THE PERFORMANCE OF THE CANADIAN FOOD, BEVERAGES AND TOBACCO PROCESSING INDUSTRIES: AN EXTENSION OF THE PROFIT-COST MARGIN MODEL TO A PRICING MODEL.

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Abstract

This study was undertaken to achieve three major objectives:

1. to estimate an econometric structure-profitability model for Canadian food, beverages and tobacco processing industries;

2. to estimate a structure-price model of the sector to compare with the profit model; and

3. to make inferences about the performance of the sector, with reference to market power and industry efficiency.

The above objectives were accomplished by comparing empirical regression results of the two models by using the following approach. First, the statistical significance of the estimated coefficients was used to determine which factors should be considered of importance in explaining performance. Secondly, the signs on the estimated coefficients were used to determine the direction of the influence of market structure on performance. Lastly, a comparison of the size and statistical significance of the difference in the respective coefficients was used to determine which of the two performance indexes (profitability and prices) is most affected by market structure.

From the study four broad conclusions were arrived at. Seller concentration and advertising do have an increasing effect on profitability, but this influence does not derive from market power (price increases). Instead, increases in these factors appear to promote price competition. However, tariff protection has an increasing effect on both profitability and prices. Furthermore, the net effect of tariffs is significantly larger on prices than on profitability.

Industry growth and market isolation factors have an increasing effect on profitabilty. But they have no significant influence on relative prices. Exports have a decreasing effect on profitability and prices. Increases in input prices may lead to increases in ouput prices.

Two broad implications can be drawn from the above results. First, price competition and industry efficiency can be enhanced by (either condoning or encouraging) high market shares, advertising, exports and industry growth.

Secondly, although tariffs can increase industry profitability, they may also lead to relatively larger increases in domestic output prices. Similarly, changes in input prices may lead to increases in output prices. Therefore, high tariffs and input prices may serve as barriers to competition, and allow inefficiency to persist in an industry.

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Chapter 1

INTRODUCTION

The Canadian food, beverages and tobacco processing sector has several features which distinquish it from mainstream manufacturing activity. First, it is characterised by having some of the factors often associated with unusual market power, actual or potential. Among its industries are to be found some with the highest market shares and barriers to competition in manufacturing, and these features have been on the increase over the years. Secondly, among its ranks are to be found some of the most profitable industries in Canadian manufacturing. These characteristics have important welfare and performance implications, which this study will attempt to unravel.

The question often asked in structure-conduct-performance (SCP) studies is the source of differences in profitability among industries. Two opposing schools of thought have emerged to explain this problem: those who believe that market structure variables should be looked into as serving to bestow market power on industries, which in turn exploit it to set prices higher than would be attainable in a competitive market; and those who associate high profits to existence of firms of superior performance in an industry, producing at relatively low costs.

A large volume of empirical work relating market structure to industrial performance has been done in the U.S., Canada and several other OECD countries [Collins and Preston (1966); Esposito and Esposito, (1971); Pagoulatos and Sorensen, (1976); Parker and Connor (1979); Scherer, (1980); Lyons, (1981); Rizvi and Uhm, (1982); Jones, Laudadio and Percy, (1973, 1977); Hazledine (1978); and Schmalensee, (1976)]. Although most of

these studies have looked into manufacturing as a whole, some have been done specifically for the food processing sector, especially for the U.S. (Imel and Helmberger, 1971; Collins and Preston, 1966; Rogers, 1978; Parker and Connor, 1979). In Canada, most of the studies have considered manufacturing as a whole (De Silva, 1971; McFetridge, 1973; Jones, Laudadio and Percy, 1973, 1977), with a few isolating food processing, either as a separate sector or combined with manufactured agricultural inputs, for analysis (Hazledine, 1978; Rizvi and Ulm, 1982).

Most of the Canadian studies on food processing have relied for the most part on data available in the early 1970s and before. Such data was in most cases available in broad industry classifications, and therefore subject to various aggregation anomalies; such as lumping together heterogeous groups of products (unrelated in production and demand) into the same SICs (Khemani, 1980, pp. 8.). This problem has been partly overcome with revision of the SIC in 1980. Altogether data for up to 26 industries (compared to 22 in the 1970 SIC) are available (20 of them food processing, 4 beverages, and two tobacco processors).

Perhaps even more important has been non availability of industry price and cost data, which could provide a more direct (and better) source of information about the pricing behavior (and hence performance and efficiency) of manufacturing industries.

1.1 Problem Statement.

The purpose of this study is to find out if there is sufficient empirical evidence to support the hypotheses that Canadian food, beverages and tobacco processing industries wield considerable market power, and whether this characteristic is significant enough to classify it as an oligopolistic sector. In particular, attempts have been made to find out whether the sector's performance can be traced to the market environment (structure)

in which the industries operate.

The other question we attempt to answer is whether the Canadian sector's pricing behavior shows any significant departure from competition, here considered the benchmark of efficiency. To what extend is the domestic market environment a possible source of this relative difference? It is hypothesised that the U.S. market is relatively more competitive, and thus any price differential between the two markets will partially provide an appropriate measure of the degree of oligopoly pricing or power in the Canadian sector.

A partial explanation advanced to support this claim is that the U.S. consumer goods market is large, in terms of the size of its domestic demand (population and income), compared to the small Canadian population. Technology permitting, demand related barriers are likely to be lower in a larger market. In the absence of centralized price-setting authority in either country, market structure can be considered as the major force behind any differences between the two[1].

The problem is reformulated into the following working hypotheses, a test of which would in effect act as a guide and evidence for answers to the problems:

1. Prices and profitability would tend to be higher in an industry with higher seller concentration, high entry barriers, and rapid growth in industry demand; factors perceived to be sources of market power.

2. Prices will tend to be higher in industries with higher relative input prices.

3. Geographical isolation affords a 'natural' barrier to competition to local industries and hence provides them leeway in price setting and higher profitability.

4. High tariff protection acts as an additional barrier to entry, and thus protection from foreign competition. Hence it would be expected that industries with higher

[1]An exception is the price and entry controls at the provincial level in Canada on liquour, wine and beer industries. (Khemani, 1984, pp. 48)

tariff rates would tend to enjoy relatively higher prices and profitability.

5. Imports have a negative influence on prices and profitability.

6. The impact of export competition on domestic industry pricing behaviour and profitability is indeterminate a priori.

1.2 Objectives of the Study.

The main objective of this study is to estimate empirical models for the Canadian food, beverages and tobacco sector which could be used to assess the relationship between various market structure variables and the performance (prices and profitability) of the sector.

1.2.1 Sub-objectives:

The sub-objectives of the research are to:

1. provide a general description of the state and trend of the sector over the period between 1970 and 1985;

2. derive Canada/U.S industry selling price indexes compatible with the current Canadian SICs (1980);

3. estimate an econometric structure-profitability model for Canadian food, beverages and tobacco processing industries.

4. estimate an equivalent structure-price model for Canadian industries to compare with the profits model.

5. Use the estimated models to test various hypotheses, and make inferences about the performance of the sector; and

6. draw implications of the results for industry competition policy.

1.3 Research Approach.

To test the hypotheses stated above, 26 industries were selected for the study (Table 1.). The first task was to assemble data for the various variables. From the available Census of Manufactures data profit-cost margins (PCM) were derived. Thence, Canada/U.S. industry output price indexes were derived (Appendix A.).

Using these variables as measures of performance, two sets of regression equations were estimated. One set related profit-cost margins to various market structure variables. The other set constitutes regression equations for the pricing model. The first set of results, was used to analyse and draw inferences about the relationship between profitability and market structure. Similarly, the estimated equations of the pricing model were used to determine if there is sufficient evidence to suggest that the Canadian industry selling price regime is different from the U.S, and if the market structure of the domestic sector (Canada) provides any evidence as to the source of such differences.

Then by comparing the statistical results of the two models, inferences about industry efficiency and market competition were made.

1.4 Plan of the Thesis.

The study is organised into eight chapters, inclusive of the introductory chapter. Chapter 2, which comprises two sections, includes a general review of the oligopoly problem. Section 2.1 provides a review of some of the traditional oligopoly theories encountered in the literature. In section 2.2, a more rigorous treatment of the theoretical foundation of the structure-conduct-performance (S-C-P) model is presented. Section 2.2 is composed of three sub-sections; where sub-section 1 looks at the domestic market situation; 2 the

international market; and in 3 a pricing model is considered.

In chapter 3, the evidence on the S-C-P relationship is considered. Included in this chapter are two sections; section 3.1 which looks at the S-C-P approach and motivation, and section 3.2 which includes a review of previous studies where the approach was put into use. Section 3.2 consists of four sub-sections; where 1 is devoted to an introduction; 2 to U.S. specific studies; 3 to Canadian cases; and sub-section 4 looks at firm-level and product-group level studies.

A detailed description of the state and trends in the Canadian manufacturing sector and the food, beverages and tobaco processing industries in particular is presented in chapter 4. Section 4.1 looks at the whole manufacturing sector and relates it to the food and kindred processing sector. Section 4.2 looks at the trend of the major aggregate production-related variables of the sector, while section 4.3 looks at individual industries.

A description of the data and regression model specification used in the study is presented in chapter 5. Section 5.1 is devoted to the analysis of the nature and sources of the data. Section 5.2 deals with the regression model and definition of variables, in addition to any a priori expectations of the regression results.

Estimation results are presented in chapter 6, where section 6.1 outlines the estimation approach, section 6.2 reports the PCM results, and 6.3 the PR results. A synthesis and wrap-up of the results of the two model estimates is provided in section 6.4. The results of the current study are compared to other case studies in section 6.5. A summary, conculsions and limitations of the study are presented in chapter 7.

Chapter 2

OLIGOPOLY THEORIES.

2.1 CLASSICAL OLIGOPOLY THEORY.

There exist well founded theories for analysing perfect competition and pure monopoly markets. In the model of perfect competition, every market is characterised by many small buyers and sellers acting independently, free entry and exit, a homogeneous product, and an excellent product and market information. In the other extreme, a market dominated by a single firm is described as a monopoly.

If there are a few firms selling the same product, or products which are close substitutes, the market would appropriately be described as an oligopoly. The bulk of market structures lie in this intermediate group. Although the role of an individual firm may be quite significant, its output and pricing behavior is also influenced by the actions, explicit or implicit, of the other firms in the industry.

Oligopolistic market conduct is complex and involves many dimensions of a firm's behavior. Unlike pure competition and monopoly, there is no single theory for the oligopoly market. The difficulty is that the theory of interdependent action which is central to oligopoly is a much more difficult problem than the theory of independent action, peculiar to perfect competition and monopoly. Some of these theories are reviewed below.

Take the case of a firm contemplating expansion of its output. In doing so it will have to take into consideration the possible reactions of its rivals. If we assume there

are N firms in the industry, under what conditions will their actions be consistent? They will be consistent when the choices each firm makes are compatible with the others' expectations.

A possible outcome will be a case where a typical firm assumes that its rivals will not respond to its action. This deduction, first attributed to Cournot, implies that each firm chooses to market the quantity of output that maximizes its own profits, assuming rival firms' output levels remain fixed.

Assuming firm 1's output is x_1 and that of the other firms (combined) is x_2, then the price consumers are willing to pay, P, will depend on aggregate supply, $P(x_1 + x_2)$. Firm 1 wishes to maximize its profits, taking the other firms output as fixed, by chosing x_1:

Max $P(x_1 + x_2)x_1 - C(x_1)$

The solution to this problem must satisfy :

$P'(x_1^* + x_2)x_1^* + P(x_1^* + x_2) - C'(x_1^*) = 0$ or

$[P(x_1^* + x_2) - C'(x_1^*)]/P(x_1^* + x_2) = -(1/e_1)$

where e_1 is firm 1's perceived price elasticity of demand. Thus, if the firm's share of aggregate industry output is very small, then its demand curve will likely be highly elastic. This would restrict its power to change its price level. In the limit, the absolute value of e_1 would tend to infinity, implying that the firm can not effectively influence market price (McCain, 1981, pp. 309).

Similarly, the analogous condition must hold for any other firm 'i' in the industry. A consistent outcome will obtain if $x_i = x_i^*$, for all firms.

An alternative assumption is that each firm may take the others' price level to be fixed, an approach initially investigated by Bertrand and later extended by Edgeworth (B-E model) in the 19th. century (McCain, 1981, pp.312). Each firm will choose its own price on the assumption that other firms will not change theirs.

If firm 1 raises its price above that of its rivals, it will lose all its customers to them.

Similarly if it lowers its price slightly below its rivals', it will get all the customers. It is evident that, in this model, all firms will have to charge the same price, say P^*.

If P^* is above its marginal cost, then for positive z, a firm can steal all customers from its rivals by charging $(P^* - z)$ and still make a profit. But in practice we expect its rivals to react by lowering their price level to match that of firm 1 if they are to remain in the market at all. In the limit, matching price strategies will lead all firms remaining in the industry to equate their price to their marginal costs, thus generating the competitive equilibrium outcome.

A variant of the Cournot model is the Leadership-follower model where one firm makes the key pricing decisions and the others follow consistently. The leader may be the largest (dominant), or the lowest cost firm in the market, and able to set price, allowing the other smaller firms to sell as much as they want at that price. By taking the residue share of the market, the leader behaves like a monopoly surrounded by a fringe of competitive firms.

Another oligopoly model, which also exploits the concept of interdependence, was proposed by Sweezy. Sweezy (Kinked demand curve model) argues that firms would react differently to a price change, depending on whether the price change is either upward or downward (Scherer, 1980 pp.165). If a firm raises its price, its rivals will acquire new customers. If on the other hand it lowers its price, its rivals will lose customers. Accordingly, the reaction to a gain in business (new customers) is indeed welcome by rivals, and thus calls for no particular action. However, loss of business (due to price cuts) will invite reaction.

Assume the initial equilibrium price is P^* (figure 2.1 below), with firm i selling Q_i. If it cuts its price, the rivals all make cuts of similar magnitute, and firm i experiences a movement downward along its demand curve, D. However if, instead, it raises price, its rivals take no retaliatory action. The firm would experience a movement upward along

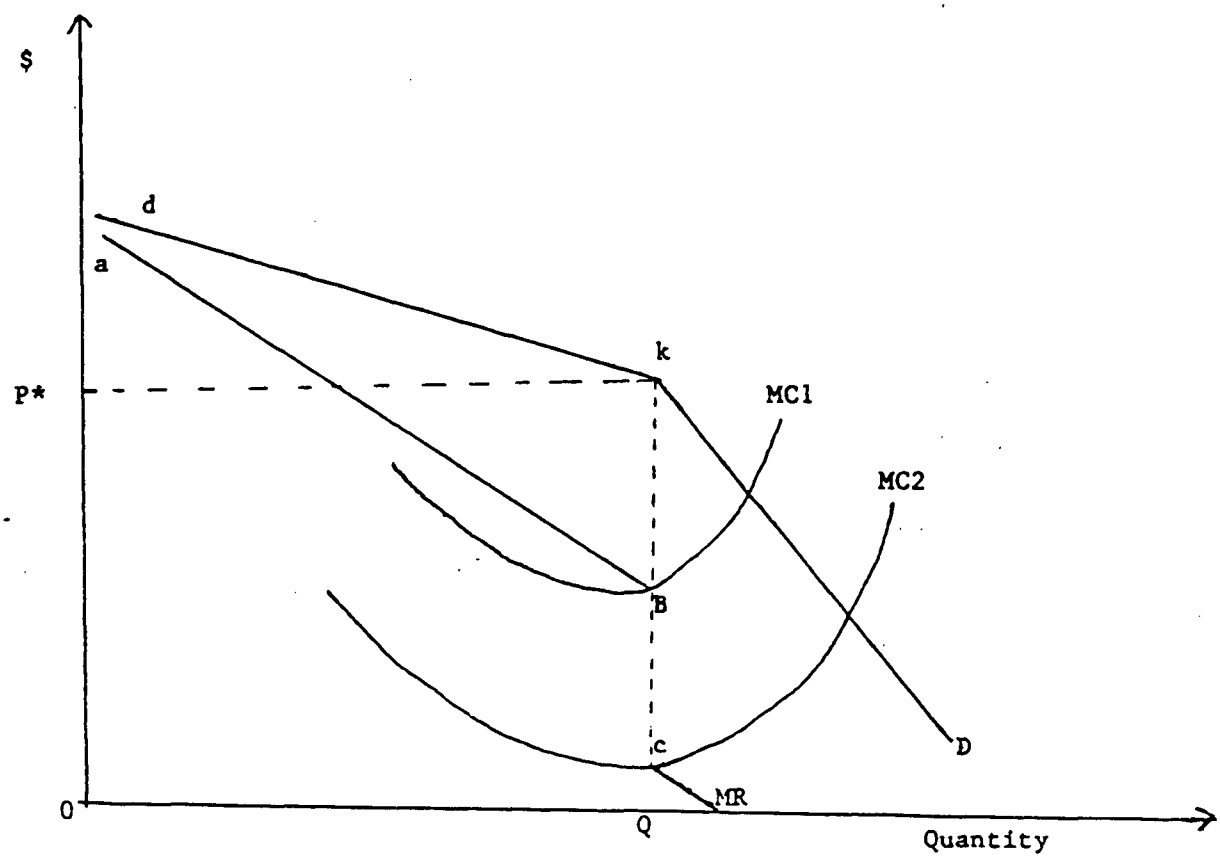

Figure 2.1: The 'Kinked' Demand Curve.

its demand curve. Thus firm i conceives its demand curve to consist of two portions; a relatively more elastic segment 'dk' for a price rise, and a less elastic segment 'kD' for a price decrease, with a kink at point k. As long as the marginal cost curve (MC) crosses the marginal revenue curve ('ab and MR') at the discontinuity (bc), price P^* and output Q_i remain optimal choices. Any moderate rise or decrease in costs which does not distort the marginal cost curve to levels outside the discontinuity will not affect the firm's output and pricing decision. It is this argument on which the Kinked demand curve model derives its proposition that prices will be quite stable in oligopoly markets.

