

Rent-Seeking and the Canadian Dairy Industry

by

Kathy Baylis

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Abstract:

The Canadian system of production controls provides rents to Canadian dairy farmers, and is kept in place by ongoing lobbying efforts. For example, the future of the supply management system came into question with the removal (tariffication) of import quotas mandated by the 1994 GATT. However, producers were able to successfully lobby to keep tariff levels sufficiently high to block imports for the foreseeable future. This paper asks what is the cost associated with rent-seeking. As opposed to what might be hypothesised under the full (or partial) rent-seeking hypothesis, expenditures on lobbying do not vary with the rent brought about by the regulation. However, rent-seeking expenditures do vary with the amount of influence producers have with the politicians. As well, the institutional changes brought about by the GATT seem to have induced a higher level of rent-seeking expenditure. Lastly, there is evidence that the smaller provinces are free-riding on the expenditure of the larger provinces, and this free-riding was increased by the GATT.

Rent-Seeking and the Canadian Dairy Industry

Introduction

Import competing industries are notoriously successful at achieving economic protection. In many developed countries, the import competing sectors of agriculture lobby for voluntary export restraints, orderly marketing arrangements, import tariffs, and export subsidies. Governments almost always responded to these calls for protection by providing sizeable income transfers from either taxpayers or consumers.

One example of an import competing industry that has successfully maintained protection from foreign competition is the Canadian dairy sector. The Canadian dairy sector has garnered rent from two government policies: domestic production controls and border measures. The production controls are a domestic policy, which limit the quantity of milk produced in Canada. The border measures restrict imports of dairy products. Together these policies result in a domestic price for milk that is three times higher than the world price.

Prior to the 1994 GATT, the Canadian dairy market was protected by import quotas. The GATT agreement required that import quotas be replaced by tariffs, which were to be reduced over time. Although these tariff-levels have decreased, they remain sufficiently high that the system of domestic production quotas continues to allow the domestic industry to set price. A number of authors have shown that this system of supply management has allowed producers to earn excess profits (Baricello 1981, Van Kooten and Spriggs 1984, Veeman 1982, Vercammen and Schmitz 1992).

Existing dairy producers will make investments in lobbying to maintain the rents from protection. This lobbying activity is costly. If the rents are shared equally by all existing producers one would expect each producer to pay their share of the cost of lobbying. However, dairy production is skewed toward the provinces of Ontario and Quebec because the initial allocation of quota was based on historical production patterns. No new quota has been given out since the initial quotas were put in place, and quota is not easily transferred between provinces. This creates an opportunity for some provinces to free ride on the cost of maintaining the economic protection.

Although there has been speculation that the creation and continued existence of these rents is a result of rent-seeking (Larue 1994, Schmitz 1995), there has been no attempt to estimate the costs of rent-seeking activities. Nor has there been any attempt to model the relationship between expenditures by dairy organisations and profits derived from supply management. This paper looks at the costs of rent-seeking in the Canadian dairy industry, and asks whether these costs are related with the rents obtained, and whether there was a change in the costs due to the 1994 GATT. It also explores the interplay between the provinces in setting their rent-seeking expenditure, and whether this interplay has changed with the GATT.

Specifically, this paper tests four hypotheses of the relationship between rent-seeking and available rent:

1. That there is some fixed minimum amount of rent-seeking activity needed to retain the system of supply management, which does not vary with profit. Alternatively, the amount of rent-seeking activity is related to the producer surplus gained from supply management.
2. The cost of rent-seeking increases whenever the federal government is forced to make a decision regarding the future of supply management. For example, when the federal government negotiates trade agreements, they must determine whether to keep the border controls supporting supply management in place.
3. The 1994 GATT agreement made maintaining the supply management more expensive.
4. The smaller provinces free-ride on the rent-seeking expenditure of the larger (more influential) provinces.

Canadian Supply Management in Dairy

The Canadian supply management system for dairy has its roots in the late 1950s and 1960s. Throughout this period of depressed prices, deficiency payments and government purchases were used to help support farm prices and incomes. Payments were made to dairy producers every year from 1958 to 1966, reaching a high of \$117 million in 1963-64, when a new dairy subsidy was formalised under the Canadian Dairy Commission (CDC) (Veeman 1975).

The size and consistency of these stabilisation payments may have contributed to the decision of the federal government to create the CDC in 1966 and the introduction of a formal system of production quotas in 1973 called supply management. Other factors contributing to this action included the loss of export markets in the United Kingdom and the European Community and rapid technological change increasing economies of scale of production (Trant, 1994). Schmitz (1995) argues that these reasons notwithstanding, the true impetus for supply management was rent-seeking on the part of producers.

Prior to the Uruguay Round of the GATT, Canada was able to block imports with a quantitative border restriction or import quota (under article 11.2.c). In the 1994 GATT, all import restrictions (including import quotas) were changed to tariffs. These tariffs were sufficiently large to block any imports (for example, the tariff on butter was initially set at 300 percent). Only an agreed-upon quantity of imports were allowed which were given tariff free access to the Canadian market. This became known as the Minimum Access Requirement (MAR).

Figure 1 illustrates the supply management system before and after the 1994 GATT. Domestic demand is given by the curve D and domestic supply by S . The border price is given by P^w , implying that Canada would be an importer of quantity $Q^2 - Q^1$ and domestic production would be Q^1 under free trade.

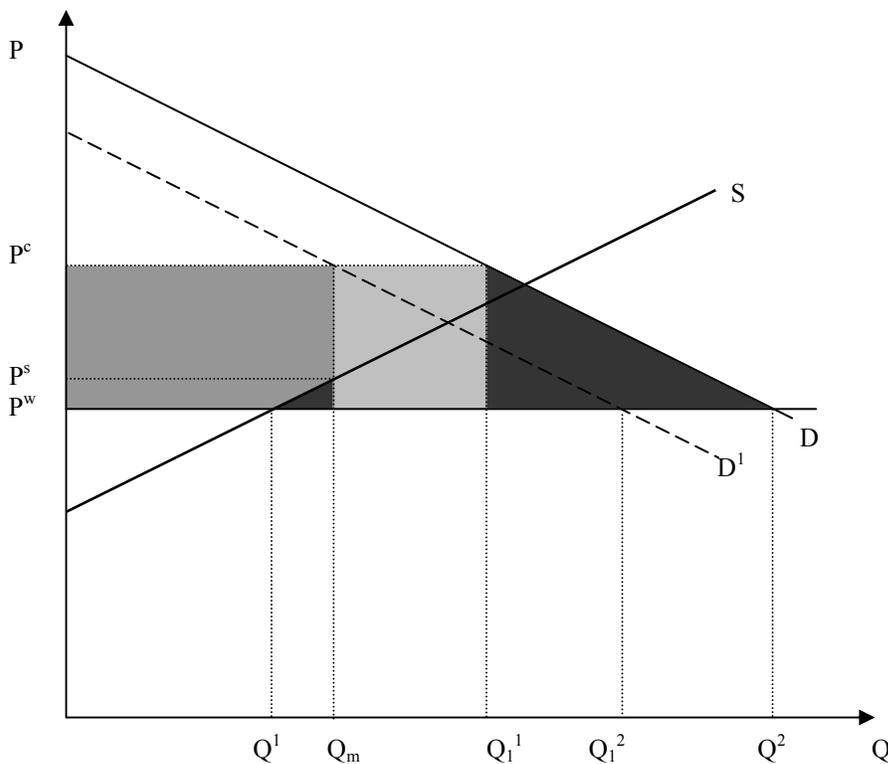
Tariffs are set to be greater than $P^c - P^w$. The MARs allow for imports equal to $Q^2 - Q_1^2$. Thus, domestic producers face the demand curve D^1 . The production quota is set at Q_m .¹ This quantity results in a domestic price to consumers of P^c .

