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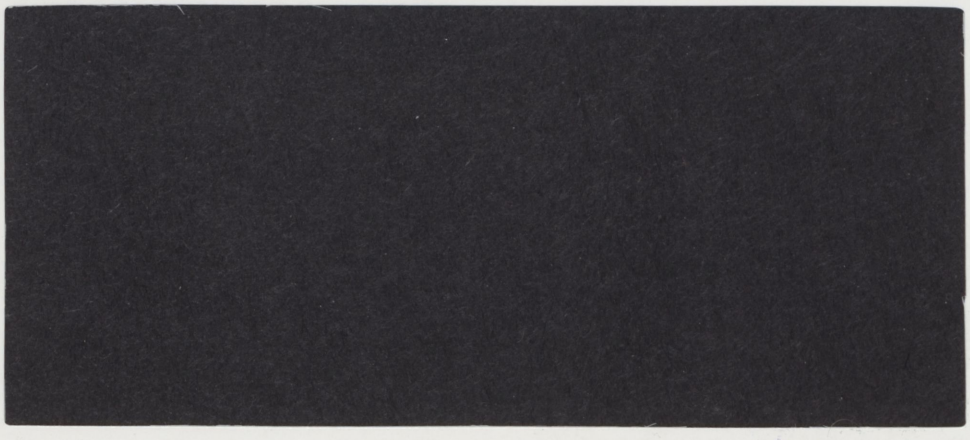

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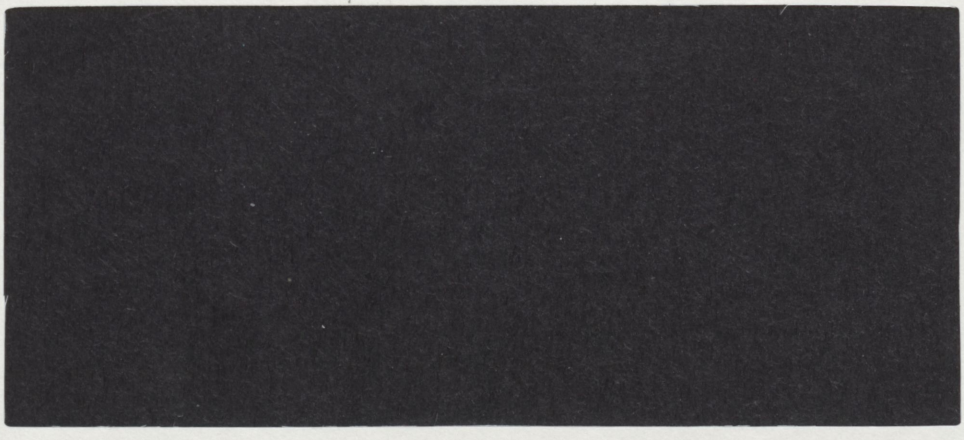

THE CANADIAN DAIRY INDUSTRY: INSTITUTIONAL STRUCTURE AND DEMAND TRENDS IN THE 1990s

(Working Paper 1/94)

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EXECUTIVE SUMMARY

Over the last few years, many participants in the Canadian dairy industry (producers, processors and administrators) have realized that some changes may be necessary in order to better meet changing consumer demand in Canada. The December 1993 GATT agreement also contributes to the pressure on the industry to become more market responsive. In May 1991 the federal government's Task Force on National Dairy Policy submitted a list of 23 recommendations for changes which would set the industry "on a clear course toward market responsiveness and greater self-reliance". This report was followed in December 1992 by another list of recommendations drafted by a committee of dairy farmer and processor representatives. Some of the changes suggested in these reports have been implemented and some are still being discussed.

To understand the impact of changes in Canada's dairy policies and programs on the dairy sector, it is essential to understand the current policy framework. This is especially important since most of the changes that have been recommended involve modification of existing programs or policies. The institutional framework currently in place for the dairy industry is complex, being implemented by both federal and provincial agencies and employing a variety of interconnected instruments.

The target price, butter and skim milk powder support prices, producer levies, and industrial milk requirements for Canada are determined at the federal level. Federal agencies are also involved in trade of dairy products and stock-holding. Provincial agencies allocate production quota for fluid and industrial milk to individual producers, and determine fluid milk prices. A number of other programs or policies are administered at the provincial level including end-use pricing, plant supply quotas, wholesale or retail price regulations for fluid milk, and rules regarding the transfer of production quota between producers.

Changes in the quantity, type and composition of dairy products consumed by Canadians have had a major impact on the industry. Various trends in demand such as the replacement of standard milk with low-fat milk and reduced demand for butter have led to shrinking domestic requirements for industrial milk over 1988 to 1992. These demand trends appear to have been due to both price effects and changes in consumer tastes. One indicator of the changes is the increasing level of skim-off cream from both the fluid and industrial sectors. In addition, Canada may be nearing the 'crossover point' where demand for milk for its solids non-fat component equals demand for its butterfat component for the first time.

Recent changes with regard to pricing such as 'crossloading' the skim milk powder price and the rebate programs for further processors appear to have halted the downward trend in domestic butterfat consumption over the last year. By crossloading the skim milk powder price, butter prices are kept down, and consumption of butter is increased. The rebate programs reduce the cost of

processed dairy inputs (e.g. butter and cheese) to further processors, thereby stimulating consumption from this sector. Forecasts made in this paper indicate that if these policies are maintained, the need for MSQ cuts for domestic demand reasons will be reduced over the next five years (no assumption about the implementation of a GATT agreement was incorporated in the forecasts).

The reduction in the direct subsidy to dairy farmers has been applied so that it has no impact on the total return received by farmers. Processors will pay more for milk due to the reduction and this will likely be reflected in higher prices for cheese and other dairy products. To the extent that these higher prices reduce consumption, domestic requirements for milk will be reduced. The new system for charging levies to producers is simpler than the previous method since all milk producers are now charged the same in-quota levy. The change in the producer levy rates also means that fluid milk producers are now contributing more to total levy revenue.

Depending on the relative prices set for the components, multiple component pricing may have a long run impact on the composition of milk produced in Canada and may increase market signals to the farmer. Single quotas for industrial and fluid milk will likely have an impact on quota value at the producer level, but provincial implementation packages may compensate producers for the change. Neither multiple component pricing nor single quotas for fluid and industrial milk are likely to have a major impact on aggregate prices or quantities of milk and milk products in Canada over the next few years.

A very significant proposal made both by the Task Force and the dairy stakeholders' Consultation Committee, is to unify the Canadian dairy market under one system. This would allow improved economic efficiency due to increased interprovincial competition and free movement of quota across Canada. The creation of such a national system would also provide the opportunity to reevaluate the various dairy policy instruments used by both federal and provincial agencies and determine how the new policy environment can best be structured. Some current provincial policies which could likely be eliminated in a national system include: controls on wholesale and retail prices of fluid milk, plant supply quotas and end-use pricing. The method for determining the milk target price may also warrant some change to make it more market responsive, as has been done with the milk support price in the U.S.. This will become more of an issue as the current GATT round is enacted and future GATT rounds further reduce the level of protection which Canada can provide producers.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

The dairy industry in Canada has been under pressure to change in recent years due to both external and internal forces. Externally, international forums such as GATT are pressuring Canada to increase imports and reduce subsidized exports. Internally, domestic demand for butterfat has been declining rapidly in Canada, pressuring policy makers to somehow deal with butterfat surpluses, either by reducing market sharing quota (MSQ) based on butterfat, by reducing prices to stimulate demand, or by exporting the surpluses.

This paper examines the internal pressures for change, focussing on the changing consumer demand for dairy products. Recent and proposed policy responses are examined, keeping in mind that external pressures may prohibit some responses. To set the scene for this discussion, a brief overview of the structure of the dairy industry is presented. Then the paper describes the institutional framework in which dairy policy parameters are set, at both the federal and provincial level. This description includes a review of the different stakeholders and detailed explanations of the institutional mechanisms used to set prices and quantities.

The fourth section explores changing consumer demand for dairy products. First, trends in Canadian consumption of dairy products over the 1980's and early 1990's are reported. Then, economic studies are reviewed to see to what extent they can satisfactorily explain these trends. Finally, some implications for the industry of these trends are discussed. The final section surveys how the industry is reacting to the pressures for change. Recent policy discussions are summarized and recent policy changes are analyzed.

Thus the paper has two main aims: to give a complete overview of the policy environment in which the Canadian dairy industry operates, and to discuss some of the recent changes to dairy policies. The overview should be useful to policy makers at the federal and provincial levels and to students and researchers examining the Canadian dairy industry. The discussion of recent changes to the operation of the industry should bring the reader up-to-date on some of the debates occurring in the industry and suggest areas where future policy changes could develop.

2 BACKGROUND

This section gives a brief overview of the structure of dairy production in Canada at the producer and processing levels. Some basic terminology is laid out and an international perspective is provided.

2.1 Structure of the Industry

Milk production in Canada is split into two markets: the "fluid milk" market and the "industrial milk" market. Fluid milk products consist of standard milk (3.25% butterfat), lower fat milk (2%, 1%, skim), buttermilk, chocolate milk, and fresh creams. Industrial milk products include cheese, butter, ice cream, yogurt, and condensed and powdered milk products. Both the fluid and industrial milk markets use the same dairy input - raw milk[1], however the regulations governing each market are different. This is discussed in more detail in later sections.

2.1.1 Milk Producer Level

Canadian milk producers generated $3 billion in farm cash receipts in 1992 which placed them third behind beef and grains and oilseeds among Canadian agricultural pursuits (Table 1). Dairy production is concentrated in central Canada with Quebec and Ontario making up 70% of dairy farm cash receipts (Table 2). Milk production is especially important in Quebec where it is the largest agricultural sector and accounts for 34% of farm cash receipts. Dairying is also important in the Atlantic provinces, B.C. and Ontario; it ranks among the top two sectors in each of these regions and accounts for over 20% of farm cash receipts. In the prairie provinces, milk production accounts for less than 10% of farm cash receipts.

Fluid milk production is distributed across Canada according to population because there is little fluid milk trade interprovincially. Industrial milk production is proportionately higher in Quebec (45% of industrial farm cash receipts and 26% of population) and lower in the other provinces such as British Columbia which has 11% of Canadian population but only 5% of industrial milk farm cash receipts. Industrial cream production is centred in Ontario and Manitoba, but represents a small and shrinking proportion of industrial milk production.

As with most agricultural activities, the number of dairy farms is declining while the average farm size (as measured by herd size) is increasing (Table 3). In addition, productivity per cow has increased over the last twenty years (Table 3).

2.1.2 Processing Level

Raw milk can be broken down into two major components in addition to water: fat (known as 'butterfat') and non-fat solids (protein, lactose and minerals). Processors use these ingredients to make various dairy products either for direct consumption by consumers or for use by other food processors (e.g. butter for bakeries, cheese for frozen pizza makers). As Table 4 shows, most industrial milk is processed into cheese in Canada.

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[1] The industrial milk market is also supplied by a small amount of 'industrial cream' as well as 'skim-off cream' from the fluid sector. 'Industrial cream' is produced on the farm and delivered to processors; it is sometimes also referred to as 'farm separated cream'. 'Skim-off cream is discussed below in section 4.4.1.

Table 1: Canadian farm cash receipts by commodity group and province, 1992 (millions of dollars)

	ATLANTIC		QUEBEC		ONTARIO		MANITOBA		SASK.		ALBERTA		B.C.		CANADA	
Grains and oilseeds	9	1%	191	6%	755	14%	673	39%	1798	56%	1106	28%	24	2%	4556	23%
Fruits and vegetables	207	26%	285	9%	571	11%	73	4%	12	0%	80	2%	297	24%	1525	8%
Other crops	67	9%	90	3%	86	2%	158	9%	438	14%	268	7%	171	14%	1279	7%
Cattle and calves	92	12%	376	12%	1009	19%	303	18%	644	20%	1844	46%	234	19%	4502	23%
Hogs	57	7%	521	17%	498	9%	255	15%	123	4%	274	7%	40	3%	1768	9%
Dairy	**177**	**23%**	**1078**	**34%**	**1077**	**20%**	**115**	**7%**	**92**	**3%**	**249**	**6%**	**260**	**21%**	**3047**	**16%**
Poultry	85	11%	321	10%	403	8%	53	3%	34	1%	98	2%	145	11%	1139	6%
Eggs	51	6%	96	3%	181	3%	49	3%	19	1%	44	1%	65	5%	506	3%
Other livestock	37	5%	30	1%	94	2%	32	2%	35	1%	39	1%	25	2%	292	2%
TOTAL RECEIPTS	782	100%	3138	100%	5316	100%	1722	100%	3194	100%	4003	100%	1260	100%	19415	100%

Source: Statistics Canada

Note: Dairy farm cash receipts do not include sales of cattle and calves from dairy farms. The Dairy Farmers of Canada (DFC) estimate that 12% of total cattle and calf sales are from dairy farms (DFC, 1991, p.).

Table 2: Dairy farm cash receipts by province and sector and compared to population

	ATLANTIC		QUEBEC		ONTARIO		MANITOBA		SASK.		ALBERTA		B.C.		CANADA	
Provincial breakdown by dairy sector (millions of dollars)																
Fluid milk	108	61%	392	36%	569	53%	61	54%	51	55%	140	56%	181	70%	1503	49%
Industrial milk	68	38%	687	64%	494	46%	49	43%	40	43%	107	43%	78	30%	1523	50%
Industrial cream	1	1%	0	0%	14	1%	4	4%	1	1%	1	0%	0	0%	22	1%
Total dairy	177	100%	1078	100%	1077	100%	115	100%	92	100%	249	100%	260	100%	3047	100%
Provincial receipts as a percentage of Canadian total																
Fluid milk	7%		26%		38%		4%		3%		9%		12%		100%	
Industrial milk	4%		45%		32%		3%		3%		7%		5%		100%	
Industrial cream	5%		0%		65%		20%		5%		5%		0%		100%	
Total dairy	6%		35%		35%		4%		3%		8%		9%		100%	
Provincial population (1992)																
millions	2.3		7.0		10.2		1.1		1.0		2.6		3.3		27.5	
as percent of Canada	9%		25%		37%		4%		4%		9%		12%		100%	

Source: Statistics Canada

Table 3: Structural Statistics for Dairy Farms in Canada

	Number of dairy farms ('000)	Average farm size (number of cows)	Average milk production per cow ('000 litres)
1961	309	10	2.7
1966	222	12	3.0
1971	145	16	3.4
1976	97	21	3.7
1981	68	26	4.4
1986	50	29	5.4
1991	39	34	5.9

Sources: Number of dairy farms: Dairy Farmers of Canada (1992), Table 2, "Census Farms Reporting Cows and Heifers 2 Years Old and Over, milking or to be milked, Canada, 1961-91".
Average farm size: number of cows (from CANSIM matrix, D225850) divided by number of farms
Average milk production per cow: total milk production (from Agriculture Canada dairy experts - includes estimate of on-farm consumption of milk) divided by number of cows.

Table 4: Industrial milk and cream use in Canada (balanced on a butterfat basis, 1992)

Amount of industrial milk used to produce:	million hectolitres	percentage
Butter*	11.3	27%
Cheese	21.4	51%
Ice Cream	5.1	12%
Yogurt	0.7	2%
Other	3.4	8%
Total industrial milk and farm separated cream (in milk equivalent)	41.9	100%

Source: estimated using FARM database and Table 30 from this paper.
* About 40% of butter is currently made from skim-off from the fluid sector as discussed in section 4.4.1.

Processing plants are located in each province since there is little interprovincial trade in raw milk. The number of plants and their associated value added are shown by province in Table 5. Ontario and Quebec have the greatest number of processing plants.

Table 5: Dairy processing plant numbers and value added by region 1989

	Number of processing plants	Value Added ($ million)
Atlantic	43	148
Quebec	98	982
Ontario	130	645
Prairies	72	n.a.
B.C.	29	n.a.
Total Canada	372	2364

Source: Jelliss (1993), Table 7 and Statistics Canada, Census of Manufactures unpublished data.
na: not available

2.2 Overview of Supply Management Policy

The Canadian milk production sector is administered under a system known as supply management. This national 'market sharing' system for industrial milk was introduced in 1972; provincial marketing boards had been in place before this. Marketing boards (of which supply managing boards are a subset) have been introduced for many commodities in Canada to increase the bargaining power of producers of primary agricultural products. (Veeman, 1987; Furtan, 1987)

Supply managing marketing boards exist for milk, eggs, chicken and turkey in Canada. In broad terms, the supply management system for these products operates as follows:

- many small producers agree to market their product together in order to achieve market power
- in order to increase the benefits of their market power, they agree to restrict production, thereby achieving higher prices than would otherwise occur
- this production-restricting activity is administered through producer operated marketing boards, and is regulated by governments

According to a number of studies (early ones are reviewed in Schmitz, 1983), the supply management system has resulted in a sizeable transfer of economic benefit from consumers to producers. The OECD estimates that, for dairy, this transfer amounts to about $2 billion in 1992 (OECD, 1993b). The Net Benefits Secretariat of Agriculture Canada estimated the consumer transfer for dairy at $1.1 billion in 1991 (Table 6). The difference between these two estimates is due to the reference price used; the OECD uses a New Zealand reference price for all milk whereas Net Benefits calculations use a U.S. reference price for fluid milk and a European-based reference price for industrial milk. The supply management system also results in some economic inefficiencies as discussed by Veeman (1987, p998-999).

Table 6: 'Net Benefits' estimate of the consumer transfer in dairy for 1991 ($ million)

	fluid milk	industrial milk	all milk
B.C.	71	25	96
Alberta	42	36	78
Saskatchewan	17	14	31
Manitoba	20	20	40
Ontario	163	215	378
Quebec	84	360	444
New Brunswick	10	8	18
Nova Scotia	19	5	24
Prince Edward Island	2	11	13
Newfoundland	7	-	7
Canada	436	694	1,131

Source: calculated using the method described in de Gorter (1992)
Notes: Fluid reference prices used in the calculations are based on U.S. prices
Industrial reference prices are based on European prices less export restitutions.

2.3 International Perspective

2.3.1 Production

Canada is a fairly small dairy producer by world standards, but shows high technical efficiency with the second highest yields per cow among the countries listed in Table 7.

2.3.2 Consumption

Table 8 shows per capita disappearance for a number of dairy products. It is interesting to note that per capita butter consumption in Canada is considerably larger than in the U.S even though butter prices are higher in Canada than in the U.S.. This fact implies that the structure of demand in Canada is different from that in the U.S.. Specifically, it seems that Canadian consumers demand more butter at a given price than U.S. consumers. Also note the high levels of per capita butter consumption in New Zealand and Finland. Government policies with respect to margarine can also affect butter consumption (discussed in more detail in section 3.3.3).

Table 7: International Comparison of Milk Production (1991)

Country	Number of Dairy cows (millions)	Yield per cow ('000 kg)
Canada	1.4	5.5
U.S.A.	10.1	6.8
Mexico	2.6	1.2
France	9.0	3.0
U.K.	2.9	5.2
Australia	1.6	4.0
New Zealand	2.3	3.4
Brazil	19.3	0.8
Argentina	2.6	2.6
China	2.9	1.5

Source: Dairy Farmers of Canada (1992), Tables 41 and 42.

Table 8: International comparison of per capita consumption for major dairy products (kg/head, 1991)

	Butter	Cheese	Skim milk powder
Canada	3.35	10.29	1.74
U.S.A.	2.17	11.69	1.23
E.E.C.	4.61	13.40	3.35
Japan	0.73	1.21	2.26
New Zealand	9.76	9.00	0.00
Australia	2.78	8.53	2.30
Sweden	2.26	14.72	2.62
Finland	7.80	12.80	3.20
Argentina	1.27	8.69	0.90

Source: calculated from consumption statistics for 1991 in GATT (1992) and population statistics for 1989 in USDA (1990). Skim milk powder consumption includes both human and animal consumption.

2.3.3 Government Intervention

Milk is one of the most highly supported agricultural commodities throughout the world. Table 9 shows producer subsidy equivalents[2] (PSEs) for a number of commodities and regions as calculated by the OECD. Canada is third after Japan and Norway among these regions in the level of support provided to dairy

[2] PSEs are an indicator of the level of support provided to a sector through government interventions.

producers. Dairy has the highest percentage PSE of all commodities in Canada for which the OECD calculates PSEs.

The international prices used in the milk PSE calculations are lower than they would be under free trade due to border protection and export subsidies[3]. Thus the measured PSE may be higher than the actual level of support required to make farmers no worse off in a free trade environment. Even so, milk is definitely one of the most highly subsidized and protected of agricultural commodities in industrial countries.

Many countries are reforming their dairy policies to become more market oriented. The GATT's International Dairy Arrangement of 1992 states "there is an almost universal trend toward increased liberalization and less government interference, with a reducing of subsidies and re-evaluating of pricing arrangements [with respect to the relative values of fat and protein]" in the world dairy market (GATT 1992, p5). The OECD also notes that countries are modifying dairy policies, stating "dairy policies have become somewhat more market-oriented, through adjustments aimed at reducing support prices and supported production ... [but] further adjustments seem warranted" (OECD, 1993, p75).

Table 9: Percentage Producer Subsidy Equivalents for Selected Countries and Commodities 1992 (%)

	Wheat	Coarse grains	Dairy	Pork	Poultry
Canada	38	33	76	18	37
U.S.A.	33	22	56	7	9
E.E.C.	52	58	67	8	11
Australia	11	7	32	5	4
New Zealand	5	1	1	1	29
Japan	89*	97	85	65	12
Finland	78	77	74	40	39
Norway	76	79	83	50	49
Sweden	51	62	72	21	20

Source: OECD 1993, Annex III.
Note: the percentage PSE for each commodity represents the total transfer due to government policies divided by the total value of production.
*The rice PSE is reported instead of the wheat PSE for Japan.

[3] In general, producer subsidy equivalents are calculated by taking the domestic price for a product (including direct subsidies) minus a world price (the OECD uses a New Zealand based price for milk), multiplied by domestic production. In this way, the OECD approximates the direct subsidy which would be necessary to replace the plethora of policy instruments used by countries to support producer returns.

3 INSTITUTIONAL FRAMEWORK

Many authors have addressed the issue of describing the regulatory system in the Canadian dairy industry. Barichello (1981) and Stonehouse (1987) both have provided very useful descriptions of the dairy system in Canada. This section builds on their descriptions by providing more details, especially about institutions and policy delivery at the provincial level.

The section first outlines the major groups involved in the dairy industry. Then, the procedures used to set various prices and quantities at all levels of the Canadian dairy market are described. In the last sub-sections, the effective prices that producers receive and processors pay are calculated, a brief discussion of the value of production quotas is provided, and a summary of the institutional framework is presented.

3.1 Participants

At least nine major groups can be identified in the Canadian dairy market:

1. Producers of milk

2. Primary processors of milk into fluid products, butter, cheese, ice cream, yogurt, etc.
   a. Private companies
   b. Producer cooperatives

3. Secondary processors who use butter, cheese, etc. as ingredients

4. Producer groups
   a. Provincial producer-run milk marketing boards
   b. Dairy Farmers of Canada - represents producers federally
   c. Dairy Bureau of Canada - advertising, promotion

5. Processor groups
   a. Provincial processor organizations
   b. National Dairy Council - represents processors federally

6. Provincial governments

7. Federal government
   a. Canadian Dairy Commission (CDC)
   b. Agriculture Canada
   c. External Affairs

8. Canadian Milk Supply Management Committee (CMSMC) - made up of representatives from:
   a. CDC - chairs the meetings
   b. Provincial marketing boards/agencies (producers and government) - have votes
   c. Dairy Farmers of Canada - observers
   d. National Dairy Council - observers
   e. Consumers Association of Canada - observers

9. Consumers

Table 10 shows the subset of this group which has the most influence on dairy policy.

Table 10: Major Canadian Dairy Institutions and their area of influence

	Milk Production Sector	Milk Processing Sector
Producer/processor groups	Provincial milk marketing boards/ agencies	National Dairy Council
	Dairy Farmers of Canada	Provincial councils
Federal Government	Canadian Dairy Commission	
Provincial Government	Marketing Boards or Commissions	
Joint Producer-Federal-Provincial	Canadian Milk Supply Management Committee	

Source: Adapted from Stonehouse (1987), Figure 4, p48.

3.2 Procedures for Determining Prices and Quantities

Eleven major price and quantity parameters in the Canadian dairy market are influenced by the activities of various agencies:

1. The level of industrial milk production ('market sharing quota').
2. The level of fluid milk production ('fluid milk quotas').
3. The producer price for industrial milk which the dairy policy aims to maintain (the 'target price').
4. The butter and skim milk powder prices at which the CDC will purchase all production offered (the 'support prices' under the 'offer-to-purchase' program).
5. The prices that processors pay for milk, depending upon what the milk is used to produce ('class prices' under 'end use pricing').
6. Wholesale prices for fluid milk.
7. Retail prices for fluid milk.
8. The amount of milk processing plants in certain provinces are allowed to purchase for certain uses (plant supply quotas).
9. The price and quantity of imported dairy products.
10. The level of exported product.
11. The level of CDC stocks of butter and skim milk powder.