A strong criticism of this model is that it does not explicitly tell where the demand curve, the kink or the stable price will be, and how the price is formed.

Instead of acting independently, firms in an oligopolistic market can improve their lot by colluding, or forming a cartel (Varian, p.100). This way, individual firms surrender their output and pricing roles to a centralized decision making agency to which they all subscribe. Optimal output decision will require maximization of the industry's aggregate profit by choosing $\sum x_i$:

Max $P \sum x_i - \sum C(x_i)$

$[x_1..x_n]$

Profit maximization requires that marginal costs be equal across all firms; i.e

$C'(x_i) = C'(x_j)$

However a common problem with a collusive market arrangement is weakness of adherence to the joint output restraint. Cost differences will make it difficult to negotiate a satisfactory joint output policy, to which each participant subscribes equally. A partial solution to this problem is possible if there are fewer firms in an industry, making it easier to coordinate their actions and police each others' behavior well enough to prevent serious cheating.

In summary, traditional oligopoly theory derives its strenghth on two assumptions, one of which is common to perfect competition and monopoly: Profit maximization by all firms in an industry; and each firm's parceived interest to the possible reaction of its incumbent rivals. But the empasis in oligopoly studies has shifted tremendously to include entry prevention behavior of new firms.

2.1.1 Barriers to Entry and New Competition.

The models reviewed above have considered the interdependence problem among incumbent firms. However, threat of entry and competition by potential firms is another factor these firms have to consider. An industry can only ignore this factor if there are sufficient

and effective barriers to entry[1].

How effective barriers are is indicated by the ability of the incumbent firm(s) to raise and sustain prices higher than the average cost of production, without inducing entry. The height of such barriers (translated into costs) will vary from industry to industry. In one extreme, firms could be able to set their price and output up to the monopoly level, without triggering entry. Or an industry may be characterised by entry barriers so low such that any slight increase in price above average costs will attract new firms. A critical price level, or 'limit price' [2], can be assumed to exist below which existing firms worry only about their fellow operating rivals.

Consider the simple monopoly industry, with an horizontal long-run cost curve - LRAC - and demand curve, DD' (figure 2.2 below.). In the absence of threat of entry, the solution to the firm's problem is straightforward: operate at the monoply equilibrium output, Q_m, and charge price P_m.

However, if we relax the above assumption, such that there exists a price level P_l which coincides with the minimum average cost curve of potential entrants, but lower than P_m, the monopoly solution may not be sustainable in the long run. The best he can do is to charge P_l and offer a relatively higher output, Q_l. Under these conditions, the firm can continue to earn above-normal profits, and still forestall entry. In the limit, a price equivalent to the incubent firm's long-run average cost curve (LRAC) will yield a 'free' entry or perfectly competitive market.

The problem facing firms in an industry where above-normal profits are attainable is whether to go ahead and maximize them in the short period, and hence attract new firms, or adopt entry prevention strategies. The later option entails that incumbent firms adopt

[1]Barriers to entry have been variously defined as the constraints potential firms face in trying to enter a market. Joe S. Bain: 'Barriers to New Competition'. Harvard University Press, Cambridge. 1956. pp. 3.

[2]Waterson (1984) defines this as the price below which the industry is not profitable enough to attract new firms to enter. pp. 57

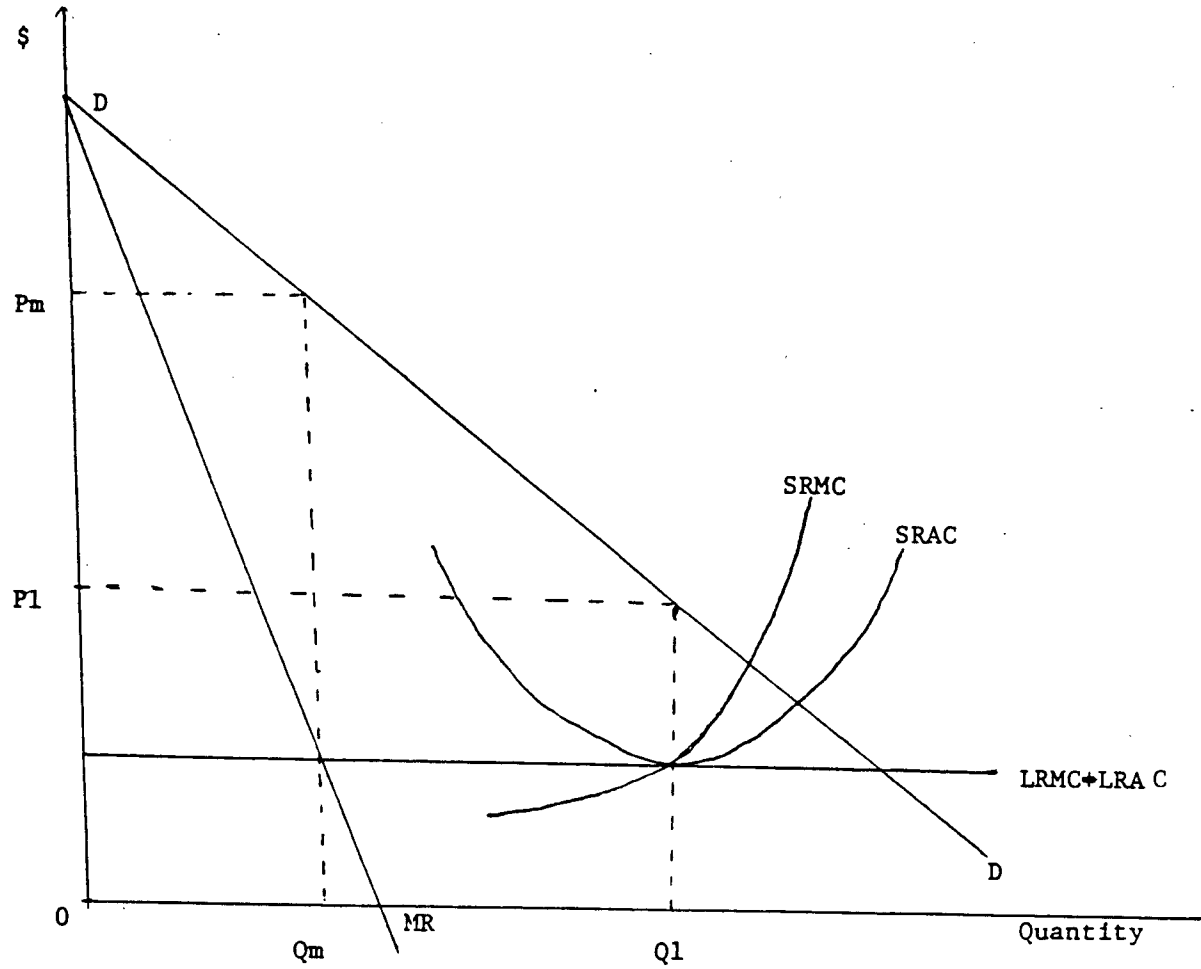

Figure 2.2: The Limit Price.

a price-policy which is not attractive to new competitors. This is done by restraining price to levels below what would obtain in a non-threat market environment. Therefore, rather than maximize profits per se, as in perfect competition or monopoly, they do so by stretching their earnings over the long-term.

How will potential entrants react to the barriers erected by incumbent firms? A new firm will have to consider whether the post-entry price will cover its average cost of production. Also new firms have to conjecture whether old firms will likely change their output shares and accomodate them. If neither of these conditions is met, then entry prevention would be effective.

Product differentiation is often the most cited indicator of barriers to new competition. Such differentiation requires that buyers have non-identical preferences among competing outputs of various sellers. Usually demand elasticities (Own price, cross-price and income elasticities) would provide some evidence of the degree of product differentiation. A perfectly elastic demand curve would imply that products from all firms are perfect substitutes and thus non-differentiated.

Advertising, as a persuasive tool, is one of the means used by firms to create and maintain such differences in their products (Scherer, 1980, pp. 376). It may also serve an informative role to consumers about the availability, quality and prices of goods (MacMillan and Pazderka, 1989.).

The relationship between advertising and industry performance can be explored by considering the impact of a firm's level of advertising expenditure on its profitability (via increasing its ability to change price) by use of the simple model[3] shown below:

(1) $\pi = PQ(P, A) - C(Q, A)$

Profit (π)maximization requires that the effects of a change in advertising expenditure

[3]Adapted from Douglas Needham's article: 'Market Structure and Firm's Research and Development Behaviour'. The Journal of Industrial Economics, Vol. 23, No. 4, (1975) pp. 253.

on total revenue be equal. i.e.

(2) $d\pi/dA = P\partial Q/\partial A - \partial C(Q,A)/\partial A = 0$, and

(3) $P\partial Q/\partial A = MC(\partial Q/\partial A) + 1$, where MC is marginal cost (or $\partial C/\partial Q$)

Therefore:

(4) $(P - MC)/P = (A/PQ)(1/e_a)$

where $e_a = (\partial Q/\partial A).(A/Q)$ is the advertising elasticity of demand.

What expression (4) shows is that advertising can have some positive effects on price mark-up over costs, depending on the good's responsiveness. If the product has a high elasticity of advertising (e_a), relatively lower promotion expenses would be needed to bring about a given increase in sales.

For instance, in a study of U.S. food manufacturing industries in 1978, Connor (1979) found that the huge expenditures required to launch new consumer food products represent the principal barrier to entry in an existing market. In order to break into the market, new firms have to spent more per customer in promotional campaigns than would an established firm. Economies of scale in advertising also work in favour of large firms, in so far as they are able to spread their expenses over a large output. It would suffice to deduce that high advertising outlays, as a pre-requisite for breaking into a market, will act as a barrier to entry and for firms to be induced to incur such expenditures there must be an opportunity to compensate them, in the form of profits.

There are other factors which can affect an industry's discretion to change the limit price (P_l) (in figure 2.2 above), either upwards or downwards. These include foreign trade and trade policies, and prices of inputs. Imports act as substitutes to domestic products, and play down market power associated with domestic concentration. A highly concentrated industry would find its ability to influence prices much curtailed if imports are priced at levels relatively lower (along the limit price scale) than domestic prices.

Tariffs can act as shelters from foreign competition to an industry. In effect, they

would afford domestic producers a price advantage, equivalent to the duty imposed (over and above other transfer costs) on competing imports. This suggests that the higher the tariff rates (and other non-tarrif trading restrictions), the higher would be the limit price domestic firms could charge, and hence high profit rates. In the extreme, a total ban on imports, or a patent will bestow monopoly power to the lucky firm(s). Khemani (1980, pp. 6), in his study of the structure of Canadian manufacturing industries, noted that tariff protection's main result is to segregate the domestic market from the larger North American and international market.

Product prices are also perceived to be highly correlated with input prices. Higher input prices will be reflected in aggregate production costs, and eventually producers have to take these into account in setting consumer prices. Not only do these costs affect individual firms at the domestic market, but they also have important implications on an industry's competitiveness in import-export trade.

However, the deductive approach, found useful in analysing other markets, is not as powerful in oligopoly (Scherer, 1980, pp. 152). It leaves us with a long list of models, each of which is applicable only in limited circumstances, under strict assumptions. Due to this limitation, many studies of oligopoly behaviour have relied less on deduction and more on results. One of these possibilities is to give up the theoretical approach entirely, and rely strictly on observation. In practice, observational approaches have posed and investigated hypotheses about the relationship between industry structure and performance. A general look at the theoretical foundation of this approach (the structure-performance model) is given below.

2.2 THEORETICAL MODEL.

Pricing and output policies are two of the most important sources of evidence which can be looked at to infer the behaviour of firms in different settings. A firm's behaviour will depend on the structure of its market; on whether it sells exclusively in the domestic market and the kind of competition it faces, or whether it faces foreign competition, both in form of imports and as an exporter. We can identify two possible scenarios faced by the typical firm:

1. it produces and sells exclusively in the domestic market, and faces no competition from imports, or

2. it may sell in both the domestic and the world markets, in addition to facing competition from imports in its home base.

2.2.1 Case I - Exclusive Domestic Market.

Consider an industry composed of N firms, producing a homogeneous product. Following Cowling and Waterson (1976), a typical firm would seek to maximize its profits, π_i:

(5) $\pi_i = PQ_i - c(Q_i)$

The inverse demand function can be written as:

$P = f(Q)$; where $Q = \sum_{i=1}^{n} Q_i$,

P is the industry selling price, Q_i is the firm's output and $c(Q_i)$ is its total production costs function. Profit maximization requires that:

(6) $d\pi_i/dQ_i = P + Q_i f'(Q)(dQ/dQ_i) - c'(Q_i) = 0$

and

(7) $dQ/dQ_i = 1 + d\sum_{j \neq i} Q_j/dQ_i = 1 + \phi_i$

Substituting for dQ/dQ_i in (6), multiplying through by Q_i and summing across the N firms gives:

(8) $PQ + \sum f'(Q)Q_i + \sum f'(Q)Q_i\phi_i - \sum c'(Q_i)Q_i = 0$

or

(9) $[PQ - \sum c'(Q_i)Q_i]/PQ = (H + \phi)/e_h$

where

$\sum(Q_i^2/Q) = H$ is the Herfindahl index of concentration;

$\sum Q_i^2\phi_i/\sum Q_i^2 = \phi$ is the conjectural industry output variation, and

e_h is industry price elasticity of demand.

Several terms in the above expressions need some special attention. $f'(Q)$ in (8) indicates how firm 'i' assumes the market price will respond to changes in its output. Two values of this term may be used to classify a particular market. If $f'(Q)$ is zero, then the result represents a competitive market, where changes in a single firm's output level has virtually no effect on aggregate industry price. Similarly if the term takes a value of one, then the industry will approximate a monopolistic market.

The other term of importance is ϕ, which captures how firm 'i' predicts its rivals will respond by changing their output. Various hypothetical values of this conjectural variation term can be used to classify some of the market structures cited in traditional firm theory. A value of zero implies the competitive market. In other words, a single firm's output would be too insignificant to warrant any meaningful response by other firms in the industry, and thus it ignores them in its decisions. A value of one implies the Cournot solution, where the typical firm conjectures that others will not change their output.

Therefore an industry's profitability would tend to be positively correlated to industry concentration, and inversely related to industry elasticity of demand.

An expression relating producer mark-up of price over costs and the number of firms

in the industry can also be derived. Assuming that all firms in the industry face an identical variable cost structure[4], the first order condition for profit maximization would be:

(10) $d\pi_i/dQ_i = P + Q_i f'(Q)(dQ/dQ_i) - \sum c'(Q_i) = 0,$

and

(11) $dQ/dQ_i = 1 + d\sum_{j \neq i} Q_j/dQ_i = 1 + \psi_i$

Substituting for (11) in (10), summing across the N firms, and

replacing $\sum Q_i^2 \psi_i / \sum Q_i^2 = \psi$ gives

(12) $[P - c'(Q_i)]/P = (1 + \psi)/Ne_h$

The left handside of (12) shows that producer mark-up of price over marginal costs would be inversely correlated to the number of firms in the industry, and the industry's elasticity of demand, other things being equal. This result, however, does not contradict the one found in (9) above, between margins and concentration, as both firm numbers and market shares are indeed related. Fewer firms imply fewer participants in the market and increased important role of individual firms in industry activities (or market shares), and hence ease of market coordination (collusion).

2.2.2 Case II. Open market Environment.

In this case, a firm can choose to produce and sell in either the domestic market or the world market, or in both. It also faces competition from imports. Following Lyons' model (1976), a typical firm's profit function becomes:

(13) $\pi_i = P_d Q_{id} + P_w Q_{ix} - c(Q_{id} + Q_{ix}) - t(Q_{ix})$, where Q_{id} and Q_{ix} are firm i's sales in the domestic and the world markets, respectively;

P_d and P_w are domestic and world market prices, respectively;

$c(Q_{id} + Q_{ix})$ are the total production costs; and

[4]This assumption implies that all firms will in effect be of identical size at industry equilibrium.

$t(Q_{ix})$ is any transfer costs associated with exporting, such as transport and tariffs.

