Who Benefits from Deregulated Milk Prices: The Missing Link is the Marketing Channel

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■ Introduction

The conference organizing committee gave me as a working title, "Who Benefits from Regulated Milk Prices." As I thought about this topic I decided to flip the topic. Today I am going to speak to you about who would benefit from deregulated milk prices. Everyone seems to know who benefits from regulated milk prices. The real question as we go forward in the near future is whether or not the Canadian milk system will be deregulated and who in fact would benefit from such a move.

In all seriousness I don't claim to be an expert on the Canadian milk marketing system. I have looked at a few documents related thereto and conclude that it is as complicated as the American system if not more. Currently among agricultural economists there is a rush to analyze the economics of deregulation. This is usually done within the context of liberalizing world trade and the implicit underlying value structure often is that freer trade is a net gain for society and therefore we should do it. A recent Fraser Institute study on Canadian milk policy is typical of the conservative, free market, free trade manifestos that the milk industry loves to see after they spend millions to finance and promote such studies. Well today I am going to criticize those studies. Perhaps not as completely as one could, however I am going to suggest to you that the analyses both in the United States and in Canada that have been done concerning milk deregulation are very deficient in one very important aspect. That aspect is the second part of the title of this talk. The missing link in these analyses is the market channel. What I mean by this is that mainstream analyses of dairy policy issues routinely assume that dairy farmers sell directly to consumers or their analysis focuses on the raw milk and commodity cheese and butter markets (see, for example, Balagtos and

Sumner, Lippert, Cox and Chavas). These studies ignore the marketing channel that exists in between farmers and consumers.[1]

In this simplified supply-demand model of dairy programs regulation has benefited farmers and deregulation, which would hurt farmers, benefits consumers. I would submit this model ignores perhaps the most powerful and important players in the policy arena. Market channel firms, the milk processors and the food retailers, have a strong vested interest in the type of economic regulation that exists in any milk market. We need to develop economic models that include the market channel structure. As I will show you today in this paper the degree of competition in the market channel structure determines to a large extent who benefit from deregulated milk prices. When one introduces the milk marketing channel to the problem one is faced squarely with a fundamental question of price transmission. What we mean by price transmission is captured by the following question: if one lowers the farm price through milk price deregulation how much of that decreased farm price will be transmitted forward to consumers?

■ Competition and Monopoly in an Integrated Market Channel

We are going to start by analyzing price transmission in a perfectly competitive market channel. We assume that the market channel has several integrated retailers, i.e., each retailer owns and operates its own milk processing plant. Our channel firms face a market demand curve such as D-market drawn on Figure 1. We also are going to assume that each market channel firm's marginal cost curve is flat at the same value. What this means is that the supply curve for the processed milk market is in fact flat and equal to the marginal cost curve. When firms supply another gallon of milk to the market its cost is the cost of a gallon or raw milk plus the labor and other inputs that go into processing and distribution. Market equilibrium in perfect competition is at Q_1 with a price of P_1 and the retail price is actually equal to the marginal cost of producing the processed milk.

[1] Other studies that have examined the marketing channel have done so in a fashion that benefits the dairy processing and retailing industry (Bailey 2000, 2001). For a critique of this work see Cotterill (2002).