The availability of import quotas gives importers the incentive to rent-seeking because the quotas have value equal to $(P^c - P^w)(Q_1^1 - Q_m)$, or the shaded in light grey. This value arises because the importers buy the product at P^w and sell it in the domestic market at P^c . As the import quota grows (through increasing MAR's), the value of the supply managed system declines and, if large enough, producers would do better under a free-trade regime (Vercammen and Schmitz 1992).

¹ There is a long-standing debate as to whether producer marketing boards set the quota at the profit-maximising quantity or not. Although much of the theoretical literature assumes profit maximisation (e.g. Vercammen and Schmitz 1992), the estimates of farm-gate demand for milk have estimated inelastic demand elasticities (Goddard 1993), which is inconsistent with the monopoly-pricing hypothesis.

The rents that accrue to the producer, on an annual basis, from restricting production are equal to the diagonally-shaded area. The quota value for any producer will be the discounted value of $P^c - P^s$ per unit of quota. The total approximate quota value for the industry will be the discounted value of rectangle $(P^s - P^c) Q^m$.² Compared to a situation of free trade, consumers lose the entire shaded area in consumer surplus. Rectangle $(P^c - P^s)Q^m$ is transferred from consumers to producers, and the two darkly-shaded triangles are the dead-weight loss.

Figure 1 Supply management before and after the 1994 GATT



Federal-provincial-producer agreement

In 1973, the federal and provincial government set up a structure to manage dairy production and milk price. The Canadian system of supply management traditionally split milk into its two end-markets: fresh ('fluid') milk and milk for producing processed dairy products (called industrial milk). Each province is allocated a fluid milk quota and an

² Moschini and Mielke (1988) use this methodology to calculate quota values for Ontario dairy production.

industrial milk quota. Production of fluid milk is divided among the provinces based on provincial consumption. Industrial milk quota was divided among provinces based on the production of industrial milk within each province at the time of the creation of the Milk Supply Management Agreement of 1973 (Canadian Dairy Commission 1975-76). Within each province a producer marketing board allocates the quota among producers.

Milk quota cannot be transferred between provinces without moving the complete dairy herd. This effectively blocks dairy production from locating in those provinces that have the lowest cost of production.³ Federal and provincial governments agreed to this rigidity in the location of milk production at the time the system was set up. The result of this lack of transferability is that quota values are much higher in some provinces than others, thus full rent dissipation may not occur.

Provinces who are not receiving their share of the rents from the system can either opt out completely or they can free ride on the cost of maintaining the system. If provinces opt out, producers in those provinces would face the world market price for milk and not be allowed to sell dairy products in any other province.⁴ Provinces may choose to free-ride by letting those provinces which get a larger share of the rents pay a greater proportion of the costs of maintaining the supply managed system.

Milk Pricing

The Canadian system of supply management has traditionally split milk into its two end-markets: fresh ('fluid') milk and milk for producing processed dairy products (called industrial milk). The marketing boards in Canada have engaged in price discrimination between these two markets, charging an average 35 percent more for fresh milk than industrial.

The price for industrial milk in Canada is based on the producers' estimated cost of production. The cost of production (COP) formula is developed by surveying producers to estimate the average direct costs incurred in the production of one hectolitre

³ Also no new quota has been offered since the system was started in 1973 because the demand for dairy products has not increased.

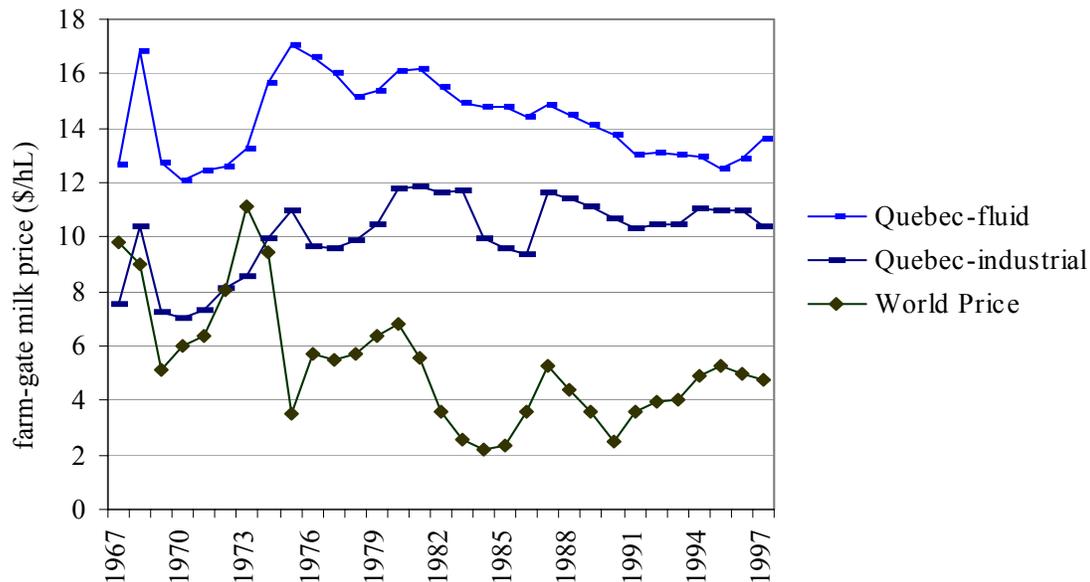
⁴ The Supreme Court of Canada has upheld this in the case of egg marketing, which has a similar system to dairy production.

of industrial milk. The COP is then further adjusted by the CDC based on a number of other factors such as the prevailing market conditions, the changing dairy environment, and the general state of the economy. One concern with the COP formula is that it does not seem to reflect decreases in the cost of production. For example, one of the major cost ingredients of milk production is feed grain (corn and/or barley) which has declined in price since 1985. Yet the COP for milk does not appear to reflect this change.

The price received by producers varies from province to province, in part, to reflect the regional cost of production. For example, the average fluid milk price was highest in Ontario, at \$14.70 per hectolitre (hL), and lowest in Alberta at \$13.85 per hL. The average farm-gate price for industrial milk was highest in Québec at \$10.07 and lowest in Alberta at \$8.28 per hL.

The Québec farm-gate prices of fluid and industrial milk are shown in comparison to the world price in figure 2 (in constant 1969 Canadian dollars). As can be seen, the price for fluid milk has not increased since the introduction of supply management, whereas the price of industrial milk has risen slightly, decreasing the gap between the two categories. However, the world price of milk has fallen.

Figure 2 Price of milk in Québec and on the World Market (\$/hL in 1969 Cdn\$)



Source: GREPA and CDC⁵ (2000).

Quotas

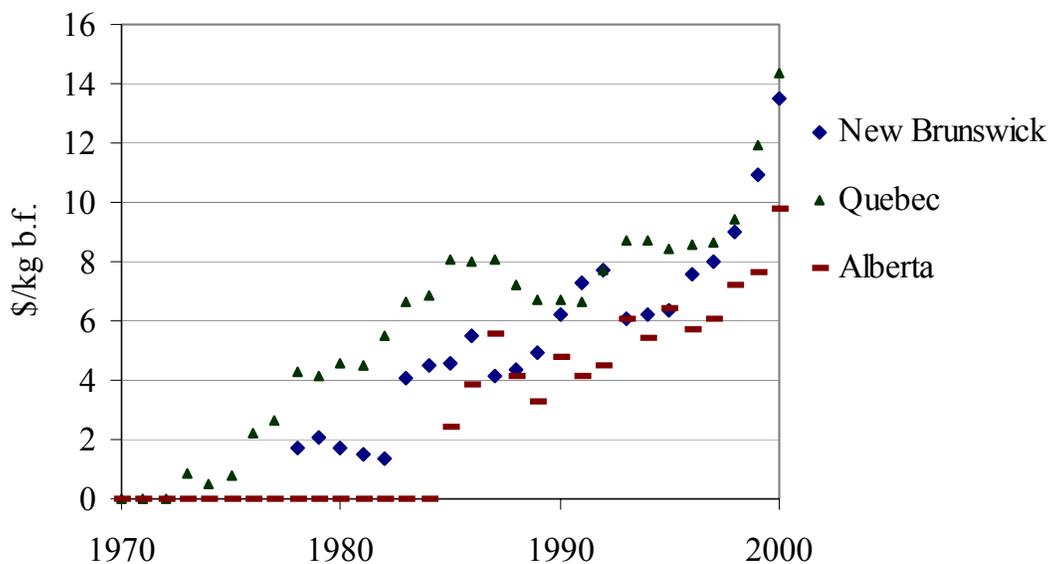
Production of fluid milk is divided between the provinces based on provincial consumption. Industrial milk quota was divided between provinces based on the production of industrial milk within each province at the time of the creation of the Milk Supply Management Agreement of 1973 (Canadian Dairy Commission 1975 - 76).