The respective inverse demand functions for domestic and export sales are:

(14) $P_d = f(Q_d + Q_m)$

(15) $P_w = g(Q_x + Q_w)$, where Q_x is aggregate exports by domestic firms, Q_m is total imports and Q_w is the supply by the rest the world.

Considering the domestic market first, the first order conditions for profit maximization are:

(16) $\partial\pi_i/\partial Q_{id} = P_d + Q_{id}f'(Q_d + Q_m)\partial[Q_d + Q_m]/\partial Q_{id} - c'(Q_{id} + Q_{ix}) = 0,$

and

(17) $\partial[Q_d + Q_m]/\partial Q_{id} = 1 + \partial\sum_{j\neq i} Q_{jd}/\partial Q_{id} + \partial Q_m/\partial Q_{id} = 1 + \tau_i + \rho_i$

Sustituting for (17) in (16) and multiplying through by Q_{id} and summing across the N firms yields:

(18) $[P_dQ_d - \sum c'(Q_{id} + Q_{ix})Q_{id}]/P_dQ_d = [H_d(1 + \tau + \rho)/e_m][Q_d/(Q_d + Q_m)]$

where

$\tau = \sum Q_{id}^2\tau_i/\sum Q_{id}^2$ and

$\rho = \sum Q_{id}^2\rho_i/\sum Q_{id}^2$

are conjectural output variation indexes, distinquished by source of output (domestically produced and imported, respectively);

$H_d = \sum(Q_{id}^2/Q_d^2)$, or the Herfindahl index of domestic market concentration; and

$e_m = -[P_d/(Q_d + Q_m)]/f'(Q_d + Q_m)$ is the industry elasticity of demand in the open domestc market.

Expression (18) suggests that an industry's profit margins in the domestic market are positively correlated to industry concentration (H^d), but inversely related to domestic price elasticity of demand (e_m). If imports were effectively excluded from the domestic market, either by high transfer costs or other restrictive trading practices[5], the conjectural

[5]these may include high tariff rates or non-tariff barriers, such as outright bans.

import term, ρ, would be zero, implying that the industry's output decisions are only affected by domestic intra-industry and market variables.

Turning to the export market, the first order conditions are:

(19) $\partial\pi_i/\partial Q_{ix} = P_w + Q_{ix}g'(Q_x + Q_w)\partial[Q_x + Q_w]/\partial Q_{ix} - c'(Q_{id} + Q_{ix}) - t'(Q_{ix}) = 0;$

and

(20) $\partial[Q_x + Q_w]/\partial Q_{ix} = 1 + \partial\sum_{j\neq i} Q_{jx}/\partial Q_{ix} + \partial Q_w/\partial Q_{ix} = 1 + \lambda_i + \mu_i$

Substituting for (20) in (19), and multiplying through by Q_{ix} and summing across the N firms yields:

(21) $[P_wQ_x - \sum c'(Q_{id}+Q_{ix})Q_{ix} - \sum t'(Q_{ix})Q_{ix}]/P_wQ_x = H_x(1+\lambda+\mu)/e_w[Q_x/(Q_x + Q_w)$, where

$\lambda = \sum Q_{ix}^2\lambda_i/\sum Q_{ix}^2$ and

$\mu = \sum Q_{ix}^2\mu_i/\sum Q_{ix}^2$;

$e_w = -[P_w/(Q_x + Q_w)]/g'(Q_x + Q_w)$ is the world price elasticity of demand; and

$H_x = \sum(Q_{ix}^2/Q_x^2)$ is an Herfindhal index of export concentration.

Therefore, from expression (21), profit-cost margins of an industry engaged in exports would be directly correlated to its share of total world supply. Similarly, profit rates would be inversely related to the world elasticity of demand. Since an individual country's industry share of aggregate world exports is likely to be quite small, the demand curve facing it would be very elastic (i.e. high absolute elasticity index).

Lastly, firms are presumed to be less interested in individual sources of profits, and thus the distinction between domestic and export markets is rather artificial. Therefore, an appropriate aggregate industry profit-structure equation can be obtained by summing (18) and (21), to give the following:

(22) $\Pi/(P_dQ_d + P_wQ_x) = [H_d(1+\tau+\rho)/e_m[Q_d/(Q_d+Q_x)]]P_dQ_d/(P_dQ_d + P_wQ_x) + [H_x(1+\lambda+\mu)/e_w[Q_x/(Q_x+Q_w]]P_wQ_x/(P_dQ_d + P_wQ_x)$ [6]

[6] Π is defined as the sum of profits on domestic and export sales, or the sum of left-hand sides of

The left-hand side of (22) is now the familiar profit-cost margin, expressed as a function of both domestic and foreign trade related variables.

2.2.3 Pricing model.

Profit-cost margin data for estimation and testing of model (22) is available in most cases. But profits per se are but a small clue to the actual performance of an industry. There is need to consider the role of cost efficiency in explaining profitability. Relatively high profit rates may not be a result of firms' exploiting their market power, but partially a result of specific-firm efficiency. This implies existence of efficient firms in the industry, capable of producing at low costs.

Therefore of more interest is the pricing-performance of industries (and even more important specific firms), which may be a better clue to whether firms exploit their market power to push prices above their competitive level. To investigate this aspect, the relevant price-cost margin model will be of the form:

(23a) $\pi_i = (P_i - C_i)/C_i = f(Z_i)$, or

(23b) $P_i = C_i.f(Z_i) + C_i$; where

Z_i is a vector of market structure variables; P_i and C_i are the price and costs of industry i, respectively.

Estimation of (23a) (or 23b) requires one to assume that all industries are cost efficient; i.e.

(23c) $C_i = \bar{C} = P_c$,

where $\bar{C}$ reflects an industry's lowest point on its average cost curve and P_c is the competitive market price. In other words, cost (C_i) is asssumed to be independent of market structure (Z_i). This will ensure that estimated regression coefficients are indeed statistically unbiased.

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expressions 18 and 21 respectively.

But if C_i is dependent of Z_i, then the assumption of cost efficiency may no longer be valid; i.e.

(23d) $C_i = h(Z_i)$.

By exploiting this dependency concept, one can infer the influence of market structure on cost efficiency. Hence, if (23d) is true and one ignores it and estimates (23b), the coefficients on the structural variables, Z_i, will be larger than those obtained in the coresponding structure-profit model, (22). This result will imply that market structure exerts relatively larger and stronger influence on price levels than they do on profitability. If, on the other hand, the estimated coefficients on (23b) are relatively smaller than those on (22), this suggests that changes in market structure bring about bigger changes in profitability than they do on price levels. It is from these two statistical outcomes that inferences about market power and efficiency can be made.

The former outcome suggests that changes in market structure can affect an industry's performance at two levels: costs and prices. Some market structure factors are perceived to impose higher production costs, which are eventually translated into higher prices, with little effect, if any, being experienced in profitability (an example of X-inefficiency).

The latter outcome suggests that profitability resulting from changes in market structure is attained at a relatively low (or invariant) cost structure, and hence firms can maintain their past price levels, or even lower them. Thus, changes in market structure could either enhance or reduce efficiency, or be neutral.

Empiricaly, the biggest limitation to assessing whether actual prices deviate from what would be perceived as true competitive levels is lack of information on the latter. A solution to this problem could be found if we can obtain a direct measure of the competitive price. This would enable estimation of both models, and capture the deviations of actual prices from the competitive levels. Thence we can use the results to test if the price-structure hypotheses holds, as oligopoly theory predicts.

A partial solution to the data problem would be to use a substitute for the elusive competitive price. An example is the prices of non-branded goods, here considered relatively competitive, against which to compare the prices of branded foods[7].

But in Canada, such data (distinquishing branded and non-branded goods) are not readily available. Under certain assumptions the U.S. price regime could be considered as a candidate for the competitive price. A basic assumption would be that U.S. industries are larger, less concentrated and more efficient (and hence competitive), than their Canadian counterparts, in general. However, caution is needed in making this generalization because it may not be valid for all U.S. food industries, for some are concentrated and indeed believed to wield market power. But as long as this power is not correlated, industry by industry, with market power in its Canadian counterpart, then the U.S. price will be a reasonable instrumental variable for the competitive price.

Therefore the model to be estimated would be

(24a) $P_i = P_i'.g(Z_i)$, or

(24b) $P_i/P_i' = g(Z_i)$;

where P_i' is the U.S. selling price for industry i.

It is also possible that U.S. pricing behaviour is sensitive to some of the U.S.-specific market structure characteristics. Hence, an improvement in the analysis could be made by estimating and testing a larger model, involving structural variables of both markets (U.S. and Canada); i.e.

(25) $P_i/P_i' = k(Z_i, Z_i')$;

in which Z_i' is a vector of U.S. structural variables.

A review of the application of some of the concepts analysed in this chapter in studies in manufacturing (and food processing in particular) is presented below.

[7]For a review of a case study in U.S. food manufacturing, see Chapter 3.2.4.

Chapter 3

EVIDENCE ON THE S-C-P RELATIONSHIP.

3.1 Background to the Structure-Conduct-Performance Model.

3.1.1 Introduction.

Basic concerns in industry performance when viewed from society's perspective are: is the right quantity and variety of goods and services being produced efficiently? With failure of traditional theory to provide an empirically testable model to tackle this fundamental question, attention has been diverted to market structure as possible evidence of market behaviour in oligopolistic markets.

By market structure, we mean such things as the number of firms in the industry, the extent to which the industry is dominated by one or a few firms, the existence and degree of barriers to entry and other factors believed to affect competition. Consequently these factors will affect market conduct.

On the other hand, the concept of perfomance describes the level and flexibility of prices, profitability, technical and cost efficiency. To tackle an empirical problem, the hypothesis to be studied is that some aspects of the structure of a market determine aspects of its performance. The usual procedure has been to express the hypothesis in terms of statistical relationships between the structure and the performance of the industry. Then the statistics can be examined to see if the predicted relationship does exist. This is the Industrial Organization (IO) approach.

In most structure-profit studies, the standard model is:

(26) $\pi = f(CR, B, D)$ [1] where π is a measure of profitability, expressed as a function of seller concentration (CR), barriers to entry (B), and market demand conditions (D). Such studies may be either inter-industry or intra-industry, where the former compare different industries, and the latter distinct submarkets or firms within an industry.

The cost and price structure of a firm would provide most of the information necessary to evaluate its performance (profitability and cost efficiency). Athough it may be possible to observe prices and output in a monopolistic or a oligolistic market, we can neither observe nor say precisely how the market would function if it were competitive. This is mainly due to non availability of sufficient information, especially costs of production data for most industries[2].

In an attempt to overcome some of the restrictive assumptions of traditional oligopoly models, Industrial Organization studies have turned to inferring conduct from market structure or performance, and a large output of such studies is now available. But there still remains some unsettled disagreement about the causal relationship between structure, conduct and performance (Roger, 1977). Some of the typical questions raised are: 'do structural factors (such as seller concentration) cause profitability or vice versa?'; 'Is it high profit rates which cause or enable firms to commit more funds to advertising campaigns, or does it take advertising to earn higher profit rates?'.

3.1.2 Industry Performance and Market Structure.

Persistently high profits in an industry have been proposed to be a good measure of monopoly pricing (Parker and Connor, 1979 pp.627). The ultimate loss in consumer welfare can be investigated by looking at the cost structure of an hypothetical firm in a

[1] Almarin Phillips: A Critique of Empirical Studies of Relations between Market Structure and profitability; The Journal of Industrial Economics; Vol. 24 No. 4; June 1976.

[2] Such information is of strategic importance to a firm, and it would not serve its interests to have it divulged to rivals.

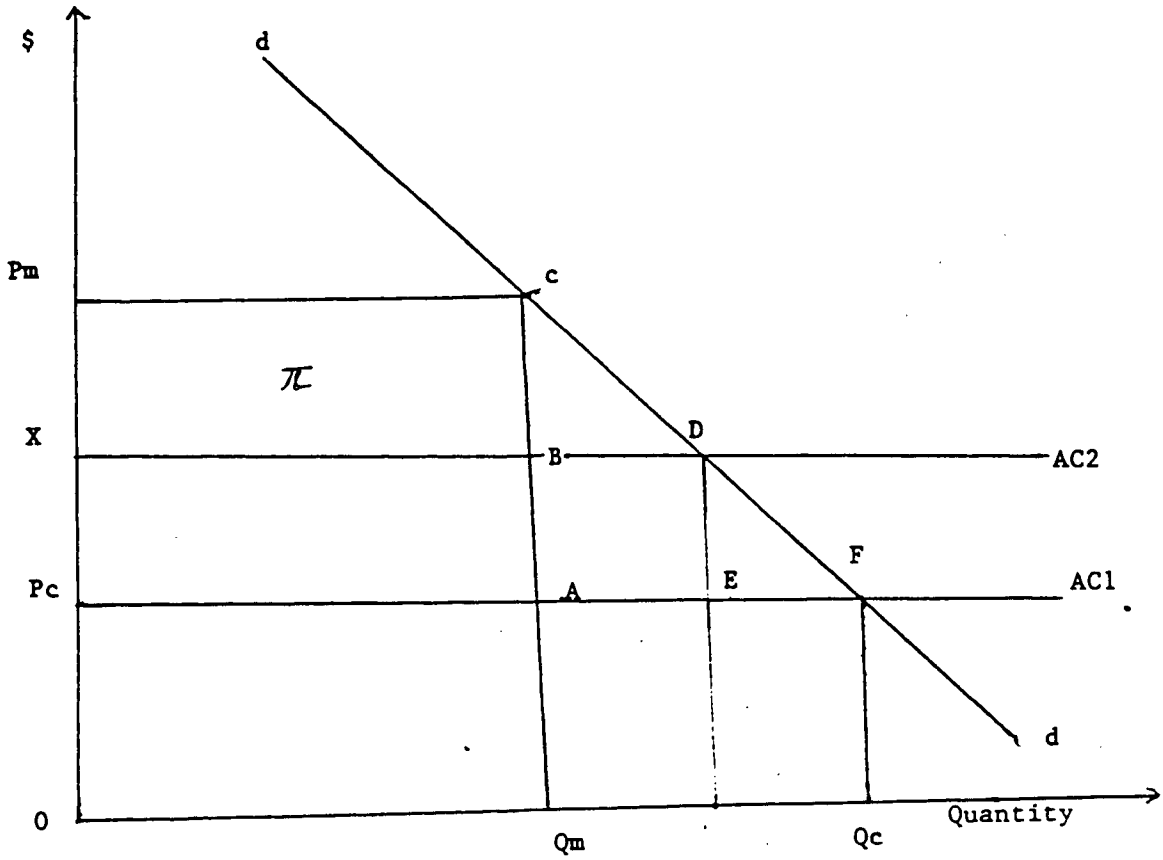

Figure 3.3: Components of Consumer Loss Due to Monopoly.

monopolised industry. Figure 3.3 depicts the differences in performance we would expect between a monopolistic and a competitive market. A firm in a competitive industry would attain equilibrium when it operates at output levels at which average costs are at the minimum and equal to price (Q_c and P_c, respectively).

But in a monopolistic industry, the firm would restrict output to Q_m and realise price P_m. Total consumer welfare loss due to monopoly is equivalent to the area P_mP_cFC. This can be apportioned into three types: the triangle CAF which is equivalent to a dead weight loss, neither reallocated to the producer nor to the consumer; and the area P_mP_cAC which would represent an income transfer from consumer. This triangle can be futher decomposed into excess profits earned by the producer (P_mXBC) - indeed

a net transfer from consumer to producer - and XP_cAB, which is the wasteful excess production costs imposed by a monopoly. This overcharge (sometimes referred to as the X-inefficiency) reflects higher costs faced by a firm due to its non-optimal management practices and excessive expenditures (such as advertising and excess plant capacity) made by firms to sustain their market power (Parker and Connor, 1979, pp.629). It is the contention among many Industrial Organisation studies that firms in concentrated industries are more prone to these malpractices.

Other hypotheses may contest the above proposition (concentration causes profits, or that dominant firms exploit their market power). It may be that concentration and profits are both the results of some other cause. In particular, the role of specific firm efficiency may increase with firm size (economies of scale), and hence concentration. In other words, a firm may be able to sustain high profits without resorting to exploiting its market power to increase prices. In the forefront of this school of thought is Demsetz (1973), who argues that superior performance (profits) should not necessarily be seen as a product of oligopolistic market coordination, but rather as a prerequisite to a firm's acquisition of a large share of the market. Thus it could be that large firms are more efficient (low costs) and hence are more profitable.

The arguments behind the Demsetz-efficiency model could be explored by looking at how large firms come to establish dominance in their particular market, and what differences could be observed in the new environment. Some of the sources of this process include internal growth (expansion), mergers and acquisition of other lesser efficient firms. These events only attract public attention in so far as they reduce competition and efficiency in the industry (Skeoch, 1976). For instance, the principal factor cited to explain the decline in number of firms in the U.S food industry in the 1950s and 1960s was the elimination of small, inefficient-sized plants (Connor, 1979, pp. 229). According

to Demsetz's approach, such events are welcome, if efficiency is enhanced with increasing firm size distribution. A similar argument underlines Canadian competition policy (Khemani, 1980, pp. 7; 1984, pp.43.).

