margins and policy constraints.

Transport costs, marketing margins and variables to describe policies are all set exogenously. While the transport costs and marketing margins can be set according to prevailing costs, policy options are included as taxes, subsidies or constraints on production or supply (flows). The model is specified in a general way to allow for flexibility in the policy options considered.

3.2 The Model

All equations of the model are expressed in absolute terms for simplicity, as some expressions involve additive or subtractive elements and are difficult to transform. The equations are all expressed in price dependent form, with prices expressed as cents per litre (c/l) and quantities expressed in million litres (Ml).

Supply

The farm-level output of all milk can be expressed as

(1) $p_i = p_{io}(O_i/O_{io})^{1/\varepsilon}$
    where
        i = supply region/State=1,n

O_i is farm output of milk; p_i is the farmgate price in region i; O_{io} is the initial output from region i; p_{io} is the initial marginal farmgate price in region i; ε_i is the (constant) elasticity of supply in region i. O_i and p_i are endogenous while all other parameters are exogenous. The supply equation is dependent upon the policy variables described below. Equation (1) provides nX1 matrices of prices and quantities, where n is the number of supply regions/States.

Demand

The demand for milk and milk products produced in Australia can be expressed in the general form

(2) $P_j = P_{jo}(D_j/D_{jo})^{1/\eta}$
    where
        j = demand centres = 1,m

D_j is the consumption at centre j; P_j is the demand price at centre j; D_{jo} is the initial consumption at centre j; P_{jo} is the initial demand price; η_j is the demand elasticity at centre j. The demand centres, of which there are m, are for a given milk product at a given place. For example, in the simple NSW-Victorian model used for the illustrative application in this paper the four demand centres are Victorian market milk, NSW market milk, Australian dairy products and export dairy products. In further development of the model only the market milk

sectors will be disaggregated. There will only be one Australian dairy product market and one export market. D_j and P_j are endogenously determined while all other parameters in equation (2) are exogenous. The demand equation is dependent upon certain policy variables discussed below. Equation (2) provides mX1 matrices of prices and quantities.

Price and Policy Equations

With n supply regions and m demand centres, there are nXm quantity/trade flows. To solve for these quantities nXm simultaneous equations are required. These simultaneous equations equate farmgate and demand prices, subject to transport costs and any policy instruments.

The transport costs are set exogenously and are an nXm matrix. With no policy instruments or marketing margins the nXm simultaneous equations are therefore:

(3) $P_j = p_i + tr_{ij}$

The policy instruments are incorporated into the model within the set of simultaneous equations and are explained below. Additional simultaneous equations would be required for each policy instrument.

<u>Blend pricing</u>

Blend pricing, the averaging of prices received for various milk usage at the farmgate, is treated in the model as a tax-subsidy arrangement. That is, blend pricing is viewed as a tax on market milk demand and a subsidy on manufacturing milk demand. Thus the supply price is equal to each demand price net of the tax or subsidy and transport costs. The taxes and subsidies are determined endogenously. The number of taxes (tx_j) and subsidies (sub_j) that are determined depends upon how many regions practice blend pricing, which demand prices are blended and how they are blended. For example, with the NSW-Victorian model, only one state (Victoria) uses blend pricing under the current system. All milk that goes to market milk (regardless of destination) is paid at the same rate. Therefore, there is only one tax (tx_i). In addition, all milk that goes to manufacturing milk is paid at the same rate and therefore there is only one subsidy (sub_i). The market clearing equation (3) is modified such that the demand price equals the supply price net of the transport costs and the tax/subsidy. In general form,

(4) $P_j = p_i + tr_{ij} + Tx_{ij}$

where

(5) $Tx_{ij} = (tx_j * pol1) + (sub_j * pol2)$

The parameters pol1 and pol2 are nXm matrices of ones and zeros which set the tax/subsidies on or off. Therefore, Tx_{ij} is an nXm matrix of taxes and subsidies. With the two additional endogenous variables two additional simultaneous equations are necessary to complete the system. These are that the market milk demand price for one demand centre supplied by one supply region is fixed (ie the demand price for Victorian market milk in Victoria is fixed) and that the sum of the taxes in each supply region (TAX_i) equals the sum of the subsidies in each supply region (SUB_i). Thus,

(6) $P_{ij} = P_{ij}F$

> where P_{ij} = demand price from supply region i to demand region j
> and $P_{ij}F$ = fixed market milk price.