A result of the supply managed system is the value of the production quota. Because farmers need a license to produce milk, these licenses (quota) have taken on a value, which reflects the rents flowing from supply management (Baricello 1982, Schmitz and Schmitz 1994). Quota increases in value when the constraint on production is binding, i.e. producers would expand production if possible. There are a number of possible reasons for this quota value. The reasons include a shifting supply curve due to changes in technology or reduction of price risk, subsidised credit for the purchase of quota, economies of scale, and falling price of inputs.

⁵ World price is estimated by taking the domestic target price less the charge on over-quota production. This approximates the price the Canadian Dairy Commission expected to receive for the production on the world market.

Production quota is traded at the provincial level on a quota exchange.⁶ The average price of quota varied from a high of \$8.99 per hL (1969 constant dollars) in British Columbia (B.C.) to a low of \$5.29 in Saskatchewan. The price of quota has risen over time, reflecting either increased benefits due to the wider spread between domestic and world price, and/or decreasing cost of production (see figure 3). The value of quota can be used as a proxy for the expected returns from supply management.⁷

Figure 3 Real Price of Provincial Production Quota, 1969 to 1999 (in \$ per kg of butterfat,⁸ 1969 constant dollars)



Source: Provincial dairy marketing boards

⁶ Some provinces, such as Ontario and Quebec have had a quota exchange for most of the period since the introduction of supply management in 1973. For other provinces, such as Saskatchewan, the quota exchange has been adopted recently (1994).

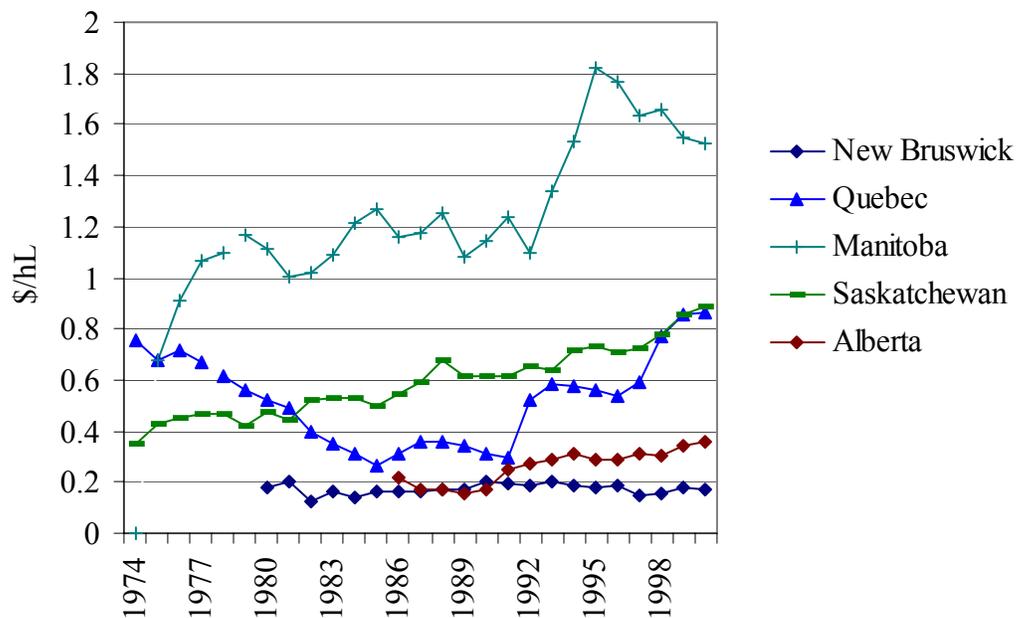
⁷ Using farm gate price of milk less cost of production was not a good option for a number of reasons. First, the data only had an 11 year series for cost of production estimates, which would have limited my data set. Second, the pricing of industrial milk changed in 1995, when Canada moved to a system of pricing milk by its components (e.g. butterfat, protein and milk solids).

⁸ Prior to 1993, production quotas were based on hL of milk produced. After 1993, provinces changed to regulating butterfat, as demand for low-fat milk increased and the quantity of butterfat became the limiting output.

Expenditure

Each provincial marketing board charges a levy on producer's production to cover their administrative and marketing costs (see figure 4).⁹ Alberta and Saskatchewan have much lower total expenditure than do the other provinces. The lower expenditures are in part due to the fact that funds for provincial advertising are not collected by the marketing board, but by the processor. In general, expenditure has increased over time.

Figure 4 Real administrative expenditure, 1974 to 2000 (in 1969 \$/hL)



Source: Provincial dairy marketing boards and GREPA

Administrative expenditure covers all marketing board activities, including meetings, conferences and lobby expenditures. Since these boards would not exist were it not for supply management, these costs can be categorized as unproductive rent-seeking expenditures. Promotional expenditures on the other hand, are used both for political and commercial reasons. Advertising campaigns have included attempts to garner public

⁹ Administrative levies are charged on both in-quota and over-quota production. Prior to 1995, over-quota production was also charged a penalty, to reduce the farm-gate price on this excess production to approximately world price.

support for supply management (such as the pre-GATT advertising campaign), and can be used to increase consumption of dairy products. These two categories of expenditure are treated separately in the analysis.

Theory of Rent-Seeking

If a government's objective function is to maximize public support, it may be subject to rent-seeking (Becker 1983, Peltzman 1976). The central thesis of rent-seeking is that individuals or groups lobby government for policies from which they will be able to accrue rent (Buchanan and Tullock 1974 and Rausser 1992). These policies may be as straight forward as a subsidy, or regulations that create barriers to entry into an industry allowing firms within the industry to charge price above marginal cost. Rent-seeking activities require the expenditure of resources on the part of the interest groups. They may take the form of directly financing a political campaign or the development of an organization that puts forth the case of the interest group to the politicians and bureaucrats.

The optimal level or quantity of lobbying occurs where the marginal return from lobbying equals the marginal cost. If more than one group is lobbying for the rents, more resources will be spent to capture the rents available. Full rent-seeking occurs when you have many groups bidding for the same rent, for example, a number of firms bidding for the income from a tariff. In this case, the winning firm may spend as much on rent-seeking as the expected rent itself. Under full rent-seeking, all the benefits from rent-seeking are dissipated in the non-productive activities of rent-seeking.

Rent-seeking is generally seen as a wasteful activity (Tullock 1967). Interest groups or firms will take resources from other productive endeavors and spend them instead on lobbying or other rent-seeking activities, decreasing overall economic efficiency. However, even with the most benign government objective - to maximise social welfare, decision-makers rely on interest groups for information to determine the social welfare function. Presumably there is asymmetric information between the government and interest groups about public preferences or the specific effects of certain regulations. Thus, some rent-seeking activities may actually increase overall welfare. One

can draw a distinction between productive versus non-productive rent seeking: some expenditure may be purely a transaction cost to informing government versus other expenditure is an attempt to influence political outcomes independent of the broader welfare implications. The literature defines this as facilitative versus persuasive rent-seeking (Esty and Caves, 1983, Wilhite and Theilman, 1987; and Mueller and Stratman, 1994). Esty and Caves argue that under the facilitative role, the industrial structure (e.g. number of employees, revenue) lends political weight, whereas under the persuasive role, the amount of rent-seeking expenditure itself which has influence. As well, they argue that if expenditures are purely facilitative, they should largely be a function of industry attributes, whereas if they are persuasive, these attributes should not affect expenditure.