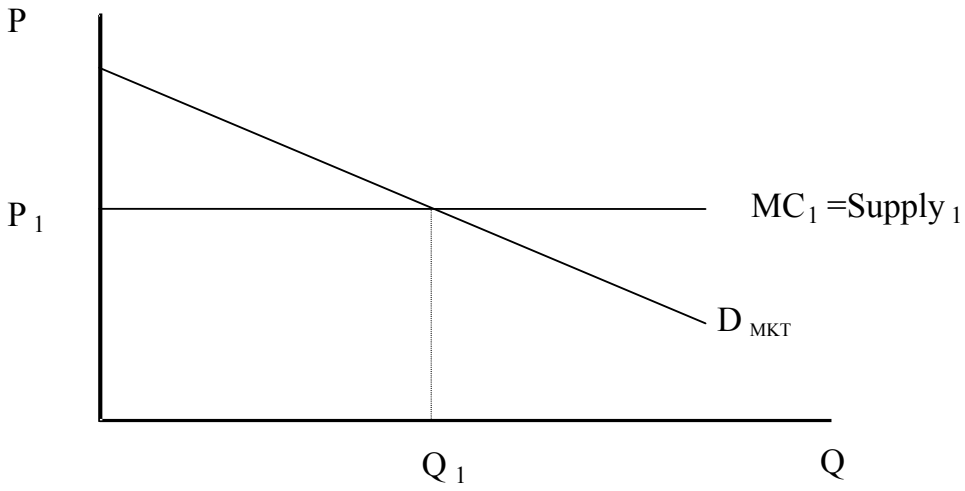

Figure 1. Fluid milk market equilibrium: -perfect competitive market channel with several integrated retailers

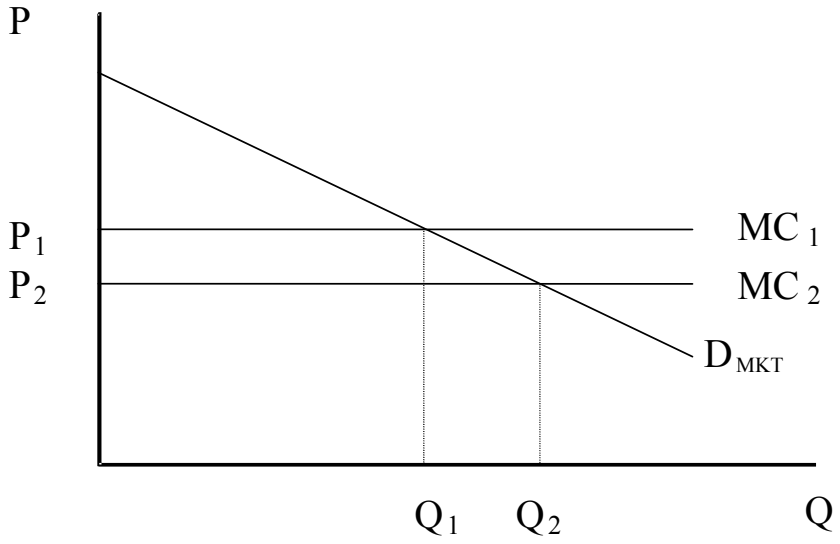

Figure 2. Now what happens to retail price when the MC drops because the raw milk price drops?

Now lets move on to Figure 2 to see how this equilibrium changes and how price transmission occurs if in fact the marginal cost of producing the milk drops because of milk market deregulation. We can do this by adding a new marginal cost curve which is lower. As one can see now the new market equilibrium occurs at Q_2 and P_2. Visual inspection of this chart reveals that the change in the retail price, $P_2 - P_1$, is equal to the change in the marginal cost in marginal cost, $MC_2 - MC_1$. Thus we conclude in a perfectly competitive market that one has 100% price transmission when we have a linear demand curve and flat marginal cost.

How robust is this conclusion to the assumptions we made? An important observation is that one still has 100% price transmission in a perfectly competitive market, given a flat marginal cost curve, even if the shape of the demand curve is something other than linear. For example, the demand curve could be convex to the origin curve and one would still have 100% price transmission in a perfectly competitive market with a flat marginal cost and therefore a flat supply curve.

FACT: $\Delta P = P_2 - P_1 = \Delta MC = MC_2 - MC_1$

Conclusion: In a perfectly competitive market linear demand and flat Marginal Cost, one has 100% Price Transmission

Fact: 100% Price transmission exists in a perfectly competitive market, given Flat MC, for all other shapes of the demand curve as well as linear.

In a perfectly competitive world with a flat supply curve the market channel is invisible and not relevant for the analysis of transfers between farmers and consumers. Every dollar that the farmer loses the consumer gains and vice versa. As we move forward in the policy debate over milk market deregulation one has to ask whether this competitive market channel model is the most appropriate. Certainly it may not be in areas that are dominated by very large supermarket chains and relatively few large milk processors. In such regional milk markets one may have effective tacit collusion or unilateral dominant firm pricing that approaches the monopoly level of pricing that one would observe if one had a single firm in these markets. Alternatively, it could deviate significantly from competitive pricing without attaining the full monopoly impact (Cotterill and Samson, Cotterill and Franklin).