(7) $TAX_i = SUBS_i$
    where $TAX_i = \sum(tx_j * pol1)$
    and $SUBS_i = \sum(sub_j * pol2)$

Market support payments and all milk levy

Market support payments (as under the Kerin Plan) are subsidies paid on exports paid by a levy on all production. The model determines endogenously the rate at which support is paid on exports subject to total subsidies paid out (SUPPORT) equalling the levies collected (LEVY). Thus, equation (4) is modified so that:

(8) $P_j * (1 + ms) = p_i + tr_{ij} + Tx_{ij} + A$
    where   j = export   ms = market support rate
and
(9)   LEVY = SUPPORT
    where
(10)   LEVY = $\sum(A * O_i)$
    and
(11)   SUPPORT = $\sum(ms * D_j)$ when j = export.

where A is the exogenously set all milk levy. As an additional endogenous variable is required, the additional simultaneous equation (9) is incorporated in the model.

Quotas

Australian states who do not use blend pricing for market milk use quotas on the supply of milk to the market milk sector to maintain high prices from the sector. These quotas are only on supply by farmers of that State to its own market milk sector. In addition, the States use proxy quotas to restrict interstate trade through a gentlemen's agreement to maintain the arrangements. To allow for both types of quotas, restrictions are placed on the volume of milk that can be supplied from one supply region to the relevant market milk demand centre. These restrictions are set exogenously:

(12) $q_{ij} \leq QUOTA$

where QUOTA is an nXm matrix, some elements of which could be restrictive.

2.3   Solution Procedure

The solution procedure involves transforming equations (4), (6), (7) and (9) so that all terms are on same side of the equation. This yields equations of the following forms:

(13) $0 = P_j - p_i - tr_{ij} - Tx_{ij} - A$

(14) $0 = P_{ij} - P_{ij}F$

(15) $0 = TAX_i - SUBS_i$

(16) $0 = LEVY - SUPPORT$

with $0 = P_j*(1+ms) - p_i - tr_{ij} - Tx_{ij} - A$

        when   j =   export
and subject to $q_{ij} \leq QUOTA$

The Nonlinear Simultaneous Equations (NLSYS) routines of GAUSS (a mathematical programming tool) have been used to solve these equations, subject to the supply and demand equations (1) and (2). The technique relies on minimising the differences on the right hand side of the equations simultaneously. To do this several modifications and additions to NLSYS have been made to accommodate the particular features and the policies of the model. The model provides demand quantities (D_j), demand prices (P_j), supply quantities (O_i), supply prices (p_i), quantity flows (q_{ij}), market support rates (ms), taxes and subsidies for blend pricing (tx_j and sub_j). From these, farm revenue, industry revenue, average prices, economic surplus measures, levy collections and support payments can be calculated.

An additional feature of the approach is that the solution will include some non-zero results for equation (13), if restrictions prevent the supply to a demand centre. These non-zero values represent a shadow price of these restrictions.

The flexibility of the approach allows for any number of policies to be considered at the same time, as can be seen by the range of policies covered in the above exposition. As well, a wide range of functional forms for the supply and demand functions may be used, although a non-linear form is used in this paper.

3.3 Data requirements

To solve the above specification we require estimates of:

* the all milk levy;
* elasticities of supply and demand;
* transport costs;
* initial price-output combinations for the supply regions and the demand centres; and
* quota levels and fixed market milk prices.

