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## IMPLICATION OF TARIFFICATION IN THE CANADIAN TABLE EGG MARKET

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### Abstract

The Canadian egg market is supply managed and uses a cost of production pricing formula. The recent GATT proposal by Arthur Dunkel proposes to change non-tariff barriers like import quotas into tariffs. This model was developed for the egg industry assuming supply management will remain intact initially but the price setting powers will be lost. The time period used in this study was from 1980 to 1989. The model assumes that three percent of imports will be allowed into the country and the remaining supply will come from domestic production. The Financial Post reports a sixty-one percent ad valorem tariff rate as the expected rate for table eggs.

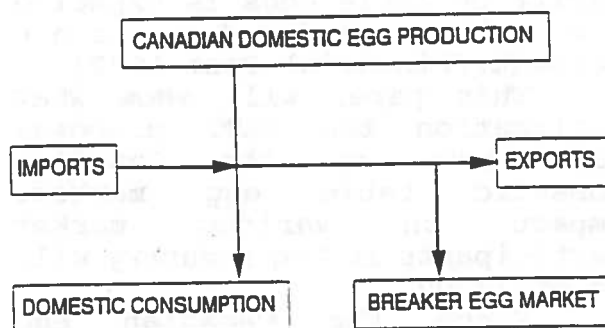
The simulation results indicate that the sixty-one percent tariff will be more than adequate to prevent an overflow of table eggs from entering the Canadian market. When the tariff is reduced production and consumption increase but quota values decrease. When the tariff is reduced from sixty-one to approximately forty percent the social welfare loss to the producer is one percent. Tariffication in the initial time period will not undermine supply management in the table egg market.

### INTRODUCTION

The table egg industry in Canada has been regulated by a supply management system, (under the control of a national marketing board, the Canadian Egg Marketing Agency), for two decades. The system is allowed to exist under GATT Article XI that allows a country that has a supply controlled industry to impose import quotas. Supply management guarantees producers a price that covers their cost of production and a "fair" return on equity. Consumers are guaranteed an adequate supply of eggs at "a reasonable price". The price paid to producers is based on a cost of production (COP) formula and is higher than the supply and demand market equilibrium is in a free market system. The existence of a value for production quota is evidence that the producer price is higher than the marginal cost price. The Canadian egg market is protected by an import quota that limits the quantity of eggs that can be brought into Canada to a small percentage of consumption. Eggs that are produced have two alternative markets, the table market which is the primary market to which producers sell their eggs and the "breaker egg" market which is mainly used as an overflow for extra table eggs (Figure 1). Table egg prices are based on the COP while the

breaker egg prices are determined by U.S.A. breaker egg prices given freer trade in breaker eggs and a much larger U.S. market.

Figure 1. Flow of Eggs in the Canadian Domestic Market



On December 20, 1991, GATT Director-General, Arthur Dunkel tabled a draft report proposing the replacement of quantitative import restrictions with tariffs. The exchange of import quotas for tariffs will make the Canadian supply managed sectors more market responsive to world price changes and reduce the price risk to the other nations. Moschini and Meilke (1991) have studied the tariffication of the Canadian chicken industry which is also supply managed. However, in the previously mentioned study the authors assumed that supply management would be eliminated while this study assumes supply

management in terms of production quota will be maintained. In the previous study the authors determine that the social welfare changes depend primarily on the level of tariff that is set. If a tariff of zero is set the producer will lose while the consumers gain and if the tariff is relatively high and the import levels are reduced then the producers gain and consumers lose because the retail price will increase. The tariff levels, that are yet to be finally determined are to be reduced by thirty-six percent on average for all commodities, with each being reduced by at least fifteen percent over six years (Dunkel Report 1991). The ad valorem tariff on table eggs is expected to be sixty-one percent. (Financial Post 1992)

This paper will show what implication the GATT proposal will have on the Canadian domestic table egg market. Impact on various market participants in the industry will be explored.

Since the Canadian egg market is supply managed a framework that incorporates both supply management and movement from quotas to tariffs must be specified. This will be done in section two. The empirical model will be summarized in section two. Section three explains the data used for developing the model. Policy impacts will be discussed and displayed in section five with the conclusions following in section six. The actual empirical model specifications are displayed in an appendix.

#### **EMPIRICAL MODEL**

In agreement with the Dunkel GATT proposal, the import restriction will be eliminated

and replaced by tariffs (Part B - Agreement on modalities for the establishment of specific binding commitments under the reform program; paragraph 4 (Dunkel 1991)). If we assume that Canada would basically be a price taker in the North American market and that existing U.S. prices are market determined and unlikely to be affected by any other provisions in the GATT negotiations then an ad valorem tariff will be multiplied by the US price to calculate the price for imports and table eggs in Canada. (For example, if the US price is \$.50 and the tariff is 60% the import price will be \$.50 x 1.60 = \$.80).