While numbers 1 to 5, and 9 to 11 in the above list affect all milk produced in Canada, only some provinces regulate the parameters reported in numbers 6 to 8. The federal government is responsible for numbers 3, 4, and 9 to 11. Provincial governments are responsible for 2 and 5 to 8. The industrial milk quota (number 1) is determined by the CMSMC which includes producer groups as well as federal and provincial government representatives.

3.2.1 Market Sharing Quota

The CMSMC meets at the end of July every year to set the level of market sharing quota (MSQ) for the upcoming dairy year[4]. The level is set based on an estimation of domestic requirements for dairy products

[4] The 'dairy year' runs from August 1 to July 31. The CMSMC also meets in February and may 'fine tune' the level of MSQ at that time, depending on market conditions.

for the upcoming year. Actual domestic requirements for butterfat and for solids non-fat for the previous year are determined by the CDC using the so-called 'stock reconciliation method'. This method simply determines domestic disappearance using production, export and opening and closing stock figures for major products. Butterfat and snf requirements for the upcoming year are then determined based on utilization in the previous year and recent trend information. MSQ is set equal to butterfat requirements in milk equivalent (based on the average composition of milk - see Appendix I) plus a 4% 'export sleeve'[5] and minus allowable imports. The sleeve is added to ensure that domestic supply does not fall short of demand in the event that domestic requirements were under-estimated and to provide a supply for certain regular export business.

The success of the CMSMC in setting MSQ close to actual domestic requirements and in restricting production to the MSQ level is illustrated in Figure 1 and Table 11. Table 11 compares actual domestic requirements, MSQ, and the supply of industrial milk delivered. Between 1982 and 1987, MSQ was set very close to domestic requirements. However, as domestic requirements started to drop off beginning in 1988, MSQ has not fallen by as much and production has fallen by even less. Over-quota production over the last number of years varied between 2% and 5% of MSQ. When this over-quota production is combined with the excess of MSQ over domestic requirements, it can be seen that Canadian supply increasingly exceeded Canadian demand over 1988-91 - by as much as 11% in 1991. Figures for 1992 and 1993 indicate that domestic requirements have increased, MSQ is closer to domestic requirements, and over-quota production is lowered.

The CMSMC also determines how much of the MSQ is to be allocated to each province. Provincial shares of MSQ have remained almost constant over the 1980s as follows: Quebec (47%), Ontario (31%), Western provinces (17%), Atlantic provinces (5%). Provincial agencies are responsible for allocating MSQ to individual producers.

3.2.2 Fluid Milk Quotas

Provincial agencies set fluid milk production quotas based on provincial demand for fluid products. Most provinces set fluid quotas above estimated provincial requirements and retroactively allocate the excess milk to industrial milk.

3.2.3 Target Price

The Canadian Dairy Commission determines the target price annually and announces it at the beginning of the dairy year. Like MSQ, the target price may be adjusted midway through the dairy year. The price is intended to reflect "a return which will cover [a producer's] labour, investment, and cash costs related to the production of industrial milk". (CDC, 1991, p 5) It is not the actual return received by farmers (as discussed in section 3.4 below), but what the CDC determines is a 'fair' return.

The cost of production (COP) of dairy farmers has been the basis for setting the level of the target price since 1988. "The cost of producing milk is calculated from data collected by surveys on approximately 350 farms in Ontario, Quebec, New Brunswick, and Manitoba. Thirty percent of the sample, made up of the producers with the highest per-hectolitre costs, is eliminated for the purpose of calculating the target price." (CDC, 1991, p 5) The high cost producers are eliminated from each provincial sample in order to measure the costs of only the more efficient producers.

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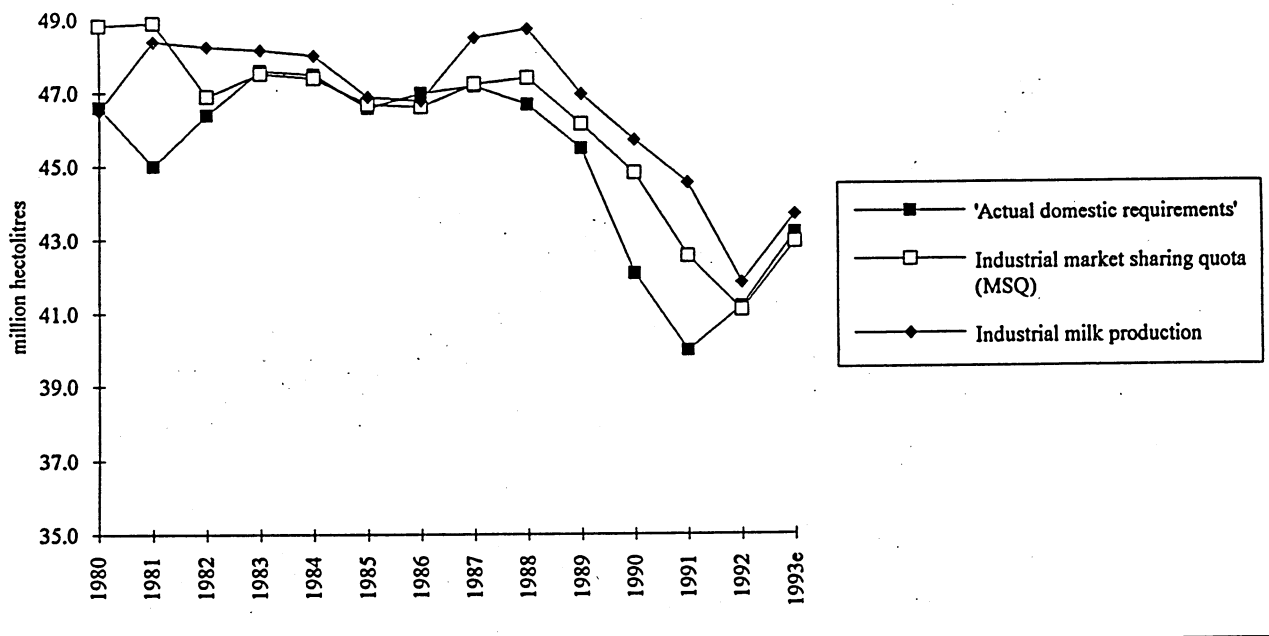
[5] The sleeve was increased from 3% to 4% of domestic requirements in 1991.

Table 11: Industrial market sharing quota in Canada (dairy year)

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993e
'Actual domestic requirements'	a	46.6	45.0	46.4	47.6	47.5	46.6	47.0	47.2	46.7	45.5	42.1	40.0	41.2	43.2
Industrial market sharing quota (MSQ)	b	48.8	48.9	46.9	47.5	47.4	46.7	46.6	47.3	47.4	46.2	44.8	42.6	41.1	42.9
Industrial milk production	c	46.5	48.4	48.3	48.2	48.0	46.9	46.8	48.5	48.8	47.0	45.7	44.6	41.9	43.7
MSQ over actual domestic requirements	d=b-a	2.2	3.9	0.5	-0.1	-0.1	0.1	-0.4	0.1	0.7	0.7	2.7	2.6	-0.1	-0.3
		4.8%	8.7%	1.1%	-0.2%	-0.2%	0.2%	-0.8%	0.1%	1.5%	1.5%	6.5%	6.4%	-0.2%	-0.6%
Supply over MSQ	e=c-b	-2.3	-0.5	1.4	0.6	0.6	0.2	0.2	1.3	1.3	0.8	0.9	2.0	0.8	0.7
		-4.7%	-1.1%	2.9%	1.4%	1.3%	0.4%	0.3%	2.7%	2.8%	1.8%	2.0%	4.7%	1.8%	1.7%
Supply over actual domestic requirements	f=c-a	-0.1	3.4	1.9	0.6	0.5	0.3	-0.2	1.3	2.1	1.5	3.6	4.6	0.6	0.5
		-0.2%	7.5%	4.0%	1.2%	1.1%	0.7%	-0.4%	2.8%	4.4%	3.3%	8.6%	11.4%	1.6%	1.2%

Source: FARM database and CDC annual reports
Note: figures for 1993 actual domestic requirements and industrial milk supply are forecasts

Figure 1: Comparison of domestic requirements for industrial milk, MSQ and industrial milk production



The costs counted in the COP calculation are divided into three types: cash costs, capital costs and labour costs as reported in Appendix II. Only the costs associated with the milking herd are measured in the calculations. Each year an 'Ex-Post Adjustment Factor' (EPAF) is added to the total calculated cost of production. The EPAF is equal to the price received by producers in the previous year minus the calculated target price in the previous year.

Prior to 1988, the target price was calculated using the so-called "Returns Adjustment Formula" (CDC Annual Report 1987/88). Figure 2 shows that since the introduction of the cost of production formula in 1988, the target price for industrial milk increased by less than the general price level in Canada. Figure 3 depicts the Farm Product Price Index for a number of commodities. For all products, the increase in this index is less than the general price index. This is a widespread phenomenon in agriculture - real output prices have been falling over time. Figure 3 shows that the nominal dairy farm product price has increased by more than the other commodities over 1980-92.

Figure 4 compares the Canadian target price, the farm price for manufacturing milk in the U.S., and a world reference price based on New Zealand prices. Prior to 1981, the Canadian and U.S. prices rose at approximately the same rate. Beginning in 1981, the U.S. price rose less steeply than the Canadian price and it has not grown significantly since 1985. The Canadian price is moving steadily upward over the entire period, albeit at a lower rate since the mid 1980's. The upward trend in the Canadian price is due to the pricing formulas, whereas the U.S. prices have become more market responsive. Beginning in 1981, the U.S. moved away from its traditional method of setting the support price for milk based on 'parity' (a system which had no relation to market forces). The new method uses minimum support prices with required reductions or increases in the support price based on the level of purchases of commodities by the Commodity Credit Corporation (OECD 1987, USDA 1991). Deloitte and Touche (1991) discuss a number of options for pricing industrial milk in Canada, including more market oriented practices.

3.2.4 Support Prices

In order to achieve the target price to producers, the CDC sets minimum prices for butter and skim milk powder. The CDC offers to purchase these commodities from processors at the support prices, thereby establishing a floor price for them and, implicitly, for milk. These two products are chosen because jointly they account for all the butterfat and solids non-fat in milk, and they are storable products.

To determine at what level to set the support prices, the CDC uses the following formula:

target price = butter support price * butter yield + skim milk powder price * skim milk powder yield - assumed processor margin + direct subsidy

where the butter and skim milk powder yields[6] are the assumed number of kilograms of butter and skim milk powder, respectively, which can be produced from a hectolitre of milk. The 'assumed processor margin' is meant to represent the non-milk costs of joint production of butter and skim milk powder.

The CDC formula may be interpreted as follows: it equates the farmers' return from the market for milk (target price less the direct subsidy) to the price received by processors for the joint products butter and skim milk powder (in milk equivalent), less an assumed cost of processing. Table 12 shows the level of the target price, butter and skim milk powder support prices and assumed processor margin for 1980-93. The table also confirms that the CDC balances the above formula.

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[6] These 'yield factors' are negotiated between processors and the CDC. Currently they are 4.365 kg butter/hl milk and 8.51 kg SMP/hl milk.

Figure 2: Index of Canadian target price for milk compared to Consumer Price Indices (1981=100)

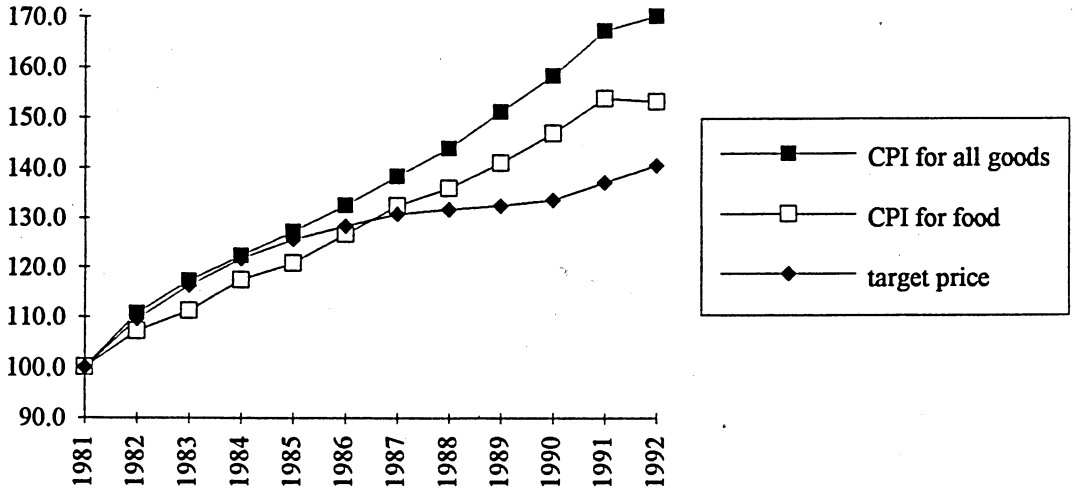
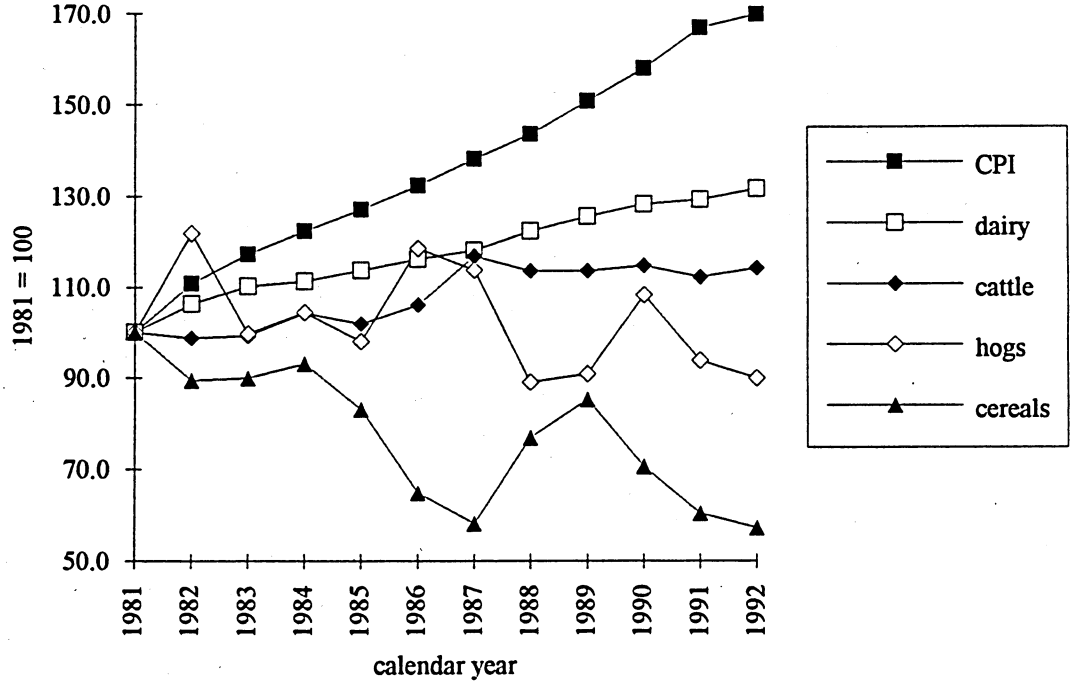
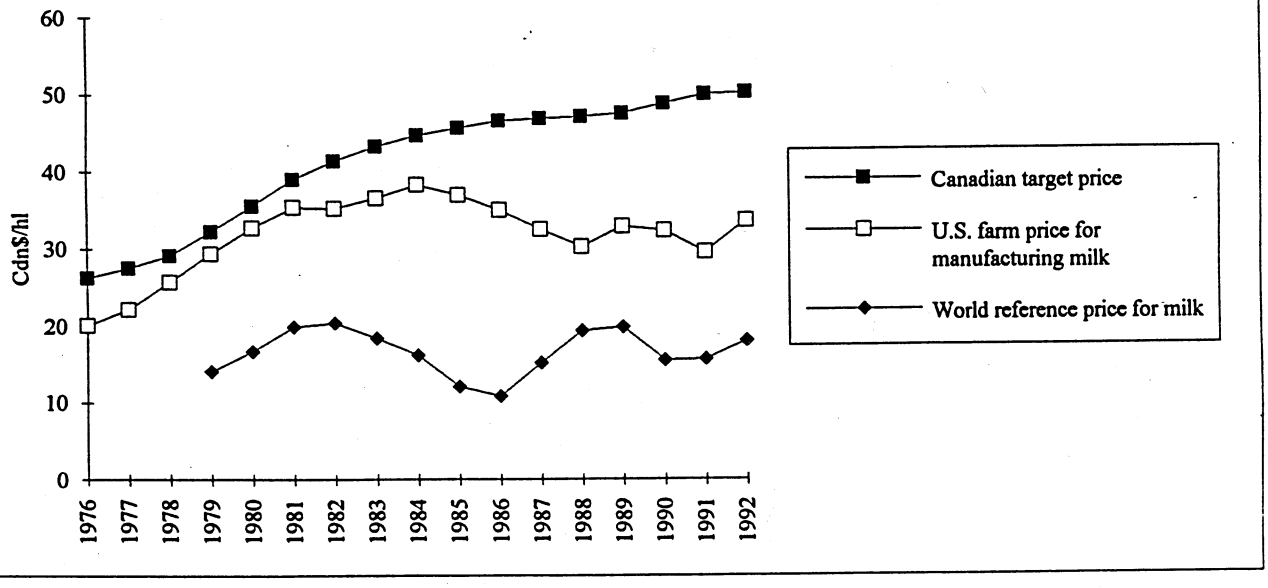


Figure 3: Farm Product Price Indices - selected commodities



Source: Farm Product Price Indices are from Statistics Canada, CANSIM database, Matrix 000176.

Figure 4: Farm price for industrial milk - Canada and U.S vs world reference price.



Sources: Canadian target price from FARM database
U.S. farm price for manufacturing milk: USDA, Dairy Situation and Outlook, various issues.
World reference price: OECD PSEs: detailed tables. It is based on New Zealand prices.

Table 12: Target price, butter and skim milk powder support prices, and the assumed processor margin: confirming the CDC formula (dairy year)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Target price for industrial milk ($/hl)	41.33	43.24	44.65	45.64	46.48	46.77	47.06	47.45	48.69	49.92	50.11	50.86
Support price for butter ($/kg)	4.373	4.616	4.784	4.923	5.035	5.069	5.102	5.167	5.331	5.331	5.340	5.324
Support price for skim milk powder ($/kg	2.615	2.748	2.850	2.919	2.978	2.996	3.013	3.046	3.130	3.304	3.322	3.498
Assumed processor margin ($/hl)	6.12	6.41	6.60	6.81	6.96	6.97	6.97	7.15	7.34	7.52	7.52	7.60
Direct subsidy ($/hl)	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	5.43
Butter conversion factor (kg/hl)	4.365	4.365	4.365	4.365	4.365	4.365	4.365	4.365	4.365	4.365	4.365	4.365
SMP conversion factor (kg/hl)	8.54	8.54	8.54	8.54	8.54	8.54	8.54	8.54	8.54	8.51	8.51	8.51
'Add-on' for Rebate program										0.02	0.02	0.02
Check CDC formula =b*f+c*g-d-(a-e-h)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: FARM database

3.2.5 End-Use Pricing

Most provinces charge different prices to processors for different 'Classes' of milk, depending on the end use of the milk. Appendix III shows the various class definitions and prices used by the provinces for 1987-91. Hurd (1992) provides a more detailed discussion of classified pricing by provinces.

Price differentiation between fluid and industrial milk

All provinces charge processors a higher price for fluid milk than they do for industrial milk, even though the milk is identical. Table 13 and Figure 5 show the Class I price for each province compared to the weighted average industrial milk price. It can be seen that in 1991, the fluid markup ranged from 10.80 in Quebec to 19.43 in P.E.I.. Also, apparent in Table 13 is the fact that fluid prices vary across provinces much more than the average industrial price. Industrial products may be traded across provinces and, as a result, their prices will tend to equalize across Canada. Fluid products are not traded inter-provincially, and thus provinces can charge different prices without arbitrage undercutting them.

The fluid markup is determined in most provinces through a cost of production formula. The fluid price deemed necessary to cover costs of production is determined; the markup is this price less the target price. The differing markup across provinces may be attributed to higher costs of production or a different method of calculating COP (e.g. different sample selection or including different items in the formula). In addition, negotiations between milk boards and processors may affect the fluid price.

Price differentiation between industrial milk classes

The degree of price differentiation among industrial milk classes varies by province and by year. All provinces have at least three classes of industrial milk (including sub-classes) and some have as many as ten. However, the degree of price differentiation between classes varies across provinces. In P.E.I., although there are 6 classes of industrial milk defined, all were priced at the same level over the period 1987-1991.[7] Saskatchewan shows the next lowest degree of price differentiation over 1987-91 with cottage cheese and ice cream receiving one price and all other industrial dairy products another. All provinces other than P.E.I. show some degree of price differentiation between industrial classes in 1991, but not necessarily a different price for every class defined. (Dairy Market Review, 1991).

Table 14 and Figure 6 illustrate the degree of differentiation of prices in 1991 for major industrial products: ice cream, cheese, butter and skim milk powder. The variance of these prices shown in the last column illustrates the spread between the different class prices. Ontario and Manitoba have the largest degree of price differentiation while P.E.I. and Saskatchewan have the lowest.

Clearly, provincial agencies are exercising market power by charging different prices for the same product. To determine whether the setting of different prices by provinces for different classes of milk is optimal price discrimination, one must know the processors' derived demand for milk for each product and the supply curve for all milk. Then, one can test whether provincial boards or agencies are setting marginal cost equal to the marginal revenue for each product (the procedure for optimal price discrimination).

In general, provinces set their industrial price class differentials a number of years ago. Annual changes to these differentials are based on the annual changes in the support prices announced by the CDC. Examination of the movements of industrial milk class prices for Ontario over time show that the differential between classes has remained essentially constant over 1983-91 despite changing demand for cheese and butter (see section 4.2). This fact implies that provinces are not adjusting their industrial price differentials from year to year based on some optimizing procedure.

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[7] In P.E.I. there is only one processor of industrial milk, and it is a producer-owned cooperative.

Table 13: Fluid Milk Prices - Class I milk prices by province

1991 calendar year, $/hl

Province	Class I milk price	weighted industrial milk price	fluid price markup	ratio fluid to industrial
B.C.	60.63	42.54	18.09	1.43
Alberta	54.83	42.92	11.91	1.28
Saskatchewan	56.24	41.34	14.90	1.36
Manitoba	58.82	42.62	16.20	1.38
Ontario	56.95	44.23	12.72	1.29
Quebec	54.75	43.95	10.80	1.25
N.B.	59.80	42.53	17.27	1.41
N.S.	61.73	42.44	19.29	1.45
P.E.I.	62.04	42.61	19.43	1.46
Newfoundland	75.68	n.a.	n.a.	n.a.
Average (not incl. Nfld.)	58.42	42.80	15.62	1.37
Variance	36.93	0.73	10.38	

Source: Agriculture Canada, "Dairy Market Review 1991", pp26-28

All data are 1991 calendar year data except for average industrial price for Manitoba which is 1990/91 dairy year.

n.a.: not applicable, Newfoundland has no industrial milk production.