The initial price-output combinations for supply regions and demand centres are relatively easy to obtain. For this paper, the level of production and consumption and prices prevailing in 1988/89 were used in all cases except for the NSW supply price. This is more difficult to obtain as the imposition of quotas for market milk shifts the aggregate milk supply function upwards to the left of the true cost supply function. This shift arises because the producer aims to produce milk in excess of his quota and uses more costly input combinations and production techniques than otherwise. He does this to ensure that he does not produce less milk than the quota amount (Alston and Quilkey, 1981). This means that the relevant marginal price for NSW dairyfarmers is not represented by the manufacturing milk price; rather, the marginal cost is equal to some point above this price for any given supply quantity.

Alston (1986) suggests a method by which the regulated price may be determined. This involves deriving the shift in the supply function due to quotas based on a capital valuation of the quota. Alston (1986) estimates this value for hen quotas, for which there is a market. There is no such market for market milk quotas in NSW. However, the NSW Dairy Corporation pays an *ex gratia* payment of $15 per quota-litre to farmers who redeem their licences (NSW Dairy Corporation, 1990, pers. comm.). An estimate of the annual per litre price to which this corresponds has been made of 1.45 c/litre. This may be regarded as a lower-bound approximation as farmers who choose to redeem their quota are unlikely intending to continue in the industry and so would place a lower valuation on the quota than in a fully tradeable quota situation. The limits on transferability will also increase the average total cost.

The initial price and quantity combinations used are shown in Tables II and III. Alternatively, an historical average could be used. Note that all consumption is expressed in milk equivalent terms. The domestic manufacturing milk volumes used here are derived from actual Australian volumes, based on per capita consumption and the populations of each State. The export volumes is then the difference between total (Victorian and NSW) supplies and the total domestic consumption of all milk. Demand centre prices are based on farmgate prices plus the all milk levy plus transport costs. No other marketing or processing margin is currently included. Prices for manufacturing milk are based on the average farmgate price estimated by the Australian Dairy Corporation (ADC) and an average butterfat content. Supply prices are the farmgate blend price for Victoria and the farmgate manufacturing price plus the supply curve shift due to the presence of quotas.

Table I
Initial Consumption Price-Quantity Combinations

Demand Centre	Quantity D_j Ml	Price P_j c/l
Victorian market milk	463	42.57
NSW market milk	585	43.75
Australian manufacturing milk	1,694	29.56
Export manufacturing milk	1,839	26.53

Source: Australian Dairy Corporation (1990), Victorian Dairy Industry Authority (1989), Australian Dairy Corporation (1989), NSW Dairy Corporation (1990)

Table II
Initial price-output combinations

Supply Region	Quantity O_j Ml	Price p_j c/l
Victoria	3,650	25.32
NSW	931	25.41

The value of the levy is readily available, as are the quota levels and the fixed market milk prices. The levy rate, quota levels and the average fixed price prevailing in 1988/89 were used for the results detailed in the following section. The levy rate used was set at 45 c/kg

butterfat, the NSW quota level for market milk was 585 Ml and the fixed price for Victorian milk sold in Victoria as market milk was 37.02 c/l (demand price net of transport costs).

The project requires previously estimated elasticities of supply and demand. In fact, the approach adopted means that the actual estimated supply and demand curves, not just the elasticities can be used. In the illustrative application here, non-linear functions were assumed and some sample elasticities from the literature were used (Industries Assistance Commission, 1983; Lembit and Hall, 1987; Ockwell and Farquharson, 1981; amongst others). The supply elasticities used were 1.2 for both Victoria and NSW. The demand elasticities used were derived from a survey of the literature (IAC, 1983; Gruen *et al*; Street, 1974) and were -0.2 for both the Victorian and NSW market milk markets, -0.4 for Australian manufacturing milk demand, and -100 for export demand for Australian manufacturing milk (this figure was chosen as Australia contributes only a small proportion of world trade).