Like any collective action problem, rent-seeking can suffer from free-rider problems. If there are numerous firms in an industry bidding for common tariff protection, the other firms in the industry receive a positive externality associated with any one firm's rent-seeking expenditures. This may lead to under-investment in rent-seeking activities. Grossman and Helpman (1996) illustrate that the higher the probability firms can achieve protection without paying the full cost, the lower both the rent and rent-seeking expenditure (compared to a situation with no free-riding).

A number of authors have discussed the implications of free-riding in rent-seeking. Olson (1965) argues that pressure group activity is more likely to result if the group is concentrated, although the empirical results are mixed on this point. Pincus (1975) argued that geographic concentration may decrease the potential for free-riding because it facilitates coordination and monitoring. Magee et al (1989) argue that the lobbying power is a function of the concentration ratio times sales, where the concentration ratio is seen as a proxy for the possibility of rent-seeking and sales is a proxy for the portion of the benefit received by the firm.

A number of authors have demonstrated the existence of a political market for protectionism (e.g. Baldwin 1989; Grossman and Hausman, 1994; Lopez and Pagoulatos 1996; Ray 1981a,b). Results are mixed as to whether contributions are facilitative or persuasive. In US agriculture and food industries, Lopez and Pagoulatos find that both PAC contributions and industry structure are factors in determining levels of protection. Specifically, they find that PAC contributions are more important in determining tariff

protection than industry structure or comparative disadvantage. On the other hand, in US manufacturing, Esty and Caves find more support that expenditures play a facilitative role. However, even after controlling for industry characteristics, Esty and Caves find expenditures did have some effect on political outcomes.

There has not been much work determining the factors that influence rent-seeking expenditure. Esty and Caves show that the amount of expenditure was in large part determined by industry structure. The authors did not find any explicit signs of free-riding, and, in fact found that the more geographically diverse the industry, the more political activity and the more success. Lopez and Pagoulatos show that PAC contributions vary with industry structure and contributions by opponents. They did not test to see whether comparative advantage or free-riding had an influence on the size of contributions. No empirical study has looked at the effect of institutional changes on rent-seeking and on the potential for free-riding.

A Model of Rent-seeking

Farmers lobby the federal and the provincial government to ensure they remain part of the supply management system. If both levels of government support supply management, the quantity of the national production (and subsequent rent) is determined at the federally in negotiations with consumers and processors at the Canadian Dairy Council. The quota is then divided between the provinces based on population (for fresh milk) and historical production (for industrial milk). Although this process is overseen by the federal government, neither level of government directly affects the size of the production quota. Thus, the rent-seeking expenditure does not directly affect the size of the rent available, only whether the rent is available at all.

Producers do not to know exactly how much rent-seeking activity is needed to ensure that the governments choose to keep supply management in place. Instead, the amount of rent-seeking affects the probability of keeping supply management in place. In each province, i , farmers are assumed to collectively choose their rent-seeking expenditure to maximise expected profit.

$$(4) \quad \underset{i}{\text{Max}} p(L) \left(\frac{1}{\rho_i} \pi^s \right) + (1 - p(L)) (\pi_i^c)$$

where l_i is the expenditure of province on lobbying, and L is the sum of lobby expenditure of all provinces, $L = \sum_i^n l_i$. The total profit under supply management π_i^s divided between the provinces on the basis of a pre-determined shares (based on population and historical processing) $\frac{1}{\rho_i}$ and π_i^c is the profit without supply management. The probability that the government keeps supply management in place is represented by p , which is a function of the total lobbying efforts, L .

The resulting first order conditions dictate that the optimal amount of rent-seeking activity will be occur where the marginal benefit of rent-seeking equals the marginal cost. Thus, the optimal quantity of rent seeking will be chosen where the effect of an extra dollar of rent-seeking on the probability of getting supply management times the benefits of supply management equals one.

$$(5) \quad \frac{\partial p}{\partial L} \left(\sum_{j \neq i}^n \frac{\partial l_j}{\partial l_i} + 1 \right) \left(\frac{1}{\rho_i} \pi^s - \pi_i^c \right) = 1$$

The optimal quantity of rent-seeking will be a function of the difference in profit with and without supply management, and the effectiveness of rent-seeking. The effectiveness of lobbying will depend on how important the provincial dairy industry is to the province and the amount of political clout the province has at the federal level. It will also be determined by the rules in place. Trade agreements and other exogenous policy changes will influence how effective any one province is at rent-seeking with their provincial and federal governments.

Marketing board administrative expenditures include the cost of lobbying and are used as an inexact estimate for rent-seeking expenditure. Rents accruing to supply management are represented by quota value, the price each producer has to pay for a 'licence' to produce milk. To capture 'political clout', I use the number of government Members of Parliament (MPs) each province has in Ottawa on the assumption that government MPs will have more influence on policy than opposition MPs. As well, which of the two governing political parties is in power is assumed to affect the degree of political influence held by dairy farmers. Dummies for trade agreements are used to capture the effect of regime changes on the optimal rent-seeking expenditure. Using the

administrative expenditure to capture optimal rent-seeking expenditure, the dependent variable is measured with error. Thus, the actual estimation equation becomes as follows:

$$(6) \quad \ln \tilde{l}_i = \beta_0 + \beta_1 \ln\left(\frac{1}{\rho_i} \pi^s - \pi_i^c\right) + \beta_z' \ln z_i + \varepsilon_i$$

where \tilde{l}_i is the expenditure by marketing boards and z_i is a vector of variables capturing the effectiveness of rent-seeking. The rents from supply management: $\frac{1}{\rho_s} \pi^s - \pi_i^c$ are a function of the farm-gate price of milk in the province, the cost of production in the province, and the price farmers would receive without supply management, which is assumed to be the world price for milk. The rents might also be affected by the 1994 GATT agreement. The effectiveness of rent-seeking will be influenced both by the industry structure (as suggested by Esty and Caves) and the political clout of dairy producers. Since trade agreements have the potential to change the bargaining power of producers, the effectiveness of rent-seeking will also be influenced by the trade regime in place.

This model is then used to test several hypotheses about the determinants of rent-seeking expenditure. The first hypothesis tested is that rent-seeking expenditure does not vary with the surplus available. If there are no other parties bidding for the surplus, then the expenditures may only be some constant maintenance cost, which would be reflected by $\beta_1 = 0$. If this is the case, there cannot be full rent-seeking. The second hypothesis proposed that rent-seeking does not increase in response to a critical government decision. If this hypothesis holds, one would anticipate that the coefficients on the two years just prior to the CUSTA and GATT agreements (denoted preCUSTA and preGATT) would not be significantly different from zero, thus $\beta_{\text{preCUSTA}} = 0$ and $\beta_{\text{preGATT}} = 0$. The third hypothesis specifically addresses the costs of rent-seeking before and after the GATT. Under the null hypothesis, GATT is assumed to not have an effect. A dummy variable is used to identify the years since the 1994 GATT agreement. If there is no change, the coefficient on this variable will not be significantly different from zero,

i.e. $\beta_{GATT} = 0$. As well, I test whether other variables change before and after the GATT in appendix B.¹⁰

So far, the hypotheses have ignored the possible interplay between the expenditure of various provinces. Assume there are two types of provinces, large provinces and small provinces. The large provinces have greater political influence with the federal government, and also gain the bulk of the rents flowing from supply management in dairy (both because of the larger population and because the processing has traditionally been located near the large population centres). Since the lobbying primarily occurs at the federal level and the benefits of retaining supply management flowing to any one province are not tied to the expenditure of that province, the smaller provinces may have an incentive to ‘free-ride’ on the lobby expenditure of the larger provinces. If there is free-riding, then for the small provinces, the expenditure of the small provinces, l_s , will be negatively correlated to the expenditure of the larger provinces

$$l_b: \frac{\partial l_s}{\partial l_b} < 0. \quad ^{11}$$

Thus, for the small provinces, a second estimation equation includes the potential effect of free-riding.

$$(7) \quad \ln \tilde{l}_s = \beta_0 + \beta_1 \ln\left(\frac{1}{\rho_s} \pi^s - \pi_i^c\right) + \beta_2 \ln l_b + \beta_z' z_i + \varepsilon_i$$

where $\frac{1}{\rho_s} \pi^s - \pi_i^c$ is the benefit from supply management flowing to the small provinces

and \hat{l}_b is the lobby expenditure of the large provinces. This model is used to test the

¹⁰ The CUSTA did not change the institutions governing supply management, nor did it change the relative bargaining power of the provinces, thus it was not seen as a precipitating a regime change. However, since it was uncertain whether the government would protect supply management in the negotiations leading up to the CUSTA, thus one might anticipate that the dairy marketing boards would increase their lobby efforts prior to the CUSTA.