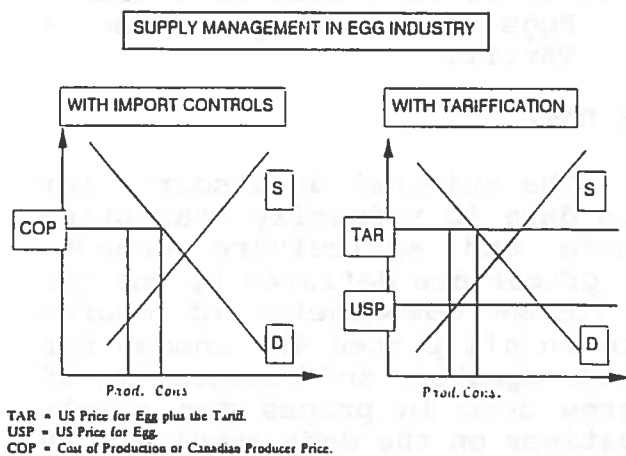
This change will make the Canadian egg market responsive to the world prices. This fluctuating price for table eggs is incompatible with the egg industries' current format of a set price based on the cost of production (COP). In periods when the world price plus the tariff is lower than the COP a large influx of imports could replace the domestic production if the industry attempts to maintain the COP for domestic producers. The marketing board can prevent this from occurring by using the world price plus the tariff as a producer price instead of the COP or alternatively it can force the production quota to decrease as the imports replace the domestic production. The only realistic alternative is to use the world price plus the tariff instead of the COP because the other alternative could lead to the eventual elimination of the Canadian egg industry. The relaxation of producer prices away from the COP will enable the current production quota system to remain in place with a different producer price, quota values and more market risk than previously.

## MODEL SPECIFICATION

The model of the Canadian egg market includes two levels of the market demand; the primary level at which producers operate is the processor derived demand and the secondary level for the consumer demand. The supply side of the model has one market level which is the marginal cost of production (Figure 2). The equilibrium quantity of eggs produced and consumed in the Canadian market is determined by equalizing the quantity demanded by consumers with the quantity supplied by producers plus the net imports minus the breaker egg diversions.

A supply equation modelling the Canadian egg industry, a demand equation modelling domestic consumption and a price linkage equation are all required in this model. The price linkage equation is to determine the demand for eggs at the processor level.

**Figure 2. Graphical Display of Model**



## DEMAND FOR EGGS AND EXPECTATIONS

Consumer's consumption or the demand for eggs may be affected by the prices of many different goods. The goods whose prices one can expect to have

impact on egg consumption include; the price of the eggs themselves, the prices of substitutes like cheddar and processed cheese and the price of complements like that of meat. Consumer theory dictates that income and the products' prices should be included in the model.

Egg price is expected to have a negative effect on consumption similar to most goods in society. The impact of the substitutes and complements is not quite as clear. It is difficult to determine whether the cheese products are gross substitutes or whether they are gross complements. One could effectively argue that processed cheese and cereal are either a substitute or a complement.

Ideally, egg price, income and the prices for substitutes and complements are included. However statistical testing suggests that the substitutes and complements that are most likely to have an impact on the demand for eggs are insignificant and therefore they have been excluded from the final model. The demand equation in the model has the following form.

Per Capita Consumption of  
 Eggs = f (Egg Retail Price Index,  
 Per Capita  
 Income, Seasonal Dummies)

## PRICE LINKAGE EQUATION

The retail price mark-up of eggs is a direct mark-up from the producer price for eggs. There is little processing or product transformation resulting in a simple mark-up equation with the following form.

Egg Retail Price Index = f  
 (Producer Price, Seasonal Dummies)

## SUPPLY OF EGGS AND EXPECTATIONS

The supply decisions are based on the premise that the goal

of each producer is to maximize profit. The producer prices, as noted earlier, are based on covering the cost of production for the average producer. The producer price is higher than the marginal cost of production which creates a value that is accrued to quota. All supply decisions are made under the assumption of no money illusion and that a larger quantity will be supplied as the producer price increases, assuming there are no quota restrictions. When quota is restricted this effect will be shown by an increase in the price paid for the quota. The marginal cost of production is expected to have a positive relationship with the production of eggs; the higher the market price the larger the supply farmers are willing to produce (*ceteris paribus*). Egg production is very capital intensive and the layer facilities are not easily converted into other enterprises. Since these facilities cannot be changed quickly into another enterprise the capital equipment must be used to produce eggs. Therefore in the short term, capital is fixed. This means that the previous period's production will have a positive effect on this period's production. Another reason for using the previous period's production is that the production period for hens is four periods and it is unlikely that a producer will discontinue producing eggs in the first six months of the lay period.