Transport costs are more difficult to obtain, although some information is available. The transport costs, as defined here, are the total transport cost per litre of milk from the supply region to the demand centre. T late the transport costs included are based on current rates of transport for market milk estau ... d by the VDIA and the NSWDC. Transport costs for market milk between States are based on information from transport companies. The costs for transporting manufacturing milk were obtained from a dairy co-operative. The transport costs used for the results reported in this study are given in Table III.

Table III
Transport Costs from Supply Region to
Demand Centre (c/l)

| Demand centre | Supply region | |
	Victoria c/l	NSW c/l
Victorian market milk	5.55	10.43
NSW market milk	10.60	5.33
Aust manufacturing milk	3.68	3.68
Export manufacturing milk	5.68	5.68

4. ANALYSIS OF SELECTED POLICIES

The general model detailed in section 3 has been applied to the simple two-State case of Victoria and NSW. As indicated in the explanation above, the simple model involves two supply regions and four demand centres. This model was applied for a selected number of simulations to provide an illustrative example of the use of the methodology.

Before the simulations were conducted, the initial simulation was compared with the actual outcomes for 1988/89. This comparison is shown in Table IV. As can be seen from this comparison, the model simulates the actual situation reasonably well, which is to be expected as the actual figures are used as the initial figures in the model.

Table IV
Comaprison of Initial Simulation with Actual 1988/89 outcome

Demand	Supply		Total
	Victoria Ml	NSW Ml	Demand Ml
Actual 1988/89			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,430	264	1,694
Export	1,899	74	1,973
Total supply	3,792	923	4,715
Current Arrangements Simulation			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,429	276	1,705
Export	1,875	64	1,939
Total supply	3,766	925	4,691

The experiments and policy simulations done for this paper were:

i.   deriving the milk export supply curves with the current arrangements and with no policies (free trade);

ii.   comparing free trade results with the current arrangements;

iii.   the impact of removing the Kerin Plan, but retaining the market milk arrangements;

iv.   the impact of blend pricing in both Victoria and NSW;

v.   the impact of market milk quotas in both States;

vi.   either blending Victorian market milk traded interstate at the manufacturing milk price or not including Victorian market milk traded interstate in the blend pricing arrangement;

vii.   the impact of removing NSW market milk quotas, both with and without the Kerin Plan, but retaining the Victorian market milk arrangements and restrictions on interstate trade; and

viii.   the impact of removing blend pricing in Victoria, both with and without the Kerin Plan and with and without the restrictions on interstate trade.