¹¹ This can be shown by assuming $\pi_i^c = 0 \quad \forall i$ and setting the first order conditions for each group of provinces equal: $\frac{\partial p}{\partial L} \left[\frac{\partial l_b}{\partial l_s} + 1 \right] \frac{\pi^s}{\rho_s} = \frac{\partial p}{\partial L} \left[\frac{\partial l_s}{\partial l_b} + 1 \right] \frac{\pi^s}{\rho_b} \Rightarrow \left[\frac{\partial l_b}{\partial l_s} + 1 \right] \frac{\rho_b}{\rho_s} = \left[\frac{\partial l_s}{\partial l_b} + 1 \right] \Rightarrow \frac{\partial l_b}{\partial l_s} > \frac{\partial l_s}{\partial l_b}$. If the expenditures of the large province are a sufficiently large portion of the total, they will not be affected by the expenditures of the small provinces, thus $\frac{\partial l_b}{\partial l_s} = 0, \therefore \frac{\partial l_s}{\partial l_b} < 0$.

hypothesis that there is no free-riding by the smaller provinces. If the hypothesis is true, then $\beta_2 = 0$. If there is free-riding, the coefficient is expected to be negative, thus $\beta_2 < 0$.

Advertising is treated somewhat differently. Because promotional expenditure can be both political and commercial, it can influence the probability of the existence of supply management, as well as the rents available. The amount of advertising chosen will then be set to maximise expected producer profit.

$$(8) \quad \underset{a_i}{\text{Max}} p_i(a_i)(\pi_i^s(a_i) - a_i) + (1 - p_i(a_i))(\pi_i^c(a_i) - a_i)$$

The first order conditions again result in the promotional expenditure being chosen where their marginal benefit, in terms of increasing probability of supply management and increasing the rents available, equal marginal cost.

$$(9) \quad \frac{\partial p_i}{\partial a_i} (\pi_i^s(a_i) - \pi_i^c(a_i)) + p_i(a_i) \left[\frac{\partial \pi_i^s}{\partial a_i} - \frac{\partial \pi_i^c}{\partial a_i} \right] = 1$$

Since the rent is a function of the advertising expenditure, the optimal amount of advertising is estimated using instrumental variables. A number of instruments are used to approximate the rents. The instruments include variables that would effect demand, such as macroeconomic variables, and supply, such as US costs of production. The estimation equation is:

$$(10) \quad \ln a_i = \beta_0 + \beta_1 \ln(\hat{\pi}_i^s - \hat{\pi}_i^c) + \beta_2 \ln z_i + \varepsilon_i$$

Like the equation for administrative expenditure, the optimal amount of advertising will depend on its effectiveness on both increasing the size of rent available and on increasing the probability that supply management will continue. The effectiveness of advertising will also depend on political influence and regime. This model is then used to test to see if promotional expenditure, like administrative expenditure:

1. Is invariant with the rents from supply management,
2. remains constant in the face of critical government decisions,
3. changed after the 1994 GATT.

Since the advertising expenditure is spent within the province, the externalities it creates for other provinces are small, thus the free-riding hypothesis is not tested for promotions.

Data Description

This study focuses on seven provinces, New Brunswick, Québec, Ontario, Manitoba, Saskatchewan, Alberta and B.C.. These provinces produce the majority of the milk in Canada, and most have had quota exchanges in place for a number of years, allowing for a more accurate estimation of quota value. The data include (by province) the farm-gate price of milk, the quantity produced, the price of production quota and the levies charged by the provincial marketing boards. Average milk production per cow by province is also included. As well, the data include the percentage of the agricultural revenue supplied by the dairy industry, to proxy for the importance of the industry to the province. As mentioned above, as a proxy for political influence, I used the number of government MP's each province sent to Ottawa. As well, a dummy variable was used to indicate when the Progressive Conservative government was in government. Supply Management was introduced by the other governing party, the Liberals, and it is assumed that dairy farmers will have less influence within the government when the Progressive Conservatives are in power. The time-period used covers the years shortly following the introduction of supply management to present (1973-1999). Summary statistics are presented in table 1.

Table 1: Summary Statistics of Continuous Variables (all \$ in 1969 constant Canadian dollars)

Variable	No. of Obs.	Mean	Variance	Minimum	Maximum
Administrative Expenditure (\$'000,000)	167	0.797	0.689	0.024	0.254
Promotional Expenditure	154	1.552	4.393	0	7.062
Price of quota (\$/kg of bf)	113	6.267	6.915	0.493	14.351
Variables affecting Quota Value					
Price of fluid milk (\$/hL)	226	14.332	2.970	11.132	19.558
Price of industrial milk (\$/hL)	226	9.248	4.336	4.647	14.389
World Price of Milk (\$/hL)	217	5.332	4.905	2.196	11.104
U.S. Price of Milk (\$/cwt)	133	35.667	34.309	26.725	46.286
Comparable US Variable Cost of Production by province (\$/cwt)	133	9.462	1.701	6.428	12.374
Comparable U.S. Economic Costs of Production (\$/cwt)	133	15.382	4.494	9.626	19.398
Production per cow (by province) ('000 hL)	193	43.264	225.180	8.302	72.145
(Real) interest rate	231	3.039	7.231	-2.176	8.244

Industry Structure Variables

Dairy as a portion of provincial agricultural revenue	203	0.147	0.011	0.013	0.380
Dairy cows in the province ('000)	238	234.170	69249	20.500	953.000
Producers in the province ('000)	184	5.943	45.711	0.313	29.809
Political Variables					
Number of government MPs elected in the province	224	19.888	580.480	0.000	98.000
Cabinet Ministers	226	4.407	21.949	0	15

The quota value and levies came from the annual reports of the various provincial marketing boards. Farm-gate milk prices come from the CDC, and an agricultural policy research group out of the Université Laval, Groupe de Recherche en Économie et Politique Agricole (GREPA). As well, the number of producers per province come from GREPA. Canadian costs of production were only available for three provinces over ten years, so regional U.S. costs of production were used instead. Since most inputs are tradable, the U.S. costs were thought to be a reasonable proxy. U.S. variable and economic production costs come from the United States Department of Agriculture (USDA). Production per cow and dairy as a percentage of agricultural revenues come from Agriculture and Agri-Food Canada.

The world price of milk was created using prices for export dairy products (butter, skim milk powder and cheese) FOB New Zealand and Rotterdam (USDA and New Zealand Dairy Board). Processing costs were subtracted and transportation charges were then added so these prices would reflect possible prices at the Canadian border. Then the prices were translated into the price for milk components to create the equivalent price of a hectolitre of milk.

The number of MP and Cabinet Ministers per province were collected from the Canadian Library of Parliament. All data is by dairy-year (August to July).

Results

Administrative and promotional expenditure were estimated as a function of time, provincial fixed effects, price of quota and the 1994 GATT using two-stage least squares. Since the quota value is the expected net present value of future profit arising from supply management, it will presumably vary with the probability of the existence of

supply management, which in turn is a function of rent-seeking expenditure. As well, although the rents from supply management are not a function of administrative expenditure, they will be affected by promotional expenditure. In both cases, the quota value is endogenous, and instruments were used to estimate the change in the quota price. The instruments used for quota value were the provincial fixed effects, US variable and economic costs, regime variables, provincial productivity and a discount factor (the regression on quota value is described in detail in appendix A).