Figure 5: Class I Milk Prices and Weighted Average Industrial Milk Price: 1991 calendar year ($/hl)

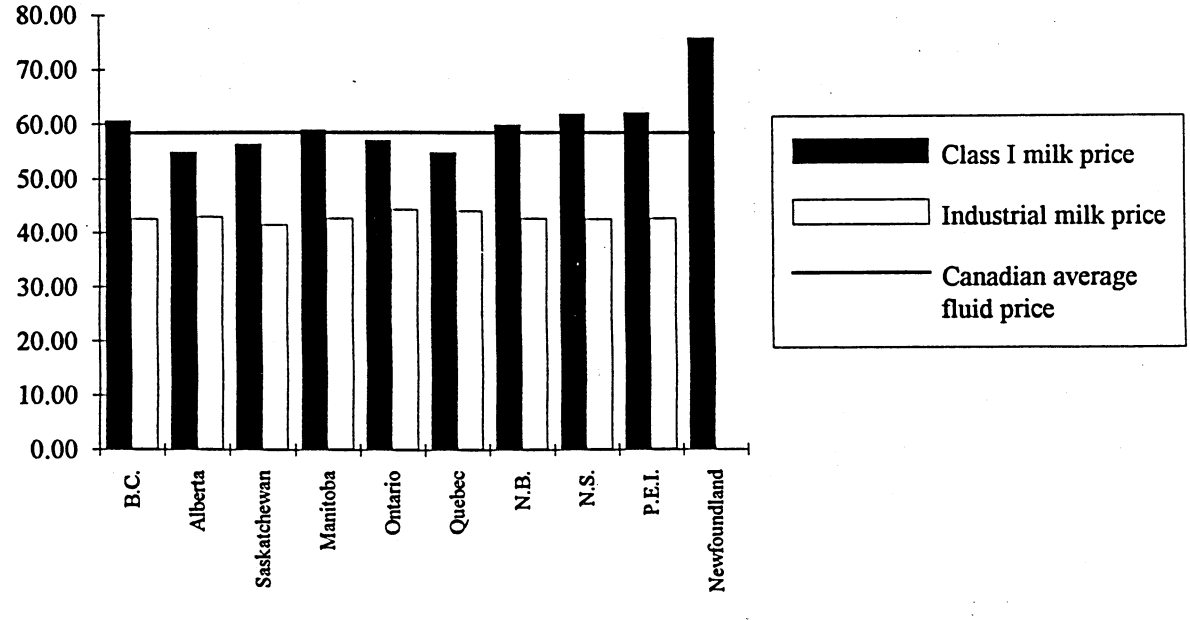
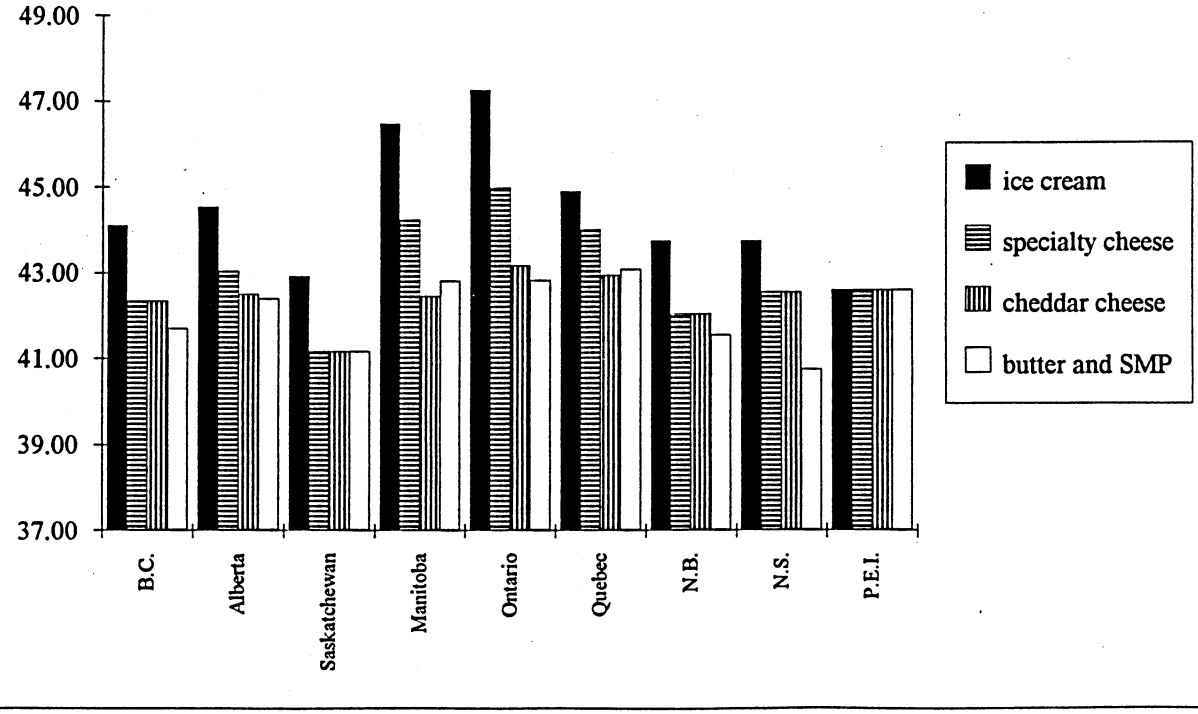


Table 14: Degree of milk price discrimination for major industrial dairy products by provinces

Province	1991 Price of milk for production of ($/hl): ice cream	cheddar cheese	specialty cheese	mozzarella (*)	butter and SMP	weighted industrial milk price	Variance between 1991 class prices
B.C.	44.10	42.35	42.35		41.70	42.54	1.06
Alberta	44.55	42.50	43.05		42.40	42.92	0.98
Saskatchewan	42.92	41.17	41.17		41.17	41.34	0.77
Manitoba	46.49	42.47	44.25	43.15	42.82	42.62	2.65
Ontario	47.26	43.17	45.00		42.84	44.23	4.12
Quebec	44.92	42.96	44.03		43.08	43.95	0.84
N.B.	43.76	42.05	42.05		41.55	42.53	0.94
N.S.	43.75	42.56	42.56		40.76	42.44	1.52
P.E.I.	42.61	42.61	42.61		42.61	42.61	0.00
average	44.48	42.43	43.01		42.10	42.80	
variance between provinces	2.39	0.33	1.46		0.69	0.73	

* Manitoba has a seperate class for Mozzarella (12% of industrial milk use in 1991)
Source: Agriculture Canada, "Dairy Market Review 1991", pp26-28
All data are 1991 calendar year data except for average industrial price for Manitoba which is 1990/91 dairy year.

Figure 6: Industrial milk class prices by end use, 1991 ($/hl)



3.2.6 Wholesale and Retail Price Controls

Some provinces set maximum and/or minimum wholesale or retail prices that may be charged for fluid milk. For example, since 1989, Manitoba has set maximum wholesale and retail prices for fluid milk using a "cost of processing/retailing model" (Manitoba Milk Prices Review Commission, Annual Report 1991-92). Alberta "no longer sets the minimum price for milk that may be charged by retailers, nor does it approve the size and type of containers. ... These changes, in part, contributed to increased fluid milk sales in Alberta at a time when other provinces showed per capita consumption declines." (Alberta Dairy Control Board, 1991-92 Annual Report p.ii). Many provinces which currently have regulated retail or wholesale prices indicated that they are considering abolishing them in the near future. Table 15 summarizes retail and wholesale price-setting behaviour by provinces.

Table 15: Retail and wholesale price-setting for fluid milk by provinces

	sets minimum wholesale prices	sets maximum wholesale prices	sets minimum retail prices	sets maximum retail prices
B.C.	no	no	no	no
Alberta	no	no	no	no
Saskatchewan	no	yes	yes	yes
Manitoba	no	yes	no	yes
Ontario	no	no	no	no
Quebec	yes	yes	yes	yes
New Brunswick	no	no	no	no
Nova Scotia	yes	no	yes	no
P.E.I.	yes	no	yes	no
Newfoundland	no	no	no	no

Source: discussions with provincial marketing boards

3.2.7 Plant Supply Quotas

In all provinces, processors may buy as much milk as they like for the higher priced classes of milk used to produce fluid products, and perishable industrial products (ice cream, yogurt, cottage cheese). How the remainder of milk (referred to as 'residual milk') is allocated to cheese and butter/powder production varies by province.

In Ontario, the residual milk used to produce cheese, butter and skim milk powder is allocated to processing plants using quotas. These 'plant supply quotas' are set on the basis of historical production plus annual adjustments to account for changes in demand. Ontario appears to have the most rigid system for allocating milk to processors. The other provinces have various systems ranging from relative freedom of milk allocation (B.C., P.E.I.), to rules such as "milk must flow to its highest valued use" (Alberta, Saskatchewan), to "minimum commitments" of milk to individual processors (Manitoba, Quebec). In some provinces (Alberta, Nova Scotia), processors are 'tied' to particular producers which may have supply quota features if the ties are rigid. More details on provincial milk allocation procedures (and some provinces' rationale for using them) are provided in Hurd(1992).

3.2.8 Import Controls

Imports of dairy products to Canada are low (Table 16) due to border restrictions. Restrictions on imports are essential to maintain the supply management system in Canada. Most products having at least 50% dairy content are on Canada's "Import Control List". Products on this list are eligible for quantitative restrictions on imports. Fixed import quotas are set for cheese (20,412 tonnes in 1991), ice cream (347 tonnes), yogurt (332 tonnes), and buttermilk powder (908 tonnes). Imports of other dairy products are subject to 'discretionary licensing' whereby prospective importers must show that they cannot supply their requirements from a domestic source. Imports are essentially zero for most of these products[8] except in special circumstances[9]. Some import permits are authorized for product for re-export and to supply ships, etc.; these imports and exports can show up in Canada's trade statistics even though the products were not consumed in Canada.

The import quotas for dairy products were considered by Canada to be legal under international trade rules due to Article XI of the GATT.[10] A GATT panel determined that ice cream and yogurt do not meet the requirements to qualify for import quotas under Article XI. However, Canada refrained from lifting the import quota on these products until the Uruguay Round of GATT concluded. The GATT agreement reached in December 1993 and slated for enactment in 1995 essentially abolishes the use of any import quotas, even under Article XI. Tariffs and minimum access provisions will be used to protect Canadian dairy farmers under the new GATT agreement - it remains to be seen exactly how these will be implemented.

It seems likely that a form of import quota will continue to exist under the new GATT agreement as a means of administering the minimum access provisions[11]. Import quotas for supply managed products can be very valuable. Those who hold them may buy product at low world market prices and sell it at high domestic prices. The CITT recently published a study examining the allocation of import quotas and recommending changes to the current system (CITT 1992).

Currently, tariffs are applied to cheese, ice cream, yogurt and buttermilk powder imports within the Article XI import quotas. Most favoured nation (MFN) tariffs are 7-8 cents/kilogram on cheeses and buttermilk powder and 15% on ice cream and yogurt. The tariffs on imports from the U.S. are being reduced under the Canada/U.S. trade agreement and are about half of the MFN rates in 1993. Australia and New Zealand get preferred rates (about 1/3 the MFN rate) on tariffs for buttermilk powder and cheeses. Again, the December 1993 GATT agreement will change the tariffs applied: the tariff on imports within the minimum access commitment will be relatively low, while tariffs on imports above minimum access will likely be very high - over 100%.

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8 Except for casein and caseinate imports which have not been restricted, even though they are on the Import Control List.

9 One such circumstance occurred in the 1986/87 dairy year when, due to export contracts, domestic demand for skim milk powder could not be met from domestic supply. In this case, the CDC authorized about 5 million kg of skim milk powder imports to meet domestic requirements.

10 Article XI.2(c)(i) permitted quantitative import restrictions for agricultural and fishery products where the government restricts production.

11 The difference between these new 'tariff-rate import quotas' and the import quotas which they replace is that product in excess of the new quotas may be imported, subject to a tariff.

Table 16: Imports of dairy products into Canada (dairy year)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Butter (mil kg)	0.04	0.05	0.10	0.04	0.04	0.08	0.11	0.13	0.12	0.17	0.18
as percentage of consumption	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
Skim milk powder (mil kg)	0.00	0.00	0.00	0.00	5.16	0.90	0.67	0.90	1.86	0.23	1.70
as percentage of consumption	0.0%	0.0%	0.0%	0.0%	10.9%	1.4%	1.3%	1.7%	5.7%	0.8%	5.5%
(mil kg)	19.7	20.6	20.5	19.5	17.3	17.5	16.9	16.5	16.8	16.6	17.2
as percentage of consumption	10.3%	10.2%	9.4%	8.3%	7.0%	6.8%	6.4%	6.3%	6.4%	6.3%	6.3%
Other dairy products (mil kg)	0.5	0.4	0.3	0.9	0.8	0.8	1.3	1.3	1.0	1.0	n.a.
as percentage of consumption	1.7%	1.2%	0.9%	2.6%	2.6%	2.3%	3.9%	4.1%	3.0%	3.1%	

Source: FARM database

Table 17: Exports of dairy products from Canada (dairy year)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Butter (mil kg)	4.0	0.2	0.5	0.6	0.3	3.0	0.2	6.1	9.5	10.8	10.1
as percentage of production	3.6%	0.2%	0.5%	0.6%	0.4%	2.9%	0.2%	6.2%	10.0%	11.9%	12.0%
Skim milk powder (mil kg)	126.4	70.9	62.6	58.9	60.9	48.9	41.3	43.9	39.8	61.0	16.0
as percentage of production	91%	55%	55%	59%	61%	45%	40%	47%	50%	97%	32%
Cheese (mil kg)	4.1	4.8	7.7	11.4	9.3	7.4	11.9	10.3	8.1	13.1	11.0
as percentage of production	2%	3%	4%	5%	4%	3%	5%	4%	3%	5%	4%
Other dairy products (mil kg bf eq)	7.6	9.1	8.9	6.0	4.9	3.7	4.0	4.0	3.3	2.9	n.a.
as percentage of production	19%	23%	21%	16%	13%	10%	11%	12%	9%	9%	

Source: FARM database

Table 18: Canadian and world prices for major dairy products (CDN $/tonne, dairy year)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canadian support price for butter	4,373	4,616	4,784	4,923	5,035	5,069	5,102	5,167	5,331	5,331	5,340
World price for butter (FOB N. Europe)	2,501	2,149	1,774	1,399	1,394	1,251	1,609	2,161	1,573	1,638	1,865
	75%	115%	170%	252%	261%	305%	217%	139%	239%	225%	186%
Canadian support price for SMP	2,615	2,748	2,850	2,919	2,978	2,996	3,013	3,046	3,130	3,304	3,322
World price for SMP (FOB N. Europe)	1,019	944	897	874	952	1,167	1,954	2,175	1,653	1,589	2,089
	157%	191%	218%	234%	213%	157%	54%	40%	89%	108%	59%
Canadian support price for cheese	4,428	4,670	4,873	4,992	5,111	5,141	5,183	5,228	5,375	5,529	5,540
World price for cheese (FOB N. Europe)	2,161	1,804	1,590	1,650	1,496	1,411	1,984	2,308	1,970	2,014	2,494
	105%	159%	207%	203%	242%	264%	161%	127%	173%	174%	122%

Source: FARM database

3.2.9 Export Subsidies

One of the main features of the supply management system which distinguishes it from many other support programs (e.g. deficiency payments or price support with no production control) is that, when it is working smoothly, it does not produce excessive levels of surpluses which must be exported. Table 17 shows the level of Canadian exports in recent years; these exports consisted mainly of skim milk powder and whole milk powder. Due to the structure of Canadian demand for dairy products and the fact that milk production quotas have been set on a butterfat basis, skim milk powder surpluses have been produced in Canada over the last 20 years. These surpluses are bought from processors by the Canadian Dairy Commission under the 'offer-to-purchase' program and exported with a subsidy.

Canadian domestic prices for dairy products are above world prices (Table 18) meaning that exports must be subsidized. The export subsidies are paid for by producers through levies. Recently, significant amounts of butter have been exported with a subsidy from Canada, as Table 17 shows. The December 1993 GATT agreement requires that the volume of subsidized exports must be reduced by 21% from 1986-90 levels over six years and the value of export subsidies must be reduced by 36% over the same period.

3.2.10 Stock Levels

Stocks of dairy products are held by both private companies and the CDC. The CDC maintains stocks of butter and skim milk powder. Butter stocks are kept because in Canada, production and consumption of butter are on different seasonal cycles. Generally, consumption of butter exceeds production from September to December, while production exceeds consumption during April to July (CDC 1992, p2). Each year the CDC determines the 'normal' level of butter stocks that they will aim to keep for each month of the year in order to satisfy the seasonal cycle of consumption. This normal level of butter stocks is a function of historical and expected consumption and historical private and CDC stock levels. 'Normal' skim milk powder stocks are not calculated since meeting domestic requirements for skim milk powder has not been an issue yet.

Skim milk powder and butter stocks are also held by the CDC as part of the offer to purchase program. Product in stock that is not required for domestic consumption is exported. Figures 7 and 8 show CDC and private stock levels for butter and skim milk powder. Normal butter stocks have declined with the decline in butter consumption. Skim milk powder stocks have also declined as Canadian excess supply of SMP has dropped.

3.3 Other Policy Instruments

In addition to the price and quantity setting activities described above, a number of other government policies affect the Canadian dairy market. The direct subsidy and producer levies directly affect the price farmers receive for milk and are described below. Also described below are Canadian regulations regarding margarine which have an impact on the demand for butter.

3.3.1 Direct Subsidy

The federal government pays dairy farmers a direct subsidy for milk produced within domestic requirements. Until 1988, the direct subsidy was paid on actual domestic requirements plus the export sleeve; since 1989, the direct subsidy is paid only on actual domestic requirements. The level of this subsidy has been $6.03/hl since 1975-76. The subsidy is included in the target price. This means that part of the target price is being achieved through the market and part through the direct subsidy; the CDC states that the direct subsidy is "intended to moderate the price consumers pay for dairy products, thus stimulating consumption" (CDC annual report). As discussed below (in section 5.2.1), the amount of the subsidy is currently being reduced.

Figure 7: Ending stocks of butter (dairy year)

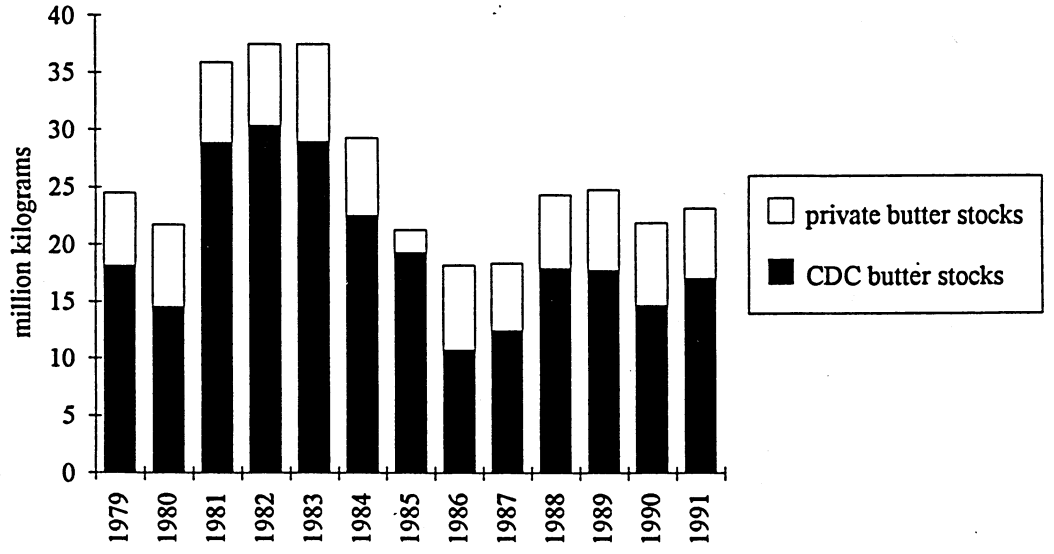
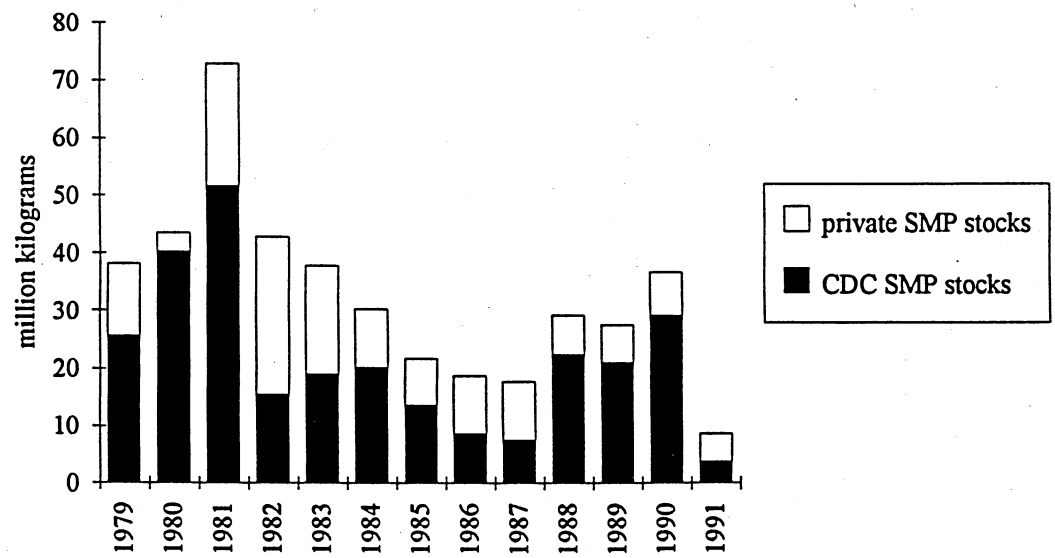


Figure 8: Ending stocks of skim milk powder (dairy year)



3.3.2 Levies

Levies are collected by provincial boards or agencies and forwarded to the CDC. Three types of levies have been charged to dairy producers in recent years: the in-quota levy, a fluid skim-off levy, and the over-quota levy. In addition, the target price includes an amount to cover the costs associated with butter inventories ($0.14/hl in 1991, reduced to $0.08/hl in 1992) and $0.02/hl as a processor contribution to the rebate program for dairy ingredient users (CDC 1992, p10). All these charges reduce the return to farmers below what the target price indicates.

The in-quota levy has traditionally been charged on all industrial milk produced within market sharing quota. The skim off levy has been charged on the volume of skim-off transferred from the fluid sector to the industrial sector. This levy was introduced because the fluid sector, through skim-off, was increasingly supplying butterfat to the industrial sector; it is the contribution from the fluid sector to industrial dairy product exports. These two levies have been combined as discussed in section 5.2.4 below. The over quota levy is charged on all production over MSQ; this levy is set very high to discourage producers from delivering milk above their quota level.

The CDC uses the levy revenue to finance exports of dairy products not required for domestic purposes. The levies are also used to finance special programs designed to increase domestic utilization of butterfat and skim milk powder (discussed in section 5.2.5). Figure 9 shows the total levies collected from the industrial and fluid sectors and illustrates how the fluid sector contributed more to levy revenue in 1992. Figure 9 also displays the world skim milk powder price to show the inverse relationship between this price and total levies collected; when the world SMP price is low, more levies are required to finance exports. Table 19 shows in-quota and over-quota levy rates over time.

3.3.3 Margarine Regulations

Three types of regulation exist for margarine in Canada: colour restrictions, restrictions on butter/margarine blends, and trade restrictions. In Ontario and Quebec, margarine may not be coloured to look like butter. This regulation ensures that consumers purchasing margarine are aware that it is not butter. Blends of butter and margarine are currently banned in all provinces except for Saskatchewan and Nova Scotia. These spreads are marketed in some other countries and it is a matter of debate whether allowing blends will add to or reduce the demand for butter. Imports of margarine and other butter substitutes into Canada are banned. This prohibition was put into place in the late 1800's and grandfathered under the GATT (Heick, 1991); margarine will be subject to tariffication and minimum access conditions under the new GATT agreement.

3.4 Effective Prices

Given the combination of target price, direct subsidy, levies and provincial class pricing, a natural question to ask is what is the bottom line? That is, what is the effective price that producers receive for milk. Also, what is the price that processors actually pay for milk? The actual average prices paid and received depend upon the amount of milk sold in each class in each province. This section attempts to estimate effective prices using policy parameters.