It may be easy to detect existence of high profitability in an industry. But to establish the causality (or lack of it) relationship between it and either market power or efficiency is a problem, as indicated by the lively debate occasioned by Demsetz's article. A sample of some of the empirical studies which back up the structure-performance hypotheses are reviewed below.

3.2 Literature Review.

3.2.1 Introduction.

Since Bain's pioneering work on the structure-conduct-performance problem. appeared in 1951 (Relation of profit rate and industry concentration), a lot of interest has been focused on this subject. The new attempts have been done mainly to improve on Bain's basic model by considering multiple structural relationships. Among the reasons advocated for the new impetus are the many differences across countries and changes which have occured in the manufacturing sector and market, caused, in part, by emergence of new production and marketing organisations, such as the appearance of the large multiproduct conglomerate, large and efficient chain-marketing networks and increased role of international trade in the last 40 years. Among the new factors which have been examined and found to play important roles are capital intensity (Collins and Preston, 1966; McFetridge, 1973; Schmalensee, 1976; Parker and Connor, 1979;), import and export variables (Cowling and Waterson, 1976; Lyons, 1981; Rizvi and Ulm, 1982), product differentiation (advertising) and other entry barriers (Comanor and Wilson, 1967; Scherer, 1980), and geographical dispersion factors. Below is a review of some of these studies.

3.2.2 Studies in U.S. and other Countries.

Collins and Preston (1966) found a strong relationship between structural variables and performance in the U.S. food processing industry, using data for 32 industries in 1958. The variables they included in their basic model, including the level of seller concentration, capital output ratio, advertising and indexes for geographical dispersion and growth of demand were found to significantly explain observed inter-industry differences in profitability (indexed by profit-cost margins).

In addition to domestic market structure variables, the role of foreign trade in profitability studies has also been investigated in several other studies. Among these is a study by Esposito and Esposito (1971) on 77 manufacturing industries (43 of these consumer goods industries and 34 producer goods industries) in the U.S. They showed that less restrictions on trade (and hence actual or potential foreign competition) encourages competitive pricing behavior in domestic industries. In industries where there is threat of actual or potential foreign entry, domestic firms exercise caution in their pricing decisions, and thus have to content with prices lower than what would obtain in a closed economy. They showed that import competition[3] exerts a significant negative influence on industry profitability in the aggregate sample (77 industries), but it was insignificant in the producer goods and consumer goods sub-samples.

Pagoulatos and Sorensen (1976) extended Esposito's work in international trade by considering the role of export opportunities and foreign direct investment. Using 1967 U.S data on 88 industries, the regression results for the traditional domestic market variables (seller concentration and product differentiation) and export competition supported their hypothesised positive significance. The same result was also found to exist between the variable introduced to capture the efffects of foreign direct investment[4] on profit-cost

[3]Indexed by the ratio of imports to domestic value of shipments.

[4]represented by a measure of multi-nationals' activities - i.e percentage foreign component of total

margins. Although non-tariff barriers were found to exert significant positive influence on profitability, nominal tariff rates[5] were not. This led them to conclude that perhaps the effects of tariff protection are more reflected in price levels (changes) but not necessarily on profit rates.

There are many other similar studies done for the U.S. food processing industries, the most recent being by Rogers (1987). A major difference between this one and previous cases is that Rogers estimated the structure-profits relationship in consecutive census years (1954-1977). His main aim was to establish whether the relationship is stable during inflationary periods. Concentration was not statistically significant in the 1954-67 period, when prices were relatively stable. Thereafter, the size of the coefficient on concentration increased, and became significant. The effect of product differentiation[6] on price-cost was also positive. Based on these results, Rogers concluded that the structure-profitability relationship grew stronger and more significant over time, and is less affected by business cycles.

Outside North America, Holtermann (1971) did a study of U.K. manufacturing, similar to the U.S. case studies but with a few innovations. In addition to the widely used profit-cost margin, various definitions of rate of return on assets and labour, and labour productivity growth, as measures of performance, were considered. Data for 113 industries in 1963 rendered support to the study's hypothesised relationship between market power[7] and barriers to entry[8] and performance. The major finding in this study was a strong and positive relationship between total factor productivity and concentration.

Lyons (1981) improved Holtermann's study by integrating foreign trade into a basic

economic activity in the largest firms within the industry.

[5]Nominal tariff rate was used as variable; and a dummy variable was introduced to capture non-tariff barriers.

[6]Proxied by media advertising-to sales ratio.

[7]Proxied by the 5-firm concentration ratio.

[8]Measured by advertising to sales ratio, ratio of average employment by the first half of the largest firms, capital output ratio and rate of investment

structure-performance model, and applied it to data for 118 U.K. manufacturing industries. He found the variable for export intensity had a significant positive effect on profit margins. On the other hand, import competition (like entry of new firms) was found to lead to a decrease in profitability. The results on the impact of import competition in the U.K. data is consistent with the findings of Esposito and Esposito, and Pagoulatos and Sorensen's studies in the U.S. market.

3.2.3 Canadian Studies.

In Canada, Jones, Laudadio and Percy (1973), in a study of 31 consumer good and 29 producer good industries, showed that different structural variables have different impacts on profits depending on whether the industry produces consumer or producer goods. Concentration and profit margins where found to be positively correlated when all the industries are looked at together, but the results differ for separate treatments. Other variables (foreign competition, growth of demand, economies of scale, regional concentration and specialisation) were insignificant, with the exception of product differentiation[9]. But when each group was considered separately, the results were mixed. Regional concentration, growth of demand and advertising were the only significant variables in the consumer goods sector (positive relationship). National concentration, advertising, foreign competition, demand (negative) and specialization, were significant in the producer goods sector.

Rizvi and Uhm (1982) went a step further and looked at data for 25 farm input and food processing industries in the 1970s, using profit-cost margins (PCM) and changes in consumer prices as indexes of performance. An important finding of their study was a negative, but insignificant, relationship between concentration and profit margins. The

[9]Indexed by advertising to sales ratio.

specification using price change, like the PCM one, also yielded weak results. But foreign ownership of manufacturing activity and income elasticity were, however, positively correlated to profit margins.

De Silva's study (1971), like Rizvi and Uhm's, used changes in producer selling price as the depended variable, on 26 manufacturing industries' data for 1961-67. Concentration was found to play an insignificant role.

The more recent study by Hazledine (1978), unlike the above cases, looked exclusively at data for 19 Canadian food processing industries for the period 1961-74. An additional innovation in this study was inclusion of 'surplus'[10] as an alternative index of performance. Although a linear specification of his model yielded insignificant results between concentration and profit margins, a non linear specification (i.e. used CR4 and its square as variables) gave significant results on both PCM and 'surplus'.

All the studies (reviewed above) have used aggregate industry level data which no doubt suppress intra-industry characteristics and differences. But others have gone a few steps further and looked at data at various levels of disaggregation, such as at the firm level [Imel and Helmberger, (1971); Dalton and Penn (1976), Rogers, (1978)] and at the product group level (Parker and Connor - 1979).

3.2.4 Firm Level and Product Group Studies.

Connor and Parker used food processing data disaggregated into two categories (one for private label products and the other national brands), in an attempt to show the effect of market structure on different pricing practices by large and small firms. Private (or Own) brands were taken to approximate a competitive market regime, relative to national brand manufactures which are priced at a premium. By assuming away quality

[10]Defined as the ratio of an industry's profits to a weighted sum of capital stock, inventories and wage bill.

differences between the two product groups (considered minimal and insignificant), any difference in their prices would approximate monopoly overcharge by national brand manufactures. Using this price difference[11] on 1976 data for 41 product groups, they found a strong relationship existed between it and other variables (seller concentration, import competition, and advertising intensity - disaggregated into T.V advertising and advertising by the largest 200 food processing companies).

Imel and Helmberger related direct after-tax company profit rates (as dependent variable) to firm-specific market structure variables, in addition to other variables common to an industry, for 99 U.S. food processing companies in the 1959-67 period. Concentration[12] and various indexes for barriers to entry[13] were found to be important explanatory variables of variation in profit rates among companies.

A similar approach to Imel and Helmberger's study was used by Rogers in 1978 (Connor, et al. 1985, Table D-2 pp. 335-336), but this time using before-tax company profit rates for 60 food processing companies during the the 1964-1970 period (which coincides with part of the Imel and Helmberger's study). There was a significant improvement in the results (including significance of concentration and product differentiation-related variables).

Dalton and Penn looked at a 1950 sample data of 97 large U.S. food industries, employing rate of return on equity[14] as a measure of firm profitability. Their study mainly sought to find out if the relationship between concentration and profitability reported in many previous studies is a continuous association. Their results established a critical level of concentration (45% for a 4-firm concentration and 60% for an 8-firm concentration), at and above which the concentration-profitability relationship assumes

[11] In place of the traditional profit/cost margin

[12] measured by CR4, or the largest firm's market sales share/ share of the 4-largest firms

[13] advertising-to-sales ratio, expenditures on Research and Development-to-industry sales ratio.

[14] measured by the ratio of net income-after-taxes to owner's equity averaged over the period 1949-54.

positive significance.

This brief review of previous empirical studies reveals that much of the inter-industry variation in performance can be explained by factors related to market power, barriers to entry, and foreign trade and tariff protection. There are other similar studies whose results are close to the few examples cited above[15]. A closer look at the Canadian manufacturing sector is presented below.

[15]For a summary, see Connor and Parker, (1985), Table D-2 pp. 356-357.

Chapter 4

The Canadian Manufacturing Sector.

4.1 Description and Trends.

In this section, a brief analysis of the Canadian manufacturing sector between the 1970 and 1985 period is provided. The number of firms in manufacturing increased by 11.2% between 1970 and 1981. The number of plants grew over the years, from 31,928 in 1970 to 36,854 in 1985, a 15% increase (Table 3).

But the percentage of all firms in manufacturing accounted for by the food and kindred sector was on the decline, from 17.2% in 1970 to 11.6% in 1981. By 1985, it reached an all time low of 9.7%.

Employment in production related activities has been fairly stable in manufacturing. Total employment grew by 11.8% (Table 4). The share of the food and kindred sector of total manufacturing employment remained fairly constant over the years, at an average of 12.3%.

In contrast, the wage bill grew more rapidly, at an average annual rate of 10.3%, compared to the growth rate of labourforce of 0.8%. The share of food and kindred sector of this total remained fairly stable, at 11.5%, over the years (Table 5).

Expenditure on fuel and electricity increased by about 125%. This increase was most rapid between 1974 and 1978, a period dominated by high crude oil prices instigated by the OPEC[1] cartel then. The food sector's share was fairly stable, at about 10% on average (Table 6).

[1]Organization of Petroleum Exporting Countries.

Expenditure on raw materials and supplies also experienced rapid growth. From a total of $ 25.7 billion in 1970, it increased to over $ 40 billion in 1985, a 55.6% increase (Table 7). This increase (for all manufacturing) is relatively higher than the 46.5% registered by the food and kindred sector alone during the same period.

Real value of shipments in all manufacturing industries increased by 60.3%, from $ 46.4 billion in 1970 to $ 74.3 billion in 1985. Food and kindred sector grew at a relatively slower rate of 31.8%. The sector's average share of all manufacturing was 18%, but a gradual decline from a high of 19.8% in 1970 to an all time low of 16.3% in 1985 is notable (Table 8).

Value added in all manufacturing increased by 43.1%, with the food and kindred sector experiencing a relatively slower growth rate of 22.9%. Its share of total manufacturing was fairly stable over the years, at an average level of 14.5% (Table 9).

Therefore, compared to other sectors of the economy, the food, beverages and tobacco sector has grown at a slower rate, in terms of employment, value of sales and contribution to value added to processed goods.

4.2 The Food, Beverage and Tobacco Processing Sector.

4.2.1 Introduction.

The food, beverages and tobacco processing sector plays an important role in the Canadian economy. During the 1970-85 period, it accounted for an average of 18% of total manufacturing sales and 14.5% of value added. The sector's real value of shipments increased from $ 7.5 billions in 1970 to over 10.2 billions in 1985, an increase of 36.3%. Its share of other aspects of production, such as employment, value added, exports and material inputs, have also remained important over the years.

4.2.2 Trends in other major Variables.

Number of Firms and Establishments.

The number of food, beverage and tobacco processing firms declined from 3022 in 1970 to 2809 in 1985, a 7% decrease (Table 2). But this trend was not uniform across the board. The number of firms increased in eight industries, declined in ten and remained unchanged in two. Among the most notable declines were in dairy processing, soft drinks, feeds and biscuit industries. Substantial increases occurred in wineries and the leaf tobacco industry. The number of plants in the sector decreased substantially, from 5805 in 1970 to 3557 in 1985, a decline of about 38.7%. This downward trend reached the lowest level in 1983, when there were only 3509.

Like in firms, these changes affected industry groups differently, with some experiencing increases in plant numbers (Table 3). Out of 26 industries, 15 registered decreases. This was most marked in the dairy processing, cane and beet sugar, and feed industries. Elsewhere, some industries experienced remarkable increases. Notable here is the wine industry.

Value of Shipments and Value Added.

Aggregate real value of shipments increased from \$9.17 billion in 1970 to about \$12.09 billion in 1985, an increase of over 31.8%. Among the industries which performed extremely well were vegetable oils (257%), frozen fruits and vegetables (166%) and the wine industry (98%). Some other industries experienced declines in their real value of shipments, such as the bakery industry, the leaf tobacco processing and the biscuits industries.

Aggregate real Value added increased by about 22% during the period under review. The pattern of performance followed closely the one in value of shipments (Table 9), with vegetable oil, frozen fruits and vegetables and wine industries registering substantial

growth.

Industry Concentration.

Use of the degree of seller concentration has developed as one of the most popular indicators of market power in industry. And in Canada, like in many other countries, its level and trend forms an important input in evaluating industry anti-competitive behaviour, and in design of competition policy. Several indexes have been proposed to measure this factor, among which is the four-firm concentration ratio (CR4) and the Herfindahl index (H).

The weighted average CR4 for the Canadian food and kindred sector has been on a general increasing trend during the period under review; averaging 60% (Table 10). From 57.6% in 1970, it increased to 61.2% in 1985. In contrast, the weighted average for all manufacturing was 53% in 1970, indicating a significant degree of concentration in the food and kindred sector. Among the three subsectors, the tobacco subsector is the most concentrated (average CR4 of 98.6%) followed by beverages (76.1%), with food processing trailing at 50.2%. In contrast, U.S. had a CR4 of 46.5% in 1977, compared to Canada's 63.8%.

But what infomation does the magnitude of concentration convey? Scherer (1980) suggested a critical lower bound CR4 of 40%, above which exploitation of market power may effectively distort prices and bring payoffs to firms engaged in collusion. In Canada, average concentration ratios (CR4), range from as low as 26% in the feed industry to a high level of 99% in the tobacco products industry. Application of Scherer's criterion places 16 of the 20 industries[2] in the Canadian sector in the upper limit, overwhelmingly suggesting that the potential for exercising market power exists. A similar deduction would also be reached using the 1980 SIC data for 1985, with 22 of the 26 industries

[2]1970 SIC data.

having ratios of over 40%. In contrast, only 13 of the 26 U.S. industrial groups surpass the 40% mark.

Other studies have proposed similar versions of Scherer's approach, mainly by defining broad clusters of industry groups in the continuum between atomistic competition and monopoly. The most widely applied approach in the Canadian market, which was proposed by Rosenbluth (1957) and later adopted by the Canadian Department of Consumer and Corporate Affairs, groups industries into four broad categories. Concentration ratios higher than 75% would be considered very high and present the case for a potential 'tight' oligopoly. Between 50% and 75%, though still considered high, such an industry would be described as a oligopoly. Other industries with ratios lower than 50% but higher than 25% could qualify as possible cases of 'loose' oligopoly. Industries with ratios well below 25% are considered fairly competitive.

In the 1970 SIC data, non of the 20 industries qualify to be considered atomistic (Table 11). Seven of these were in the 75-100% 'tight' oligopoly category, another seven were classified in the high concentration category and the remaining 6 as moderate.

For the 1980 SIC, the proportionate distribution of the 26 industries remain fairly unchanged. 35% and 31% of the industries fall under the 'tight' oligopoly class and the high oligopoly category, respectively. Of the remainder, 8 are in the 'loose' oligopoly category, with only the feed industry qualifying as a potential competitive industry.

There are other suggested classifications, two of which are briefly considered here[3]. Meehan and Duchesneau (173) estimated a critical lower bound 8-firm concentration of 70% at which the concentration-profit relationship becomes significant. However their suggested 55% at the 4-firm level yielded weak results. Dalton and Penn's study, though using a different specification of profitabilty (firm level rate of return on equity) from Meehan and and Duchesneau's came up with threshold levels of 45% and 60%, at the

[3]for a general review of these, see article by Dalton and Penn (1976), cited in chapter 3.

4-firm and 8-firm aggregation levels respectively.