Autocorrelation was found to be a problem for both the administrative and promotional expenditure regressions, and the variance of the error terms was assumed to be correlated with the previous year (AR(1)).¹² Using the White test for heteroskedasticity, the hypothesis of homoskedasticity could not be rejected at the ten percent level for either the administration or promotion equation (P-stats of 0.328 and 0.706 respectively.) The results of the regressions are presented in table 2.

¹² Higher order lags were tried and found to be insignificant.

Table 2: Two-Stage Least Squares Regression on Expenditure

Variable	Administrative		Promotion	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	20.720**	4.966	16.352**	7.824
Time trend	-0.045	-0.967	-0.053	-1.677
LQ2DP_Q	0.091	1.178	-0.007	-0.149
Fixed effects				
New Brunswick	-3.391**	-2.945	-2.725**	-5.771
Quebec	-0.974*	-1.759	-0.018	-0.058
Manitoba	-0.257	-0.252	-2.491**	-4.042
Saskatchewan	-0.248	-0.171	na	na
Alberta	-0.990	-1.051	na	na
British Columbia	-3.100**	-3.250	na	na
Regime				
preGATT	0.216**	2.408	-0.026	-0.553
GATT	0.211*	1.828	0.172**	2.767
preCUSTA	0.030	0.460	0.056	1.456
Political Influence				
Government MPs	-0.001	-0.531	0.000	0.557
Same provincial governing party	-0.091*	-1.900	0.006	0.232
Cabinet members	-0.006	-0.536	-0.011*	-1.975
Industry Structure				
Butter imports	0.000	0.867	0.000*	1.722
ln(dairy)	1.748**	3.302	-0.147	-0.483
ln(producers)	-0.442	-1.375	0.073	0.535
ln(US price of milk)	0.286	1.656	0.032	0.301
AR(1)				
AR(1)	0.875**	9.561	0.917**	49.959
R-squared	0.989		0.998	
Durbin-Watson stat	1.938		2.095	
Obs	81		64	

* indicates significance at the 10 percent level.

** indicates significance at the 5 percent level.

Administrative expenditure per hectolitre did not increase significantly over time, and promotional expenditures per hectolitre decreased marginally over time. Only the fixed effect for Manitoba was significant. Manitoba spent more in administrative pursuits and less in promotions than did Ontario and B.C.

Interestingly, the change in the price of quota had no significant effect on either administrative or promotional expenditure. This would seem to imply that the costs of rent-seeking did not vary with the rents brought about by supply management. The other option is that the quota value was not a good proxy for the rents accruing to producers. Whether quota values capture the variation in profits accruing to producers is discussed in appendix A.

Industry structure did help determine administrative expenditure. A one percent increase in the relative size of the dairy industry was related to a 1.5 percent increase in expenditure per hectolitre. Using Esty and Caves' methodology, this correlation might imply that the rent-seeking expenditure was, in part, productive. However, the number of producers was negatively correlated with administrative expenditure. In general, provinces with fewer farms spent more money per hectolitre. If more producers give the dairy industry more influence, here expenditure seems to be acting as a substitute for influence, as opposed to the compliment as suggested by Esty and Caves.

Industry structure had less influence on advertising expenditure per hectolitre. The only exception is the intuitively appealing result that as world price falls, advertising expenditure increases (although this was only significant at the ten-percent level). If the marketing boards fear consumers importing dairy products, increasing domestic advertising may be a reasonable response.

Most of the various measures of political influence were not significant at the ten-percent level. Strangely, the number of federal cabinet ministers a province had was negatively correlated with the amount of promotional expenditure per hectolitre.

The total expenditure did increase after the 1994 GATT agreement. Both administrative and promotional expenditure increased after the passing of the GATT. As well, administrative expenditure increased in the two years prior to the GATT agreement. Given that the supply management industries engaged in heavy lobby campaigns leading up to the GATT, the increase in administrative expenditure just prior to the GATT was expected. What is interesting is that the increase has persisted. This increase may be due to the increased threat to supply management from imports, or foreign countries.¹³

¹³ For example, the Canadian dairy industry was actively engaged in supporting the federal government in fighting the NAFTA-challenge from the United States when it attempted to replace the import quotas with tariffs.

Returning to the hypotheses, it would seem that rent-seeking expenditure does not vary with the rents available, thus the first hypothesis cannot be rejected. This implies that there is not full rent-seeking. However, as the government faces decisions critical to the survival of supply management, such as posed by negotiating trade agreements, the dairy producers are willing to increase their lobby efforts. Lastly, the GATT agreement has seemed to cause supply management to be more expensive for producers to maintain. The above analysis cannot discern whether this increase is due to a change in the bargaining power of other interest groups, such as consumers or importers or some other factor. None the less, the 1994 GATT has seemed to cause some institutional change that makes supply management less certain, and more costly.

Next, the administrative expenditure of the smaller provinces were estimated as a function of all the above variables plus the expenditures of Quebec and Ontario. Since Quebec and Ontario produce 65 percent of the fluid and 78 percent of the industrial milk, they can be perceived as large provinces as described in the model of rent-seeking proposed earlier. They also account for 78 percent of the total administrative expenditure, thus small provinces may feel they can rely on these two central provinces to ensure that supply management remains in place.

Both the change in quota price and the expenditures by Quebec and Ontario may be endogenous, so instruments were used for both. The list of instruments are the same as in the above regressions. The results are presented in table 3.

Table 3 Two-State Least Squares Regression on Administrative Expenditure (per hL) of Western Provinces as a function of expenditures of Quebec and Ontario

Variable	Coefficient	t-Statistic
Constant	31.635**	5.933
Time trend	0.091*	1.914
ln(change in quota price)	-0.123	-1.399
ln(expenditure by Ontario and Quebec)	-0.940**	-2.729
Fixed Effects		
Manitoba	1.686**	2.976
Saskatchewan	1.438	1.462
Alberta	1.031	1.703
Regime		
preGATT	0.199	1.180
GATT	0.212	1.019
preCUSTA	0.028	0.285
Political influence		
MPs	0.003	0.453
Cabinet	0.041	1.277
Industry structure		
Butter Imports	0.000**	-2.471
ln(dairy)	1.110**	2.447
ln(producers)	-0.542*	-1.857
ln(US Price)	-0.158	-0.507
AR(1)		
AR(1)	0.509**	3.192
R-squared		0.991
Durbin-Watson stat		2.165

* indicates significance at the 10 percent level

** indicates significance at the 5 percent level

There were significant differences between the smaller provinces. Once again, Manitoba had significantly higher expenditure than did B.C. Also, like the regression for all of the provinces, the as the number of producers in the province increased, the administrative expenditure per hectolitre decreased. Other than these few similarities, the expenditures for the smaller provinces seem to be determined by a number of different factors than the expenditures of provinces as a whole.

First, the expenditure of the small provinces is negatively correlated with the expenditure of Quebec and Ontario. A one percent increase in the expenditure of the two central provinces leads to an almost one percent (0.978 percent) decrease in expenditure by the other provinces. Second, the smaller provinces actually decreased their expenditure for the two years prior to the GATT agreement and kept it down thereafter. It is impossible to determine whether this is due to the fact that the smaller provinces were less concerned about losing supply management as a consequence of the GATT agreement than were Quebec and Ontario or some other factor is in play. Since the majority of processing is done in the two central provinces, they may be more affected by the increase in imports precipitated by the MARs. This could explain why the GATT shifted the bargaining power among the provinces.¹⁴ Another possible cause for the decrease in expenditure in the 1990s is that there was an exogenous regional change in cost of production just after the GATT agreement. The cost of feed grain dropped in the western provinces after August 1995 due to the loss of the export grain transportation subsidy. Due to the rigidity in the rules allocating production quota between the provinces, the western provinces have not been able to take advantage of this increase in comparative advantage. However, since the costs of production in the western provinces are still higher than in many U.S. states, it is uncertain whether the change in domestic comparative advantage would be enough incentive for the provinces to risk losing supply management, if, in fact, they truly felt that was a possibility.