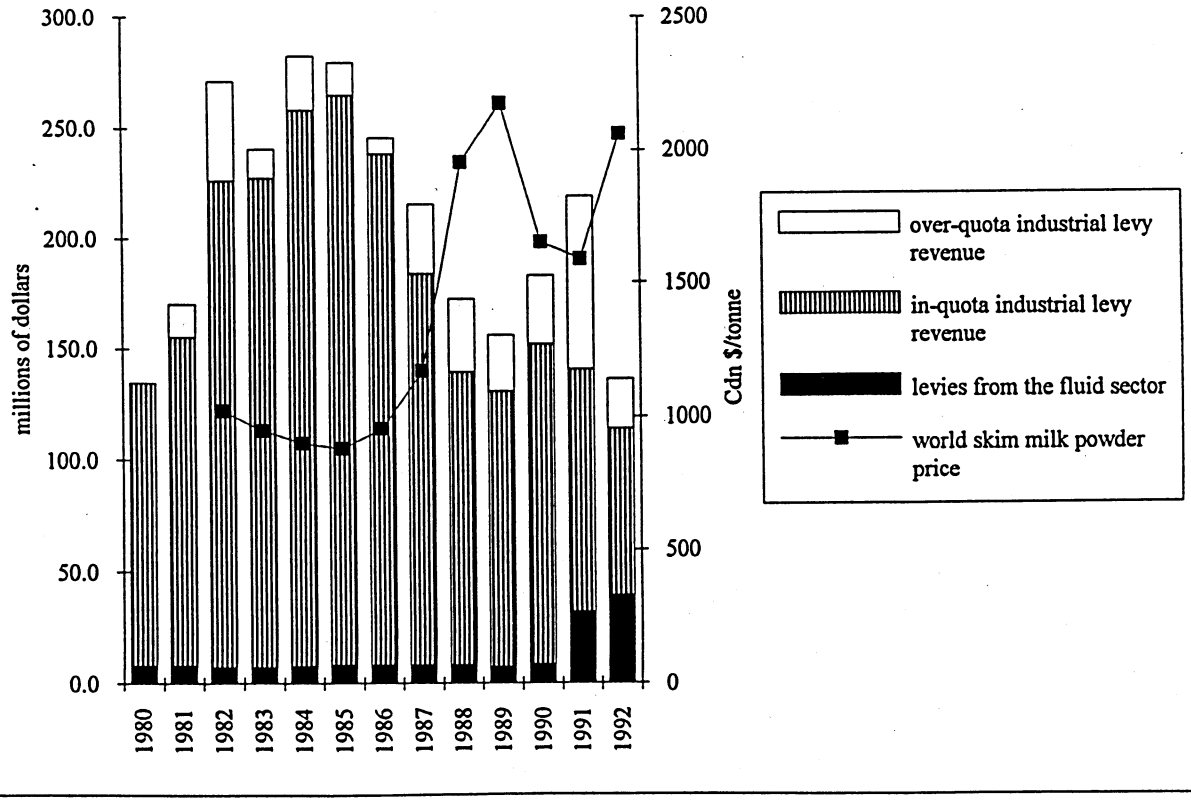
To estimate the effective price paid to farmers for in-quota industrial milk using policy parameters, the in-quota levy, the charges for butter storage, and the processor contribution to the Rebate program (see

Table 19 Dairy levies

		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
in-quota industrial levy	$/hl	4.68	5.14	6.17	6.07	5.35	4.11	3.08	2.91	3.40	N.A.	N.A.
over-quota industrial levy	$/hl	27.31	31.47	37.21	37.98	38.00	33.90	26.63	28.49	32.64	37.15	33.86
levies from the fluid sector	$ million	6.8	6.9	7.5	7.9	8.0	8.1	8.0	7.2	8.1	31.8	39.4
in-quota industrial levy revenue	$ million	218.9	220.0	250.3	256.6	230.0	175.4	131.3	123.8	143.6	109.0	75.0
over-quota industrial levy revenue	$ million	45.1	13.4	24.4	14.8	7.5	31.9	32.9	25.0	31.3	78.5	22.4
Total levies collected by CDC	$ million	270.8	240.3	282.2	279.3	245.4	215.3	172.3	155.9	183.1	219.3	136.8

Source: CDC annual reports

Figure 9: Dairy levies and the skim milk powder price



Source: levies from CDC annual reports, world skim milk powder price from USDA, World Dairy Situation and Outlook

section 5.2.5) are all subtracted from the target price as shown in Table 20. For over-quota industrial milk, the over-quota levy, the direct subsidy, the storage charges, and the processor contribution are subtracted from the target price to determine the effective price. This method of estimating effective prices assumes that the target price is achieved; Table 21 shows that this is the case.

The effective price farmers receive for fluid milk depends on the class I price. All levies paid by fluid producers should be subtracted from the class I price to estimate the effective price. Table 20 presents the Ontario Class I price for fluid milk (which was a little under the national average fluid price in 1991 as shown in Figure 5) and subtracts levies to arrive at an estimate of the effective price to farmers. A refinement to this estimate would be to calculate the weighted average class I price across provinces and subtract the skim-off levy from this. Levies paid by fluid milk producers increased significantly beginning in 1992, causing the effective price for fluid milk to diverge from the Class I price.

Processors pay the Class prices set by the provinces for milk, depending upon which product they are making. The average price that processors pay for industrial milk is the weighted average industrial price reported in Table 21. As shown in Table 21, this price is approximately equal to the target price less the direct subsidy. The average price paid for fluid milk in Canada is the average Class I price, weighted by provincial production.

Figure 10 summarizes the results discussed above. The effective price received for fluid milk (as approximated by the Ontario price) is about 8-10 dollars per hectolitre greater than the effective price received for industrial milk. The price received for over-quota milk is well below the world price of milk and almost zero in some years. Figure 10 also shows that the effective prices for fluid and industrial milk are moving upward at a steady pace and appear unresponsive to world price changes.

3.5 Transfer and Value of Production Quotas

As discussed above, the provincial milk boards or agencies allocate production quota for fluid and industrial milk to individual farmers. The complex issues regarding milk production quota value and the transfer of these quotas between farmers are discussed briefly in this section.

Quota Transfer

Tallard and Curtin (1991) provide an up-to-date description of quota transfer policies in Canada. Table 22, taken from their report, summarizes some of the main features surrounding quota transfer in Canada. Barichello and Cunningham-Dunlop (1987) also provide a complete description of each province's quota transfer policies as they existed in the mid 1980's; however, some changes have occurred since then. For example, in 1986, Manitoba prohibited any value being placed on quota; by 1989, Manitoba was allowing exchange of quota.

Quota Values

At the introduction of supply management, farmers were allocated production quota based on their historical production levels. Since then, the production quotas have attained value. This value reflects the profits dairy farmers are making due to supply restriction. If there were no supply restrictions and free entry to the dairy industry, production quotas would have no value.

Farmers who were already producing milk in the early 1970's and were given quota, have made large capital gains. On the other hand, new farmers wishing to enter the dairy industry as well as farmers who wish to expand their current operations, must purchase quota, thereby increasing their overhead costs. The following example gives an idea of the value of quota. In 1992 in Ontario, the industrial milk production quota embodying the right to deliver one kilogram of butterfat in a year cost about $30. (Dairy Market

Table 20: Calculation of effective prices for industrial milk (in and over quota production) and fluid milk ($/hl)

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
In-quota production of industrial milk														
Target price	a	35.55	38.96	41.33	43.24	44.65	45.64	46.48	46.77	47.06	47.45	48.69	49.92	50.11
In-quota levy *	b	2.96	3.27	4.68	5.14	6.17	6.07	5.35	4.11	3.08	2.91	3.40	3.37	2.90
Butter storage charge	c							0.14	0.14	0.14	0.14	0.14	0.14	0.08
Processor contribution to rebate program	d												0.02	0.02
Net return	e=a-b-c-d	32.59	35.69	36.65	38.10	38.48	39.57	40.99	42.52	43.84	44.40	45.16	46.39	47.11
Direct subsidy	f	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03
Net return from market	g=e-f	26.56	29.66	30.62	32.07	32.45	33.54	35.10	36.63	37.95	38.51	39.27	40.52	41.18
Over-quota production of industrial milk														
Over-quota levy	h	18.16	20.04	27.31	31.47	37.21	37.98	38.00	33.90	26.63	28.49	32.64	37.15	33.86
Net return	j=a-h-f-c-d	11.36	12.90	7.99	5.74	1.41	1.63	2.31	6.70	14.26	12.80	9.88	6.58	10.12
Fluid milk production														
Ontario class I price	k	39.62	43.37	45.67	46.75	49.81	51.74	51.89	52.29	53.67	54.15	55.75	56.63	57.26
Fluid milk production - Canada	l	26.12	26.24	26.75	28.35	28.18	28.85	29.43	29.97	29.90	29.95	30.12	30.71	30.36
Total fluid levies collected	m	7.75	7.78	6.80	6.88	7.50	7.87	7.95	8.07	8.03	7.15	8.15	31.83	39.36
Est. per unit levy on fluid milk	n=m/l	0.30	0.30	0.25	0.24	0.27	0.27	0.27	0.27	0.27	0.24	0.27	1.04	1.30
Estimated effective price	p=k-n	39.32	43.07	45.41	46.51	49.54	51.46	51.61	52.02	53.40	53.91	55.48	55.59	55.96
World reference price for milk		16.61	19.84	20.36	18.36	16.14	12.02	10.73	15.11	19.28	19.82	15.43	15.56	17.96

Sources: Policy parameters are from FARM database and CDC annual reports
World reference price is from OECD PSEs and is based on New Zealand export prices.
* industrial in-quota levy for 1991 and 1992 is from Dairy Farmers of Canada (1992), Table 29.

Table 21: Comparing weighted average industrial milk price with net target price

	weighted average industrial price ($/hl)			1990 MSQ
	1989/90	1990/91	1991/92	(mil kg bf)
B.C.	41.2	42.1	43.5	6.4
Alberta	41.1	42.6	42.9	10.7
Saskatchewan	39.5	40.8	42.1	4.1
Manitoba	41.7	42.6	44.3	6.2
Ontario	42.7	43.9	48.5	50.0
Quebec	41.7	43.1	44.3	76.2
New Brunswick	40.8	42.1	43.2	2.1
Nova Scotia	40.5	41.9	43.2	2.1
P.E.I.	40.5	41.6	43.9	3.0
average weighted by 1990 MSQ	41.9	43.1	45.4	
target price	47.5	48.7	49.9	
target price less direct subsidy (net)	41.5	42.7	43.9	
percentage difference between average price and net target price	0.9%	1.0%	3.5%	

Sources: Weighted average industrial milk prices from Agriculture Canada, Dairy Market Review, 1991 (p.34) and 1992 (p.44).

Figure 10: Effective prices for milk in Canada

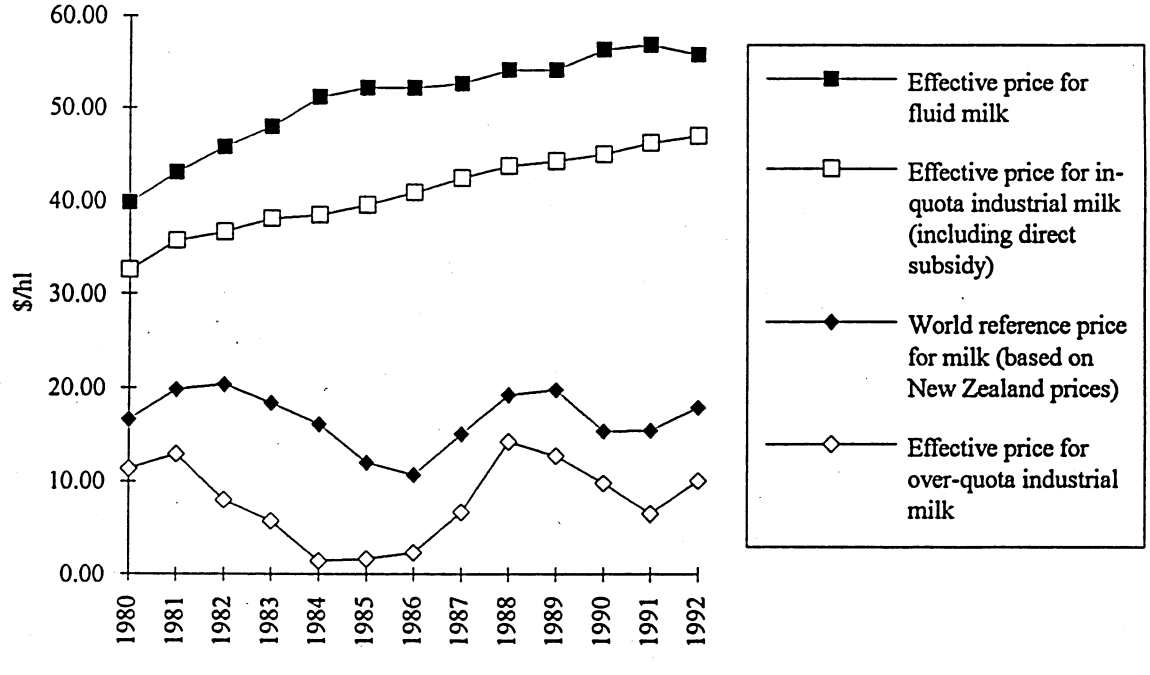


Table 22: Current Situation for redistributing quotas between producers interprovincially

Province	Transfer without assessment	Transfer with assessment	% assess-ment	New producers program	Regional constraint
British Columbia	Within families	All other transfers	10.00	priority to acquire quotas	Yes
Alberta	All transfers	-	-	None	None
Saskatchewan	Within families Integral part of a complete dairy unit	All other transfers	20.00	Board distribute quota	None
Manitoba	Within families Integral part of a complete dairy unit	All other transfers	15.00	Board distribute quota	None
Ontario	Within families Integral part of a complete dairy unit	All other transfers	15.00	None	Yes
Quebec	Within families Integral part of a complete dairy unit	All other transfers	15.00	Board distribute quota	Yes
New Brunswick	Within families Integral part of a complete dairy unit	All other transfers	FMQ 15 MSQ 25	None	None
Nova Scotia	Within families Integral part of a complete dairy unit Fluid milk	All other transfers	MSQ 10	Board distribute quota	Yes
Prince Edward Island	Within families Integral part of a complete dairy unit Fluid milk	All other transfers	15.00	Board distribute quota	None
Newfoundland	All transfers	-	-	Board distribute quota	None

** Regional constraint: means that you are not allowed to buy quota from a certain region to produce in another region.

Source: Tallard and Curtin, 1991

Review, 1992) A cow that produces 55 hectolitres a year requires about $6,000 worth of quota and a farm of 50 producing cows requires about $300,000 worth of quota.

Quota value embodies the net present value of the expected stream of benefits (above normal returns) arising from milk production under the current system (Veeman 1987, p999). Things that directly affect quota value are the size of the gap between the target price and farmers' marginal cost of production, uncertainty about the maintenance of the supply management system, and interest rates. Other factors which may affect the price of quota are institutional rules regarding quota transfer (e.g., linking quota to a particular farm, waiting periods, maximum farm size, assessments, etc.) and the degree to which non-farmers find investment in quotas attractive (Schmitz, 1983, p143-4).

Table 23 and Figure 11 present quota values, by province, for February 1992

3.6 Summary

The major groups involved in the setting of prices and quantities are the federal government (CDC and CMSMC), provincial government agencies, and provincial producer marketing boards.

The federal government, through the CDC, sets a target price for milk based on cost of production surveys and then determines what level of support prices for butter and skim milk powder will guarantee the target price. Based on information prepared by the CDC, the CMSMC sets the quota level to meet domestic requirements plus a 3-4% 'sleeve' or safety margin. Imports of all dairy products are tightly restricted through tariffs and import quotas. The CDC also pays farmers a direct subsidy and collects producer levies to finance exports of surplus product.

Provincial governments have primary responsibility for fluid milk pricing and quota. Provinces also administer the industrial milk market given federally set prices and quotas. They allocate industrial milk quota to farmers, calculate payments to farmers for milk shipments, collect levies, and negotiate with processors to determine the prices paid for milk. Some provinces also set maximum and/or minimum prices to be charged for fluid milk at the retail or wholesale level. Some provinces determine the amount of milk individual processors may purchase through plant supply quotas.

Provincial governments either perform these duties themselves or producer-run marketing boards administer the milk arrangements. Sometimes the duties are split with, e.g., a provincial government agency determining the fluid price and a producer group determining the fluid quota. Table 24 reports the provincial agencies directly involved in the milk market and shows which groups have responsibility for setting the major milk policy parameters. The classification producer vs government in this table may not be completely clear-cut; government may have an influence on the decisions of producer boards and vice-versa.

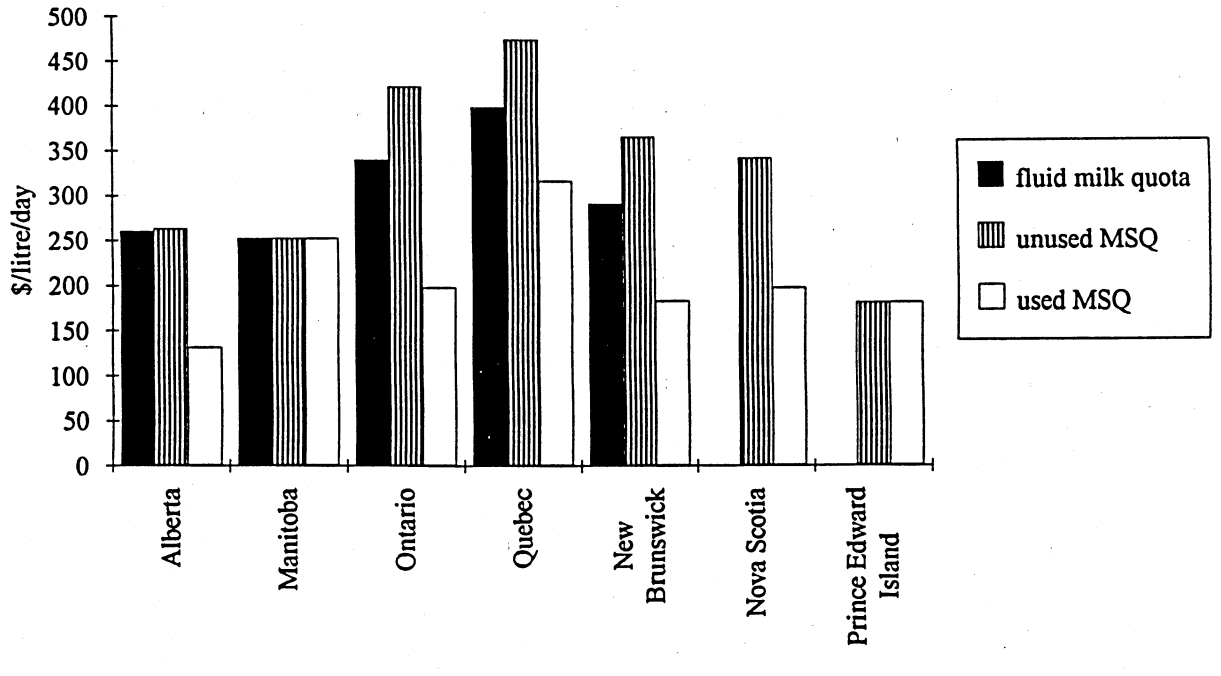
Table 25 summarizes the instruments used by the federal and provincial agencies. Although the instruments in this table are separated into fixed categories, in reality, as previously discussed, they are inter-related and policy makers cannot set one without considering the others.

Table 23: Production quota value by province, February 1992

	fluid milk	unused MSQ	unused MSQ	used MSQ	used MSQ	all milk
	$/litre/day	$/kg butterfat/year	$/litre/day	$/kg butterfat/year	$/litre/day	$/litre/day
B.C.	no exch	no exch		no exch		
Alberta	260.00	20.00	262.80	10.00	131.40	
Saskatchewan	no exch	no exch		no exch		
Manitoba						252.00
Ontario	339.95	32.05	421.14	14.98	196.84	
Quebec	397.62	36.01	473.17	24.00	315.36	
New Brunswick	290.00	27.78	365.03	13.89	182.51	
Nova Scotia	no exch	26.00	341.64	15.00	197.10	
Prince Edward Island	-	13.75	180.68	13.75	180.68	
Newfoundland	no exch					
Average	321.89	25.93	340.74	15.27	200.65	

no exch: there is no official quota exchange in these markets
- : no quota was exchanged during the time period
Source: 1992 dairy market review, page 45
Note: $/kg butterfat/year *3.6 kg butterfat/hl milk *365 days/year /100 litres/hl = $/litre/day

Figure 11: Milk production quota values in Canada, February 1992



Source: Table 23

Table 24: Provincial dairy agencies and areas of responsibility

Province	Agencies	Producer or Government	Who sets fluid quota	Who sets fluid price	Who sets Industrial prices	Differential end-use pricing? (# of industrial classes)
British Columbia	B.C. Milk Marketing Board	government	government	government	government	yes (4)
Alberta	Alberta Dairy Control Board	government	government	government	government	yes (4)
	Public Utilities Board	government				
Saskatchewan	Milk Control Board	government	government	government	government	yes (2)
Manitoba	Manitoba Milk Prices Committee	government	producers	government	producers	yes (7)
	Manitoba Milk Producers' Marketing Board	producer				
Ontario	Ontario Milk Marketing Board	producer	producers	producers	producers	yes (6)
	Ontario Cream Producers Marketing Board	producer				
	The Farm Products Marketing Commission	government				
Quebec	Federation des producteurs de lait du Quebec	producer	producers	government	producers	yes (6)
	Cooperative Federee de Quebec	producer owned processors				
	Conseil de l'industrie laitere du Quebec	non-producer processors				
	Regie des marches agricoles	government				
New Brunswick	New Brunswick Milk Marketing Board	producer	producers	producers	producers	yes (3)
	Farm Products Marketing Commission	government				
	New Brunswick Cream Marketing Board	producer				
Nova Scotia	Nova Scotia Dairy Commission	government	government	government	government	yes (3)
P.E.I.	Natural Products Marketing Council	government	producers	government	producers	no (6)
	P.E.I. Milk Marketing Board	producer				
Newfoundland	Newfoundland Milk Marketing Board	producer	producers	producers	not applicable	n.a.

Source: compiled from CDC factsheet on provinces' role in dairy (1989)

Table 25: Overview of Dairy Industry Policy Instruments

Jurisdiction	Policy Instrument				
	Supply Control	**Income Support**	**Import Constraint**	**Export Assistance**	**Demand Enhancement**
Federal		Offer-to-purchase for butter and SMP Product support prices Direct subsidy for industrial milk Industrial milk target return	Import embargoes or quotas Tariffs Licenses to importers	Direct export subsidies In-quota levy to fund planned exports Over-quota levy to fund additional exports	in-quota levy to finance input subsidies to further processors
Federal-Provincial (CMSMC)	Aggregate industrial milk quota and allocation to provinces			Approval of producer levies recommended by the CDC	Approval of demand enhancing programs
Provincial	Allocation of industrial milk quota to producers Determination of fluid milk quota and allocation to producers Plant supply quotas	Discriminatory pricing to milk processors depending on end-use Fluid milk pricing formula Wholesale or retail price controls			

Source: Adapted from Stonehouse (1987), Figure 5, p51.

4 DEMAND CHARACTERISTICS

Administrators at the federal level must have a good idea about the demand for industrial milk products in order to set the MSQ level and support prices for butter and skim milk powder. At the provincial level, a good idea of fluid milk demand helps administrators set the fluid milk quota and Class I price, as well as any controls on wholesale or retail fluid product prices. Knowledge of demand for industrial milk products would also help provincial agencies in setting the milk class prices.

As with most aspects of the dairy industry in Canada, demand for dairy products has been the subject of a number of studies. This section first states recent trends in consumption levels for dairy products. Then, other studies' findings regarding the structure of demand are used to see how well they can explain the trends. Finally, some implications of the consumer demand trends are discussed.

4.1 Trends in Consumption

Per capita consumption levels for major dairy product groups are plotted for 1980 to 1992 (Figures 12 and 13). The average rate of change in Canadian per capita consumption over the periods 1980-92, 1980-85, 1986-92, and 1989-92 are compared in Table 26.

Fluid milk: Per capita consumption of fluid milk (standard milk plus low fat milk[12]) declined by almost 1% per year over the period 1980 to 1992. The makeup of fluid milk consumption has changed dramatically over the last ten years with a switch from standard milk to low-fat milk.

Cream: Per capita fluid cream consumption (table cream, whipping cream, sour cream and cereal cream) increased by an average of 3% per year over 1980 to 1992. The increase was concentrated in the first part of the 1980's with over 5% per year increases over 1980-85; increases over 1986-92 were under 1% per year.

Butter: Per capita butter consumption fell by 2.6% per year over 1980 to 1992. The fall is more pronounced in the second half of the period; over 1986-92 per capita butter consumption fell by over 3% per year while the drop over 1980-85 was only about 1.5 % per year. In the last few years (1989-92) the drop in butter consumption is even higher at an average of 4.6% per year.

Skim milk powder: Per capita skim milk powder consumption fell by an average of almost 4% per year over 1980-92. Like butter consumption, the decrease is greater in the later part of the period than the earlier, falling by over 6% per year over 1986-92; per capita consumption fell by an average of 1% per year over 1980-85.

Cheddar cheese: Per capita cheddar cheese consumption remained fairly stable over 1980-92, increasing a little in the first half of the decade and declining in the second half.

Specialty cheese: Specialty cheese consumption grew rapidly at close to 5% per year on average over 1980-92. Growth was at a greater rate in the early 1980's, averaging 7% per year, and continued at around 2% per year in the late 1980's and early 1990's.

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[12] Low fat milk is defined here to consist of 2% milk, 1% milk, skim milk, buttermilk (2% butterfat) and chocolate milk (2% butterfat).