The supply equation for a supply managed industry is somewhat problematic due to the fact that observable producer prices are not directly on the supply curve. The static quota values must be derived from observable values that reflect the return to the quota over an

infinite period of time. The marginal cost of production can then be calculated by subtracting static quota value from the COP price. Per capita production of eggs is used because the increase in egg production quota during the time period has been attributed to an increase in population. The supply equation will have the following form.

$$\text{Per Capita Production} = f(\text{Marginal Cost of Production, Production in the Previous Period, Seasonal Dummies})$$

#### CLOSING THE MODEL

The closing of the model has the following identities:

$$\text{Total Production} = \text{Per Capita Production} * \text{Population.}$$

$$\text{Total Consumption} = \text{Per Capita Consumption} * \text{Population.}$$

$$\text{Marginal Cost Price} = \text{Producer Price} - \text{Quota Value.}$$

$$\text{Total Production} = \text{Total Consumption} - \text{Imports} + \text{Breaker Egg Diversions;}$$

$$\text{Producer Price} = \text{U.S. Price for Eggs} * \text{Exchange Rate} * \text{Tariff;}$$

#### THE DATA

The original data source for this data is primarily Statistics Canada and Agriculture Canada. All prices are deflated by the CPI to impose homogeneity of degree zero in all prices and income for demand equation and homogeneity of degree zero in prices for supply equations on the data resulting in 1981 as the base year. The quarterly dummies are included to account for seasonality in the data. The time period used in this study is from 1980:1 to 1989:4. The following are definitions of the data:

QUOTVAL - per dozen quota value which is the price producers pay for the right to produce eggs.

MCP - marginal cost of production; calculated using the producer price minus the static quota value.

IR - real interest rate; The bank rate interest rate minus inflation.

PROD - supply of eggs in each period in dozen per capita.

PROD(-1)- supply of eggs in the previous period.

PRODT - per capita production \* population.

PPRICE - producer price per dozen eggs.

CONS - per capita consumption of eggs in dozens

CONST - per capita consumption of eggs in dozens \* population

PIEGG - retail price index for eggs.

PDICP - personal disposable income per capita in 1981 dollars.

Q1,Q2,Q3- quarterly dummy variable for the corresponding quarter.

#### MODEL ESTIMATION

The estimation is done using the OLSQ command in TSP for the supply equation and the price linkage equation. In the supply equation and the price linkage equation the dependent variable is lagged one period. The demand equation is adjusted for first order auto-correlation. Other equation specifications were rejected if there was no statistical reason for keeping the other variables in the equations. The estimated equation results are in Appendix 1.

#### SIMULATION SPECIFICATIONS AND RESULTS

In the "Base" model which will be used as a measure of comparison, the producer price which is based on the COP, imports and the breaker diversion are considered to be exogenous. Endogenous variables in this model include PROD, PRODT, CONST, CONS, PIEGG, QUOTVAL, MCP. The base model (first simulation) results will be used as a measure of comparison for the other four simulations. The simulation for this model use the time period from the third quarter in nineteen eighty-six to the third quarter in 1989.

According to the GATT agreement one possible approach is a minimum access agreement where all countries must agree to allow imports equal to three percent of consumption. These imports are subjected to a preferred tariff rate which is lower than the regular tariff rate. Using this guideline all simulations assume the minimum import level will be set at three percent of consumption. Since this level is significantly higher than imports with the quota the minimum imports are assumed to represent total imports.

In the second simulation the Canadian producer price is used to calculate the ad valorem tariff rate required to clear the market using the current producer price. When compared to the base simulation consumption remains constant while production declines because of the increase in imports. With lower production the marginal cost of production decreases resulting in the quota values increasing from \$.036 to \$.080. The ad valorem tariff required is fifty-six percent. There is no change in the welfare of consumers at this tariff level

because they are consuming the same number of eggs with the value of those eggs remaining unchanged. (Table 1)

The third simulation shows the impact the suggested sixty-one percent tariff will have on the production and consumption levels and the values of the quota. This level of tariff results in the quota values increasing to \$.133. Production and consumption decreases by 1.5 percent and .47 percent respectively. The social welfare of each producers and consumers decreases because of the decline in production and in consumption.