Third, some of the political variables now have a significant effect on administrative expenditure. When there was a Liberal government in power or when the province had elected fewer MPs, the smaller provinces spent more on lobbying. The smaller provinces in general, and the western provinces in particular, have more influence with the Conservative government on agricultural policy (Schmitz et al 2001), thus in both these cases it would seem that lobbying expenditure is acting as a substitute, as opposed to a compliment, to political influence. Last, the world price had a significant

¹⁴ The fact that GATT changed the bargaining power between the provinces is further supported by the regressions presented in Appendix B. For example, it seemed that although provinces in general spent more on promotions after the GATT, provinces with larger populations, such as Ontario and B.C., had a greater increase in promotional expenditure than those with smaller populations.

influence on the administrative expenditure. As world price decreases, administrative expenditure of the smaller provinces increases.

Areas for Further Study

In attempting to estimate the cost structure of rent-seeking and the effect of the GATT, this paper overlooks a number of issues involved in estimating the true cost of rent-seeking in the Canadian dairy industry. For example, the existence of supply management may have blocked the rationalisation of dairy production, keeping costs of production from dropping as much as they might have otherwise. One could compare the rate of technical progress in dairy production in Canada against the northern states in the U.S. to determine if slower technology change should be included as a cost of supply management.

A further extension of the paper would be to include the lobbying costs of the processors and importers, and see whether they have any effect on the costs of rent-seeking for the producers.

Summary

Dairy producers gain rents from the system of supply management in Canada (Baricello 1981, Van Kooten and Spriggs 1984, Veeman 1982, Vercammen and Schmitz 1992). Maintaining the system has a cost. Provincial milk marketing boards engage in rent-seeking to ensure that the federal government keeps supply management in place. One would anticipate that optimal rent-seeking expenditure would be set where the marginal benefit equalled the marginal cost. Marginal benefit would be determined by the amount of influence the provincial dairy industry had over the federal government. Interestingly, the industry structure and political variables often seemed to imply that expenditure acted as a substitute for influence as opposed to a complement, as suggested by Esty and Caves.

If the full rent-seeking hypothesis held, one would expect that the cost of rent-seeking would equal the anticipated rent. Even if producers had to partially bargain for the rents (against processors or consumers), the costs of rent-seeking would vary with the rents available. If instead supply management just requires some marginal maintenance

cost, then the levies should be independent of expected rents. When a regression was run on levies as a function of rents (proxied by the change quota value), the change in quota value had no effect on either administrative or promotional expenditure. Thus, one can conclude that the full or partial rent-seeking hypothesis does not hold in the Canadian dairy industry.

Whenever the government faced a decision regarding the future of supply management, such as when negotiating trade agreements, lobby expenditures increased. For the two years 1994 GATT, administrative expenditure increased and the levies remained high after the 1994 GATT. The 1994 GATT required that Canada change the import quotas supporting the higher domestic price for milk to tariffs, and that these tariffs were to be decreased over time. Canada was also required to import a certain percentage of their domestic consumption (called the minimum access requirement or MAR), which was to increase over time. These changes may have given other parties, such as consumers and importers leverage to bargain for the rents going to producers under supply management. For example, both Canadian consumers and importers would gain with an increase in the MAR, and consumers would also gain from a decrease in the import tariff. This increase in bargaining power on the part of consumers and importers may have required producers to spend more after the 1994 GATT to retain the system of supply management than before.

There is also indication that smaller provinces may be free-riding on the expenditure of Quebec and Ontario. When the expenditure of the five smaller provinces was regressed on the expenditure of the larger provinces, a one percent increase in the expenditure of the larger provinces resulted in an almost one percent decrease in expenditure of the smaller provinces. The GATT also changed the bargaining power of the provinces when determining their level of rent-seeking expenditure. Both for the administrative and promotional expenditures, the larger provinces increased their expenditures more after the GATT than did the smaller provinces. Thus, GATT seems to have increased the potential for free-riding.

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Appendix A. Quota Value

To ask whether quota price is a good proxy for the profit accruing to supply management, the price of quota was estimated as a function of demand price and cost of production. Quota value is modelled as the net present value of the demand price for milk less the marginal cost of milk production:

$$(A.1) \quad V_0(\bar{q}_t) = E \left[\sum_{t=0}^T \delta^t (D_t(\bar{q}_t) - S_t(\bar{q}_t)) \right]$$

where \bar{q}_t is the production quota at time t , T is the last period supply management is in place, and δ is the discount rate.

A number of instruments were used to account for the variation in the demand and supply price at the quota level. To account for demand, GDP was used. Given that most inputs into dairy production are traded across the Canadian-U.S. border, the Canadian cost of production was instrumented by the U.S. cost of production and provincial productivity (represented by output per cow per province in Canada). Policy changes in Canada also affected the cost of production. For example, the Canada-United States Trade Agreement (CUSTA), introduced in 1989, allowed for freer movement of inputs from one country to the other. As well, the removal of the statutory freight rates on export grain (called the Western Grain Transportation Act or WGTA), affected the cost of production of dairy regionally. Lastly, since the quota value is the expected net present value of future profits, various political variables were thought to influence the expected future of supply management. Therefore the number of government MPs per province, the number of cabinet ministers per province and whether the government was conservative were included as instruments. There are also random shocks to supply and demand that are assumed to be uncorrelated with the instruments.

$$(A.2) \quad \begin{aligned} P(\bar{q}) &= \alpha'X + \varepsilon \\ S(\bar{q}) &= \beta'Y + \nu \end{aligned}$$

Using the above instruments to predict the change in the domestic price and cost of production, the value of quota was estimated as function of the price of fluid and

industrial milk, variable costs of production and the GATT. Since the 1994 GATT agreement placed the future of supply management in question, it was assumed that the GATT would affect producer's perceptions of T in equation (1). All continuous variables were estimated in log form. The value of quota is measured with error given that some of the quota markets may be thin. Autocorrelation was a problem, and the variance-covariance matrix was corrected for terms following an AR(1) process (results are presented in table A.1).

$$(A.3) \quad V(\bar{q}) = \hat{\alpha}'X - \hat{\beta}'Y + \eta$$

where $E(\varepsilon - v|\eta)$ is assumed to equal 0.

Table A.1 Two-Stage Least Squares Regression of Quota Value (\$/kg of bf)

Variable	Coefficient	t-Statistic
C	-29.017*	-1.948
Time trend	0.512*	1.809
Fixed Effects		
New Brunswick	-0.595	-0.748
Quebec	1.624**	2.290
Manitoba	-1.198	-1.086
Saskatchewan	-3.817**	-3.371
Alberta	-0.765	-0.781
British Columbia	1.351	0.725
Regime		
preGATT	0.342	0.340
GATT	0.189	0.129
preCUSTA	-1.191	-1.044
CUSTA	1.797	1.325
preGTA	2.799**	2.377
GTA	1.036	0.617
NPV(Profit)		
Price of Industrial Milk	0.357	0.759
Price of Fluid Milk	1.779**	2.054
World Price of Milk	-0.521	-1.672
Milk per Cow	0.000	-0.760
discount rate (real interest rate)	0.041	0.477
R-squared		
		0.538
Durbin-Watson stat		
		1.431

** indicates significant at the 5 % level.

* indicates significant at the 10 % level.

Quota prices were positively correlated with the price of fluid milk whereas the price of industrial milk was insignificant. The price of quota did not vary with the cost of production, measured by the milk output per cow. One might have suspected that as production became more efficient, quota value would increase. However, quota prices were negatively correlated with the world price of milk. This could either be because world prices are positively correlated with the Canadian cost of production, or because producers receive a price close to the world price for any hectolitre produced in excess of their production quota. As the world price decreases, the greater the incentive to sell milk

at the elevated domestic price, thus the greater incentive to purchase another unit of production quota. The discount rate did not have a significant effect on quota price.