Table 26: Trends in per capita consumption of dairy products

	1980 level	1992 level	total change 1980-92	Average annual change 1980-85	1986-92	1980-92	1989-92
Fluid milk (litres)	104.5	93.7	-10.3%	-0.4%	-1.6%	-0.9%	-1.1%
Standard milk (product equivalent)	40.5	18.2	-55.0%	-4.7%	-6.6%	-4.6%	-8.0%
Low-fat milk (product equivalent)	64.0	75.5	18.0%	2.3%	0.4%	1.5%	1.1%
Fluid creams (3.6% milk equivalent)	15.0	20.1	34.3%	5.3%	0.5%	2.9%	-0.1%
Butter (kilograms)	4.4	3.0	-31.7%	-1.5%	-3.4%	-2.6%	-4.6%
Skim milk powder	2.1	1.1	-46.3%	-1.1%	-6.7%	-3.9%	-14.5%
Total cheese	7.9	9.9	24.7%	3.5%	0.3%	2.1%	-0.4%
Cheddar cheese	4.1	3.8	-7.7%	0.2%	-2.2%	-0.6%	-2.6%
Specialty cheese	3.8	6.2	61.3%	7.0%	2.6%	5.1%	1.5%
Ice cream (litres)	13.0	11.2	-13.4%	-1.0%	-1.8%	-1.1%	-2.1%
Yogurt	1.6	3.3	100.0%	9.8%	2.9%	8.3%	-1.0%
Other dairy products (butterfat equivalent)	1.2	1.1	-9.1%	1.1%	-1.7%	-0.8%	-1.5%

Source: FARM database
Average annual change = percent change over period/number of periods
Note: due to the nature of the FARM database, other dairy products includes ice cream and yogurt consumption in butterfat equivalent

Figure 12: Per capita consumption of fluid products

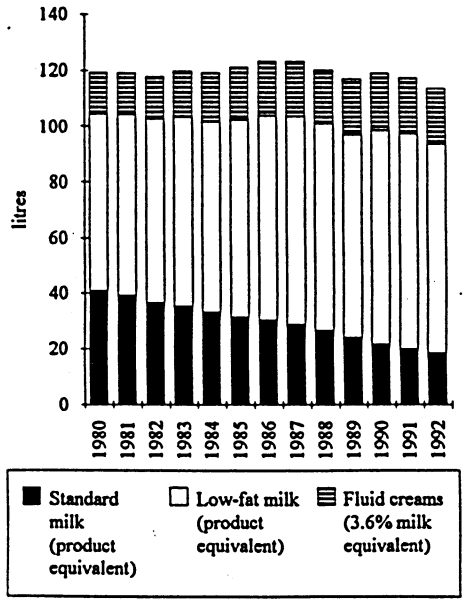
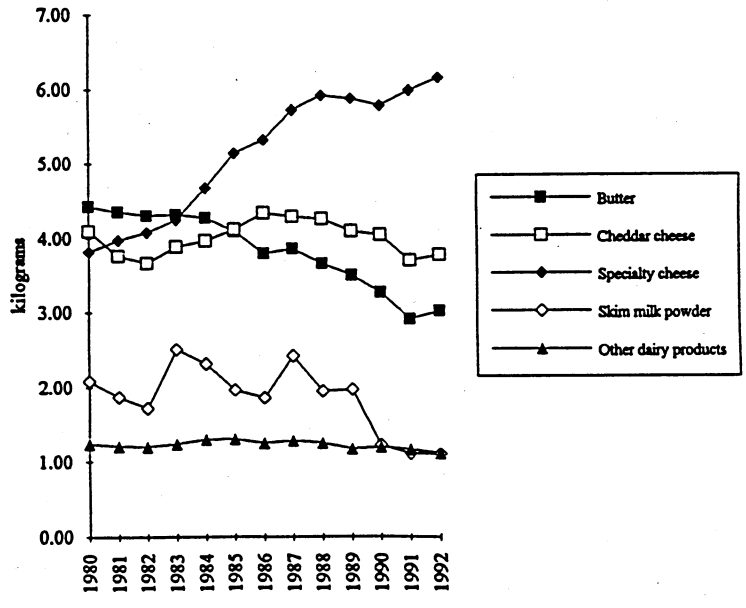


Figure 13: Per capita consumption of dairy products (product equivalent)



Ice cream: Per capita ice cream consumption fell by an average of 1% per year over the last decade.

Yogurt: Yogurt consumption doubled between 1980 to 1992 for an average annual growth of over 8%. The growth tapered off in the last few years.

Other dairy products: Per capita consumption of other dairy products expressed in butterfat equivalent (includes ice cream, yogurt, cottage cheese, whole milk powder and other milk concentrates) fell slightly over 1980-92.

4.2 Explaining Consumer Trends

Total demand for various dairy products depends on prices, income, demographics and preferences. Heien and Wessells (1988) in a cross-sectional analysis of dairy product demand for the U.S., decompose observed changes in consumption into various demographic and economic causes. They find that most of the change in demand for milk and butter in the U.S. over 1948-84 can be explained by demographic (age/sex composition of households, fraction of meals eaten at home, race, occupation, region, tenancy, and others) and economic (own-price, cross-price and income) variables. They state "Although not tested as a formal hypothesis, the authors conjecture that very little taste change has occurred in [U.S.] dairy product demand.". (p.226)

On the other hand, Chang and Kinnucan (1990) consider that "health concerns may be a significant element in determining the trend in [Canadian] butter consumption". This hypothesis seems reasonable, but no empirical studies explicitly modelling this factor have been found. Reynolds (1991) considers the switch of consumption from standard milk to low-fat milk a proxy for consumer preference for a low-fat diet. He says "with the exception of fat content, standard milk is comparable with lowfat milk in most respects including cost and convenience of use. Consequently the observed consumption shift from standard milk to lowfat milk may be taken as a clear indication of consumer preference toward a lowfat diet."

Campbell (1990) points out "No one factor dominates the host of current trends in the dairy market. The public's heightened health awareness is behind some of the changes, while increased income and a taste for indulgence drive up consumption of higher fat products. In particular, there is not a generalized decrease in the consumption of products containing butterfat; consumption is down for some of these products and not others." (p. 6)

In summary, a number of demographic variables (such as slowing of population growth and aging of the population) have likely had some effect on dairy product demand in Canada over the last decade (Hampton 1993). Health concerns regarding fat and cholesterol have likely decreased demand for butter and standard milk which have close substitutes that are perceived to be 'healthier'. Other products such as specialty cheese and yogurt may have been positively affected by demographics and taste changes. Advertising may also have increased demand for some dairy products. The next sections will attempt to sort out the effects that changes in each major dairy product's own price, its substitutes' prices, and disposable income of consumers have had on consumption over the last 12 years.

4.2.1 Demand Elasticity Estimates

Own price elasticities

Table 27 compares the own-price elasticities estimated in four studies - more complete reporting of the elasticities from these studies is presented in Appendix IV. These elasticities were computed using data from

different time periods. Thus, to the extent that demand curves have shifted over time due to preferences or other factors not captured in the experimenters' models, one would expect these elasticities to differ.

Table 27: Comparison of own-price elasticity estimates for dairy products

	Hassan and Johnson (full demand system)	Hassan and Johnson (SUR*)	Moschini and Moro	Reynolds	Chang and Kinnucan
Fluid milk	-0.44	-0.44	-0.26	-0.71	n.e.
Butter	-0.86	-1.06	-0.88	n.e.	-1.42
Cheese	-0.91	-0.86	-0.55	n.e.	n.e.
Skim milk Powder	-0.19	-0.16	n.e.	n.e.	n.e.

* SUR = Seemingly Unrelated Regressions
Sources:
Hassan and Johnson, 1976, full demand system estimates - Table 15, SUR estimates - Table 5
Moschini and Moro 1993, Table 25
Reynolds 1991, Table 3
Chang and Kinnucan 1990, page 304.
n.e.: not estimated

All four fluid milk own-price elasticity estimates indicate that demand for fluid milk is price inelastic. This result conforms with the idea that fluid milk is considered to be a necessity and thus has a fairly inelastic demand. Reynolds estimated a higher elasticity for fluid milk than the others.

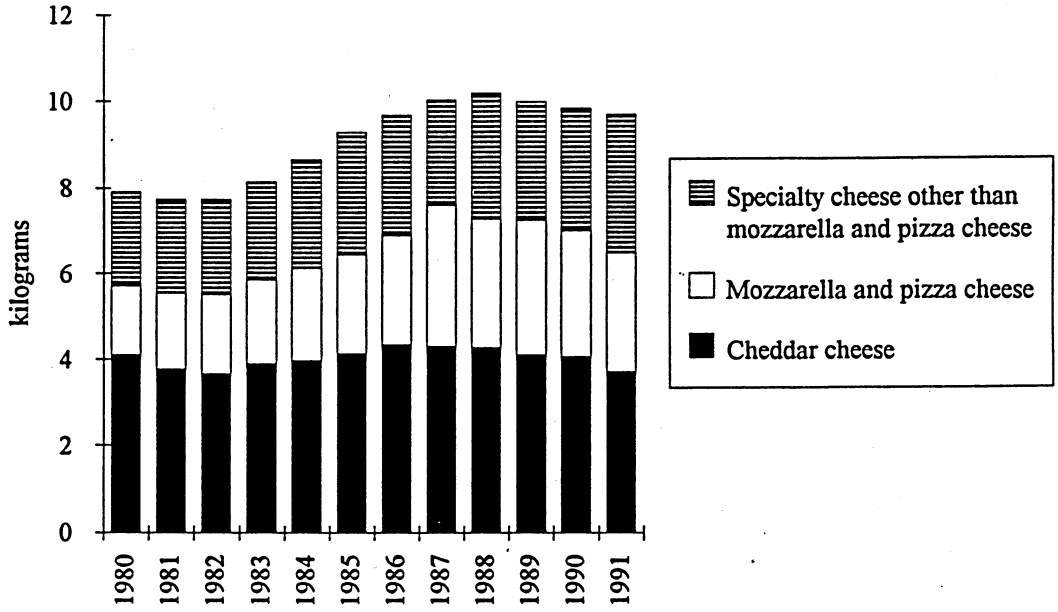
All four butter elasticities are more elastic than the fluid milk elasticities, indicating that butter demand is more price responsive than fluid milk demand. However, the demand system estimates show butter demand as price inelastic, whereas Hassan and Johnson's SUR and Chang and Kinnucan's estimates indicate that butter demand is price elastic. The higher the own-price elasticity of butter, the greater the effect of changes in the support prices on butter demand.

The cheese elasticities show cheese demand to be price inelastic. In their demand system estimates, Hassan and Johnson estimate cheese demand to be more price elastic than butter while Moschini and Moro show cheese demand as less elastic than butter. Moschini and Moro's cheese variable is defined to be cheddar and processed cheese only. Hassan and Johnson included all cheeses in a single cheese aggregate. The treatment of the cheese aggregate will have an impact on the results. Figure 14 shows that specialty cheese consumption was responsible for all the increase in cheese consumption over the 1980's and now accounts for over half of all cheese consumption. Unfortunately, a retail price series for specialty cheese is not readily available, so it is difficult to separate the price and income effects on consumption of the different cheese types.

Cross price elasticities

Appendix IV presents the cross price elasticities from the four studies. In general, the demand systems tend to show low positive cross price effects on dairy product consumption for most non-dairy commodities (elasticities in the order of .03). Higher cross price effects are estimated between dairy products. Some negative cross price elasticities occur in the demand system estimates, indicating complementary relationships.

Figure 14: Per capita cheese consumption (dairy year)



Source: cheddar and total specialty cheese consumption from FARM database
Consumption of mozzarella and pizza cheese estimated using production figures in Dairy Market review - various issues

Specialty cheese other than mozzarella and pizza cheese includes the following products:

	1992 calendar year production (tonnes)
brick	5,449
brie-camembert	1,427
colby	2,632
cream	18,318
farmer's-skim milk	3,442
feta	3,581
gouda	2,455
havarti	1,906
monterey jack	1,583
parmesan	3,237
quark-baker's-cook	1,195
ricotta-whey	3,198
swiss-emmental gruyere	3,831
others	8,299

Total	60,553

Source: Dairy Market Review 1992, p.49

It is interesting to note the results for the effect of changes in the margarine price on butter consumption. Hassan and Johnson's demand system estimate of this cross-price elasticity is very low at 0.05; Moschini and Moro's estimate shows margarine being a complement for butter. Chang and Kinnucan's estimate of this elasticity is 0.29[13]. The regulations in Ontario and Quebec regarding margarine colour likely reduce the butter/margarine cross-price elasticity. An examination of butter and margarine consumption levels in Canada shows that over the 1970's butter consumption fell and margarine consumption rose (Figure 15). However, over the 1980's, margarine consumption has remained fairly constant at about 5.8 kg/person while butter consumption continued to fall. In the U.S., both butter and margarine consumption levels remained fairly constant over the 1970's and 1980's at about 2kg and 5kg respectively (Agriculture Canada 1990, Table 201). Figure 16 shows that the ratio of butter to margarine price in Canada increased over 1975-81 and has remained fairly flat since then. This evidence suggests that there has not been much substitution of margarine for butter in the last decade.

Income elasticities

Hassan and Johnson's income elasticities for milk, butter and cheese are an order of magnitude larger than Moschini and Moro's (see Appendix IV for details). It seems reasonable that the fluid milk income elasticity would be very low. However it seems likely that butter and cheese (especially specialty cheese) would have higher income elasticities than fluid milk.

4.2.2 Explanatory Power of Demand Elasticities

This section gives a rough idea of how much of the changes in Canadian dairy product consumption over the last decade are due to price and income changes and how much are due to demographic or preference changes. Table 28 shows changes in real prices for a number of food items. Real prices for dairy products have fallen over the period; these price drops, taken alone, would cause an increase in dairy product consumption. Real prices of substitutes for dairy products have also fallen over the last decade; these drops, taken alone, imply a decrease in dairy product consumption due to substitution effects[14]. Table 28 also shows the change in real disposable income over the last decade. Real disposable income rose over the period which tends to increase consumption of most dairy products (except perhaps skim milk powder and standard milk for which some studies estimate negative income elasticities).

Fluid milk (standard plus low-fat): The real fluid price dropped by 11% over 1980-92 which could cause a 3-8% increase in consumption due to own-price effects (depending on the choice of elasticity). According to the cross price elasticities estimated by Moschini and Moro, substitution effects could cause a decrease in fluid milk consumption of about 6%. The positive income effect is less than 1% (again using Moschini and Moro's estimates). Thus, price and income effects can at most explain a drop in fluid milk consumption of about 2% over 1980-92. The actual decline in consumption of 9% likely incorporates some demographic or taste change. Certainly the switch from standard to low fat milk appears to be partially due to preference change.

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[13] Chang and Kinnucan used a non-systems approach. They state that "in preliminary analysis, we estimated an almost ideal demand system model. Results indicated that, for our data, most restrictions implied by theory did not hold. The estimated parameters, moreover, were unreasonable ... own-price effects for three out of four commodities were positive ... and cross-price effects indicated that butter and margarine were complements". The sample is quarterly data for 1973-1986.

[14] Moschini and Moro also estimated some complement relationships between dairy and other foods. The impact of these relationships on dairy product consumption would be positive since all prices fell. However, an examination of the size of these complement effects indicates that they are smaller than the substitution effects and thus the net effect of changes in the prices of non-dairy items on dairy consumption is negative.

Figure 15: Per capita consumption of butter and margarine in Canada

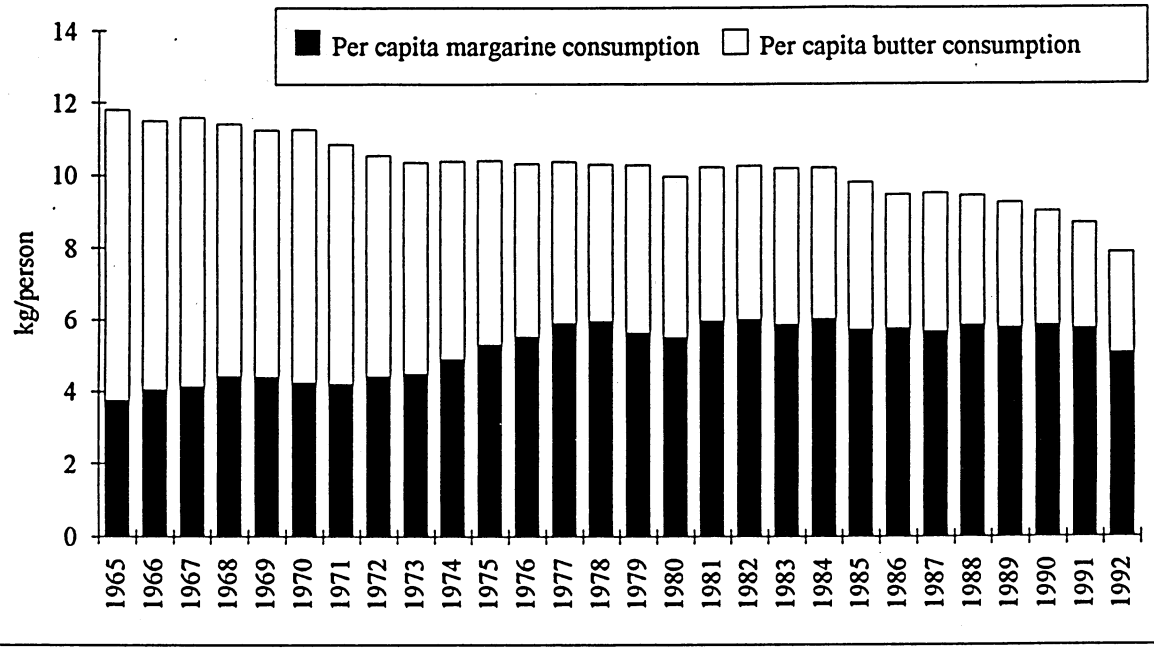
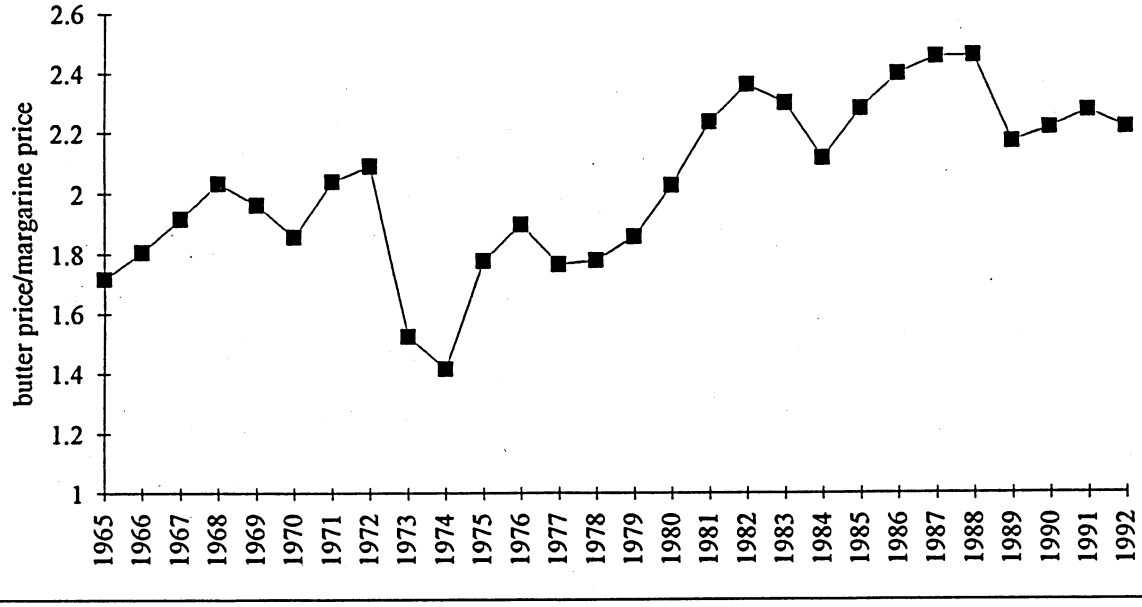


Figure 16: Ratio of butter price to margarine price, Canada



Source: FARM database

Butter: The real butter price fell by 15% over the period which, taken alone, would stimulate demand significantly (13% to 21% depending on the own-price elasticity chosen). Cross price effects from margarine and other products could be as large as -23%. Thus own and cross price effects could explain up to about 10% of the 36% drop in butter consumption. Again, it appears that demographic and/or preference changes have had a major impact on butter consumption in Canada over the last decade.

Cheese: The real cheddar cheese price did not change much over the period and thus there is little own-price effect on cheddar cheese consumption. Substitution effects imply about a 7% drop in cheese consumption over the period (using elasticities from Moschini and Moro). This matches quite well the actual drop in cheddar consumption of 9% over 1980-92, implying that there has been little demographic or taste change affecting consumption of cheddar. Although it cannot be tested until a specialty cheese price series is found, it seems unlikely that prices alone could account for the massive increase in specialty cheese consumption (close to 50% of which is mozzarella). Changes in eating habits towards food made away from home (namely pizza) may explain part of the increased specialty cheese consumption over the 1980s.

Table 28: Percent change in real retail price of selected food products and per capita disposable income 1980-1992

	Percent change 1980-1992
Fluid milk	-11
Butter	-15
Cheddar cheese	-1
Skim milk powder	-4
Beef	-27
Pork	-6
Chicken	-5
Eggs	-32
Margarine	-24
Bread and bakery	-8
Income	8

Source: FARM database

4.2.3 Summary

Real prices for dairy products and their main substitutes declined over the period which, when multiplied by the relevant elasticities, led to positive own-price effects, negative substitution effects and positive complement effects. Real per capita income rose over the period yielding positive income effects for normal goods, but income effects were likely small for major dairy commodities. The positive own-price, income and complement effects for dairy products were more than cancelled out by negative cross-price effects.

In addition to prices and incomes, other factors such as demographic and taste changes appear to have affected demand for fluid milk and butter over the 1980's. Cheddar cheese demand appears to have been less

affected by demographic and taste changes. More analysis is required to determine how the different factors affected fluid cream, specialty cheese and other dairy product demand.

4.3 Cross-Border Shopping

Another contributor to the increased slowdown in apparent consumption of some dairy products in the 1988-1991 period is cross border shopping. Purchases of U.S. dairy products by Canadian consumers during brief trips over the border are not counted in Canada's import figures and are therefore not counted when calculating the domestic disappearance of dairy products. The higher the incidence of cross-border purchases of dairy products is, the lower per capita consumption of these products appears.

A number of studies estimated Canadian dairy sales losses due to cross border shopping for different regions for 1989-90. Their results show that losses are equal to about 4-8% of the level of consumption within 80 kilometres of the border for fluid milk and about 1-5% of the level of consumption within 80 kilometres of the border for cheese (Jelliss 1993). The Southern Ontario study found that 4% of consumption of fluid milk within 80 kilometres was from cross border shopping and about 1% of total Southern Ontario fluid milk sales were from cross border shopping (Casavant et al, 1991). Another study estimated that 5-10% of B.C.'s consumption of all dairy products was purchased in the U.S. (Jellis 1993). Since many Canadians live close to the border, one can estimate that 1-5% of Canadian consumption of all dairy products were purchased in the U.S. in 1990. The figures also suggest that cross border purchases of fluid milk were higher than for cheese; the studies did not estimate cross border butter purchases.

Cross border shopping does not appear to be as great in the last year or so. Canada's dollar has fallen compared to the U.S. meaning that although dairy products are still significantly cheaper in the U.S., other items (e.g., electronics, clothing) which had been the primary purpose for the cross border trips are now not cheap enough to motivate lots of shoppers.

4.4 Implications of Consumer Trends

Consumption trends are affecting the structure of the dairy industry in Canada and changing some of the basic foundations of dairy policy. Specifically, the traditional focus on butterfat is being challenged. Butterfat was once considered to be the most important component of milk with regard to setting policy parameters. These policy parameters encouraged farmers to increase the butterfat levels in their milk. Now, the trends in consumption mean that the time is nearing where butterfat is a surplus component. The level of 'skim-off' cream produced by both the fluid and industrial sectors is an indicator of this change.

This section first discusses the level of skim-off. Then, a 'crossover calculation' is made to forecast if and when solids non-fat will cease to be the surplus component in milk, and butterfat will become surplus; performing this calculation also gives insights into which variables will likely affect the crossover point. Finally, the impacts of consumer trends on other features of the structure of dairy production and processing are briefly discussed.

4.4.1 Skim-off

As discussed above, the makeup of fluid milk consumption has changed dramatically over the last 20 years with a switch from standard milk to low fat milk. Raw milk delivered to fluid milk processors varies in composition, but generally is 3.6-3.7% butterfat or higher, and has been increasing. Standard milk is 3.25% butterfat while 2%, 1%, skim, chocolate and buttermilk all have lower fat contents. Table 29 shows the fluid products produced in Canada over the last twelve years and Figure 17 plots the average fat content of these products. The butterfat content of milk delivered to dairies has been increasing over time but the content of

fluid milks has been declining - especially since the introduction of 1% milk in 1989. This phenomenon has led to butterfat surpluses from fluid milk production. Some of the surplus is retained in the fluid sector and used to make table creams. The remainder is transferred to the industrial sector where it is mainly used to produce butter. Table 30 shows the amount of skim-off butterfat transferred from the fluid sector to the industrial sector.

An examination of butter and skim milk powder production levels provides evidence that increasing amounts of butter are being produced from skim-off cream from the industrial sector. No direct estimates are available for industrial skim-off but an estimate based on the ratio of butter to skim milk powder production is presented in Table 30.

4.4.2 'Crossover' Point

Various dairy stakeholders have been predicting when the domestic requirements for milk for its solids non-fat component will outweigh the requirements for its butterfat component. When forecasts of domestic requirements of the two components are plotted, a 'crossover point' may be found. Many things will affect when this crossover takes place including:

- Popularity of the new 1% milk. As shown above, the introduction of this milk has had a dramatic effect on butterfat requirements in the fluid sector. The more that 1% milk takes market share from 2%, the sooner will be the crossover point.

- Butter consumption. If the downward trend in butter consumption is reduced, as appears to be the case, this will delay the crossover point.