Therefore despite the variety in market classifications, the Canadian food, beverages and tobacco processing sector appeals to meet many of the criteria suggested which place market power within reach, other thighs equal. A brief description of the 26 industries is presented below.

4.3 Food, Beverages and Tobacco Intra-Industry Structure.

4.3.1 Meat and meat processing industry - SIC 1011.

This industry comprises establishments primarily engaged in abattoir operations and meat packing. It is the largest 4-digit industry in the Canadian food and kindred sector, acounting for an average of 24% of value of shipments and 13% of all value added. Its importance can also be judged by its contribution to aggregate value of output, value added and purchase of inputs. In 1970, the industry processed over 600,000 tonnes of cattle, worth $740 million, and about the same volume of hogs valued at about $405 million. Currently, four firms hold a major share of the industry [4].

The meat processing industry is characterised by a large and growing number of firms and pants, and low concentration. Holloway and Goddard (1988, pp. 207) have shown that large firms tend to be more efficient than small ones, especially if they produce both fresh and processed meat. Also attempts at price leadership by Canada Packers in the early 1970s were ineffective (Green,1980, pp. 100). Indeed the small size of the domestic market relative to the U.S. and modest meat trade restrictions between the two countries suggest the ernomous role played by foreign trade in Canadian price determination [5] (Higginson et. al. 1988.). Other more recent studies have shown that

[4] Canada Packers, Burns Meat, Gainers and Intercontinental

[5] An exception was the countervailing duty of $0.053 per lb imposed on Canadian processed pork exports by U.S. in April 1985 in protest against Canada's subsidies to her producers, but revoked in

Canadian meat product prices are largely determined in the U.S market, and are on average equal to the U.S. price adjusted for differences in foreign exchange and transfer costs (Coleman and Meilke, 1988 pp.402). Thus meat processing can be described as a highly competitive industry.

4.3.2 Poultry Processing - SIC 1012

Poultry processing comprises establishments engaged in slaughtering, eviscerating and packing or canning poultry; chickens and turkeys being the most important (85% of all poultry processed). The combined volume of chickens and turkey processed increased from 622,000 tonnes in 1970 to 688,000 in 1984, valued at $205 and $285 millions, respectively.

An important feature of this industry is the strong influence exercised by input (poultry) suppliers through the widely practised production quota system, reiforced by high tariff protection (Hazledine, 1989, pp. 36). This factors have important implications on the cost structure (high cost inputs) of the processors and their competitiveness in the world market.

Given the large number of firms and establishments involved in the sector and the low CR4 (36.8%), low entry barriers, in addition to existing competition from large U.S. manufactures, it would be safe to describe the poultry industry as highly competitive

4.3.3 Fish Product Industry - SIC 1021

Included in this industry are establishments whose principal activity is the canning, salting, freezing and pickling of fish as well as producing fish meal, seal oils, and seaweed products. The industry is concentrated in two major raw fish producing regions: the East Coast groundfish processing industry and the B.C salmon canning industry.

July.

Regionally, the Pacific region dominates the fish canning subsector (84%) while the Eastern region produces 76% of total fresh fish, 84% of frozen fish, almost all cured fish, and 89% and 87% of fish meal and marine oil, respectively[6].

The industry is characterised by a relatively small number of large integrated firms and a much larger number of smaller operations, and differentiated cost and profitability structure (with large firms more profitable).

Over 65% of value of Canadian processsed fish products is destined for the export market, in addition to exports of raw and semi-processed fish. The U.S., which meets only 10% of its demand from domestic sources, provides the biggest market for Canadian fish, and thus exerts tremendous pressure on prices, both at wholesale and retail level. Therefore major movements in U.S. prices are subsequently transmitted back and forth between the two markets, regardless of supply demand balances in Canada[7].

Declining raw fish supply, caused by overfishing by foreign fleets (from Japan, Taiwan and Korea) and local fishermen, is one of the major problems facing the industry in the 1980s, especially in the Atlantic region. The dominant firms (Fishery Products International Ltd. and Clearwater Fine Foods Ltd.) have witnessed rapid drops in raw fish supply, leading to fish plant closures and layoffs. Despite these problems, new firms are still setting up, thus compounding the already low plant capacity utilisation[8] (55%). Low and declining market shares, and dependency on international markets, in addition to the stiff competition for raw materials places the industry among the competitive category.

[6]Food Prices Review Board, Fish and Fish Products Industry, 1975.
[7]Food Prices Review Board, 1975.
[8]The Financial Post, June, 12 1989.

4.3.4 Fruit and Vegetable Canners and Preservers - SIC 1031

This industry comprises establishments primarily engaged in processing fruits and vegetables. Important products of the industry are canned or processed fruits and vegetables, vegetable and fruit juices, soups and pickles

Because of the high proportion of fresh produce imported from the U.S., fruit and vegetable price movements in Canada reflect to a substantial degree the corresponding pattern of U.S. prices. This factor, in addition to seasonal factors tend to dominate prices in both markets [9].

The large number of firms and strong competition from soft drinks in the industry's juices market and low concentration levels (average CR4 of 39.7%) would suggest this industry is highly competitive.

4.3.5 Frozen Fruit and Vegetable Processing Industry - SIC 1032

This industry constitutes establishments engaged in processing and freezing of fruits and vegetables, fruit juice concentrates and french fried potatoes.

Its activities are closely related to those of the above one (SIC 1031) in most aspects, except for its small size and high growth potential. The number of firms involved has fluctuated around 30. Due to increasing preference for fresh produce around the year, the level of activities of this industry have been growing rapidly over the recent past. Value of sales jumped from $72.1 million in 1970 to over $191 million in 1985 (166%). Value added grew even more rapidly, by 201% during the same period.

The industry's frozen fruit subsector is dominated by two firms[10] which have interests in other soft drinks industries in Canada and U.S. Stiff competition among the big players

[9]Food Prices Review Board - September 1974: Food price trends in Canada and U.S. A U.S. - Canada Comparison 1970-74.

[10]Tropicana Products, a Subsidiary of Seagram - Montreal, and Minute Maid, a Subsidiary of Coca-Cola company.

for dominance of the market and protection of their market shares has been on the increase[11]. Unlike its counterpart above, concentration has been rising, achieving an average CR4 of 60.9%. This factor alone would tempt one to place the industry among the class of oligopolistic industries. But low barriers to entry, power of distribution chains and competition from generic producers and imports strongly play down any potential market power, leading to moderate competition among sellers of branded goods.

4.3.6 The Dairy processing Industry - SIC 1041, 1049.

This industry includes establishments primarily engaged in processing raw milk and cream. Since 1982, the industry has been redefined to distinquish establishments primarily engaged in fluid milk (SIC 1041), from those engaged in other dairy activities (SIC 1049).

Important features of this industry is its regional distribution and raw milk quota system, operated according to raw material source and product market, and non-tariff trade barriers (Hazledine, 1989.). Most of the secondary processing plants are also owned and controlled by the primary producers (farmers groups).

Competition is high, among dairy processing firms and other non-alcoholic beverages. A large, but declining, number of firms and establishments is also involved. To boost sales various provincial milk marketing boards have, in the recent past, engaged in promotional activities. Studies have shown that increasing expenditure on fluid milk promotion would increase consumption and sales revenues net of advertising costs, especially through attracting consumers from other non-alcoholic beverages (Goddard and Tielu, 1988, pp. 261). Low size distribution of firms and entry barriers would suggest that the industry is competitive.

[11]Financial Post, June, 13 1989.

4.3.7 Flour and Breakfast Cereals Products-SIC 1051, 1052.

This industry comprises establishments engaged in milling wheat and other cereal grains, blending flour, and processing cereal grains into cereal breakfast preparations.

On revision of the SIC in 1980, the industry was grouped into cereal grain flour (1051), and prepared breakfast cereals (1052). Although the breakfast cereals industry is highly concentrated, product heterogeneity, stiff non-price competition (especially advertising) among local producers and imports, mainly from the U.S; substantially reduce the potential market power of firms to a moderate level. On the other hand, profit rates and entry barriers are quite low in the flour milling industry, puting it among the competitive category.

4.3.8 The Feed Industry - SIC 1053

This industry comprises establishments primarily engaged in producing balanced feeds and premixes or feed concentrates for poultry, hogs, cattle and pets. Other products include animal and vegetable proteins, vitamins and antibiotics.

The industry is closely linked to the grain flour industry, from where most of its raw materials originate. The large number of firms involved, low concentration and barriers to entry suggest the industry is competitive.

4.3.9 Vegetable Oil mills - SIC 1061

This industry comprises establishments primarily engaged in manufacturing vegetable oils. Important raw materials are soybean, and flaxseed and rapeseed ('Canola') which has recently emerged as the most prominent. Some of the leading firms are Canada Packers Ltd; Proctor and Camble Co; Fine Foods, Kraft, and Stardard Brands Ltd. High tariff protection rates (10% on crude oils and 17% on refined oils) enables Canadian

firms to earn larger processing margins than their U.S. counterparts [12].

The future of this industry is bright, with its product having gradually emerged as the main substitute for animal oil and fat products, of which the popularity has been on the decline due to health concerns.

Despite high seller concentration levels (average CR4 of 72.7%) and a small number of firms, other factors serve to reduce or enhance the industry's market power potential. First, the capital intensive nature of oil processing posses a potential barrier to entry. Similarly, the ban on margarine imports (which accounts for about 40% of edible oil products) is another source of barrier to entry (Rigaux, 1976, pp. 54-69).

On the other hand the major impact on oil processing comes from the industry's heavy reliance on soybeans imports from the U.S. (about 35% of its needs). Thus any major changes in the larger U.S. soybean market is easily felt in other oils, leading Canadian prices to strongly reflect the U.S. price structure. Therefore it would be more appropriate to categorise this industry as competitive.

4.3.10 Biscuit Manufactures - SIC 1071

This industry comprises establishments which manufacture as their principal products biscuits, crackers, and similar 'dry' bakery products.

Concentration and profit levels are quite high which, in addition to a relatively small number of firms and stiff non-price competition (advertising), would suggest that the industry is highly oligopolistic.

4.3.11 Bread and other Bakery products Industry - SIC 1072

This industry covers establishments engaged in manufacturing bread, cakes and other related perishable bakery products.

[12] Regaux, L. R: The Canadian Edible Oils Industry. Food Prices Review Board. 1976

Over the years, the number of firms has declined enormously. The number of large plants decreased by over 75%, from 1921 in 1970 to 473 in 1985. One of the main sources of this trend is the proliferation of small bakeries selling their produce across the counter, whose output is not recorded in this industry.

Unlike in the U.S. market the Canadian bakery industry is less affected by international wheat price changes (and hence flour prices) since it benefits from a cheaper wheat flour input[13]. Despite low seller concentration, a large number of firms and low barriers to entry (widely accessible technology), individual firms can still earn reasonable profit rates by producing specialty goods which sell at a premium price (Hazledine, 1989.).

4.3.12 Confectionery Manufacturers - SIC 1082, 1083.

This industry consists of establishments engaged in producing candies of all types. In 1980, the industry was re- classified into two: chewing gum (SIC 1082) and sugar and chocolate confectionary (SIC 1083).

This industry is among the most highly concentrated (CR4 of 92%). Through a series of acquisitions in the 1980s, three firms have become the key players, accounting for well over 90% of the domestic market[14]. Despite stiff competition (mainly advertising), the enormous market share of a few firms suggests a potentially 'tight' oligopolistic industry.

4.3.13 Cane and Beet sugar Processing Industry - SIC 1081.

This industry comprises firms primarily engaged in processing raw cane and beet sugar into granulated sugar, liquid sugar and sucrose. Some of the leading firms in this industry are Redpath, Atlantic Sugar, B.C. sugar, Quebec Sugar, St. Lawrence Sugar, and Westcane Sugar Refineries.

[13]resulting from Canadian wheat subsidy. Food Price Review Board-september 1974.

[14]William Neilson, which purchased Caramilk and Crunchie from Cadbury Schweppes; Hershey Canada Inc. which acquired Effem Ltd. from Nabisco; and Rowntree Ltd.).

Canada depends to a large extend on imported raw cane sugar, with minimal tariffs imposed. In turn, cane sugar refineries price their products on basis of the London Daily Price, by adding a processing margin that covers costs and returns on capital. Over the years, Redpath has emerged as the acknowledged domestic price leader on whose daily price quotations other firms follow[15]. Under the price leadership system and substantial capital intensity (as a barrier to entry), the structure of the Canadian Sugar processing industry could be viewed as potentially oligopolistic.

4.3.14 Miscellaneous Food Industries-SIC 1091, 1092, 1093, 1099.

This industry includes firms primarily engaged in processing foods not elsewhere classified. Since 1970, it has been defined to include establishments manufacturing baking powder, flavouring extracts, macaroni, starch, yeast, spaghetti, 'health foods' and other food specialities, roasting coffee, blending and packaging teas.

The industry was redefined under the 1980 SIC into several four digit level industries. Tea and coffee industry are grouped under SIC 1091, dry pasta products as 1092, potato chips, pretzel and popcorn as 1093, and malt and malt flour industry as 1094. Other industries not elsewhere classified are under SIC 1099.

Although the heterogeneous nature of this industry prior to 1982 precludes any useful unified analysis, concentration levels in the first three industries in the new SIC are quite high, suggesting a potentially oligopolistic market.

4.3.15 Soft Drinks Industry - S.I.C. 1111

This industry includes establishments primarily engaged in manufacturing non-alcoholic beverages and carbonated mineral waters, or concentrates and syrups for manufacture of carbonated beverages.

[15]Food Prices Review Board: Sugar Prices II - The Canadian Sugar Refining Industry. 1975.

Consolidation of minor plants into large efficient establishments has led to a sharp decline in small firms[16]. The number of firms fell by 54.2%, from 330 in 1970 to 151 in 1985. Larger firms fair better in profits than small ones. The market is dominated by two firms; Coca-Cola Co. and Pepsicola Co., the parent company (Atlanta) of the former accounting for 35% of world soft drinks sold[17].

Although non-price competition (as partially indicated by intense advertising campaigns) and concentrations are high (54.2% in 1970 increasing, to 67.2% in 1985), differentiated cost efficiency and profitability by firm size places the industry among the competititive category, but with heterogeneity.

4.3.16 Distillery products - SIC 1121

This industry comprises establishments primarily engaged in the manufacture of potable spirits such as whisky, brandy, rum and gin.

Although the industry is characterised by high concentration (average CR4 of 98.2%) and a relatively small number of firms, intense competition from imported spirits plays down the potential market power of the industry.

4.3.17 Brewery Industry - SIC 1131

This industry comprises establishments primarily engaged in manufacture of beer, including ale, porter, stout and other malt liquors.

The industry was dominated by three firms (Labbat, Molson and Carling O'Keefe), which achieved their dominant production share (94%) through a series of mergers beginning in the the 1930s (Clarke, 1989). Labbat controls 42% of the domestic market while Molson and Carling O'Keefe take up another 52%.

[16]production and delivery equipment is more efficiently utilized in a large establishment
[17]Blue Book of Canadian Business, 1985.

The structure of the Canadian beer industry provides a classic example of an oligopolistic industry. Concentration levels run high, in addition to various provincial liquor control restrictions and high tariff rates. The CR4 increased from 94% in 1970 to a peak of 99.1% in 1979, and then declined gradually to 97.7% in 1985. Indeed with the conclusion of the proposed Molson - Carling O'Keefe merger, the industry's concentration has reached an even higher level (Clarke, 1989).

4.3.18 Wineries - S.I.C. 1141

This industry comprises establishments primarily engaged in producing wines and cider with alcoholic content. There are two categories of firms in this industry, distinquished by size and ownership. On one side are the small family-operated firms, which specialise in vintage wines, and on the other the large firms which, in addition to engaging in primary production of their own label wine, also bottle imported wines.

The market shares (average CR4 of 70.7%) were on the upward trend in the early 1970s, from an all time low of 63.9% in 1972, to a high of 77% in 1976. But differences in cost structure and profitability between large and small firms suggests that firms still claim some market power through specialization.

4.3.19 Leaf Tobacco, Tobacco Products Industries-SIC 1211, 1221

These industries include firms primarily engaged in processing raw tobacco, and manufacturing cigarettes, cigars, tobacco and snuff. The industries' activities are concentrated in the two major raw material source provinces: Ontario and Quebec. The number of firms has remained quite stable over the years.

The industries are dominated by three companies; Imperial Tobacco Ltd., Rothmans Inc. and RJR-Macdonald Inc., which accounts for about 55%, 28% and 17% of the

domestic cigarette market, respectively[18].

Production activities showed an upward trend in the 1970s, especially sales and value added. But the recent concerted anti-smoking campaign prompted by health concerns and higher taxes seem to be swaying the market, as indicated by decline in sales, especially in the 1980s. High and increasing market shares (CR4 of 90%) indicate a potential case for a 'tight' oligopolistic market.

[18]Globe and Mail, July 26, 1989. pp. B9.

Chapter 5

Database and Regression model.