The fourth simulation measures the impact of the reduction of the sixty-one percent tariff by fifteen percent on the model. Fifteen percent is the minimum reduction allowed in the proposed GATT agreement over the six year period. Reducing the tariff by fifteen percent changes it from sixty-one percent to almost fifty-two percent. In the simulation the quota values decrease to \$.076 per dozen. The consumption increases as the price of eggs decreases resulting in a substantial gain in the consumers social welfare. Production increases to meet the consumer demand resulting in a higher marginal cost of production and a lower producer surplus.

The fifth simulation measures the impact of the reduction of the sixty-one percent tariff by thirty-six percent on the model. This is the average reduction required across all commodities as proposed by the GATT agreement over the six year period. As in the fourth simulation the production decrease and consumption increase. With these changes the social welfare will decrease by a total of one

percent when compared to the base simulation. Even with the thirty-six percent reduction the producer's marginal cost of production (MCP) is still lower than the producer price suggesting positive quota values and positive returns to a producer supply management system.

#### SUMMARY

In summary the proposed level of the tariff will be higher than is needed to maintain production close to current levels and positive quota values. The additional imports cause a slight decline in the total production. The imports that result from a decrease in the tariff will not undermine supply management in the first six years even if the tariff is reduced by fifteen to thirty-six percent. Production quotas can remain intact but the price setting ability of the marketing board would be lost. Initially the quota values will increase depending on the chosen tariff level. The higher the tariff, the more the quota values will increase. The producers will lose one percent of their producer surplus as the tariff is reduced by thirty-five percent.

A limitation to this model is it's simplistic nature. Many economic characteristics of the market have been simplified or held at exogenous levels (eg Breaker Market). The fact that producers in the egg market will face a higher level of market risk has not been accounted for in the simulation results.



Table 1: MEANS OF THE SIMULATION RESULTS

	BASE SIMULATION	SIMULATION # 2	SIMULATION # 3	SIMULATION # 5	SIMULATION # 6
Total Consumption ('000)	90,663	90,645	90,237	90,647	911947
Total Production ('000)	104,405	103,280	102,884	103,282	103,813
Imports ('000)	1612	2719	2707	2719	2736
Tariff	0	1.56	1.61	1.5185	1.3965
Quota Values (\$/Doz.)	0.036	0.080	0.133	\$0.078	\$0.005
Retail Egg Price Index	.756	.756	.794	.757	.707
Producer Price (\$/Doz)	.674	.674	.714	.673	.619
Marginal Cost Price (\$/Doz)	.638	.594	.581	.595	.614
Producer Surplus (\$'000)	621,470	617,024	619,164	616,636	613,207
Consumer Surplus (\$'000)	885,229	885,229	881,650	885,325	890,219
Social Welfare (\$'000)	1,506,669	1,502,253	1,500,814	1,501,961	1,503,426

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## APPENDIX I

## Statistical and Estimation Results

Independent Dependent Variable  
Variable PROD

CONSTANT	0.786	(6.90)*
MCP	.339	(2.33)*
PROD(-1)	.750	(6.61)*
Q1	-.0074	(-2.67)
Q2	-.019	(-.68)
Q3	.046	(1.62)**
h-stat	-.72*	
R <sup>2</sup>	.71	
Adj R <sup>2</sup>	.666	
F-Stat	16.6	

\* Significant at 98% or greater.

\*\* Significant at 89%.

## Estimated Coefficients for Egg Consumption and the Price Linkage equation.

Independent Variable	<u>Demand</u>	<u>Dependent Variable</u>	PIEGG	T-Stat
	CONS	T-Stat		
Constant	4.33	6.90*	.025	1.65*
PIEGG	-0.427	-1.54**		
FPICP	-.000033	-0.64***		
Q1	-0.224	-9.37*	-.005	7.44*
Q2	-0.177	-6.27*	-.0085	-1.12
Q3	-0.163	-6.94*	.0019	-1.90*
PIEGG(-1)			.594	.43
FPRICE			.421	10.98*
Rho	.806	11.06*		
R <sup>2</sup>	.81%		98.9%	
Adj R <sup>2</sup>	.79%		98.8%	
F-Stat	54.0		630.0	

\* Significant at 80% or greater.

\*\* Significant at 88%.

\*\*\* Significant at 48%.

## REFERENCES

Chyc, K. and E. W. Goddard, 1992. Optimal Investment in Generic Advertising and Basic Research: The Case of the Canadian Supply Managed Egg Market. Dept. Of Agriculture Economics and Business Working Paper WP92/02 April.

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