Let's shift now to the other extreme of the market structure spectrum and analyze price transmission between farmers and consumers under conditions of a monopoly. Figure 3 begins our analysis of monopoly pricing. It has the market demand curve and the constant flat marginal cost curve. Since the

monopolist is the only firm in the market, as it changes the quantity sold to the market it influences the price. In other words monopolists are not price takers; they are price setters. In this situation the monopolist needs to know the marginal revenue curve that is related to the market demand curve. We have drawn that curve on the chart. The monopolist maximizes its profits at the value of output where the marginal revenue curve intersects the marginal cost curve. That occurs at quantity Q_1 in this chart. The price that the monopolist will charge for Q_1 is found by going up from Q_1 to the market demand curve and across to the price axis. It is P_1. Finally the profits that the monopolists make over and above the required rate of return for a competitive capital market are the shaded area. This is market equilibrium for a monopoly channel before any milk market deregulation.

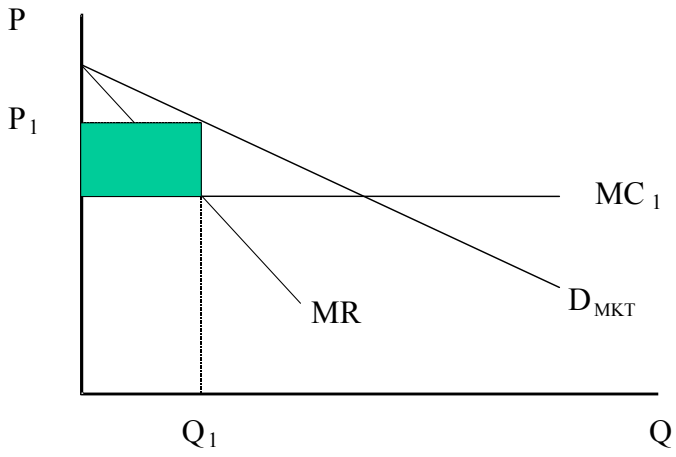

Figure 3. Monopoly Pricing. To maximize profits, the monopolist needs to know the Marginal Revenue curve. Now the monopolist maximizes at Q1, and P1, its profits are given by the shaded area.

Now let's analyze the price transmission that would occur in this monopoly market channel with market deregulation or any other decrease in raw milk price. In Figure 4 we have the same equilibrium as before at P_1 Q_1. We now analyze what happens when the marginal cost drops from MC_1 to MC_2. As one might expect the new equilibrium output is Q_2. That is where the marginal revenue curve intersects the new marginal cost curve. We go up from that quantity to the demand curve and across to the price axis to find the new equilibrium price, P_2. The shaded area in Figure 4 gives the profits to the monopolist after milk deregulation.

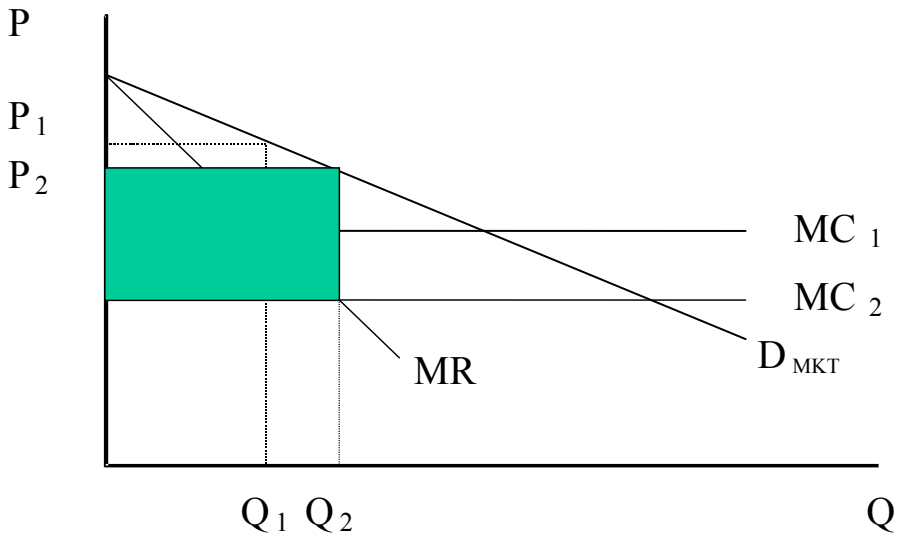

Figure 4. Price transmission in a monopoly: What happens to retail Price when MC_1 drops to MC_2 because of a drop in raw milk price?
Answer: the new π max is at Q2 and P2
Fact: $\Delta P=P_2-P_1=1/2\ \Delta MC=MC_2-MC_1$