5.1 Data Base

The Standard Industrial Classification (SIC) used in the census of manufacturing activities has been revised twice during the 1970-1985 period. Data and industry definitions for the 1970-1981 sub-period are based on the 1970 SIC version, constituting 20 industries, while the 1980 SIC comprises 26 industries (Table 1). Most of the data used for deriving variables is obtained from various annual census of manufactures publications by Statistics Canada.

Profit-cost margins (PCM) and market growth of demand (GROW) variables are constructed from data available in the 1982-85 period (Table 12). PCM is the value of shipments, less production costs (labour, raw materials and supplies, and energy costs), weighted by industry value of shipments. The industry growth variable is defined as the average annual growth rate of industry value of shipments during the 1982-85 period.

The Canada/U.S. industry price index was derived from primary product ouput-value data for 1982. In each Canadian industry, product groups were identified and their output-value data matched to those of equivalent U.S. industries. This data was used to estimate product group prices. To aggregate to the industry level, the derived Canada/U.S. product price ratios, each weighted by its share of the respective Canadian industry shipments, were summed up to obtain unadjusted industry price indexes. Finally, Canadian sales tax and transportation expenses were removed, to obtain adjusted

Canada/U.S. price indexes (PR). The detailed proceedure is shown below.

$PR_i = \sum_j^m shC_{ij}(Pc_j/Pu_j)[(VSci - TX_i)/VSc_i]/1.21$, where

shC_{ij} is product 'j's share of Canada's value of shipments for industry 'i';

Pc_j is Canada's derived price for product 'j' and Pu_j is the corresponding derived product price for the U.S. An exchange rate of 1.21 was used to convert U.S.$ to Can.$. VSc_i and TX_i are Canada's value of shipments and sales tax and transport expenses, for industry 'i', respectively, and 'm' is the number of products in industry 'i'. The primary data and derivation of PR are given in appendix A.

Canadian concentration ratios (CR4) were obtained by taking the simple average of annual concentration ratios during the 1981-85 period.

The foreign trade related variables (TRF, XPEN and MPEN) were derived from 1982 data. Tariff protection (TRF) is the total industry duty on imports, weighted by total value of dutiable imports. U.S. tariff protection (USTRF) is the total tariff on imports from the U.S., weighted by total value of dutiable imports from the U.S. Export competition (XPEN) is the value of all industry exports, weighted by the value of shipments. Import competition (MPEN) is the total value of all industry imports, weighted by the total value of domestic demand, which includes domestically produced goods and imports.

Relative input price indexes (RPI) were constructed from 1982 raw materials quantity-value data, using the following weighing approach:

$RPI = shK * RPK + shL * RPL + shE * RPE + shM * RPM$,

where shK, shL, shE and shM are the shares of total industry costs accounted for by expenditures on capital services, labour, energy and raw materials, respectively. RPK, RPL, RPE and RPM are the relative Canada/U.S. price ratios of capital services, labour services, energy, and raw materials, respectively. The price ratios are weighted sums of individual input prices. For instance, RPM was derived as follows:

$RPM = \sum_i^n S_i RP_i$,

where S_i and RP_i are the share of total raw material costs and price of input 'i', respectively.

There is no adequate Canadian advertising data. In its place, U.S. advertising (USADS) was used as a proxy for Canadian advertising. However, due to differences in SICs between the two countries, a shipment-weighted average of 1977 U.S. advertising-to-sales ratios was used to construct USADS, as shown below:

$USADS_i = \sum_j^n [ADS_j * VS_j / \sum_j^n VS_j]$,

where ADS_j and VS_j are the advertising-to-sales ratio, and value of shipments for U.S. industry 'j', and 'i' is the approximate Canadian SIC.

The data for constructing USCR4 is obtained from the 1982 U.S. Census of Manufactures. A Box-Cox transformation of U.S. concentration was used to aggregate the U.S. data to the Canadian SIC level, as shown below.

$USCR4_i = [.53((-2.625 + .498(B_i^{.53} - 1)/.53) + .574(A_i^{.53} - 1)/.53))]^{1/.53}$,

where A_i is the U.S. Number of enterprises-weighted CR4, and B_i is the U.S. value of shipments-weighted CR4, equivalent to the Canadian SIC 'i'.

The regional dummy variable (RG) was constructed such that industries deemed to possess regional markets are assigned a value of one, and zero otherwise. Four industries (SICs 1041, 1072, and 1111) were classified as regional, on the basis of either the perishable or bulky nature of their products.

Although the basic sample comprises 26 industries, some were dropped for various reasons. In estimating the PCM model, the Leaf tobacco processing industry (SIC 1211) was omitted because of inconsistencies noticed in deriving the dependent variable. Similarly, the two tobacco industries and the distillery industry were excluded in estimating the PR model, because no adequate sales tax and transport costs data[1] were available

[1]Such data is classified as confidential.

to construct adjusted price indexes. A summary of the database is provided in Tables 12 and 13.

5.2 Model Specification and defination of variables

5.2.1 Regression Model

This section specifies a model of the determinants of industry performance. The variables used are also discussed, in addition to a priori expectations of their estimated coefficients. The general model proposed to explain the association of performance and market structure variables is:

$Y_i = \alpha + \sum_j \beta_j SC_i + \sum_k \theta_k B_i + \sum_l \psi_l F_i + \sum_m \omega_m D_i + \varphi RPI_i + \phi USCR4_i + \epsilon_i$

where

Y_i = [PCM_i, or PR_i] defines one of the measures of industry 'i's performance, and:

PCM_i=(value of shipments-wages-Other costs)/Value of shipments;

PR_i = Canada/ U.S. output price index for industry 'i'.

SC_i = [$CR4_i$ or H_i] defines the level of seller concentration where:

$CR4_i$ = The industry's share of total output accounted for by the largest four firms in industry i;

and H_i is the Herfindhal index of concentration.

B = [ADS_i, KOR_i] are barriers to entry-related variables where:

ADS_i=(Industry's Advertising expenditure)/Industry shipments;

KOR_i=Industry value of fixed assets /Industry shipments;

F = [$XPEN_i, MPEN_i, Trf_i, USTrf_i$]

where:

$XPEN_i$=Value of domestic exports/Total Value of an industry's shipments;

$MPEN_i$ = Value of imports/Value of domestic demand[2];

Trf_i = Ratio of total import duty collected on imports to total value of dutiable imports, from all sources;

$UStrf_i$ = Ratio of total import duty collected on imports from the U.S. to value of dutiable imports from the U.S.

$D = [Grow_i, RG_i]$, defines demand related variables, where:

$Grow_i = \sum_{t=1}[(S_{t+1} - S_t)/S_t]/4$

and S is the value of shipments of industry 'i' in year t;

RG_i= A dummy variable, taking a value of one if an industry is perceived as regional, and a value of 0 if otherwise.

RPI_i is the relative Canada-U.S. industry input price index.

α, β, θ, ψ, ω, φ and ϕ are regression parameters, and ϵ is an error term.

5.2.2 Variables

Performance:-

Variations in profit rates (proxied by PCM or profit-cost margins) are the traditional measure of inter-industry differences market power, as noted in section 3.1.1.

The price difference between Canadian and U.S., or any other country's products would, partially, provide a relative measure of competitiveness and efficiency between industries. Taking the U.S. price to approximate a competitive market, it is proposed that the lower the Canada/U.S. difference, the more competitive the relevant industry.

[2]Here, domestic demand is taken to include consumption of both domestically produced goods and imports.

Seller Concentration (CR4 or H):-

The level of seller concentration (as measured by either CR4 or H) measures the possibility for collusion among competitors, and hence will act as a proxy of the degree of monopoly power. It is proposed that as concentration increases, coordination of joint profit maximization arrangements and pricing (among large firms) become easier and profits and prices are expected to be higher. However if an inverse relationship holds between seller concentration and price levels, then an argument that concentration increases industry efficiency could be advanced.

Barriers to Competition:-

(1) Advertising Intensity:-

Product differentiation has been identified as the major barrier to competition in the food and beverage processing sector, and it is assumed to be created and maintained by advertising.

Advertising is assumed to serve either two roles. It may serve as persuasive and hence act as a tool for increasing market power, by increasing product differentiation. In so doing, it would be geared towards making demand for a given product less elastic. Alternatively, it could be perceived as informative. In the latter role, lack of adequate product information is seen as a barrier to competition and advertising is assumed to break this barrier and thus increase competition. The two roles will have opposite effects on performance, with the latter serving to increase competition and hence lower price levels, while the former entrenchs entry barriers and therefore increases market power (and hence prices and profitability).

If advertising is viewed purely as persuasive, then the coefficient on advertising in a profit-structure regression will be greater than one. A negative coefficient is expected for

the informative role. The total effect will be determined by the relative importance of these two. If the two effects exert about equally the same influence, then the coefficient on advertising would be close to zero.

A comparison of the statistical relationship between advertising and profitability and prices could be used to make inferences about efficiency. If the advertising variable comes up with a positive sign in a structure-profit equation while a negative outcome emerges in a structure-pricing equation, then advertising could be perceived as an efficiency-enhancing tool.

(2) Capital Intensity (KOR):-

This variable provides control, or adjustments, for differences in capital intensity among industries, resulting from different technological feasibilities or requirements. It is found necessary to account for this because the available data from which profit margins are derived usually do not isolate returns on fixed assets. A high capital-output ratio implies more funds are tied up in the production process, and hence profit rates have (it is assumed) to be high to include a normal return on investments and depreciation.

Foreign Trade.

(1) Export Competition (XPEN):-

This variable captures relative competitiveness of the domestic industry and the rest of the world. More exports could signify efficiency in an industry, thus precipitating a positive relationship between it and profitability. On the other hand, the domestic market may indeed be relatively more profitable[3]. Therefore, if a proportionately larger share of an industry's output is exported, a negative relationship between this variable and performance may obtain. This possibility is considered more likely due to Canada's

[3]This may, for instance, be due to a price edge provided to indigeneous producers by trade protection policies and other 'home base' advantages.

heavy reliance on export markets.

(2) Import Competition (MPEN):-

As a factor of performance, imports are perceived to play two roles. First, import competition is introduced as a correction for domestic concentration. Other things equal, the effect of this variable on performance would be the opposite of that of seller concentration (negative).

Secondly, more imports could be indicative of a relatively lucrative industry, and hence a profitable domestic market. Threat of more imports would be a message to domestic firms to restrain prices at relatively lower prices than otherwise. This way, foreign competition provides an incentive for domestic firms to be more efficient, suggesting a positive relationship between profits and imports.

Therefore, it is not possible to predict, a priori, the sign the import penetration variable will take in a regression equation.

(3) Tariff Protection (Trf and USTrf):-

Tariff related variables are introduced to measure the degree of protection from foreign competition enjoyed by domestic firms. Possible impact of tariffs on imports from the U.S. is considered to be of particular importance to Canada, due to the large proportion of Canada's trade accounted for by imports from the U.S. An industry may be accorded tariff protection either because of its inefficiency relative to foreign firms, or for other nationalistic goals. In the first case, it is possible for such firms to sustain relatively higher production costs and survive, though still earn low profit margins. Alternatively, tariff protection will simply increase barriers to entry, and profitability. A negative correlation between tariff rates and industry profitability is likely in the former case, while a positive outcome is predicted for the later. In this model, the positive effect is perceived to outweigh the negative effects and thus suggest a positive relationship.

Demand Variables.

(1) Industry growth (Grow):-

This variable (which measures short-term industry growth) is included to control for above-normal profit rates at times when changes in demand outstrip growth in production capacity. It is assumed that if an industry is operating at, or near, full capacity, rapid growth in its market will affect its price levels and profit rates positively, in the short run.

(2) Geographical Market Dispersion or Segmentation (RG):-

This variable is considered useful for adjusting national concentration, especially if the market is segmented into a clear regional supply and demand pattern. Concentration data is available at the national level, and in cases where an industry's market is clearly local or regional, such aggregate indexes may underestimate the significance of the concentration variable. This is the case in industries producing perishable and (or) bulky products[4]. Regional concentration is expected to reinforce the impact of the national concentration variable.

On the other hand, geographical isolation may limit an industry's access to a larger market. Therefore isolation may influence profitabilty negatively.

U.S. Market Structure Variables - USCR4.

In addition to domestic market variables, industry concentration in the U.S. (USCR4) is another variable perceived to affect relative prices between the two countries. Concentration in the U.S. may increase efficiency in its domestic market and hence affect U.S. prices negatively. However if increases in U.S. concentration increase market power to its domestic firms, then prices will likely be affected positively. If we assume that Canadian

[4]Examples include milk, soft drinks and bread.

prices are higher, then increases in U.S. prices will lower the difference between the two. Hence the sign of the coefficient in the PR model is indeterminate, a priori.

Input prices - RPI.

Changes in production costs are perceived to influence output prices positively. High production costs (either as a result of industry inefficiency or input costs) generally reduce an industry's range over which it can lower prices, and still make profits. A positive relationship is anticipated between RPI and PR.

Chapter 6

MODEL ESTIMATION and RESULTS.

6.1 Estimation Approach.

The principal regression tool used in this study is Ordinary Least Squares. In addition to linear specification of all explanatory variables in both models, a quadratic form of CR4 was tried in equation 1b. Tables 14 and 15 show the results of multiple regression for both models.

6.2 The Profit-Cost-Margins Model.

This section discusses the results that emerge from the PCM model estimation. Six regression equations were estimated for this model, two of which are for average margins (PCMavg), and the rest for annual sub-periods (1982-85).

Equation 1a. includes all the variables proposed to influence industry profitability. Seller concentration (CR4), advertising (USADS) and tariff protection (TRF) emerged with positively signed and significant coefficient estimates (at 2.5%, 0.5% and 5% level, respectively). Export competition came out with a negative coefficient, and was significant at the 5% level. Import competition (MPEN), industry growth (GROW) and the regional dummy variable (RG) were found insignificant. The variables specified in this equation explain 71% of the observed variation in industry profit-cost margins (R^2).

An estimate of the model with a non-linear specification of seller concentration yielded equation 1b. On the basis of statistical significance of the largest number of variables,

this equation yielded the best fit for the PCM model. MPEN, GROW and RG emerged significant (at 1%, 10% and 10%, respectively.). The other variables found significant in equation 1a. were also significant in this equation. Altogether, these variables explain about 73% of the variation in profit margins. The R^2 adjusted for degrees of freedom ($\bar{R}^2$) increased from 0.58 to 0.60.

U.S. specific tariff protection (USTRF) was also considered, in place of general tariffs, and the results were similar to those of equation 1a.

Another feature of the estimates is the similarity in results for both the average PCM model (PCMAVG) and the annual sub-periods (equations 3a., 3b., 3c, and 3d.). Analysis of the results show little annual variation in the relationship. This leads one to conclude that the structure-profit relationship is reasonably stable, at least as attested by the similarity in the results of the 4-year period sub-models, reported in Table 15.

6.3 The Pricing Equation.

The results of the pricing model estimates are also presented in Table 14, as equations 2a. and 2b. In addition to all the the explanatory variables used in the PCM model, U.S. seller concentration (USCR4) and relative Canada/U.S. input prices (RPI) were also included in this model.

Equation 2a. includes all the proposed explanatory variables. Canadian seller concentration (CR4), advertising (USADS) and export competition (XPEN) came out with negatively signed and significant coefficients (the former two at 10% and the latter at 2.5% levels, respectively). TRF, MPEN and RPI had positively signed and significant coefficients (at 0.5%, 10% and 2.5% levels, respectively). The other variables were not significant (including USCR4, GROW, and RG). Altogether the variables considered in this equation explain about 58% of the observed variation in relative prices between

Canada and the U.S., with a R^2 adjusted for degrees of freedom equal to 0.29.

The model was reestimated, using only the variables found significant in 2a. Similar statistical results (in terms of significance and signs of variables) were obtained. Although the unadjusted R^2 drops slightly to 0.57, the fit of the regression, corrected for degrees of freedom, rises to 0.41 from 0.29.

6.4 Evaluation of the two Model Estimates, with Reference to Market Power and Industry Efficiency.

In this section, the relative performance of each variable in both models is evaluated, and the results compared and contrasted. The statistical significance, magnitude and the signs of the estimated coefficients forms the basis for the comparative analysis of the results. Table 16 reports the statistical test of the difference between coefficients of the two model estimates.

The coefficient on CR4 was positively signed in the PCM model (equation 1a.), while it was negative in the PR estimate. Using the size of the two coefficients, a t-test of the difference between the coefficients of the two models reveal that the influence of seller concentration on prices and profitability is significantly different (Table 16).

The negative coefficient on CR4 in the PR equations suggest that seller concentration has a decreasing effect on Canadian price levels, relative to those of the U.S. On the other hand, a positive coefficient in the PCM equation leads to the conclusion that increases in concentration would lead to increases in profitability. The two results, combined, suggest that increases in seller concentration do not give market power to industries to enhance their profit maximization goal through price increases, but rather act as a source of market competition. And in the absence of tangible evidence of market power in pricing behaviour of the sector, industry efficiency can be advanced as a possible source

of profitability in Canadian food processing industries.