- Fat content of cheeses. If low-fat cheeses start replacing higher fat cheeses, then the crossover point will be brought forward in time.

Using Agriculture Canada's Medium Term Outlook[15], the crossover point is predicted to occur in 1996 (Figure 18). This forecast incorporates the slowing of the butter consumption decline due to a freeze on the butter support price at 1991 levels. It is clear in figure 18 that if the trend in butterfat requirements over 1987-91 is projected forward, the crossover point would occur earlier, probably by 1994. It seems that the ideal situation for the dairy industry would be where domestic requirements for butterfat (in milk equivalent) just equalled domestic requirements for solids-non-fat (in milk equivalent); then there would be no surplus product to export. The CDC has some control over this through the relative prices they set for butter and skim milk powder.

4.4.3 Reduction in MSQ over 1988-92

The consumer trend toward lower butterfat consumption has resulted in a shrinking of the industrial milk sector over the last five years[16]. As more and more skim-off butterfat is available to the industrial

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15 The Medium Term Outlook (MTO) of April 1993 has been updated somewhat for this paper. One important change incorporated in the revised model is the apparent decision by the CDC to allocate all increases in the target price to the SMP support price. The April MTO assumed 1/3 of increases would be allocated to the butter support price and two thirds to the SMP support price. Thus, the forecast used in this paper has higher butter consumption and lower skim milk powder consumption over the period 1993-99 than the April MTO shows. The model used for the MTO is documented in Cozzarin (1993); the model used for analysis in this paper is essentially the same, but has some modifications.

16 It should be stressed that although part of this trend is due to demographic and preference changes which are exogenous to the dairy sector, prices also affect consumption and these are set within the dairy sector. In addition, increased cross-border shopping during this time period decreased the demand for domestically produced dairy products.

Table 29: Calculation of the average butterfat content of fluid milks

	standard milk	2% milk	1% milk	skim milk	buttermilk	chocolate milk	average butterfat content all milk	average butterfat content lowfat milk
butterfat content	3.25%	2.00%	1.00%	0.05%	2.00%	2.00%		
Sales by dairies (mil hl)								
1977	10.13	11.85	0.00	0.87	0.15	0.85	2.46%	1.88%
1978	10.04	12.65	0.00	0.91	0.15	0.92	2.44%	1.88%
1979	9.98	13.08	0.00	0.92	0.15	0.96	2.43%	1.88%
1980	9.77	13.52	0.00	0.86	0.14	0.97	2.42%	1.89%
1981	9.51	14.15	0.00	0.85	0.14	0.92	2.40%	1.90%
1982	8.95	14.59	0.00	0.87	0.14	0.85	2.37%	1.90%
1983	8.68	15.16	0.00	0.93	0.14	0.88	2.35%	1.89%
1984	8.21	15.28	0.00	1.04	0.14	0.87	2.32%	1.88%
1985	7.80	15.82	0.00	1.18	0.13	0.89	2.29%	1.87%
1986	7.63	16.35	0.00	1.35	0.14	1.01	2.26%	1.86%
1987	7.31	16.77	0.00	1.45	0.14	1.08	2.24%	1.85%
1988	6.79	16.83	0.00	1.51	0.14	1.06	2.21%	1.85%
1989	6.28	16.23	0.00	1.72	0.14	1.09	2.18%	1.83%
1990	5.78	15.74	2.16	1.78	0.13	1.00	2.06%	1.73%
1991	5.31	15.44	2.77	1.77	0.13	0.93	2.02%	1.70%

Source: Fluid sales are from Statistics Canada, CANSIM matrix 005652.
butterfat content of products from Agriculture Canada dairy experts.

Figure 17: Butterfat content of fluid milk consumed in Canada

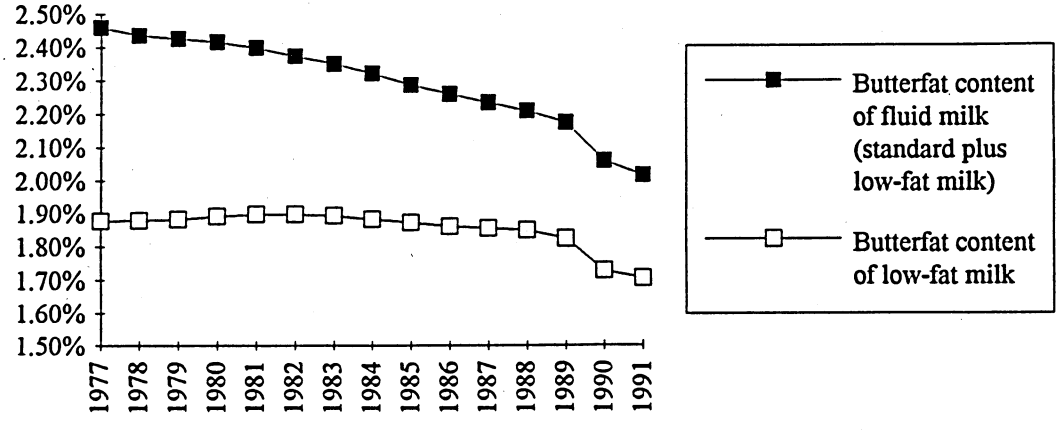


Table 30: Skim-off levels

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Fluid Skim-Off (mil hl 3.6% ME)	a	4.8	4.8	4.9	5.0	4.9	4.9	5.3	5.6	6.3	6.7	6.9	7.6	7.9
Farm Separated Cream Supply (mil hl 3.6% M	b	2.3	2.2	2.1	2.0	1.9	1.9	1.8	1.8	1.6	1.4	1.3	1.2	1.0
Skim Milk Powder Production (mil kg)	c	119.6	157.0	138.9	128.3	113.2	100.2	100.3	109.3	103.2	93.8	80.1	63.0	49.9
Butter Production (mil kg)	d	104.5	120.6	111.8	107.8	99.6	96.0	94.0	102.6	101.5	99.1	94.4	91.0	83.8
- from whole milk	e=c/1.815	65.9	86.5	76.5	70.7	62.4	55.2	55.3	60.2	56.9	51.7	44.1	34.7	27.5
		63%	72%	68%	66%	63%	57%	59%	59%	56%	52%	47%	38%	33%
- from fluid skim-off	f=a*4.365	21.0	20.9	21.4	21.7	21.2	21.4	23.0	24.5	27.4	29.1	30.2	33.4	34.3
		20%	17%	19%	20%	21%	22%	24%	24%	27%	29%	32%	37%	41%
- from farm separated cream	g=b*4.365	10.1	9.6	9.2	8.8	8.3	8.2	7.8	7.7	7.2	6.1	5.6	5.4	4.5
		10%	8%	8%	8%	8%	9%	8%	7%	7%	6%	6%	6%	5%
- from industrial skim-off	h=d-e-f-g	7.5	3.7	4.7	6.5	7.7	11.2	7.9	10.2	10.0	12.2	14.5	17.5	17.5
		7%	3%	4%	6%	8%	12%	8%	10%	10%	12%	15%	19%	21%
Estimated level of industrial skim-off (mil hl 3.6% ME)	h=g/4.365	1.7	0.9	1.1	1.5	1.8	2.6	1.8	2.3	2.3	2.8	3.3	4.0	4.0

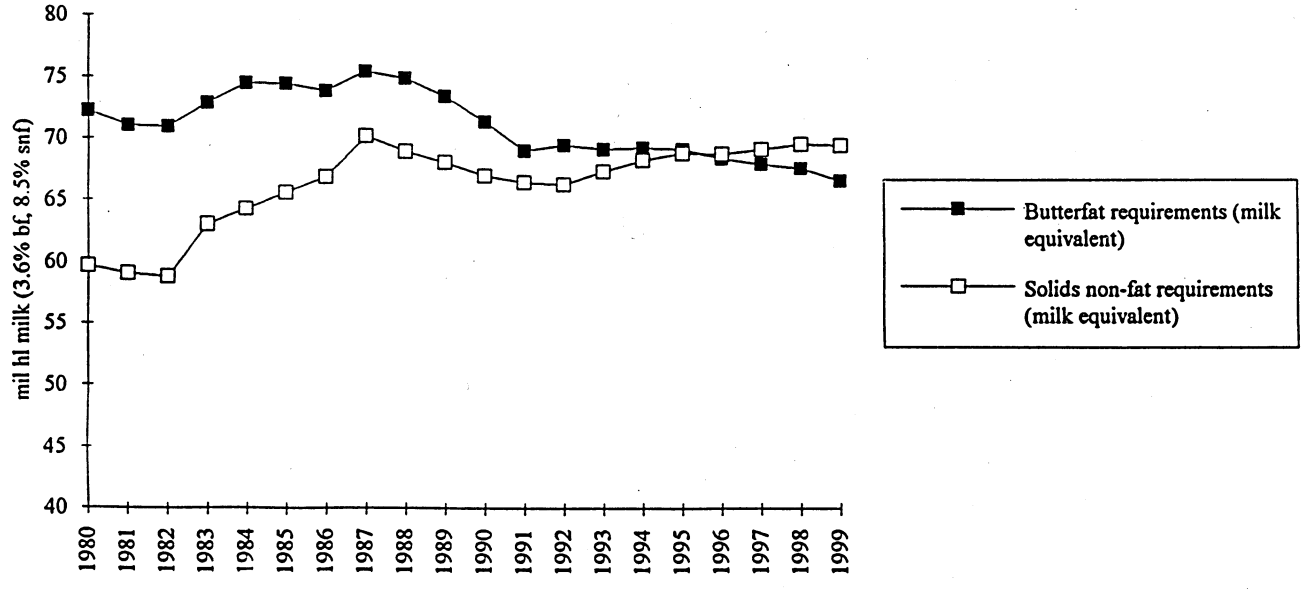
Source: FARM database

Notes: 1) where 1.815 = kg of SMP produced per kg of butter, and 4.365 = kg of butter produced per hl of milk.

2) mil hl 3.6% ME: million hectalitres 3.6% butterfat milk equivalent

3) These calculations assume all skim off cream and farm separated cream is used to make butter; in reality, some may be used for manufaturing other products such as ice cream.

Figure 18: Illustration of Crossover Point: Comparison of total Canadian milk requirements (fluid and industrial) by component



sector from the fluid sector, less industrial milk has been required to meet domestic demand for dairy products. Although skim-off has had an impact on MSQ, the most important determinant of the fall in MSQ over 1988-91 was the decline in butter consumption, coupled with a flattening of cheese consumption. Prior to 1988, declines in butter consumption were more than offset by increases in cheese consumption. However, since 1988, cheese consumption flattened while butter consumption continued to drop. Table 31 shows that butter consumption was the largest factor contributing to the decline in MSQ over 1988-1991. The table also shows that MSQ was not reduced by as much as the change in requirements would imply (see Figure 1 also).

Table 31: Explaining the decline in MSQ over 1988-91

	1991 level minus 1988 level	Change in milk equivalent (3.6% butterfat)
Change in skim-off	+0.8 mil hl	+0.8 mil hl
Change in butter consumption	-15.6 mil kg	-3.6 mil hl
Change in cheese consumption	-1.7 mil kg	-0.1 mil hl
Change in other dairy product consumption	-5.4 mil kg bf equiv	-1.5 mil hl
Implied change required in MSQ		-6.0 mil hl
Actual change in MSQ		-4.9 mil hl

Source: FARM data base and conversion factors reported in Appendix I.

4.4.4 Other Structural Implications

Butterfat consumption trends may affect the makeup of milk that farmers are asked to supply. That is, farmers may be asked (probably through some pricing system such as multiple component pricing or bonuses) to supply milk lower in fat and/or higher in non-fat solids.

Campbell (1990) sums up the impact of consumer demand trends on processors as follows: "It is likely that most traditional, high-volume categories [of dairy products] will continue to stagnate, while many specialized, low-volume products will grow." (p.6) Clearly butter processors are losing their market, while the wide variety of specialty cheese producers have been expanding theirs. Cheese production increased rapidly over the early 1980's but has stagnated in recent years due to the slowdown in consumption. Cheese processors may be able to restimulate demand by introducing or developing new cheeses. However, prices may have to fall also; Table 28 showed that the real price of cheese has fallen by less than any other major food product over the 1980's.

The main determining factor and potential source of change of structure in the dairy processing industry appears to be regulation. In particular, the inter-provincial barriers to trade in raw and fluid milk probably keep processors smaller than would otherwise occur.

5 RECENT POLICY CHANGES

In response to demand and other pressures (e.g., desire to reduce inter-provincial barriers, upcoming GATT agreement), the Canadian dairy industry has realized that some changes will be needed.

5.1 Recent Policy Discussions

The federal government's "Task Force on National Dairy Policy" (Government of Canada, 1991) and the industry stakeholders' "Consultation Committee on the Future of the Dairy Industry" (National Meeting of Industry Stakeholders, 1992) have each presented 23 recommendations for changes to the administration of the dairy industry. On reviewing the recommendations, it appears that both the federal government Task Force and the Stakeholders' committee agree that a more national system of supply management for dairy is necessary, rather than the current provincial splintering. Both groups also endorse multiple component pricing, a single quota for fluid and industrial milk, and a 'rebate' program for further processors. A third set of proposals presented by the Dairy Development Division of Agriculture Canada concentrates on ways to stop or reduce the declines in market sharing quota witnessed over the last few years.

5.2 Analysis of Recent Policy Changes

A number of changes in policy (or policy delivery) have been implemented both at the provincial and federal level in the last few years, partly in response to the recommendations mentioned above:

- Reduction of direct subsidy
- Increase in weight given to skim milk powder support price relative to butter support price ("cross-loading")
- Multiple Component Pricing
- In-quota levy collected on all milk production
- Butterfat Utilization Program
- Rebate Program for Further Processors
- Single quota for fluid and industrial milk
- Calculation of domestic requirements on both a butterfat and solids-non-fat basis
- 'Bari Cheese ruling' in British Columbia
- GATT agreement in December 1993

The following sections examine these changes and assesses their potential for success in helping the dairy system adapt to current and future market features.

5.2.1 Reduction in Direct Subsidy

In the budget review of December 1992, the federal government determined that the direct subsidy to

milk producers ($6.03/hl) was to be reduced by 60 cents per hl beginning August 1993. The 1993 budget announced further cuts of 30 cents per year in 1995 and 1996.

In implementing this cut, the CDC needed to decide whether to reduce the target return by the amount of the subsidy cut, or whether to keep the target return constant and increase butter and skim milk powder support prices to compensate for the cut in subsidy. In order to ensure that the combination of the butter and SMP offer-to-purchase programs and the direct subsidy will support the target price, the CDC must balance the target price equation:

> target price = butter support price * 4.365 + skim milk powder price * 8.51 - assumed processor margin + direct subsidy

Cozzarin (1992) estimates that a 60 cent/hl drop in the industrial milk subsidy in 1992, completely passed through to producers, would reduce dairy farm cash receipts by an average of 1.1% per annum over 1992-97. The effect would be different depending on region and size of farm. Cozzarin states that the effects would be felt most in PEI and Quebec where the subsidy comprises over 10% of provincial dairy receipts. Ontario dairy farm net revenue would fall by 1.6% to 13.7%, depending on the size of the farm; smallest farms would have the greater drop.

On August 1, 1993, the CDC announced they would fully support the target price by raising the support price for skim milk powder. This choice means that consumers will be compensating producers for the loss in revenue due to the subsidy cuts. The FARM model is used to examine the impact of the subsidy cuts as compared to maintenance of the $6.03/hl over the forecast period. The subsidy is reduced to $5.43/hl for dairy years 93/94 and 94/95, then to $5.13/hl for 95/96 and $4.83/hl for 96/97 onward.

Possible impacts of the reductions are shown in Table 32. The table shows that there is not a great effect on production and consumption due to the reduction in the subsidy. In this scenario the drop in the subsidy is compensated by increases in the SMP support price, while the butter support price remains constant. Cheese and other dairy product prices rise slightly as the price of industrial milk to processors increases. Other effects are:

- small reduction in skim milk powder, cheese and 'other dairy product' consumption due to higher prices
- small increase in butter consumption due to substitution effects
- small reduction in domestic requirements for industrial milk , and hence MSQ
- reduction in the total dairy subsidy by about 55 million dollars in each year from 1995 on.

5.2.2 'Crossloading' Butter and Skim Milk Powder Support Prices

Recently, instead of allocating increases in the target price 50/50 to the butter and skim milk powder support prices as they used to, the CDC has allocated more of the increase to the SMP support price. This partial shift in the relative weights of the support prices for butter and skim milk powder was implemented by the CDC on August 1, 1991. (CDC Annual Report 1991-92, p3) The shift was extended and expanded on August 1, 1993 when the CDC announced that they would reduce the butter support price, maintaining the target price with a SMP support price increase.

As shown in Appendix V, the more price increases are allocated to SMP and not butter, the less is butter demand dampened. Since butter supply is targeted to meet demand, and SMP is a by-product of butter production, both butter and SMP production increase as price increases are allocated more to SMP. In the forecast, the effect of this pricing decision is to increase MSQ above what would be required if price increases were partially allocated to butter. Figure 19 illustrates the impact that the pricing decision could have on MSQ over the medium term.

Table 32: Analysis of a reduction in the dairy direct subsidy completely compensated for by an increase in the skim milk powder support price

SCENARIO 1: NO REDUCTION IN DIRECT SUBSIDY

		1992	1993	1994	1995	1996	1997	1998	1999	change 1992-99
Direct subsidy per unit	$/hl	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	0.0%
Total payout under direct subsidy	$ mil	237.92	248.63	252.68	252.25	247.84	244.28	240.88	233.48	-1.9%
Butter support price	$/kg	5.34	5.32	5.32	5.32	5.32	5.32	5.32	5.32	-0.3%
Skim milk powder support price	$/kg	3.32	3.50	3.49	3.60	3.77	3.91	4.08	4.25	28.1%
Retail price index for cheese	1986=100	116.69	120.42	120.26	122.74	126.48	129.54	133.12	136.98	17.4%
Retail price index for ice cream	1986=100	120.41	116.07	114.86	117.28	120.99	123.82	127.18	130.87	8.7%
Butter consumption	mil kg	83.45	80.53	78.14	76.71	74.56	72.32	70.28	67.42	-19.2%
SMP consumption	mil kg	30.86	41.12	40.05	38.77	37.39	36.14	34.95	33.70	9.2%
Cheese consumption	mil kg	271.98	281.95	289.38	296.18	297.95	301.12	304.23	302.60	11.3%
Other dairy product consumption	mil kg	30.79	31.70	32.35	32.43	32.05	31.87	31.65	31.08	0.9%
Butter production	mil kg	83.84	85.64	84.25	84.07	81.89	79.53	78.64	75.59	-9.8%
SMP production	mil kg	49.88	52.46	49.44	47.34	44.11	39.16	35.84	30.80	-38.3%
Industrial quota	mil hl	41.10	42.95	43.65	43.58	42.81	42.20	41.61	40.33	-1.9%

SCENARIO 2: REDUCTIONS IN DIRECT SUBSIDY AS LAID OUT BY CDC

		1992	1993	1994	1995	1996	1997	1998	1999	change 1992-99
Direct subsidy per unit	$/hl	6.03	5.43	5.43	5.13	4.83	4.83	4.83	4.83	-19.9%
Total payout under direct subsidy	$ mil	237.92	223.89	226.75	213.08	196.43	193.62	190.95	185.11	-22.2%
Butter support price	$/kg	5.34	5.32	5.32	5.32	5.32	5.32	5.32	5.32	-0.3%
Skim milk powder support price	$/kg	3.32	3.50	3.49	3.64	3.85	3.99	4.15	4.32	30.2%
Retail price index for cheese	1986=100	116.69	120.42	120.26	123.51	128.03	131.08	134.66	138.52	18.7%
Retail price index for ice cream	1986=100	120.41	117.87	116.66	119.98	124.59	127.42	130.77	134.46	11.7%
Butter consumption	mil kg	83.45	80.53	78.14	76.76	74.65	72.40	70.36	67.50	-19.1%
SMP consumption	mil kg	30.86	41.12	40.05	38.68	37.22	35.99	34.81	33.56	8.8%
Cheese consumption	mil kg	271.98	281.95	289.38	294.86	295.38	298.57	301.72	300.17	10.4%
Other dairy product consumption	mil kg	30.79	31.19	31.83	31.71	31.16	31.00	30.82	30.27	-1.7%
Butter production	mil kg	83.84	86.28	84.22	84.11	81.97	79.56	78.65	75.59	-9.8%
SMP production	mil kg	49.88	53.16	49.41	47.38	44.19	39.19	35.85	30.80	-38.3%
Industrial quota	mil hl	41.10	42.95	43.50	43.27	42.36	41.76	41.18	39.92	-2.9%

This seems to be an appropriate move, given that demand for butterfat is declining relative to solids non-fat and given that a main policy objective is to maintain the target price. It will stimulate butter demand and hence butter and SMP production. Lowering both prices would stimulate demand further and bring Canada more into line with world market price levels, but the return to farmers would have to fall.

In addition, as Figure 20 shows, crossloading the skim milk powder price begins to bring Canada more in line with world market trends in the price of butter relative to skim milk powder. In the U.S. and world markets, this ratio fell over the 1980's whereas in Canada it remained constant over the 1980's; the drop in Canada's ratio in the early 1990's is due to crossloading.

5.2.3 Multiple Component Pricing

As of August 1993, four provinces (Ontario in Jan/92, Quebec in Aug/92, Manitoba in Jan/93 and New Brunswick in August 1993) have introduced multiple component (MCP) methods to determine the price paid to farmers for industrial milk. Initial component prices were chosen for butterfat, protein, and other solids such that the overall return from milk of average composition is the same as if there were no MCP. Farmers are paid a price equal to the composition of their milk multiplied by each component price. Cost of production surveys are being maintained to assist in determining the level of fluid milk prices.

Multiple component pricing to producers is not expected to have a large immediate impact on returns or milk supplies. It is unlikely that producers can quickly change the composition of their milk in response to the component prices, although this is still under investigation.

Table 33 shows component prices for Ontario for 1992 and projected to 2000. Rodenburg (1991) determined that at 1992 MCP prices for Ontario, there is no incentive to change feeding practices to achieve more protein. However, he says, at the projected prices for 1995 and 2000, their is an incentive to increase protein in the diet to achieve higher protein levels in the milk.

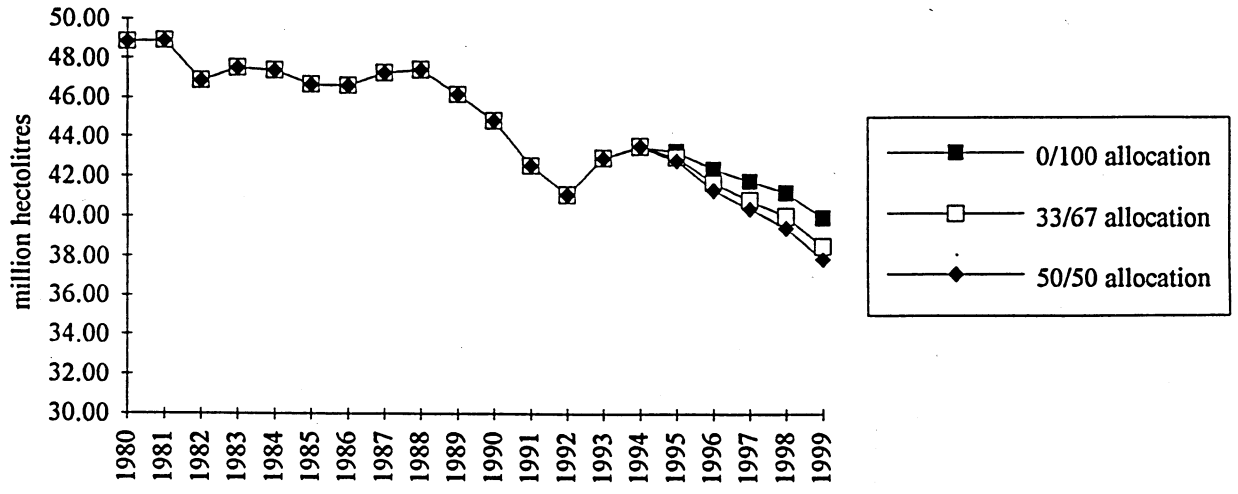
Table 33: 1992 and projected milk component prices for Ontario ($/kg)

Components	Aug 1, 1992	1995	2000
Butterfat	5.4643	5.53	5.55
Protein	6.3359	9.16	12.67
Lactose and Minerals	0.5474	0.58	0.81

Source: 1992 levels are from OMMB Dairy Statistical Handbook 1991-92, Table 28. Projections are from Ontario Milk Producer, October 1991, p. MCP2.