4.1   Export Supply Curves

For this simulation, a range of initial world prices was used with all policies currently in place and with no policies for either market milk or for manufacturing milk. A total export supply curve under each scenario was then obtained. Figure 1 shows the export supply curve under the two scenarios.
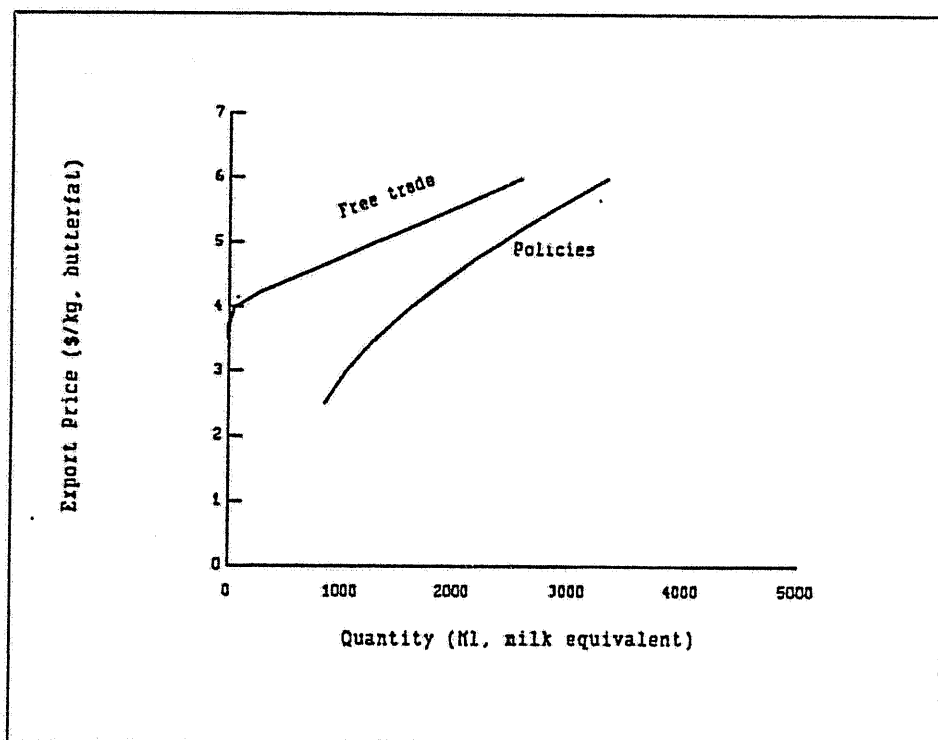
Without any policies to encourage production Australian (represented by Victoria and NSW) exports would cease at a world price of around $3 80/kg butterfat (or 16.3 c/litre). As expected the export supply curve is shifted down to the right with the market milk arrangements and the Kerin Plan. The arrangements in effect subsidise output. Much of the increased output is exported. At higher export prices the "free trade" and "policy" curves converge. This is to be expected as the rate at which exports are subsidised under the Kerin Plan falls as export prices rise (as the amount of levy collections is limited). Thus, the gap between the "free trade" curve and the "policy" curve in Figure 1 narrows. However, the "free

trade" export supply price-quantity combination will never be the same as that for the "policy" scenario, as the Kerin Plan always provides some measure of support, as do the market milk arrangements.

At the other end of the scale, the export supply curve under the "policy" scenario increasingly turns towards the quantity axis as the price falls. This suggests that it is optimal for the Australian dairy industry to export dairy products regardless of the export price and subsidise the price as much as possible. This is to be expected as rate at which exports are subsidised increases as the export price falls. By subsidising the export price, the Australian domestic price for dairy products is maintained (as there is no imports into Australia permitted in this illustrative application).

4.2   Policy simulations

The results of the policy simulations are shown in Tables V, VI, VII and VIII. Milk supply, demand and flows of milk (from a supply centre to a demand centre) arising from the policy simulations are given in Tables V and VI, while the prices, revenues, support payments and levies are given in Tables VII and VIII.

Deregulation of the manufacturing milk sector (ie removal of the Kerin Plan) results in a reduction in production and exports, and an increase in domestic sales of manufacturing milk, regardless of the arrangements for market milk. This is due to a reduction of around 4 c/l in the marginal (supply) price for milk. The fall in production is up to 660 Ml (18%) for Victoria and 173 Ml (19%) for NSW (the free trade simulation); this is accompanied by a rise in domestic sales of manufacturing milk of up to 646 Ml (45%) for Victoria, but a fall of up to 185 Ml (67%) in NSW domestic sales of manufacturing milk. Exports of manufacturing milk from both states falls significantly; by up to 1,352 Ml (72%) for Victoria and 48 Ml (75%) for NSW. Gross farmgate revenue also falls as domestic prices are lower; Victorian revenues are up to 30 percent lower while NSW revenues are up to 46 percent lower.

By introducing blend pricing in both States (and abolishing quotas in NSW), the marginal (supply) price in NSW increases by around 5 c/l. As a result NSW milk production increases by 219 Ml (24%), as does the NSW supply of both the domestic and export manufacturing milk market. This increases the NSW farmgate revenue by some $42m. Victorian revenue is reduced by $15m as the subsidised export price and domestic manufacturing milk price is lower in response to the increased NSW production.