Our answer to what happens to retail price is at the bottom of Figure 4. The new profit maximizing point is at Q_2 and P_2. The change in the retail price, P_2-P_1, is always equal to one-half of the change in the marginal cost. In other words, if milk market deregulation leads to this drop in the raw milk price and marginal cost then only half of the raw price drop is passed forward to consumers.

Conclusion: In a monopoly with linear demand and flat MC< one always has 50% price transmission

Conclusion: $\pi_2 > \pi_1$ Unlike in perfect competition, the monopolist has a direct profit interest in seeing lower raw milk prices.

Conclusion: As a milk marketing channel becomes more monopolistic, the firms in it have a direct profit incentive to deregulate the system and will attempt to do so in the policy area.

We have three conclusions from this analysis. The first is that in a monopoly with a linear demand curve and a flat marginal cost curve one always has a 50% price transmission rate. It doesn't vary. Our second conclusion is if the profits after milk deregulation to the monopolist are greater than the profits that the monopolists enjoyed before milk market deregulation. We have rigorously proven that unlike perfect competition the monopolist can clearly have a direct profit interest in seeking lower raw milk prices. Thus we have been able to demonstrate that the market channel structure can play a very important role in the political process that unfolds in the milk market deregulation debate. In a perfectly competitive market structure processors and retailers really don't care what the price of milk is. In a monopolistic market structure they in fact do and have a monetary incentive to be active participants in any regulatory reform process. The channel firms will lobby for the deregulation in milk prices.

Well let's stop and take stock for a moment here and ask how realistic is this monopoly prediction? Do we have any evidence on price transmission?

Let's examine two recent studies in this area. Lass et al. analyzed price transmission in New England milk markets. They report that for the 1982-1998 period in the Hartford, Connecticut market the price transmission rate was 45%. The report for the same time period that price transmission in the Boston market was 68%. These estimates basically bracket the monopolist price transmission rate in a linear demand constant cost world. In another study, Kim finds that in the American cheese category price transmission of a raw milk price change is only 30%. This is even lower than what one would expect in the linear monopoly model. I have more to say on this later.

Presently, it seems that we can conclude that the exercise of market power by channel firms deadens price transmission. If this is true, it is not good news for farmers. Farm prices are more volatile in this type of market structure than they would be in a perfectly competitive market channel. Also large fluctuations in farm price have relatively little impact on the retail price. What this means is that it is tougher for farmers to sell their way out of an excess supply situation.

When they have surplus the retail price simply doesn't drop much and farm price must drop even more to absorb the excess supply. This creates a greater need for government to stabilize and support farm income via quotas, direct payment subsidies or price support programs.

■ Models of Successive Monopoly in the Market Channel.

The problem with monopoly in market channels is doubly disconcerting when one has two monopolies in the market channel. Let's look at this situation and analyze price transmission as well. We start with Figure 5. We assume that we have two monopolists in the channel, for example a monopoly processor that sells to a monopoly retailer. In this situation we indeed have double monopolization. The top chart analyzes the retail market. It has retail market demand curve and the retailer's marginal revenue curve. Next let's look at the lower graph that describes the processors price and quantity space. Here we draw the processors demand curve, which in this simple model is equal to and identical to the marginal revenue curve of the retailer. We have obtained this result by assuming that the only cost that the retailer faces is the wholesale cost of the milk that it buys. One could make this model more complex and add in other retailer costs, however, it would prevent us from using these two graphs so we avoid that. This simplification really doesn't affect the economic conclusions that we are going to show.