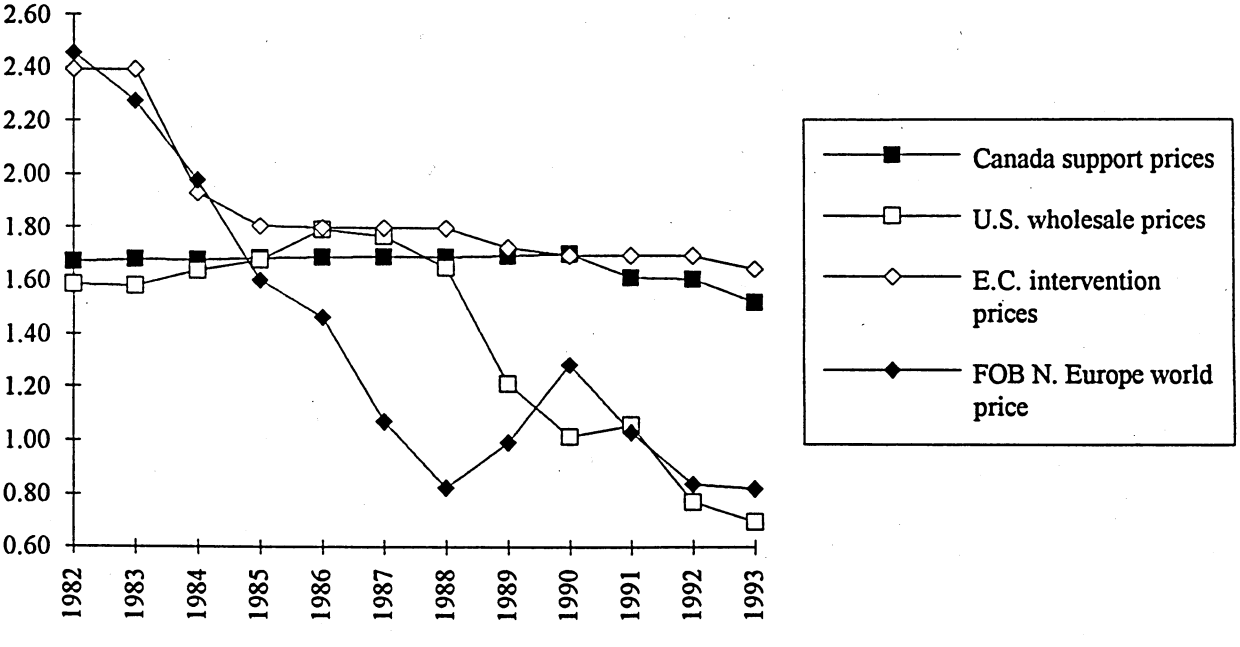
Quebec specifies component prices for each class of milk. All classes have the same butterfat price, but some classes have a high protein price and low 'other milk solids' price whereas for others, the protein price and the other solids price are equal (see Appendix III for more details on class definitions and multiple component price levels).

Figure 19: Market Sharing Quota (MSQ) levels under three assumptions about the allocation of increases in the target price to butter and skim milk powder support prices over 1994-99



Source: Annex V

Figure 20: Ratio of butter price to skim milk powder price for selected markets



Source: Canadian prices from FARM database
Other data are from FAPRI (1993)

5.2.4 Levies

The basis for applying the in-quota and skim-off levies has been changed over a three year phase-in period that began in 1991-92; the in-quota levy is now applied to both fluid and industrial milk production and the skim-off levy is dropped. For 1991-92, 55% of each province's in-quota levy requirements were from the traditional MSQ in-quota levy rate plus the per hectolitre skim-off charge on fluid milk, and 45% were from a levy applied to all milk production. This ratio between new and old methods increased to 75%-25% in 1992-93 and 100%-0% from 1993-94 on. (CDC Annual Report, 1991-92, pp8-9,28)

The CDC has stated that from now on they will determine what total in-quota levy requirements are for each province, and leave it to the provinces to determine what rate to charge producers. The factors that influence in-quota levy requirements are the differential between world dairy product prices and Canadian prices, the extent to which Canada is exporting dairy products produced from MSQ milk, and the level of adoption of the 'special programs' which are financed using the in-quota levy.

This policy change moves the regulation of the fluid and industrial markets closer together. It also equalizes the contribution of each sector to financing exports and demand enhancing programs. The fluid market is now a large contributor to the industrial sector through skim-off cream. Thus it is being made more responsible for issues such as exports which used to be largely in the industrial milk sector's domain.

5.2.5 Rebate and Butter Utilization Programs

Two programs have been introduced to address the declining demand for butterfat; the Butterfat Utilization Program was introduced in 1991, and the Rebate program for Further Processors was implemented in January, 1992. Two other programs, The Animal Feed Assistance Program and the Milk Bread program, were introduced in the mid-1980's to bolster skim milk powder consumption. The Butterfat Utilization and Rebate programs, described in Côté (1993), are funded jointly by dairy producers (from in-quota levy) and processors (from add-on of 2 cents/hl to the target price of industrial milk). (Côté, 1993, p3).

The Butterfat Utilization Program pays a flat rate of $2.00 per kilogram to processors such as bakeries and popcorn manufacturers who buy butter. The program also compensates manufacturers of clarified butter, ghee[17], and fractionated butter at rates of $1.00, $1.50 and $2.75 per kilogram respectively. This program expended about $6.4 million from June 1992 - May 1993. (Côté, p 5)

In the first two years of the Rebate Program for Further Processors, "further processors who demonstrate actual or potential loss of market share to an imported product, due to higher ingredient costs, [were] eligible to a rebate equivalent to 60% of the difference in the dairy product ingredient cost between Canada and the United States." (Côté, p3) Spending on this program was $3.2 million in 1991-92 and $7.3 million in 1992-93. The program has been extended for three years and the rebate now covers 85% of the Canada-U.S. price gap.

The CDC has credited these two programs with stimulating butterfat demand such that MSQ was increased by 2% at the beginning of the 1993-94 dairy year, the first increase since 1988. (CDC, 1993) The lack of increases in butter support prices over the last two years has also helped stimulate demand as section 5.2.2 discusses.

In order to determine the likely effects of these programs, it must be determined how much they could have stimulated demand. Both programs could affect butter demand and the Rebate program could stimulate

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17 Ghee "is a low-grade butter-oil used in East Indian cooking". (Campbell 1990, p7)

demand of other dairy products used in further processing - mostly cheddar and mozzarella cheese (Côté 1993, p3). The programs provide a lower price for a segment of production, financed by producer levies and by primary processors. The following analysis assumes that this lower price stimulates demand but has no negative effect on production[18].

To determine the impact of the programs on consumption it is necessary to know the position of further processors' input demand curves for the various products. This information is not readily available. The following discussion attempts to quantify the potential impact of the programs.

The butter program spent $6.3 million dollars over the roughly one year period May 92 to June 93. If all of this money was spent on the $2/kg subsidy on butter, this corresponds to 3.15 million kg of butter subsidized under the program. Total consumption of butter for 1992/93 was approximately 83.5 million kg. Thus approximately 4% of butter consumed was covered by the program. With the support price of butter at $5.33/kg, the subsidy represents a significant saving. World butter prices were around $1.90 in 1992 (Table 18), so even with the subsidy, the price charged to further processors was above the free market[19] price.

The rebate program spent $7.3 million in the 1992/93 dairy year. The program made up 60% of the difference between Canadian and U.S. prices in that year. Table 34 shows U.S. and Canadian wholesale prices for butter, skim milk powder and cheddar cheese. Assume that all of the rebate program was spent on cheese; the difference between Canadian and U.S. cheese prices is about $1.15/kg; at 60%, this means the subsidy per kg is $0.69/kg. So the $7.3 million could have been spent subsidizing the purchase of 10.6 million kg of cheese; this represents 4% of the 272 million kg of cheese consumed in 1992.

Table 34: Comparison of Canadian and U.S. wholesale prices for selected dairy products, 1992 (Cdn$/kg)

	Canada	U.S.	Difference
Butter	5.97	2.92	3.05
Cheddar Cheese	5.53	4.38	1.15
Skim milk powder	3.49	2.87	0.62

Source: U.S. prices from Agriculture Canada, Dairy Market Review 1992, p103
Canadian butter and SMP prices from Agriculture Canada - published in Agrifood Perspectives. Canadian cheddar cheese price from Dairy Farmers of Canada, Facts and Figures 1992, Table 28.

To illustrate the sorts of impacts these programs could have on MSQ, the effect of increasing butter consumption by 3 mil kg and cheese consumption by 10.6 mil kg are examined. These figures could be thought of as the maximum increase in consumption the programs could generate at their current levels of expenditure. Increases in consumption of this magnitude could raise MSQ by 4%. 10.6 mil kg more cheese consumption allows MSQ to be raised by 0.95 mil hl or about 2.3%; 3 mil kg more butter consumption allows MSQ to be raised by 0.69 mil hl or about 1.7%.

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18 This assumption is probably correct at the milk production level because it has been shown that milk producers' marginal cost of production is below the price of milk. Thus the average price producers receive for milk can be reduced without causing their optimal level of output to be below their quota level. The reduction in their profits could have a negative effect on quota values. At the primary processing level, we need to assume that they too have a margin of rents that can be reduced by their contribution to the programs without an impact on production.

19 As mentioned above, due to the high level of subsidization in world markets for dairy, world prices are probably lower than would exist in a truly free market.

5.2.6 Single Quota for Fluid and Industrial Milk

Both the Task Force and the Stakeholders Consultative Committee have recommended that provinces pool fluid and industrial quota. Manitoba, Saskatchewan and New Brunswick are currently using a single quota for fluid and industrial milk. Most other provinces are considering changing to a single quota system.

The implications of a single quota for fluid and industrial milk are as follows:

- simpler to administer
- all producers receive same price for milk
- skim-off is no longer a fluid vs industrial issue but an issue that all milk producers must face
- will make it easier to move toward a national system of supply control in Canada
- no major effects on aggregate quantities and prices
- individual producers may feel some changes: owners of higher priced fluid quota may see a reduction in quota value and industrial milk quota holders may see an increase in quota value. How the change is implemented/compensated for in each province will affect the magnitude of these effects.

5.2.7 Bari Cheese Ruling in B.C.

In August, 1993, a B.C. judge ruled that the B.C. Milk Marketing Board (BCMMB) does not have the right to collect over-quota levies from industrial milk producers in B.C.. The Board continues to have the right to collect levies on fluid milk production. The law suit was brought against a number of milk producers, including suppliers of milk to the Bari Cheese processing plant, by the BCMMB. The ruling has been appealed by the BCMMB and the province. (Still (1993), MacArthur (1993)).

This ruling could have major implications for industrial milk producers in Canada. If successfully upheld in B.C. and other provinces, it could mean the breakdown of the supply management system for industrial milk unless new regulations are introduced which preserve control over milk supplies.

5.2.8 GATT

In December 1993, participants in the Uruguay Round of GATT finally reached an agreement. Dairy import quotas will be replaced by tariff equivalents and there will be limits on the amount of product that may be exported with subsidies. In addition, increased imports will be required for some dairy products. The impact on the dairy industry of these changes will largely depend on the size of the tariff equivalents and how minimum access commitments are implemented. At this point it seems likely that Canadian tariff equivalents for dairy products will be high enough to protect producers. However, minimum access commitments - especially for butter - will likely have an impact on the industry. Two options for accommodating increased imports under the current system are 1) decrease MSQ in order to maintain prices, or 2) maintain MSQ and allow prices to fall.

6 CONCLUSIONS

6.1 The dairy industry is highly regulated in Canada and other countries.

- One of the results of Canadian regulation is that consumers pay more for dairy products and producers receive more for milk than would be the case were there no regulation. Primary processors receive more for their products but must pay higher milk prices. This report does not determine whether they receive a higher margin due to dairy regulation. Further processors pay a higher price for inputs and, in some cases, face international competition for their products. This puts them at a definite disadvantage.

- Government intervention around the world results in subsidized exports and restricted imports which dampen world market prices. This means there may be some economic justification for protecting Canadian producers somewhat, due to artificially depressed prices in the world market.

- The Canadian regulations include interprovincial barriers to trade in certain dairy products and barriers to movement of milk producers within Canada. This reduces the efficiency with which Canadian farmers can supply Canadian consumers.

- The extent and complexity of dairy regulation makes it difficult to identify when the different stakeholders are reacting freely to economic signals, when their activities are determined by administrative rules, or when some combination is occurring. This state of affairs also makes it difficult to estimate the underlying supply and demand parameters for dairy.

6.2 Good knowledge of the structure of Canadian demand is essential for smooth operation of the supply management system.

- One of the main aims of Canadian dairy policy is to set domestic supply of milk equal to domestic demand for milk at a price which will "provide efficient producers with a return which will cover their [cost of production]" (CDC 1990, p.5). Thus it is essential for administrators to have a good idea about the structure of demand when setting policy parameters.

- Prices and incomes do not explain all of the decline in consumption of fluid milk and butter over the last decade; demographic and/or taste changes appear to have reduced milk and butter consumption . Prices and income do appear to explain the reduction in cheddar cheese consumption over the last decade.

6.3 Butter and cheese demand have a major impact on industrial milk requirements.

- Demand for butter appears to be relatively price elastic compared to other dairy products (own-price elasticity estimates range from -0.8 to -1.4). This implies that a relatively large demand response will arise from changes in the butter price. Butter demand also has a large impact on the dairy industry because of its high butterfat content.

- Cheese production uses more than half of Canada's industrial milk supply. Demand for cheddar (about half of total cheese demand) appears to be fairly responsive to price (own-price elasticity of -0.6 to -0.9), but less elastic than butter. No econometric results were found for specialty cheese demand

parameters, but it seems likely that specialty cheese would be more price and income elastic than cheddar cheese. This implies that reductions in cheese prices will have a significant impact on demand and, because of the size of cheese demand, a relatively large impact on industrial milk requirements.

6.4 Domestic requirements for industrial milk declined each year between 1988 and 1991 due to decreases in consumption.

- In the fluid sector, demand for low-fat milk increased and demand for standard milk decreased leading to butterfat surpluses which were transferred to the industrial sector.
- In the industrial sector, demand for butter decreased and demand for other dairy products (in butterfat equivalent) also decreased; demand for cheese increased.
- Overall, the demand for butterfat from industrial products declined and the supply of butterfat from the fluid sector increased - both these facts had a dampening effect on industrial milk requirements as reflected in the MSQ over 1988 to 1992.

6.5 Two main pressures are affecting the dairy industry in the early 1990's.

- Consumption of butterfat is declining in Canada due to demographic changes, taste changes, health factors, and pricing policies.
- Canadian import quotas for dairy products must be removed under the new GATT agreement. Even before the agreement, GATT had ruled that Canada's import quotas on ice cream and yogurt could not be justified under Article XI.

6.6 The dairy industry is beginning to react to these pressures.

- All dairy industry stakeholders agree that the dairy policy system must change in order to adjust to the new environment, the question is - how?
- Two studies were released recently recommending changes to dairy policies - one by the federal government and one by a group of dairy producers and processors.
- Most of the changes that have been implemented so far involve modifying existing support mechanisms to reflect the reduced demand for butterfat (e.g., adjustments to support prices, multiple component pricing, changes in domestic requirement calculations, changes to levy collection).
- Other recommended changes are more radical (in terms of changes to current administrative structures), such as a national system of supply management with freely traded production quota instead of the current segregated provincial systems.

6.7 Crossloading the skim milk powder support price increases domestic consumption of butterfat.

- One of the recommended changes already implemented is to stop increasing the butter support price and to maintain any target price or other increases through the skim milk powder support price (referred to as crossloading the skim milk powder price).

- Crossloading the SMP support price appears to have a significant, positive impact on the dairy industry. In particular, according to calculations made here, it will significantly reduce the need to cut MSQ over the next six years. The main reason for this is that the butter price will not be increasing as it has in the past and this will stimulate butter demand.

- Crossloading the skim milk powder support price also brings Canada more in line with the butterfat-solids non-fat price ratio in U.S. and world markets.

6.8 The Rebate and Butterfat Utilization programs also provide significant incentives to increase utilization of dairy products in Canada.

- These programs create a lower priced market for dairy products for further processors, financed by milk producers and primary processors.

- The savings to further processors appear large (up to 30% off the purchase price of dairy inputs) but still do not reduce prices to the levels available in U.S. or international markets. Thus, further processors who face international competition for their products could still be at a disadvantage with regard to the price of dairy inputs.

- Maintaining these programs at current levels should allow for increased MSQ in the order of 1-3%. Increases in the level of coverage (both eligible buyers and size of rebate) will boost consumption further.

6.9 In 1993, the CDC determined that MSQ could be increased by 4.5%.

- Forecasts made for this paper suggest that the projected increase in consumption is not a reversal of the downward trend, but that the trend has been reduced, due largely to the unchanged butter support price.

- The CDC credits the Rebate and Butterfat Utilization programs with the increased demand; these programs were not considered in the forecasts, but rough calculations indicate they could have had a positive impact on milk requirements in the order of 1-3% of MSQ.

6.10 The formation of a national supply management system would create opportunities to increase the industry's market responsiveness.

- By itself, the move to a more national system is desirable in economic terms because it will mean that the Canadian dairy industry is 'playing on a level playing field' within Canada. The increased interprovincial competition could improve the efficiency of the industry and better prepare them for the day when they face increased foreign competition.

- In addition, if a national dairy marketing system is created, the opportunity may arise to rid the industry of some of its more economically questionable regulations. For example, retail and wholesale price regulations, plant supply quotas, and end use pricing are three types of regulation which could be dropped under a national system. Some provinces already operate without these types of regulations, and their removal would lower the level of dairy market distortion.

- Another major step toward market responsiveness and international competitiveness would be to lower the target price for milk (and the butter and skim milk powder support prices). The price milk producers are paid in Canada is well above U.S. and international prices and is unaffected by movements in these prices. Regulators are reluctant to reduce the target price because the price system is based on a cost of production formula and there are questions about the appropriateness of setting the target price below what it is calculated that farmers need to cover their costs.

- One way to lower the target price within the current system would be to change the cost of production formula by, for example, lowering the percentage of farmers whose costs are measured from the most efficient 70% to, say, the most efficient 50%.

- The impact of lower prices on the Canadian dairy sector is not entirely clear as it depends on how far prices fall and where the underlying supply curve for milk for Canada is. This issue, as well as more complete analysis of the effect of GATT on the Canadian dairy industry would be a good subject for further analysis.

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APPENDIX I: CONVERSION FACTORS

This appendix shows some conversion factors for dairy products. Many of these factors change over time as products change.

Table I.a shows composition coefficients used to break down milk and milk products into butterfat and solids non-fat:

Table I.a - Composition of major dairy products

	butterfat	solids non-fat
Raw milk	3.60 kg/hl	8.52 kg/hl
Fluid products:		
Standard milk	3.25 kg/hl	8.52 kg/hl
Low-fat milk[1]	1.74 kg/hl	8.72 kg/hl
Cream[2] (product equiv)	15.80 kg/hl	6.14 kg/hl
Cream (milk equiv)	3.60 kg/hl	1.41 kg/hl
Skim-off cream[3] (milk equiv)	3.60 kg/hl	1.41 kg/hl
Industrial products:		
Butter	0.816 kg/kg	0.126 kg/kg
Skim milk powder	0.003 kg/kg	0.973 kg/kg
Cheddar cheese	0.360 kg/kg	0.849 kg/kg
Specialty cheese	0.294 kg/kg	0.694 kg/kg
Total Cheese (45% cheddar, 55% specialty)	0.324 kg/kg	0.764 kg/kg
Ice cream	0.120 kg/kg	0.105 kg/kg
Yogurt	0.025 kg/kg	0.110 kg/kg
Other dairy products[4]	0.054 kg/kg	0.223 kg/kg
Other dairy products incl. ice cream & yogurt	0.078 kg/kg	0.150 kg/kg
Other dairy products incl. ice cream & yogurt (bf equiv)	1.000 kg/kg	1.923 kg/kg

Source: Fluid product conversion coefficients do not include wastage and are from Agriculture Canada dairy experts. Industrial product conversion factors include wastage and are derived from Canadian Dairy Commission, Economics Section, "Dairy Products Conversion Factors on a Solids Non-Fat & Butterfat Basis", revised June 1993.

[1]Low-fat milk is comprised of 2% milk, 1% milk, skim milk, buttermilk, and chocolate milk.

[2]Cream is comprised of cereal cream, table cream, whipping cream and sour cream.

[3]The level of fluid skim-off is reported in milk equivalent (3.6% butterfat). At present it is assumed that the solids non-fat in skim-off cream is the same as for other cream.

[4]Other dairy products consists of various evaporated, condensed and concentrated milks, cottage cheese, and whole milk powder.

Another way these composition coefficients can be presented is to show how much product is produced from one hectolitre of milk. Table I.b shows these 'production coefficients' calculated in two ways: using the butterfat composition, and using the solids non-fat composition. The lower of the two calculations shows the limiting component in production.

Table I.b - Amount of product which can be produced from one hectolitre of milk

	butterfat	solids non-fat
Raw milk	1.00 hl/hl	1.00 hl/hl
Fluid products:		
Standard milk	1.11 hl/hl	1.00 hl/hl
Low-fat milk	2.07 hl/hl	0.98 hl/hl
Cream (product equiv)	0.23 hl/hl	1.39 hl/hl
Cream (milk equiv)	1.00 hl/hl	6.04 hl/hl
Industrial products:		
Butter[5]	4.41 kg/hl	67.62 kg/hl
Skim milk powder[6]	1200 kg/hl	8.76 kg/hl
Cheddar cheese	10.00 kg/hl	10.04 kg/hl
Specialty cheese	12.24 kg/hl	12.28 kg/hl
Total Cheese (45% cheddar, 55% specialty)	11.11 kg/hl	11.15 kg/hl
Ice cream	30.00 kg/hl	56.80 kg/hl
Yogurt	144.0 kg/hl	77.45 kg/hl
Other dairy products	66.67 kg/hl	38.21 kg/hl
Other dairy products incl. ice cream & yogurt	46.15 kg/hl	56.80 kg/hl
Other dairy products incl. ice cream & yogurt (bf equiv)	3.60 kg/hl	4.43 kg/hl

Source: calculated from Table I.a.

[5]Note that this conversion coefficient for butter is different from the coefficient used in the CDC target/support price equation (4.365 kg/hl). 4.41 is the conversion factor that the CDC calculated from a survey of processors (80% butterfat in butter plus a 2% loss factor). However, processors complained that 4.41 kg butter/hl milk was too high and so the value used in the target price formula was lowered to 4.365.

[6]Note that this conversion coefficient for skim milk powder is different from the coefficient used in the CDC target/support price equation (8.51 kg/hl) for the same reasons as discussed above for butter.

So, choosing the limiting factor from table I.b, the production coefficients used in the model can also be written as shown in table I.c:

Table I.c - Hectolitres of milk required to produce dairy products

	limiting component	amount produced per hl of milk	hl of milk required per unit
Raw milk	either	1.00 hl	1.00
Fluid products:			
Standard milk	snf	1.00 hl	1.000
Low-fat milk	snf	0.98 hl	1.023
Cream (product equiv)	bf	0.23 hl	4.389
Cream (milk equiv)	bf	1.00 hl	1.000
Industrial products:			
Butter	bf	4.41 kg	0.227
Skim milk powder	snf	8.76 kg	0.114
Cheddar cheese	either	10.00 kg	0.100
Specialty cheese	either	12.24 kg	0.082
Total Cheese (45% cheddar, 55% specialty)	either	11.11 kg	0.090
Ice cream	bf	30.00 kg	0.033
Yogurt	snf	77.45 kg	0.013
Other dairy products	snf	38.21 kg	0.026
Other dairy products incl. ice cream & yogurt	bf	46.15 kg	0.022
Other dairy products incl. ice cream & yogurt (bf equiv)	bf	3.60 kg	0.278

Source: calculated from Table I.b.

And the milk components which are surplus in production of each of the products are as follows:

Table I.d - Amount of surplus in production of dairy products

	component which is surplus	amount of surplus per unit produced
Raw milk	neither	0.00
Fluid products:		
Standard milk	bf	0.350 kg/hl
Low-fat milk	bf	1.945 kg/hl
Cream (product equiv)	snf	31.253 kg/hl
Cream (milk equiv)	snf	7.110 kg/hl
Industrial products:		
Butter	snf	1.805 kg/kg
Skim milk powder	bf	0.408 kg/kg
Cheddar cheese	neither	0.003 kg/kg
Specialty cheese	neither	0.002 kg/kg
Total Cheese (45% cheddar, 55% specialty)	neither	0.003 kg/kg
Ice cream	snf	0.134 kg/kg
Yogurt	bf	0.021 kg/kg
Other dairy products	bf	0.040 kg/kg
Other dairy products incl. ice cream & yogurt	snf	0.035 kg/kg
Other dairy products incl. ice cream & yogurt (bf equiv)	snf	0.444 kg/kg

Source: calculated from Table I.b.

APPENDIX II: Details of the Cost of Production Formula

The costs counted in the COP calculation are divided into three types: cash costs, capital costs and labour costs (CDC factsheet, rev. 03/93). The Canadian Dairy Commission Cost of Production Handbook describes measurement practices and other COP issues in detail.