The simulation for the introduction of quotas in both States suggests that quotas has the reverse effect on production and revenues, compared with the introduction of blend pricing. Instituting quotas in both State results in a reduction in the marginal price for Victorian producers of around 1 c/l. This in turn results in a fall in Victorian production and exports, resulting in

smaller levy collections and lower subsidised export and domestic manufacturing milk prices. Farmgate revenue falls as a result, with a fall of $33m (3.5%) in Victoria and $10m (3.4%) in NSW.

Currently Victorian milk sold interstate as market milk is "blended" at the same price as intrastate sales. This effectively prevents interstate sales. Simulations were conducted to consider the impact of either "blending" the price for interstate sales at the manufacturing milk price, or excluding interstate sales from the blend price arrangements. Neither change has a significant effect on Victoria milk production or the flows of Victorian milk to the Victorian market milk, domestic manufacturing milk or export markets. However, both options result in an identical fall in NSW production of 58 Ml (6%). Both options cause a similar fall in the NSW farmer supply price and both result in a small increase in the Victorian supply price. Under both options Victoria trades milk interstate, although different amounts. With the interstate milk blended at the manufacturing milk price, Victoria trades 22 Ml to NSW, while with no blending of the interstate sales only 17 Ml is traded. However, with no blending, the price to Victorian producers is higher than with blending at the manufacturing milk price. In both cases Victorian farmgate revenue increases by $8m, while NSW revenue falls by $56m and $47m. The fall in the NSW revenue is due to the market milk price falling to the price at which Victoria supplies milk.

A further simulation considered the impact of removing NSW market milk quotas, both with and without the Kerin Plan, but retaining the Victorian market milk arrangements and restrictions on interstate trade. The overall impact of such a policy is to cause a significant increase in the volume of milk supplied to the NSW market milk market from NSW producers, and a reduction in NSW supply to the manufacturing milk markets (by 57 Ml with the Kerin Plan). This shift is accompanied by a fall in the price for market milk in NSW to a level equivalent to that for manufacturing milk. NSW farmgate revenue falls by $86m (29%) and $137m (46%) with and without the Kerin Plan. The effect on Victoria is only minor, with diversion of milk from the export market to the domestic manufacturing milk market (of around 100 Ml [with the Kerin Plan]) and an increase in Victorian farmgate revenue ($11m [with the Kerin Plan]).

The impact of removing blend pricing in Victoria, both with and without the Kerin Plan and with and without the restrictions on interstate trade was considered in the final simulation. With restrictions on interstate trade retained, the effects are mostly seen on the Victorian industry. Victorian production contracts by 179 Ml (around 5%) in response to the lower supply price (with the Kerin Plan retained). Victorian supply to its own market milk market increases by 29 Ml (around 7%), while supply to the manufacturing milk markets falls. Victorian farmgate revenue decreases by $80m (around 8%) [Kerin Plan retained]. The effect on NSW is felt as a result of the reduction in the price for manufacturing milk; this results in a fall in NSW production of 46 Ml (around 5%) and a fall in revenue of $9m (3%).

The impact on NSW of removing blend pricing in Victoria is greatly increased when the restrictions on interstate trade are removed. NSW price for supplying the NSW market milk market falls to import parity with Victoria, resulting in a significant fall in NSW farmgate revenue (down $50m or 17%). However, NSW milk production is around the same with interstate restrictions removed as with the restrictions. In response to the removal of the restrictions on interstate trade Victoria diverts milk from the export market to the NSW market milk market. As a result Victorian revenue is around $3m greater than with the restrictions retained.