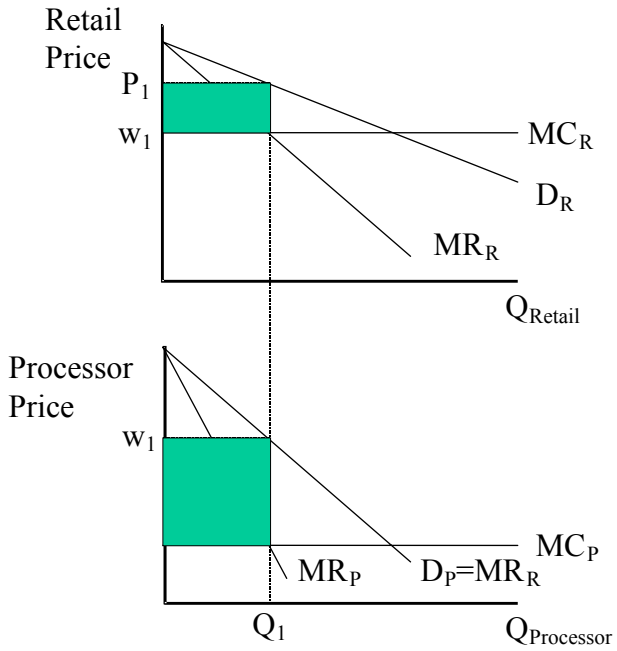

Figure 5. What if two monopolists are in the market channel (e.g. Monopoly processor selling to monopoly retailer)? Answer: We get double monopolization

The marginal revenue curve of the retailer is the demand curve for the processor for the following reasons. We know that for any processor price, W, in this model the retailer demands the quantity that comes from the intersection of that price line and the marginal revenue curve. In other words, you can read from the marginal revenue curve in the top graph of Figure 5 the quantity the retailer will demand for any processor price, W. All we have done is reproduce that price-quantity schedule in the processors chart and called it the processor's demand curve. Now we can find a corresponding marginal revenue curve for the processor. It is MR_w in the lower graph. We now have a complete demand structure for the channel.

Let's now look at the cost side in Figure 5. We start with the marginal cost for the processor. We assume that the marginal cost is flat. Of course a major component of the marginal cost at the processing level is the price of raw milk. Once we add the marginal cost to the processor's chart we clearly can find the equilibrium quantity that is going to maximize the processor's profits. It is Q_1 and that quantity is sold downstream through the channel. It is the quantity that the processor is going to produce and offer to the retailer at price, W_1. The

retailer in fact is going to demand quantity Q_1 when the processor charges price W_1. In the upper graph of Figure 5, since, the retailer pays W_1 for Q_1 the retailer is going to charge the consumer $P_1$for the final product. The shaded area in the lower diagram indicates the profits that the processor makes from the sale of this milk; and, the shaded area in the top chart indicates the profits that the retailer makes from the sale of milk. The market channel is in equilibrium.

> To find price transmission in this two stage market channel, we apply the monopoly price transmission rule twice:
>
> $\Delta w = .5\Delta MC = .5\Delta P_{\text{Raw Milk}}$
>
> $\Delta P_{\text{Retail}} = .5\ \Delta w$ since Δw is the change in the retailers marginal cost
>
> So, $\Delta P_{\text{Retail}} = .25\ \Delta P_{\text{Raw Milk}}$
>
> Answer: Price Transmission from raw milk to retail = 25%

The question of interest is what would price transmission be in this channel if milk prices are deregulated? The answer is 25%. To obtain this result, one uses the monopoly price transmission rule twice. For the processor the change in the processor price is equal to 50% of the change in the raw milk price. Then for the retailer the change in the retail price is equal to 50% of the change in the processor price. Putting these together one gets that the change in the retail price is equal to 25% of the change in the raw milk price.

If we went to a market channel with three successive monopolist in fact the price transmission rate would again be cut in half to 12.5%. Thus one can see that if one has a market channel with several stages and one has substantial market power being exercised in each of the stages within this channel there is indeed a possibility that very little of a deregulated raw milk price would be passed forward to consumers, most of the gain would be captured by the channel firms. Well how real is this possibility? To date there has been very little research on price pass through that uses a structural model such as this to assess the distribution of the benefits from the lowering of a raw commodity price throughout the channel.