Cash costs:

purchased feed
artificial insemination
transportation, fees and promotion
machinery, equipment repairs
fuel and oil
custom work
fertilizer and herbicides
seed and plants
land and building repairs
property taxes and insurance
hydro and telephone
hired labour (including paid family labour)
other (miscellaneous)

Capital costs (does not include costs of quota or personal items such as the farm house):

returns to equity-financed capital
costs of debt-financed capital
building depreciation
machinery and equipment depreciation
cow herd inventory change

Labour costs:

return to producer labour
return to unpaid family labour
return to management

APPENDIX III: Milk Class definitions and prices by province 1987-91

Source: Agriculture Canada, Dairy market review 1992.

MILK AND QUOTA PRICES

MILK CLASS DEFINITIONS

PROVINCE	CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V	CLASS VI	CLASS VII
BRITISH COLUMBIA	Fluid use	Products not elsewhere specified	Cheeses, excluding cottage cheese	Canned evaporated milk, condensed whole milk & condensed skim milk	Fluid Sales in Yukon, North-west Territories or beyond Canadian borders	Non-Fluid Sales in Yukon, Northwest Territories or beyond Canadian borders	Butter non-fat milk powder
ALBERTA	Fluid use (U.H.T.) Fluid creams and milk products	Cottage cheese, ice cream mix, sour cream, yogurt, sherbet, shake mix, plus any unaccounted inventory milk	IIIa - Specialty cheese IIIb - Cheddar IIIc - Skim milk powder and butter, conc. milks				
SASKATCHEWAN	Fluid use Ia - (U.H.T.)	Cottage cheese, ice cream	Fluid creams, butter, cheddar, yogurt, powders				
MANITOBA	Fluid use	Fluid creams, IIa - Cottage cheese, yogurt, eggnog IIb - Ice cream related mixes	Cheddar, stirred curds IIIa - mozzarella	Specialty cheese other than in class III or IIIa	Butter, milk powder, soups (conc.) concentrated milk used in other products	New products	
ONTARIO	Fluid use, partly skimmed milk, buttermilk & chocolate milk	Liquid milk concentrated	Fluid creams, cottage cheese dressing, yogurt, yogurt beverage, kefir, egg nog and fluid plant inventories, flavoured dairy cordials, pressurized creams, sour cream IIIa - Cottage Cheese Curd	Sterilized infant foods, ice cream mixes, confect-ionary products, pudding, soups, yogurt shakes, ice milk mix frozen cheese cake, flavoured mousse, frozen yogurt malted milk, & milkshake mixes IVa - Specialty cheese, IVb - colby & brick IVc - U.H.T. export only	Butter, casein, milk powder, concentrated milks Va - cheddar	New products	
QUEBEC	Fluid use (U.H.T.)	Creams, part. skim & skim chocolate and flavoured milk concentrated milk	Ice cream mix, ice cream, ice milk mix, ice milk milkshake mix, frozen yogurt, frozen yogurt mix, sherbet mix, fudge mix, sour cream, pudding, cafeinate, eggnog, buttermilk, soup mix, curds du Lac St-Jean beverage IIIa - cottage cheese, quark, baker	Cheddar curds, specialty cheese, (cheese related to cheddar curds)	Brick, colby, farmer, mozzarella, part. skim milk, caraway, monterey jack	VIa - Cheddar, stirred curds, mozzarella cheese base cheeses (related to cheddar) VIb - id. to VIb	Butter, milk powder, evaporated milk, condensed milk, other non-enumerated products
NEW BRUNSWICK	Fluid use	Fluid creams	Ice cream, ice cream mix,ice milk,ice milk mix, milk shake mix, sherbet, sherbet mix dietetic frozen dessert egg nog, sour cream cottage cheese & yogurt	Speciality Cheese, colby and colby type and brick cheese	Va - Cheddar	VIb - Butter, skim milk powder	
NOVA SCOTIA	Fluid use	Cottage cheese, yogurt, ice cream, ice cream mix and products	IIIa Cheddar cheese IIIb Butter and skim milk powder				
PRINCE EDWARD ISLAND	Fluid use, cream, conc. liquid milk	Cottage cheese, eggnog, sour cream, yogurt, buttermilk, conc. liquid milk (industrial)	Ice cream, ice cream mix, ice milk, ice milk mix, milk shake mix, sherbet, sherbet mix, dietic frozen dessert, pudding	Cheddar, mozzarella, stirred curd, skim milk cheese	Brick, colby, specialty cheese	Butter, evap-orated milk, evaporated partly skimmed milk, skim milk powder, whole milk powder	All other food products.
NEWFOUNDLAND	Fluid						

Source: Milk Marketing Boards.

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MILK AND QUOTA PRICES

PRICES BY CLASS (Calendar year)

PRIX DU LAIT ET DES QUOTAS

PRIX DE CLASSE (Année civile)

PROVINCES	CLASS	1992	1991	1990		1989	1988	CLASSES	PROVINCES
	CALENDAR YEAR – ANNÉE CIVILE								
	$ per hectoliter (3.6 kg of b.f.) F.O.B. Plant – $ par hectolitre (3.6 kg de m.g.) F.A.B. Usine								
BRITISH COLUMBIA									COLOMBIE-BRITANNIQUE
	I	60.56	60.63	59.51		58.63	57.03	I	
	II	44.92	44.10	42.86		42.19	41.96	II	
	III	43.17	42.35	41.11		40.44	40.21	III	
	IV	43.17	42.35	41.11		40.44	40.21	IV	
	VII	42.52	41.70	40.90		40.44	40.00	VII	
ALBERTA									ALBERTA
	I	54.62	54.83	53.60		52.05	49.44	I	
	II	45.46	44.55	43.37		42.36	42.31	II	
	IIIa	43.96	43.05	41.70		40.56	40.51	IIIa	
	IIIb	43.41	42.50	41.47		40.56	40.51	IIIb	
	IIIc	43.31	42.40	41.43		40.56	40.51	IIIc	
SASKATCHEWAN (1)									SASKATCHEWAN (1)
	I	56.24	56.24	56.24		56.24	53.87	I	
	Ia	52.24	52.24	52.24		52.24	49.87	Ia	
	II	43.62	42.92	41.67		40.84	40.79	II	
	III	41.87	41.17	39.92		39.09	39.04	III	
MANITOBA									MANITOBA
	I	57.71	58.82	57.44		57.31	53.09	I	
	II	48.24	47.42	46.30		45.51	45.26	II	
	IIa	46.61	46.02	45.59		44.80	44.55	IIa	
	IIb	47.31	46.49	45.37		44.58	44.33	IIb	
	III	43.29	42.47	41.32		40.63	40.39	III	
	IIIa	43.97	43.15	41.95		41.27	41.01	IIIa	
	IV	45.07	44.25	43.01		42.28	41.68	IV	
	V	43.54	42.82	41.59		40.81	40.56	V	
	VI	43.29	42.47	41.32		40.63	40.39	VI	
ONTARIO									ONTARIO
	I		56.95	55.28		54.47	53.84	I	
	II		55.95	54.28		53.48	52.71	II	
	III		47.60	46.15		45.24	44.99	III	
	IV		47.26	45.81		44.90	44.65	IV	
	IVa		45.00	43.72		42.97	42.79	IVa	
	IVb		45.00	43.72		42.97	42.79	IVb	
	IVc		47.26	45.81		44.90	44.65	IVc	
	V		42.84	41.61		40.88	40.71	V	
	Va		43.17	41.93		41.28	41.01	Va	
	VI		42.84	41.61		40.88	40.71	VI	
QUEBEC									QUÉBEC
	I	55.50	54.75	54.60		52.96	52.20	I	
	II	47.87	47.10	45.87		45.16	44.94	II	
	III	45.80	44.92	43.69		43.43	43.51	III	
	IV	44.86	44.03	42.80		42.49	42.65	IV	
	V	44.86	44.03	43.52	(2)	41.42	41.52	V	
	Va	43.76	42.96	42.45	(2)	40.98	40.77	Va	
	Vb	43.70	42.96	42.45	(2)			Vb	
	VII	43.83	43.08	42.55	(2)			VII	
	VIII	43.77	42.94	42.45	(2)			VIII	
NEW BRUNSWICK									NOUVEAU-BRUNSWICK
	I	59.80	59.80	59.80		58.30	55.80	I	
	II	59.41	59.80	59.80		57.00	54.50	II	
	III	44.46	43.76	42.53		41.78	41.57	III	
	IV	42.75	42.05	40.82		40.07	39.86	IV	
	V	42.75	42.05	40.82		39.98	39.86	V	
	VI	42.25	41.55	40.32		39.57	39.36	VI	
	VII	51.80							
NOVA SCOTIA									NOUVELLE-ÉCOSSE
	I	62.11	61.73	60.27		58.42	57.70	I	
	II	44.47	43.75	42.41		41.74	41.56	II	
	IIIa	43.28	42.56	41.33		40.55	40.37	IIIa	
	IIIb	41.48	40.76	39.53		38.75	38.57	IIIb	
PRINCE EDWARD ISLAND									ILE-DU-PRINCE-ÉDOUARD
	I	62.04	62.04	59.04		56.54	54.99	I	
	II	43.89	42.61	40.87		40.23	40.02	II	
	III	43.89	42.61	40.87	(3)	40.23	40.02	III	
	IV	43.89	42.61	40.87	(3)	40.23	40.02	IV	
	V	43.89	42.61	40.87	(3)	40.23	40.02	V	
	VI	43.89	42.61	40.87	(3)	40.23	40.02	VI	
NEWFOUNDLAND									
	I	74.77	75.68	73.60		72.68	72.68	I	TERRE-NEUVE

Source: Milk Marketing Boards.
(1) $ per 100 kilograms (3.5% b.f.).
Change in the class definition:
(2) Aug. 90, new class: V, VIa, VIb, VII and VIII.
Average by class from Aug. to Dec. 90.
(3) January 1990, new classes: III, IV, V and VI.

Source: Offices de commercialisation du lait.
(1) $ par 100 kilogrammes (3.5 % m.g.).
Changements dans la définition des classes:
(2) Août 90, nouvelles classes: V, VIa, VIb, VII et VIII.
Moyenne des classes de août à déc. 90.
(3) Janvier 1990, nouvelles classes: III, IV, V et VI.

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MILK AND QUOTA PRICES

PRICES BY CLASS (Calendar year)

PRIX DU LAIT ET DES QUOTAS

PRIX DE CLASSE (Année civile)

(continued/suite)

CALENDAR YEAR – ANNÉE CIVILE

ONTARIO CLASS	1991	1990	1989	1988	CLASSES ONTARIO
$ per hectoliter (3.6 kg of b.f.) F.O.B. Plant – $ par hectolitre (3.6 kg de m.g.) F.A.B. Usine					
I	56.95	55.28	54.47	53.84	I
II	55.95	54.28	43.48	52.71	II
III	47.60	46.15	45.24	44.99	III
IV	47.26	45.81	44.90	44.65	IV
IVa	45.00	43.72	42.97	42.79	IVa
IVb	45.00	43.72	42.97	42.79	IVb
IVc	47.26	45.81	44.90	44.65	IVc
V	42.84	41.61	40.88	40.71	V
Va	43.17	41.93	41.28	41.01	Va
VI	42.84	41.61	40.88	40.71	VI

CLASS PRICE DIFFFERENTIALS – DIFFERENTIELS PAR CLASSES DE PRIX

1992 (1)

$ per kilogram – $ par kilogramme

Butterfat	5.47	Gras
Protein	6.34	Protéine
Other Milk Solids	0.55	Autres Solides

$ per hectoliter – $ par hectolitre

	1992 Southern/Sud	1992 Northern/Nord	1992 Thunder Bay	1992 N.Western/N.Ouest	
I	15.39	16.86	16.27	18.58	I
II	14.45	14.45	14.45	14.45	II
III	4.90	5.07	4.40	4.85	III
IIIa	4.90	4.90	4.90	4.90	IIIa
IV	4.56	4.56	4.56	4.56	IV
IVa	2.19	2.19	2.19	2.19	IVa
IVb	2.19	2.19	2.19	2.19	IVb
IVc	4.56	4.56	4.56	4.56	IVc
V	-	-	-	-	V
Va	0.43	0.43	0.43	0.43	Va
VI	-	-	-	-	VI

CALENDAR YEAR – ANNÉE CIVILE

QUEBEC CLASS	1992 (2)	1991	1990	1989	1988	CLASSES QUÉBEC
$ per hectoliter (3.6 kg of b.f.) F.O.B. Plant – $ par hectolitre (3.6 kg de m.g.) F.A.B. Usine						
I	55.50	54.75	54.60	52.96	52.20	I
II	47.87	47.10	45.87	45.16	44.94	II
III	45.80	44.92	43.69	43.43	43.51	III
IV	44.86	44.03	42.80	42.49	42.65	IV
V	44.86	44.03	43.52 (3)	41.42	41.52	V
Va	43.76	42.96	42.45 (3)	40.98	40.77	Va
Vb	43.70	42.96	42.45 (3)			Vb
VII	43.83	43.08	42.55 (3)			VII
VIII	43.77	42.94	42.45 (3)			VIII

CLASS PRICE DIFFFERENTIALS – DIFFERENTIELS PAR CLASSES DE PRIX

1992 (4)

$ per hectoliter – $ par hectolitre

I	56.79	I
II	48.16	II

$ per kilogram – $ par kilogramme

	Butterfat	Protein	Other Milk Solids	
I	5.48	-	-	I
II	5.48	-	-	II
III	5.48	2.92	2.92	III
IIIa	5.48	7.24	0.45	IIIa
IV	5.48	6.95	0.45	IV
V	5.48	6.95	0.45	V
VIa	5.48	6.62	0.45	VIa
VIb	5.48	6.62	0.45	VIb
VII	5.48	2.72	2.72	VII
IX	5.49	6.10	0.82	IX

Source: Milk Marketing Boards
Change in the class definition:
(1) New Multiple Component Pricing Effective Jan 1992

(2) Average by class from Jan to July 92.
(3) Aug. 90, new class: V, Vla, Vlb, VII and VIII
Average by class from Aug to Dec 90
(4) New Multiple Component Pricing Effective Aug 1992
Average by class from Aug to Dec 92.

Note: For the 1992 calendar year, Quebec and Ontario are the only provinces with Multiple Component Pricing.

PRICE1.wk1

Source: Offices de commercialisation du lait.
Changements dans la définition des classes:
(1) La fixation du prix du lait selon les composants est entrée en vigueur en janv. 92.
(2) Prix moyenne par classe, janv. à juillet 92.
(3) Août 90, nouvelles classes: V,Vla,Vlb,VII et VIII
Moyenne par classe de août à dec 90.
(4) La fixation du prix du lait selon les composants est entrée en vigueur en août 92.
Prix moyen par classe de août à déc. 92.
Note: Pour l'année civile 1992, seules les provinces du Québec et de l'Ontario possédaient un système de fixation du prix du lait selon les composants.

AVERAGE TEST BY CLASS (Calendar year/Dairy year)

TEST MOYEN PAR CLASSE(Année civile/Année laitière)

CALENDAR YEAR – ANNÉE CIVILE

ONTARIO CLASS — 1992 — CLASSES ONTARIO

kilograms / hl – kilogrammes / hl

Butterfat	3.99	Gras
Protein	3.33	Protéine
Other Milk Solids	5.77	Autres Solides

CALENDAR YEAR – ANNÉE CIVILE (1)

QUEBEC CLASS — 1992 — CLASSES QUEBEC

kilograms / hl – kilogrammes / hl

	Butterfat	Protein	Other Milk Solids	
I	3.84	-	-	I
II	3.81	-	-	II
III	3.79	3.28	5.67	III
IIIa	3.80	3.28	5.67	IIIa
IV	3.80	3.26	5.65	IV
V	3.80	3.26	5.65	V
VIa	3.81	3.27	5.64	VIa
VIb	3.80	3.27	5.66	VIb
VII	3.84	3.26	5.65	VII
IX	3.78	3.24	5.66	IX

DAIRY YEAR – ANNÉE LAITIERE (2)

ONTARIO CLASS — 91 – 92 — CLASSES ONTARIO

kilograms / hl – kilogrammes / hl

Butterfat	3.98	Gras
Protein	3.31	Protéine
Other Milk Solids	5.81	Autres Solides

Source: Milk Marketing Boards.
(1) August 1992 to December 1992.
(2) New Multiple Component Pricing Effective Jan 92.

Average by class from Jan 92 to July 92.
Note: For Québec, Multiple Component Pricing began in August 92.
Therefore, no data exists for 91–92 Dairy Year.

avetest2.wk1

Source: Offices de commercialisation du lait.
(1) Août 1992 à décembre 1992.
(2) Système de prix en fonction des composants était en vigueur jan 92.

Moyenne par classe de jan 92 à juil. 92.
Note: Au Québec, la fixation du prix du lait selon les composante a débuté en août 1992. Par conséquent, il n'existe pas de donnée pour l'année laitière 91–92.

APPENDIX IV Dairy product demand elasticities - detailed tables

In 1976, Hassan and Johnson (H&J) constructed a complete demand system for Canadian food. Two sets of elasticities for dairy are presented in Hassan and Johnson's study: first the results of seemingly unrelated regressions (SUR) for four major dairy products are presented (H&J, Table 5). Then these elasticities are used, along with other information, to construct the full demand matrix for food. The main difference between the SUR estimates and the demand system estimates is in the butter equation. The SUR butter own-price elasticity (-1.059) and margarine cross-price elasticities (0.3229) are higher than the demand system estimates reported below in Table IV.a.

More recently, Moschini and Moro (M&M, 1993) estimated the impact of economic variables on demand also using a complete demand system for food products in Canada. Table IV.b shows own-price, cross price and income elasticities for Canadian dairy products from this study.

A comparison of the two demand systems yields the following points. M&M and H&J have similar own price elasticities for butter. H&J have higher own-price elasticities for fluid milk and cheese and a lower own-price elasticity for the aggregate 'other dairy products'. The income elasticities estimated by M&M are much lower than those in H&J. H&J show pork having a relatively large cross price effect on butter whereas in M&M the effect of pork on butter is zero. M&M show a complement relationship between eggs, milk and cheese and between butter and cheese, neither of which is present in H&J.

Reynolds (1991) estimated the following elasticities for fluid milk using cross sectional data for 1986 including socioeconomic and demographic variables. Reynolds' own-price elasticities are higher than H&J and M&M. His total fluid income elasticity is close to M&M, but the income elasticities for the various components of fluid milk are larger; standard milk has a negative income elasticity implying that it is an inferior good. Reynolds' cross-price elasticities imply that while low-fat milk is a substitute for standard milk and standard and low-fat milk are substitutes for skim milk, low-fat milk has no substitutes.

Table IV.c.: Fluid milk demand elasticities computed at data mean

Elasticity with respect to:	Total fluid milk	Standard milk	Lowfat milk	Skim milk
Fluid milk price	-0.7130			
Standard milk price		-0.9026	0.0390 (n.s.)	1.1119
Lowfat milk price		0.5897	-0.8139	0.6148
Skim milk price		0.2327 (n.s.)	0.1335 (n.s.)	-1.8926
Income	.0390	-0.1348	0.0518	0.3579

Source: Reynolds (1991), Table 3
n.s.: T-statistic is below 2.00

Demand elasticities for dairy

Table IVa: Elasticities from Hassan and Johnson (1976): Full Demand System Elasticities

	Milk	Butter	Cheese	SMP	Other dairy
Beef	0.02	0.07	0.03	0.03	0.03
Pork	0.08	0.23	0.10	0.01	0.09
Chicken		0.01			
Turkey		0.01	0.01		
Eggs					
Milk	-0.44	0.01	0.01	0.09	0.01
Butter	0.01	-0.86			
Cheese			-0.91		
SMP				-0.19	
Other dairy					-0.33
Margerine		0.06			
Cereals	0.01	0.02	0.01	0.01	0.01
Income	0.21	0.29	0.52	0.00	0.11

Source: Hassan and Johnson (1976), Table 15.
Note: cross-price elasticities not shown for commodities listed in the table were below .005.
Cross price elasticities for other commodities in demand system but not shown in table were below .05.

Table IV.b: Elasticities from Moschini and Moro (1993)

	Milk	Butter	Cheese	Other dairy
Beef	0.03	-0.01	0.04	0.04
Pork	0.02		0.03	0.03
Chicken	0.03	0.03	0.03	0.03
Eggs	-0.06		0.05	
Milk	-0.26	0.56	-0.15	0.14
Butter	0.13	-0.88	-0.08	0.23
Cheese	-0.14	-0.32	-0.55	0.35
Other dairy	0.11	0.76	0.29	-1.01
Fats and Oils	0.05	-0.09	0.07	0.02
Bread and bakery	0.03	-0.01	0.05	0.04
Income	0.03	0.01	0.04	0.04

Source: Moschini and Moro (1993), Table 25.
Note: cross-price elasticities not shown for commodities listed in the table were below .005.
Cross price elasticities for other commodities in demand system but not shown in table were below .05.

In a study of the effects of butter advertising on consumer demand for fats and oils in Canada, Chang and Kinnucan (C&K, 1990) report the following own-price, cross-price and expenditure elasticities[7]. C&K show higher butter own-price and higher margarine cross price elasticities than the demand systems of either H&J or M&M.

Table IV.d: Butter and Margarine demand elasticities

	Butter	Margarine
Butter price	-1.42	1.28
Margarine price	0.29	-0.35
Expenditure on fats and oils	0.89	1.15

Source: Chang and Kinnucan (1990), p 304

[7]Chang and Kinnucan used a non-systems approach. The sample is quarterly data for 1973-1986. Elasticities are evaluated at the sample mean.

APPENDIX V Impact of 'crossloading' SMP and butter support prices - detailed table

The butter and skim milk powder support prices are used to provide a floor price for these joint products of milk and thereby support the target price for industrial milk[8]. Under this system, to increase the target price for milk by, e.g., one dollar per hectolitre, the prices of the products (in milk equivalent) must be increased by a total of one dollar. The increase in the product prices may be shared between the two in any proportion without affecting the average price for 3.6% butterfat milk[9]. Changes in the assumed processor margin and the direct subsidy also affect the support prices as the CDC balances their target/support price equation (see section 3.2.4).

In the April 1993 Medium Term Outlook, one-third of the annual increase in the target price plus processor margin was allocated to the butter support price and two-thirds to the skim milk powder support price. This rule results in the forecast projecting support prices for butter and skim milk powder to rise by about 1.5% and 2.5% per year respectively. The one-third/two-thirds rule was an ad hoc measure to model the decision by the CDC to allocate further increases in the target price more to the skim milk powder support price than to the butter support price; in April 1993, it was not clear how the CDC intended to implement their decision.

In August 1993, the CDC announced that 100% of the target price and assumed processor margin increase would be allocated to the skim milk powder price. In addition, the decrease in the direct subsidy to farmers was compensated for by an increase in the SMP support price. Also, the butter price was reduced for the 1993/94 dairy year and the SMP price increased further to maintain target returns. It now appears clear that the CDC intends to allocate all increases in the target price to the skim milk powder support price in the future. The FARM model for dairy is used to estimate the impact that different allocation rules could have. The previous baseline 33.3%/66.7% allocation rule is compared to 50%/50% and 0%/100%.

The results show that as the target price increases are allocated more to skim milk powder than to butter, the following effects occur:

- butter demand is increased
- skim milk powder demand is reduced
- butter production is increased
- skim milk powder production is increased
- MSQ is increased

In particular, Table V.a summarizes the changes in these variables under the three scenarios.

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[8] The fact that much of butter production is from skim-off and therefore does not result in skim milk powder production should not change the effectiveness of the floor prices. These prices will support the target price because they are available for the marginal units of butter and SMP produced.

[9] However, the price producers receive would be affected to the extent that the average provincial butterfat test was different from the 3.6% used in CDC calculations (CDC 1992b).

Table V.a: Level of selected variables in 1992 and in 1999 under three assumptions about how target price and assumed processing margin increases and direct subsidy decreases are allocated to butter and skim milk powder support prices.

	1992 level	1999 level		
		50/50 split	33/67 split	0/100 split
Butter support price ($/kg)	5.34	6.13	5.86	5.32
Skim milk powder support price ($/kg)	3.32	3.91	4.05	4.32
Butter consumption (mil kg)	83	59	62	68
Butter production (mil kg)	84	67	70	76
Skim milk powder consumption (mil kg)	31	34	34	34
Skim milk powder production (mil kg)	50	23	26	31
Industrial quota (MSQ) (mil hl)	41	38	39	40

This table implies that for milk producers, it is beneficial for all future increases in the target price to be supported solely through increases in the skim milk powder price. Producers receive the same target price (for 3.6% bf milk) and can ship more milk under the 0/100 scenario as compared to the other scenarios.

Butter processors produce more butter but at a lower price in the 0/100 scenario; in addition they produce more SMP at a higher price. Overall, they are processing more milk and are receiving the same 'assumed processor margin' per hectolitre of milk under the 0/100 scenario as compared to the other scenarios.