A similar conclusion to that on CR4 can also be drawn regarding the advertising variable (USADS). By contrasting USADS's negative coefficient in the PR equations to its positive outcome in the PCM model, inferences about market competition can be made. The results imply that increases in advertising expenditure would play an informative role, rather than a persuasive one, and hence promote price competition. One can only assume that the positive advertising-profitabity statistical relationship is not generated by price increases, but possibly by increase in sales.

The above proposition is based on the assumption that USADS can be used as a proxy for actual Canadian advertising intensities. However, if we drop this assumption, a different interpretation of the results can be made. Increases in U.S. advertising will be perceived to promote price competition in Canadian industries, and hence the negative coefficient on USADS in the PR model. Similarly, changes in U.S. advertising may precipitate some positive efficiency effect on Canadian industries. If prices are destined to fall with increases in USADS, then Canadian industries would feel pressured to increase their efficiency if they are to withstand imminent onslaught into their domestic market. It is also possible that U.S. advertising has an increeasing effect on the U.S. price level.

The TRF variable was consistently significant and positively signed in both model estimates. Its coefficient was also significantly larger in the PR model than in the PCM model, at the 0.5% level of significance (Table 16). An important conclusion of this result is that tariffs simply appear to promote further increases in price differences between Canadian processed products and those of other countries. This way, increases in tariffs would be considered as a barrier to price competition.

Similar statistical results (to those for TRF) were also obtained for the U.S. specific tariff variable (USTRF). This outcome supports the hypotheses of the important role

played by Canada-U.S. trade policies, and their significant influence on domestic industry performance. Imposition of higher tariff rates on imports from the U.S. would tend to allow Canadian industries greater freedom in setting their local prices, and earn relatively higher profits. However, the fact that Canadian prices will increase by a higher magnitude than profitability points to the possibility of tariff-induced inefficiency creeping into protected industries.

Industry growth (GROW) was not significant in the PR model, although it was in the PCM model (equation 1b.). These outcomes suggest that changes in demand do not necessarily have any pronounced influence on pricing behaviour. However profitability would tend to be higher in industries with higher rates of growth in consumer demand.

The coefficient on the RG variable was positive in the PCM model, but negative and insignificant in the PR equations. This result rules out market power (in pricing) in isolated markets. Hence profitability in industries with regional market characteristics can not be traced to higher price levels.

Export competition (XPEN) has a negative and significant influence on both profitability and relative prices. However, the absolute size of the coefficient in the PR model is statistically larger than that in the PCM model (at least at the 5% level of significance). This suggests that changes in the level of exports have stronger depressing effects on domestic prices than on profitability. The negative signs on the coefficients may be interpreted in terms of trade rationalisation. Is it the case that firms in the export market are constrained to set prices in both domestic and foreign markets at fairly equal levels? In special cases where foreign markets are more competitive than the domestic base, increases in the share of exports of total production will tend to pull down the aggregate industry price. Consequently, aggregate unit profit rates will also tend to be lower where relatively competitive and low priced foreign markets claim a bigger share of total industry output.

The import competition variable (MPEN) emerged significantly positive in PCM's equation 1b. and the PR estimates. This result (positive relationship) is against a priori expectations. Furthermore, the size of this coefficient was significantly larger in the PR model than in the PCM equations. However, a negative relationship between imports and domestic price levels and profitability presumes that the causality runs from imports to prices (and profitability). A reversal of this relationship, such that imports become the dependent variable, will require a different interpretation of the results. In other words, industries with higher prices and profit rates will attract more imports, and hence a positive relationship is anticipated. Therefore, the positive relationship found in this study may be a result of simultaneity problem between the independent (MPEN) and the dependent variables (PCM and PR).

The variable introduced to capture the influence of relative input prices (RPI) on output pricing (PR) was consistently significant and larger that one, by about 0.13 in equation 2a. and 0.21 in equation 2b. This result implies that a given increase in input prices will cause a relatively larger increase in output prices. For instance, a 10% increase in input prices could lead to a 13% increase in output prices.

Although U.S. seller concentration (USCR4) was proposed as a possible explanatory variable of relative prices, its coefficient was statistically insignificant. This may imply that concentration in the U.S. market has no apparent influence on U.S. pricing behaviour.

6.5 Wrap-up of the Results and Comparison with Other Studies.

A summary of the results of this study is presented in Table 17. Two equations from the current study and a sample of other related studies is presentd in Table 18. Although these studies considered other variables, in addition to some in the current study, several

similarities can be noted between them.

The role of seller concentration is emphasized by its inclusion in almost all profitability studies. It is reported statistically significant and positive in the current study and the two U.S. case studies. However, it is not in the Canadian case study by Rizvi and Uhm. Collins and Preston had also estimated a critical lower bound CR4 of about 20%, on and above which the influence of seller concentration begins to manifest itself as a source of market power. In the current study, a critical CR4 of 51% was estimated (from equation 1b.), far much higher than Collins and Preston's for the U.S. sector.

Parker and Connor's private-manufactured label price differential equation is compared to the PR model of the current study. While concentration appears to exert a positive influence on U.S. relative prices of manufactured prices, the opposite outcome was arrived at in the Canadian PR model.

The statistical results on the advertising variable is another area of similarity between the current profitability model and the U..S. cases. In both cases, it is established that advertising does have a positive role to play in boosting profitability. However the relationship differs for the pricing models. While it appears to affect prices negatively, and hence promote price competition in the Canadian sector, it emerges as a powerful barrier to competition in the U.S. Pdiff model.

Another possible area of comparison between the current study and the U.S. cases is the performance of industry growth (GROW). It was reported significant and positively signed in Connor and Parker's PCM model as well as in the current one. However, it appears to play an insignificant role in pricing behaviour, in both countries. There is also a major difference in the results of the import competition variable (MPEN) in the pricing models. While imports showed a negative effect on U.S. manufactured food prices, the opposite relationship appears to exist in the Canadian market.

Another area of comparison is in the difference in the influence of geographical location

factors (RG), or regional concentration on industry profitability. In the U.S., RG exerts a negative influence, while a positive relationship exists in the Canadian sector. In summary, the explanatory power (as indicated by the R^2) of the variables considered in the current study lies within a reasonable range of other similar studies.

Chapter 7

SUMMARY and CONCLUSIONS, and LIMITATIONS.

7.1 Summary and Conclusions.

Industry Competition policies are for the most part designed to promote and maintain competition and fair business practices, and, if necessary, check the adverse economic effects associated with anticompetitive firm behaviour. This is important, especially if such activities involve active price-fixing conspiracies and inefficiency. Most industry performance studies have generally been undertaken to generate an information base upon which effective industry policies can be build, and their performance evaluated.

From the public interest point of view, industry performance is evaluated in terms of how and at what costs and prices industries deliver goods and services. Efficiency is assumed to be achieved if this objective is met at the lowest cost and prices. Firms pocket the difference between the two, as profit. The current study looked at what role market structure possibly plays in explaining the observed variation in profitability and prices across industries. These factors can be later looked into as possible public policy tools for effecting changes in the market.

The discussion in the foregoing chapter (6) suggests that the performance of the Canadian food, beverages and tobacco processing sector can be partially explained by market factors peculiar to its operating environment. Three broad factors identified to provide support to the structure-performance hypotheses are domestic industry concentration, foreign trade competition, and the state and trend in domestic market demand.

In particular, factors such as seller concentration, advertising, tariff protection and export competition emerged as the most influential determinants of industry profit-cost margins and relative prices.

Perhaps the most important result of this study regards the statistical relationship between seller concentration and performance. In most previous studies, identification of concentration as a source of market power has been more or less unanimous. However, the results of this study suggest that an alternative to this traditional view of the relationship is necessary. Its reported negative influence on relative prices points to a possible link between it, price competition and efficiency.

Similarly, advertising has been viewed as a barrier to entry and competition in an industry, and capable of allowing incumbent firms to set and maintain prices higher than competitive. However, the current study suggests the opposite. Advertising appears to have a strong decreasing effect on prices, and hence could be viewed as promoting price competition. Hence the association of high profitability with large advertising expenditures may not be resulting from higher prices, but perhaps from higher aggregate sales. This way, advertising may be perceived as serving to expand total market demand, without any increase in price levels. Indeed, advertising appears to force industries to lower prices.

Relative input costs are another area of concern in evaluating industry performance. Preliminary analysis of input prices data imply that the majority of Canadian industries face relatively higher production costs than their U.S. counterparts. This study confirmed our earlier hypotheses that output prices may be adversely affected by production costs. Furthermore charges in output prices in response to changes in input prices may exceed the later. And by extension, if output prices increase by more than it is necessary to compensate for higher production costs, then it is possible that a positive relationship exists between RPI and profitability.

Another implication of this study relates to the concept of performance and its measurement. In addition to the traditional profit performance criteria, due attention should be paid to pricing behaviour. This additional dimension is considered important, for it is in pricing where market power is first manifested, at least in the eyes of the consumer. As noted in section 3.1.2, the mere existence of profits in an industry need not automatically imply exploitation of market power. Given this possibility, relative pricing behaviour provides an alternative choice variable, which does not condemn profitability outright by ignoring the role of efficiency.

In case of need for public corrective intervention, governments are well equiped to influence some of the market structure factors identified above. These include tariffs and foreign trade. For instance, since there is strong evidence from the study that tariffs on imports appear to allow domestic firms to set prices higher than normal, changes in that area may be an appealing corrective policy option.

7.2 Limitations and Recommentations for Further Research.

Several market factors considered important in the structure-performance model were not incorporated in this study, mainly due to lack of adequate data. These include capital assets and changes in consumer income and tastes. Another area of interest is the role of existing government regulations on trade, both at the provincial and the national levels. Especially relevant for further attention is the existing government control on inter-provincial trade in beer, liquor and wine. Such restrictions do affect competition, at least at the domestic market level, and consideration of such factors would be considered an improvement.

Performance at the firm level is another aspect that needs further insight. But unavailability of suitable micro-level data has placed limitations on this area of research.

Any efforts in this direction would be vital for understanding intra-industry structure and interactions, which generate the macro-results arrived at in this study. Increasing the sample size is another area of improvement that needs attention. A more disaggregated SIC, such as the U.S.s, would provide a larger sample, and hence minimise some of the limitations a small sample may impose on estimation of the models and interpretation of the results.

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Table 1: Canada: Industry Definitions; 1980 SIC

SIC	Industry
1011	Meat & meat processing.
1012	Poultry processing.
1021	Fish processing.
1031	Fruit & vegetable proc. & Canning.
1032	Frozen fruit & vegetable processors.
1041	Fluid milk processing.
1049	Other dairy products
1051	Cereal grain flour
1052	Prepared breakfast cereals.
1053	Feeds industry.
1061	Vegetable oil mills.
1071	Biscuit industry.
1072	Bread & other bakery products
1081	Cane & beet sugar industry.
1082	Chewing gum industry.
1083	Sugar & chocolate confectienery.
1091	Coffee and tea industry.
1092	Dry pasta products industry.
1093	Potato chip, pretzel & popcorn.
1099	Other food products industries
1111	Soft drinks manufacturers.
1121	Distillery products industry.
1131	Brewery products industry.
1141	Wineries.
1211	Leaf tobacco products industry.
1221	Tobacco products industry.

Source: Statistics Canada; Census of Manufactures; Various publications.

Table 2: Number of Firms - 1970-85.

SIC	1970	1980	1985	% Growth (1970-85)
1011	404	489	486	20.3
1012	86	70	68	-20.9
1021	249	283	299	20.1
1031	184	154	153	-16.8
1032	33	27	29	-12.1
1041*	612	281	82	-
1049	-	-	161	-
1051*	33	32	16	-
1052	-	-	16	-
1053	633	488	430	-32.1
1061	9	8	9	0
1071	31	22	21	-32.3
1072	-	-	412	-3.3
1081	7	8	5	-25.6
1082	-	-	6	-
1083*	132	100	92	-
1091	-	-	22	-
1092	-	-	16	-
1093	-	-	31	-
1099*	227	245	224	-
1111	330	189	151	-54.2
1121	13	17	16	23.1
1131	9	8	11	22.2
1141	13	19	30	130.8
1211	6	7	8	33.3
1221	11	10	11	0.0
Total	3022	2457	2901	-0.4

* For 1970 and 1980, the 1970 SIC is used in defining industries. Source: Stat. Canada. Census of Manufactures; cat. 31-422.

Table 3: Number of Establishments - 1970-85.

SIC	1970	1975	1980	1985	%Growth (1970-85)
1011	453	477	547	535	18.1
1012	102	88	90	96	-5.9
1021	344	325	376	390	13.4
1031	238	208	233	187	-21.3
1032	34	38	33	35	2.9
1041*	880	519	456	164	-
1049	-	-	-	230	-
1051*	51	48	49	39	-
1052	-	-	-	19	-
1053	789	643	609	554	-29.8
1061	10	8	10	11	10.0
1071	42	40	33	31	-26.2
1072	1921	1599	1487	473	-75.4
1081	14	15	13	9	-35.7
1082	-	-	-	7	-
1083*	129	93	109	92	-
1091	-	-	-	32	-
1092	-	-	-	22	-
1093	-	-	-	33	-
1099*	273	245	312	269	-
1111	395	288	238	187	-52.7
1121	27	31	33	30	11.1
1131	42	44	41	41	-2.4
1141	22	31	32	46	109.1
1211	10	10	9	10	0.0
1221	19	17	16	15	-21.1
Total(FBT)	5805	4767	4726	3557	-38.7
" All Man.	31928	30100	35495	36854	15.4
FBT/All Man.	18.2	15.8	13.3	9.7	-

* For 1970, 1975 & 1980, the 1970 SIC is used in defining industries Source: Stat. Canada. cat. 31-422.

Table 4: Production Labour - 1970-85.

SIC	1970	1975	1980	1985	% Growth 1970-85
1011	22182	24621	26610	24099	8.6
1012	6489	7022	8708	9325	43.7
1021	16782	14223	23065	23744	41.5
1031	12014	11726	9716	8896	-26.0
1032	2463	3295	3429	4219	71.3
1041	14083	13780	14097	6283	-
1049	-	-	-	8237	-
1051*	3278	3268	3322	1829	-
1052	-	-	-	1961	-
1053	5359	5991	5979	5942	9.0
1061	524	503	905	771	47.1
1071	5275	5467	4748	4595	-12.9
1072	19129	17533	17971	14381	-24.8
1081	2276	2048	1847	5487	-
1982	-	-		855	-
1083*	7954	6865	7411	6342	-
1091	-	-	-	1426	-
1092	-	-	-	2132	-
1093	-	-	-	880	-
1099*	10735	11508	14003	8773	-
1111	6071	6432	6133	5956	-1.9
1121	3136	3192	2876	2123	-32.3
1131	5324	7011	7419	8571	61.0
1141	522	606	743	795	52.3
1211	1257	1069	675	387	-69.2
1221	6064	5471	4732	3751	-38.1
Total(FBT)	150917	151631	164389	156809	3.9
All Manuf.	1167063	1271786	1346187	1305159	11.8
FBT/ALMAN(%)	12.9	11.9	12.2	12.0	-

* 1970, 1975 & 1980 figures refer to the 1970 SIC. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 5: Production Labour Wages: 1970-85. - Million $.

SIC	1970	1975	1980	1985	% Growth (1970-85)
1011	153	195	211	184	19.8
1012	28	39	54	58	107.6
1021	60	77	138	111	84.6
1031	55	64	60	56	2.0
1032	9	17	17	21	129.8
1041*	82	99	114	53	-
1049	-	-	-	63	-
1051*	23	26	28	17	-
1052	-	-	-	18	-
1053	29	39	43	40	36.8
1061	3	4	8	8	147.8
1071	25	34	30	30	19.2
1072	95	106	114	90	-5.8
1081	16	17	15	14	-10.8
1082	-	-	-	6	-
1083*	37	37	42	34	-
1091	-	-	-	11	-
1092	-	-	-	13	-
1093	-	-	-	6	-
1099*	62	76	95	61	-
1111	33	43	46	46	36.5
1121	26	28	27	22	-15.4
1131	45	70	80	89	99.0
1141	3	5	6	7	102.6
1211	6	6	4	3	-50.7
1221	44	45	42	41	-5.9
Total(FBT)	835	1027	1174	1101	31.9
All Man.	7232	8879	10221	10015	38.5
FBT/ALMAN(%)	11.5	11.6	11.5	11.0	-

* 1970, 1975 & 1980 figures refer to the 1970 SIC. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 6: Costs of Fuel and Electricity - 1970-85. - ('000 $)

SIC	1970	1975	1980	1985	% Growth (1970-85)
1011	11391	14930	22132	22736	99.6
1012	2412	3019	5153	6282	160.4
1021	5723	7335	13558	12256	114.2
1031	4912	5443	7547	8604	75.2
1032	1354	3047	5401	5364	296.2
1041	21943	21655	26146	12817	-
1049*	-	-	-	15705	-
1051*	2620	2526	3954	2856	-
1052	-	-	-	2507	-
1053	7288	7185	11643	15357	110.7
1061	1428	1946	4413	5318	272.4
1071	1308	1563	2132	2500	91.1
1072	11091	9424	11618	14107	27.2
1081	3096	4554	6458	6619	113.8
1082	-	-	-	491	-
1083*	2124	2302	3354	3221	-
1091	-	-	-	1712	-
1092	-	-	-	4126	-
1093	-	-	-	687	-
1099*	8387	11516	20124	30377	262.2
1111	6284	6394	7336	8061	28.3
1121	5062	6336	9961	8795	73.7
1131	4728	7288	10210	12272	159.6
1141	380	498	736	844	122.1
1211	571	574	565	568	-0.5
1221	1471	1557	2288	2889	96.4
Total(FBT)	103573	118092	174729	200546	93.6
All Manuf.	903264	1082634	1811936	2032330	125.0
FBT/ALMAN(%)	11.5	10.9	9.6	9.9	-

*-1970, 1975 & 1980 figures refer to the 1970 SIC. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 7: Cost of Raw Materials and Supplies - 1970-85 (million $).