■ Strategic Partnerships Revisited

Lets switch now to discussing something that is very popular in the business literature these days especially in agribusiness market channels: strategic

partnerships. Strategic partnerships are alliances between vertically related firms such as a milk processor and a milk retailer. Of course people involved in these and others in the channel ask the following question. Do they make sense? And they also might like to ask how do strategic partnerships affect price transmission?

We can answer these questions by using the double monopolization model. Before getting to our answer the standard answer to the first question is that they make sense when and if they can save on processing and distribution costs. In other words, strategic partnerships are often seen and often justified because they are logistically efficient. What we offer today is a different answer, a separate justification for strategic partnerships. Vertical alliances make sense if in fact the channel has successive monopolies. In our successive monopoly example we have assumed that both monopolists price independent of each other. In other words, the processor takes as given the derived demand curve from the retailer and sets his price from that derived demand curve. And in a corresponding fashion the retailer takes as given any announced price by the processor and then sets the retail price. These two successive monopolists never get together and talk about setting the processor and retail price jointly.

Well what if in fact they did get together in a vertical alliance, i.e., a strategic partnership? If they get together and talk about setting the processor and retail prices jointly and figure out a way to divide up the profits that result from vertical price collusion one comes to some very astounding conclusions. In fact, this negotiation process can reduce two monopolies to one monopoly, and this reduction to a single monopoly actually increases total channel profits and channel output. It also lowers retail prices and it increases price transmission in the channel from 25 to 50%. Therefore in a channel with two successive monopolists one can prove that farmers and consumers, as well as the monopolists themselves, benefit when these two firms get together and jointly set prices to maximize profits.[2]

We actually show this graphically in Figures 6 and 7. To show the impact of eliminating double monopoly in a channel we start by combining the retailer and processor graphs in a single graph as shown in Figure 6. The graph has a price axis and a quantity axis. The demand curve at retail extends to the far right. Underneath it one has the marginal revenue curve for the retailer which is the processors demand curve, and one has the marginal revenue curve for the processors, MRp, which is the steepest revenue line and closest to the price axis.

[2] There are other scenarios where a vertical alliance can damage farmers and consumers. Consider a perfectly competitive milk channel that is transformed via strategic alliances into two successive but competing monopolists.

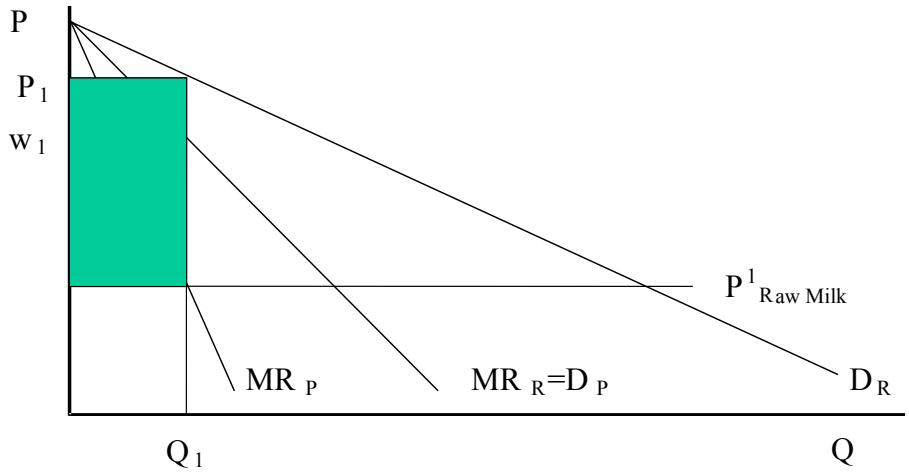

Figure 6. To show how elimination of double marginalization increases channel profits, lowers prices, and increases output, we combine the retailer and processor graphs to illustrate the double marginalization equilibrium.

Finally, we introduce the price of raw milk which we basically equate to the marginal cost of the processor. In the case of double marginalization equilibrium is at Q_1 with a processor price, W_1, and retail price P_1. The combined profit of the retailer and the wholesaler is the shaded area.