As might be predicted by the figure illustrating quota values, the price for production quota did vary significantly across provinces. The price for quota was significantly lower in Saskatchewan than in Ontario, and significantly higher in Quebec. Given the various different rules governing the quota exchange in the provinces, the fact that the fixed effects were significant is unsurprising. As well, the price for quota increased over time.

One might have expected the value of quota to have decreased since the 1994 GATT, given the uncertainty brought about by the removal of the import quotas and the decrease of the import tariffs over time. However, neither the GATT, nor the uncertainty in the preGATT period caused quota values to decrease. This may be due to the fact that a number of producers were attempting to increase production so that they would be at the minimum efficient size if and when they did have to compete with the larger U.S. dairy operations.

For both the two years prior to the WGTA and after the WGTA, quota values increased. Since the WGTA changed the regional comparative advantage for dairy production by decreasing the price of feed grain in some areas of the country, the increase in quota value may have been a result of producers in these areas trying to expand production.

Appendix B Regime Shift Caused by the 1994 GATT

The 1994 GATT not only changed the level of expenditure, but it may have had an effect on other variables on administrative and promotional expenditure. To study this effect, four regressions were run allowing the coefficients on the variables to change between the time before and after the GATT. In one case, only the fixed effects were allowed to vary, to capture whether the GATT had different effects among the provinces. For example, one might hypothesise that some provinces were more concerned about the effects of the GATT than others. The other two regressions allowed all variables to change. Some variables only had observations before or after the GATT for some provinces, and were therefore not split. A Wald test was then performed to determine whether the coefficients remained unchanged before and after the GATT. The results are given in table B.1. Note that for the fixed effects regressions, for all non-fixed effect variables, the coefficient and t-statistic are for the variable over the entire time-period.

Table B.1 Two-Stage Least Squares Regression on Expenditure with Regime Shift

Variable	Admin. Exp (per hL)		Prom. Exp (per hL)	
	All Variables	Fixed Effects	All Variables	Fixed Effects
Constant	-3.241 (-0.204)	-18.182** (-2.224)	0.153 (0.033)	-0.229 (-0.054)
Time trend	-0.032 (-1.152)	-0.006 (-0.275)	-0.029* (-1.947)	-0.024 (-1.456)
ln(change in quota price)*GATT	0.000 (-0.001)	0.086 (0.628)	-0.163 (-0.631)	-0.022 (-0.454)
ln(change in quota price)*(1-GATT)	0.083 (0.624)	na na	-0.014 (-0.299)	na na
Fixed Effects				
New Brunswick*GATT	0.448 (0.680)	1.408** (4.942)	0.391 (0.553)	-0.333 (-1.192)
New Brunswick*(1-GATT)	-0.817 (-0.589)	1.478** (4.775)	-1.401** (-2.282)	-0.164 (-0.571)
Quebec*GATT	1.530 (1.313)	-0.486** (-2.768)	0.189 (0.174)	-0.193 (-1.327)
Quebec*(1-GATT)	-1.081 (-1.693)	-0.821** (-7.572)	-0.042 (-0.421)	-0.163 (-1.141)
Manitoba*GATT	1.098** (5.361)	0.926** (6.220)	0.131 (0.264)	-0.531* (-1.835)
Manitoba*(1-GATT)	0.216 (0.168)	0.605** (3.386)	-1.250** (-2.793)	-0.460 (-1.488)
Alberta*GATT	-0.376 (-0.913)	-1.030** (-7.832)	na na	na na

Alberta*(1-GATT)	-1.477 (-1.057)	-1.318** (-8.801)	na na	na na
Regime				
preGATT	0.251* (1.686)	0.206** (2.322)	0.063 (1.508)	0.070 (1.614)
GATT	-0.711 (-0.028)	0.015 (0.092)	-0.240 (-0.014)	0.303** (3.660)
preCUSTA	-0.057 (-0.528)	-0.095 (-1.009)	-0.005 (-0.102)	-0.003 (-0.076)
Political Influence				
MPs*GATT	0.022 (1.550)	-0.003 (-1.450)	0.005 (0.417)	-0.001 (-0.931)
MPs*GATT	-0.003 (-1.444)	na na	-0.001 (-0.782)	na na
Conservative Government	-0.010 (-0.188)	-0.009 (-0.163)	0.033 (1.220)	0.029 (1.019)
Cabinet Ministers	0.007 (0.538)	0.007 (0.607)	-0.011** (-2.370)	-0.009* (-1.811)
Industry Structure				
ln(dairy)*GATT	0.018 (0.066)	-0.286** (-2.096)	na na	na na
ln(dairy)*(1-GATT)	0.617 (0.454)	na na	na na	na na
ln(# of producers)*GATT	-0.737 (-1.228)	0.293** (2.731)	0.066 (0.117)	-0.017 (-0.189)
ln(# of producers)*(1-GATT)	-0.433 (-1.012)	na na	-0.413** (-2.006)	na na
ln(milk per cow)*GATT	0.695 (0.487)	1.171 (1.603)	-0.200 (-0.175)	-0.050 (-0.140)
ln(milk per cow)*(1-GATT)	0.608 (0.558)	na na	0.263 (0.708)	na na
ln(world price)*GATT	-0.457 (-1.154)	0.117 (1.304)	0.543* (1.758)	0.088* (1.947)
ln(world price)*(1-GATT)	0.124 (1.196)	na na	0.014 (0.294)	na na
Rho	0.478** (3.351)	0.426** (3.193)	0.675** (6.137)	0.823** (24.286)
Wald Test Coef(GATT)=Coef(1-GATT)	15.634	11.488**	23.277**	3.813
R-squared	0.981	0.952	0.977	0.928
Durbin-Watson stat	1.894	1.823	2.059	1.823

** indicates significant at 5 % level

* indicates significant at 10 % level

t-statistics are given in parentheses.

There are some surprising results in the above (excessively long) table. In the fixed effects regression on administrative expenditure, the provincial dummy variables did change significantly before and after the GATT. Although New Brunswick was spending more on administration than Ontario and B.C. before the GATT, this spread increased after the GATT. Quebec and Alberta, however, decreased their relative expenditure after the GATT, even though they were already spending less per hectolitre

than Ontario and B.C. Manitoba decreased its expenditure after the GATT, although it continued to spend more than Ontario and B.C. before and after the GATT.

Comparing the fixed effects regression to the more general regression for administrative expenditure also yields some interesting results. For example, the coefficient on world price, although insignificant at the ten percent level, switches signs before and after the GATT agreement. Since imports were more of a threat after the 1994 GATT, the fact that a drop in world price after the GATT may lead to increased lobbying efforts is sensible. Less intuitive is the effect of the number of government MPs. Before the GATT agreement, an increase in the number of government MPs from a province decreased the administrative expenditure, whereas after the GATT, the effect was reversed.

The regression on promotional expenditure also indicates a regime shift before and after the GATT. The fixed effects for both Manitoba and New Brunswick switch signs before and after the GATT. Before the GATT, New Brunswick spends at least as much as Ontario and B.C. on promotions, whereas after the GATT, it spends significantly less. The same is true for Manitoba. If one reason for promotional expenditure is to stem off imports, perhaps these two provinces with smaller populations and few processing facilities are less concerned about imports after the GATT than the larger provinces of Ontario and B.C. Note that the world price has a significant effect on promotions after the GATT, whereas the effect is not significant before.

The effect of the number of producers also changes before and after the GATT. Before the GATT, the fewer producers, the higher the per hectolitre promotional expenditure, whereas after the GATT, the number of producers did not have a significant effect. Like the administrative expenditure, after the GATT, the number of government MPs increased expenditure, whereas before the GATT, it was negatively correlated with expenditure (although in neither case was it significant at the ten percent level).