Table V
Supply, demand and flows for some policy simulations

Demand	Supply Victoria Ml	NSW Ml	Total Demand Ml
Current Arrangements Simulation			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,429	276	1,705
Export	1,875	64	1,939
Total supply	3,766	925	4,691
Free Trade			
Victorian market milk	507	0	507
NSW market milk	0	645	645
Domestic manufacturing milk	2,075	91	2,166
Export	523	16	539
Total supply	3,105	752	3,857
No Kerin Plan, retain market milk arrangements			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	2,068	118	2,186
Export	917	43	960
Total supply	3,448	746	4,194
Blend Pricing in both States			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,338	390	1,726
Export	1,931	171	2,102
Total supply	3,732	1,144	4,876
Quotas in both States			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,422	255	1,676
Export	1,693	37	1,730
Total supply	3,578	877	4,455
Blend Victorian interstate traded milk at manufacturing milk rate			
Victorian market milk	463	0	463
NSW market milk	22	585	607
Domestic manufacturing milk	1,454	241	1,695
Export	1,843	41	1,884
Total supply	3,782	867	4,649
Victorian interstate traded milk not blended			
Victorian market milk	463	0	463
NSW market milk	17	585	602
Domestic manufacturing milk	1,453	244	1,697
Export	1,849	38	1,887
Total supply	3,782	867	4,649

Table VI
Supply, demand and flows for further policy simulations

Demand	Supply Victoria Ml	NSW Ml	Total Demand Ml
Current Arrangements Simulation			
Victorian market milk	463	0	463
NSW market milk	0	585	585
Domestic manufacturing milk	1,429	276	1,705
Export	1,875	64	1,939
Total supply	3,766	925	4,691
No quotas in NSW, retain Kerin Plan			
Victorian market milk	463	0	463
NSW market milk	0	626	626
Domestic manufacturing milk	1,548	145	1,693
Export	1,776	97	1,874
Total supply	3,787	868	4,655
No quotas in NSW, no Kerin Plan			
Victorian market milk	463	0	463
NSW market milk	0	646	646
Domestic manufacturing milk	2,093	91	2,184
Export	985	9	904
Total supply	3,451	746	4,197
No blend pricing in Victoria, retain Kerin Plan, restrict interstate trade			
Victorian market milk	491	0	491
NSW market milk	0	585	585
Domestic manufacturing milk	1,432	240	1,673
Export	1,664	53	1,717
Total supply	3,587	879	4,466
No blend pricing in Victoria, no Kerin Plan, restrict interstate trade			
Victorian market milk	507	0	507
NSW market milk	0	585	585
Domestic manufacturing milk	2,030	139	2,169
Export	563	27	590
Total supply	3,100	751	3,851
No blend pricing in Victoria, Kerin Plan, free interstate trade			
Victorian market milk	491	0	491
NSW market milk	21	585	606
Domestic manufacturing milk	1,433	237	1,669
Export	1,650	59	1,708
Total supply	3,594	881	4,475
No blend pricing in Victoria, no Kerin Plan, free interstate trade			
Victorian market milk	507	0	507
NSW market milk	38	585	623
Domestic manufacturing milk	2,026	141	2,167
Export	533	25	558
Total supply	3,103	752	3,855

Table VII
Prices, revenues, and support levels for some policy simulations

	Current	Free Trade	No Kerin Plan	Blend Pricing	Quotas	Inter milk at manuf	No blending interstate milk
Supply price (c/l)							
Victoria	25.17	21.43	23.39	24.98	24.12	25.26	25.26
NSW	25.47	21.43	21.27	30.38	24.35	24.12	24.11
Average price (c/l)							
Victoria	25.17	21.43	23.39	24.98	25.53	25.26	25.26
NSW	32.02	21.43	34.73	30.33	32.57	27.68	28.60
Farmgate price (c/l) at demand centres							
Victorian market milk	35.04	21.43	37.02	35.04	35.04	35.04	35.04
NSW market milk							
- NSW farmer	36.67	21.43	38.43	36.67	36.67	29.40	30.76
- Victorian farmer	·				·	23.90	25.28
Domestic manufacturing	23.79	21.43	21.27	23.55	24.12	23.90	23.89
Export	23.79	21.43	21.27	23.55	24.12	23.90	23.89
Gross Farmgate revenue ($m)							
Victoria	947	665	806	932	913	955	955
NSW	296	161	259	348	286	240	249
Market support rate (%)	18.9	0	0	18.1	20.1	19.3	19.3
Market support payments ($m)							
Victoria	87.8	0	0	86.3	84.4	88.2	78.3
NSW	3.0	0	0	7.6	1.9	1.9	1.8
All milk levy collections ($m)							
Victoria	74.6	0	0	73.9	70.8	74.9	74.9
NSW	16.2	0	0	20.1	15.4	15.2	15.2