Shifting to Figure 7 lets examine how this equilibrium changes when the processor and retailer agree to price jointly. They maximize profits by increasing output to quantity Q_2 and setting the retail price at P_2. As one can see from Figure 7 pricing in a cooperative fashion drops the retail price from P_1 to P_2 and the profit box increases. Finally, since we've gone from two monopolists to effectively one monopolist in this second equilibrium the price transmission rate increases from 25 to 50%.

In conclusion a strategic partnership between two successive monopolists may or may not make sense for reasons other than real economic cost savings related to vertical coordination. Independent of that answer a strategic partnership between two successive monopolists clearly makes sense from the standpoint of pricing. The retailer and the processor need only agree on how to share the larger profits. This certainly shouldn't be a deal breaker because each person can be made better off by moving to this new equilibrium. It is just a question of who gets most of the gains and that would be a function of how astute each is when setting up the strategic alliance. The bottom line is that a

strategic alliance benefits consumers and farmers as well as the alliance partners themselves when one has a successive monopoly.[3]

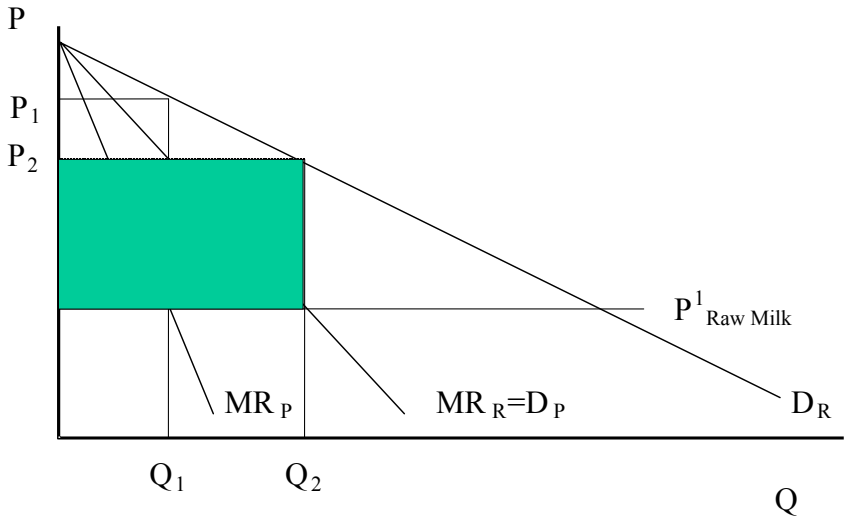

Figure 7. Now if the processor and retailer agree to price jointly, they set P_2 and sell Q_2.
In fact: $P_2<P_1$ $Q_2>Q_1$ $\pi_2>\pi_1$
They must bargain to split the profit by setting a transfer price w_1
Price transmission goes up from 25% to 50%

Well let's shift gears now and use this successive monopoly model in a slightly different fashion. Critics of Canadian milk market system have in fact alleged that the government programs at the farm level are a cartel or effectively a monopoly. Lets accept this as a given, but lets now assume that we also have a monopoly market channel between this public monopoly in the raw milk market and the consumer. Here again we have a successive monopoly problem in the market channel. If the government agency and the channel monopolist price independently of each other, one in fact tends to obtain the double monopoly market equilibrium with high prices and low quantity. This suggests the following insight for the management of milk marketing policy. Farmers and others who support the government program could engage in a dialogue with the channel monopolist and negotiate a new lower retail price of fluid milk in a fashion that increases the profits of the channel firms and the farmers.

[3] Also see last footnote for a market power reason to form vertical alliances that benefit channel firms but not farmers and consumers.

Conclusions

In this paper I am not arguing that the Canadian or the U.S. milk industry is rife with monopoly. That is a paper for another day. What I have done is show you that the structure of the market channel matters for the analysis of dairy policy programs. Clearly not all of the structures that I've reviewed today can be relevant for the current dairy industry in Canada or the U.S. I strongly suspect that the monopoly models are much more relevant than many of the participants in the policy process have acknowledged to date. There is a need for more research by agricultural economists on the degree of imperfect competition in milk market channels. As this research is done and we clarify the degree of market power and its location in the milk marketing channel we will have a much clearer perspective on various policy options and the strength of the incentives that processors and retailers have to promote milk market reform in Canada and the U.S.

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