Table VIII
Prices, revenues, and support levels for further policy simulations

	Current	No quotas		No blend, restrict		No blend, no restrict	
		Kerin	No Kerin	Kerin	No Kerin	Kerin	No Kerin
Supply price (c/l)							
Victoria	25.17	25.29	23.40	24.17	21.41	24.21	21.42
NSW	25.47	24.16	21.29	24.40	21.41	24.43	21.42
Average price (c/l)							
Victoria	25.17	25.29	23.40	24.17	21.41	24.21	21.42
NSW	32.02	24.15	21.29	32.56	34.66	27.94	25.53
Farmgate price (c/l) at demand centres							
Victorian market milk	35.04	35.04	37.02	24.17	21.41	24.20	21.42
NSW market milk							
- NSW farmer	36.67	24.15	21.29	36.67	38.43	29.72	26.70
- Victorian farmer	·			·		24.22	21.43
Domestic manufacturing	23.79	23.93	21.29	24.17	21.41	24.21	21.42
Export	23.79	23.93	21.29	24.17	21.41	24.21	21.42
Gross farmgate revenue ($m)							
Victoria	947	958	807	867	664	870	665
NSW	296	210	159	287	260	246	191
Market support rate (%)	18.9	19.4	0	20.3	0	20.4	0
Market support payments ($m)							
Victoria	87.8	85.0	0	83.8	0	83.6	0
NSW	3.0	4.7	0	2.7	0	3.0	0
All milk levy collections ($m)							
Victoria	74.6	75.0	0	71.0	0	71.2	0
NSW	16.2	15.2	0	15.4	0	15.5	0

6. CONCLUSIONS

This project has been initiated as a result of the need for estimates of the impact of alternative policy options. These policy options will affect arrangements for both the manufacturing milk and market milk markets. The method and technique outlined in the paper is, as far as is known, a new approach to answering the kinds of questions raised in this paper. The method provides the flexibility to consider a wide range of policy options at the same time and permits a range of functional forms for the supply and demand curves to be considered. The working model of Victoria and NSW can and will be used in its current form to provide preliminary analysis of policy options for Victoria and NSW in the current negotiations between the two States and in assessing policy options for the Victorian market milk sector.

The simulations of selected policies performed for this paper indicate the impact changing either the manufacturing milk or market milk arrangements will have on each state's dairy industry. Needless to say, any deregulation involves a cost to the industry in terms of a fall in gross farmgate revenue. This does not indicate, however, the net effects of such deregulation. To provide information on these net effects, economic surplus measures need to be included in the model. This will be done shortly.

Having developed a working model of Victoria and NSW it is now an easy task to add other States and New Zealand. Several refinements are called for. The first is to include the different seasonal supply functions in each state. This is expected to have a significant impact on the results of and conclusions from policy simulations Second, as the current and alternative arrangements are imposed on different sectors of the industry (for example, the all milk levy is collected at the farm-gate while the export subsidy is paid at the wharf), the inclusion of the post-farmgate sector offers considerable scope for improvement. Again, this is currently being considered. Plans for further development include using the model to assess best-bet policy options for each region (in particular NSW-Victoria and Australia-NZ), developing a regional (rather than State) model of the industry and to consider seasonal fluctuations rather than an aggregate annual model.

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