SIC	1970	1975	1980	1985	% Growth (1970-85)
1011	1684	1754	2070	2171	28.9
1012	226	233	268	361	59.7
1021	232	190	339	385	65.4
1031	288	207	240	366	27.1
1032	42	47	60	106	152.0
1041*	999	1147	1192	1488	48.9
1049	-	-	-	872	-
1051*	217	165	210	235	-
1052	-	-	-	199	-
1053	457	422	578	733	60.5
1061	103	104	201	317	208.8
1071	65	59	58	81	25.4
1072	229	156	171	223	-2.7
1081	133	248	201	91	-31.6
1082	-	-	-	22	-
1083*	122	98	127	139	-
1091	-	-	-	170	-
1092	-	-	-	62	-
1093	-	-	-	30	-
1099*	442	394	541	536	-
1111	161	165	181	373	131.6
1121	117	82	89	111	-5.3
1131	104	91	109	212	104.3
1141	23	19	28	43	91.8
1211	166	109	82	143	-13.8
1221	181	100	120	181	0.1
Total(FBT)	5991	5789	6865	8779	46.5
All Manuf.	25700	30690	40675	40002	55.6
FBT/ALMAN(%)	23.3	18.9	16.9	21.9	

* For 1970, 1975 & 1980, the 1970 SIC is used in defining industries. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 8: Value of Shipments - 1970-85 (Million $).

SIC	1970	1975	1980	1985	% Growth (1970-85)
1011	2061	2382	2878	3010	46.0
1012	284	276	411	492	73.4
1021	355	313	450	481	35.5
1031	472	489	520	523	10.7
1032	72	118	161	192	165.8
1041*	1369	1519	1657	749	-
1049	-	-	-	955	-
1051*	306	308	319	221	-
1052	-	-	-	129	-
1053	586	727	930	1012	72.8
1061	123	141	309	439	257.0
1071	137	141	125	105	-23.5
1072	503	460	444	369	-26.8
1081	204	222	166	171	-16.6
1982	-	-		49	-
1083*	240	220	253	155	-
1091	-	-	-	228	-
1092	-	-	-	143	-
1093	-	-	-	42	-
1099*	782	901	1057	753	-
1111	358	350	354	433	21.1
1121	344	425	433	374	8.7
1131	399	403	444	444	11.2
1141	42	57	81	83	98.4
1211	151	180	147	111	-26.5
1221	376	420	482	416	10.6
Total(FBT)	9166	10051	11620	12078	31.8
All Manuf.	46381	54943	64908	74345	60.3
FBT/ALMAN(%)	19.8	18.3	17.9	16.3	-

* 1970, 1975 & 1980 figures refer to the 1970 SIC. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 9: Value Added - 1970-85 (Million $).

SIC	1970	1975	1980	1985	% Growth (1970-85)
1011	363	443	451	499	37.6
1012	58	65	93	127	120.1
1021	126	111	147	176	39.4
1031	182	191	198	224	23.1
1032	29	49	73	86	201.1
1041*	346	335	361	224	-
1049	-	-	-	217	-
1051*	87	86	88	46	-
1052	-	-	-	75	-
1053	122	130	167	217	77.2
1061	19	15	36	46	145.1
1071	71	65	62	55	-22.0
1072	263	233	230	201	-23.2
1081	70	31	27	67	-3.8
1082	-	-	-	35	-
1083*	119	103	122	35	-
1091	-	-	-	90	-
1092	-	-	-	90	-
1093	-	-	-	17	-
1099*	338	332	413	300	-
1111	192	156	158	181	-5.8
1121	247	284	269	220	-11.0
1131	293	268	310	304	3.9
1141	22	32	42	43	94.3
1211	16	17	12	4	-74.3
1221	191	244	278	255	33.9
Total(FBT)	3152	3191	3538	3875	22.9
All Man.	20048	22434	25434	28684	43.1
FBT/ALMAN(%)	15.7	14.2	13.9	13.5	-

* 1970, 1975 & 1980 figures refer to the 1970 SIC. Source: Census of Manufactures - Various Publications. Stat. Canada.

Table 10: Canadian Four-Firm Concentration Ratios. 1970-85. (%).

SIC	1970	1976	1980	1983	1985	Average 1981-5
1011	54.8	49.5	42.4	40.6	35.9	38.8
1012	37.0	39.0	36.3	37.4	35.9	36.2
1021	39.8	49.0	44.0	46.0	47.1	46.0
1031	41.7	39.3	39.0	38.8	40.7	39.9
1032	-	-	72.7	63.2	60.9	65.3
1041	-	-	-	41.9	48.5	46.2
1049	-	-	-	48.1	47.7	47.6
1051	-	-	-	79.7	78.5	78.8
1052	-	-	-	-	72.9	72.6
1053	29.5	27.2	25.7	26.3	23.1	24.6
1061	78.5	-	71.4	76.5	68.2	70.7
1071	68.1	73.6	79.9	83.8	78.8	80.6
1072	31.6	31.9	33.5	38.6	45.0	41.9
1081	-	-	92.0	-	-	92.0
1082	-	-	-	-	-	-
1083	-	-	-	70.2	64.7	67.5
1091	-	-	-	65.9	70.3	68.9
1092	-	-	-	88.3	88.9	88.4
1093	-	-	-	88.0	-	88.0
1099	33.7	37.8	33.8	35.4	33.3	34.6
1111	54.5	61.2	61.4	64.4	67.2	65.0
1121	86.5	78.2	74.9	75.5	77.0	75.8
1131	94.0	-	99.0	98.2	97.7	98.2
1141	64.4	77.7	72.0	68.7	65.6	69.2
1211	-	-	97.4	97.2	-	97.3
1221	97.2	98.4	99.6	99.5	99.4	99.5
Avrg.(Food)	46.7	44.2	48.0	56.9	55.3	-
Avrg.Bever.	74.8	72.3	76.8	76.7	76.8	-
FBT	57.6	54.9	58.5	62.5	61.2	-

Source: Census of Manufactures; Statistics Canada. cat. 31-401.

Table 11: Industry Classification by Concentration.

CR4	Description of Concentration	No. 1970	(%)	No. 1985	(%)	Avrg. 1970-85	(%)
75-100	Very High:'Tight' Oligopoly	7	35	9	35	9	35
50-75	High: Oligopoly	7	35	8	31	8	31
25-50	Moderate:'Loose' Oligopoly	6	30	8	31	9	35
Below 25	'Low': Atomistic	-	-	1	4	-	-
	Total	20	-	26	-	26	-

Source: Table 10.

Table 12: Database: PCM, PR and RPI.

SIC	PCM82	PCM83	PCM84	PCM85	PCMavrg	PR	RPI
1011	8.37	10.01	10.72	9.60	9.68	107.00	1.051
1012	13.40	13.04	12.26	13.86	13.14	160.80	1.291
1021	17.64	18.31	17.64	17.04	17.66	104.20	1.145
1031	29.10	33.57	31.50	31.89	31.52	168.90	1.304
1032	30.07	34.29	35.19	36.27	33.96	100.60	0.958
1041	18.38	19.49	20.33	23.92	20.53	136.50	1.036
1049	15.25	15.63	13.69	16.93	15.38	108.30	1.122
1051	14.76	15.98	13.22	14.48	14.61	124.00	1.199
1052	45.69	47.20	44.30	45.71	45.72	65.54	1.015
1053	14.25	14.76	14.35	16.81	15.04	98.28	1.029
1061	4.16	1.81	6.66	7.79	5.11	100.70	1.185
1071	35.06	36.53	35.51	34.27	35.35	87.32	1.072
1072	34.41	35.88	36.70	35.42	35.60	97.67	1.024
1081	21.27	27.93	28.70	30.08	27.00	90.84	0.805
1082	56.63	59.38	59.65	59.89	58.89	106.00	1.045
1083	38.72	39.95	41.15	37.02	39.21	111.60	1.272
1091	34.71	35.83	34.00	35.51	35.01	95.8	1.062
1092	46.83	49.71	53.96	54.46	51.24	118.30	1.117
1093	34.14	32.28	29.63	28.14	31.05	96.12	1.130
1099	30.62	31.71	30.19	33.40	31.48	111.90	1.220
1111	36.30	34.51	34.70	33.45	34.74	86.37	1.053
1121	48.60	52.32	49.57	51.58	50.52	180.52	1.195
1131	56.27	56.67	56.88	54.69	56.13	140.20	0.951
1141	42.16	40.25	42.73	44.40	42.38	172.60	1.234
1211	-9.26	-4.58	-15.79	41.72	3.02	79.84	0.858
1221	48.14	50.44	51.51	51.13	50.51	78.37	1.071
Mean					30.93	112.22	1.090

PR and RPI are the 1982 Canada/U.S. output price and input price indexes; respectively. PCM is the price-cost margin, for 1982 through to 1985. PCMavrg is the average price-cost margin: 1982-85. Source: Stat. Canada; Census of Manufactures. Various Publications; U.S. Census of Manufactures, 1982.

Table 13: Database: Market Structure Variables.

SIC -	CR4 1981-5	MPEN 1982	XPEN 1982	TRF 1982	USTRF 1982	GROW 1982-5	RG	USCR4 1977	USADS 1977
1011	38.8	5.1	13.0	2.7	2.1	1.40	0	17.89	0.24
1012	36.2	2.9	0.3	8.8	8.9	8.93	0	14.02	0.14
1021	46.0	33.4	79.1	9.9	7.4	5.42	0	19.52	0.57
1031	39.9	22.2	4.6	13.0	11.4	5.95	0	29.25	1.21
1032	65.3	32.9	16.2	6.1	5.5	7.19	0	23.91	1.71
1041	46.2	0.0	0.0	15.9	16.2	7.88	1	11.65	0.36
1049	47.6	3.5	9.0	3.1	5.6	5.09	0	22.57	0.54
1051	78.8	2.5	16.9	3.2	2.9	1.81	0	35.04	0.76
1052	72.6	7.6	2.5	9.5	9.6	4.53	0	61.95	11.57
1053	24.6	2.6	7.1	5.9	5.9	3.00	0	18.45	1.57
1061	70.7	22.0	21.0	12.4	12.1	11.14	0	42.36	0.77
1071	80.6	6.8	5.9	7.1	8.0	5.05	0	59.00	1.25
1072	41.9	1.8	3.3	11.6	12.1	0.76	1	34.00	0.85
1081	92.0	33.7	9.2	5.6	4.3	-8.48	0	46.31	0.14
1082	68.5	0.8	8.6	16.9	18.1	9.14	0	95.00	11.89
1083	67.5	20.4	6.3	14.0	15.3	6.39	0	34.75	2.03
1091	68.9	39.9	0.7	1.4	1.7	2.96	0	44.00	2.80
1092	88.4	2.9	26.3	10.7	10.4	-2.59	0	42.00	4.22
1093	88.0	7.3	9.7	5.6	7.0	13.64	0	58.00	2.16
1099	34.6	0.0	4.0	6.0	4.9	9.63	0	28.96	0.51
1111	65.0	2.4	0.6	12.7	13.1	10.73	1	11.10	2.83
1121	75.8	25.4	42.8	66.9	73.2	1.03	0	69.56	8.62
1131	98.2	0.9	7.9	39.4	39.2	6.02	0	77.00	3.41
1141	69.2	46.5	0.5	5.9	7.8	5.34	0	51.00	4.99
1211	97.2	4.6	30.8	9.9	9.9	1.71	0	68.00	0.00
1221	99.5	3.1	1.1	35.7	39.3	3.73	0	69.56	6.26
Mean	65.5	12.7	12.6	13.1	13.5	15.75	-	40.82	2.74

The variables are defined in chapter 5.2.1. Source: Industrial Org. & Concentration in Manufacturing, mining & Logging. cat 31-422; Other Census of Manufactures publications.

Table 14: Regression Results: Average PCM & PR Equations.

Eqtn.	1a.	1b.	2a.	2b.
Dep.	PCMavg	PCMavg	PR	PR
Const.	5.918	30.958	-11.838	-23.413
	(0.876)	(1.736)	(0.230)	(0.504)
CR4	0.226	-0.814	-0.375	-0.265
	(2.514)	(1.300)	(1.512)	(1.254)
$CR4^2$		0.008		
		(1.752)		
USCR4			0.188	
			(0.547)	
USADS	2.318	2.744	-2.468	-1.629
	(3.734)	(3.901)	(1.358)	(1.410)
TRF	0.233	0.137	1.834	1.894
	(2.006)	(1.363)	(3.332)	(4.170)
XPEN	-0.152	-0.116	-0.444	-0.418
	(1.923)	(1.872)	(2.643)	(2.235)
MPEN	0.096	0.225	0.632	0.646
	(0.976)	(2.838)	(1.681)	(1.805)
GROW	0.398	0.612	0.133	
	(0.777)	(1.397)	(0.117)	
RG	4.228	8.842	-5.537	
	(0.771)	(1.502)	(0.502)	
RPI			1.130	1.209
			(2.573)	(3.253)
R^2	0.71	0.73	0.58	0.57
$\bar{R}^2$	0.58	0.60	0.29	0.41
F	5.806	5.500	2.019	3.548
Sample	25	25	23	23

t-statistics are in parentheses.

Table 15: Regression Results: Annual PCM-Structure Equations.

Eqtn.	3a.	3b.	3c	3d.
Dep.	PCM82	PCM3	PCM4	PCM5
Cont.	5.614	7.570	3.883	6.602
	(0.897)	(1.061)	(0.566)	(0.939)
CR4	0.222	0.215	0.252	0.214
	(2.655)	(2.302)	(2.682)	(2.287)
USADS	2.334	2.392	2.340	2.307
	(3.922)	(3.754)	(3.415)	(3.787)
TRF	0.217	0.242	0.236	0.239
	(1.877)	(2.075)	(1.849)	(2.140)
RG	4.405	3.599	4.763	4.158
	(0.821)	(0.654)	(0.798)	(0.774)
GROW	0.391	0.241	0.477	0.482
	(0.797)	(0.446)	(0.907)	(0.925)
XPEN	-0.149	-0.147	-0.150	-0.164
	(1.791)	(1.768)	(1.825)	(2.183)
MPEN	0.068	0.076	0.112	0.128
	(0.692)	(0.734)	(1.093)	(1.303)
R^2	0.71	0.69	0.69	0.71
$\bar{R}^2$	0.59	0.56	0.57	0.59
F	5.866	5.299	5.531	6.008
Sample	25	25	25	25

t-statistics in parentheses.

Table 16: Statistical t-test for H_o: $A_i = B_i$.

Indep. Var.	Eqtn. 1a. A_i	Eqtn. 2a. B_i	Calc. t	α
CR4	0.226	-0.375	-3.401	0.5
USADS	2.318	-2.468	3.727	0.5
TRF	0.233	1.834	4.296	0.25
XPEN	-0.152	-0.444	2.325	2.5
MPEN	0.096	0.632	2.074	2.5
GROW	0.398	0.133	0.314	-
RG	4.228	-5.537	-	-

A_i and B_i are the estimated coefficients of the PCM and the PR model; respectively. α is the attained level of significance. The degrees of freedom are 30.

Table 17: Summary of the Regression Results.

	PCM MODEL (1b.)			PR MODEL (2a.)		
Independent Variable	Expected Sign	Result Sign	Signif-icant ?	Expected Sign	Result sign	Signif-icant ?
CR4	+	+	Yes	±	-	Yes
USCR4	*	*	*	±	+	No
USADS	+	+	Yes	±	-	Yes
TRF	+	+	Yes	+	+	Yes
XPEN	±	-	Yes	±	-	Yes
MPEN	-	+	Yes	-	+	Yes
GROW	+	+	Yes	+	+	No
RG	+	+	Yes	+	-	No
RPI	*	*	*	+	+	Yes

The tests on the coefficients are at the 10% level of significance. * Not used

Table 18: Results of Other Structure-Performance Studies.

Author Period	Collins& Preston 1958	Parker & Connor 1972	Rizvi & Uhm 1971-77	Parker& Connor 1976	Current Study 1982-85	Current Study 1982
Dep.	PCM	PCM	PCM	Pdiff.	PCMavg	PR
CR4	-0.27	0.19	-0.825	0.630	-0.814	-0.375
	(1.45)	(3.49)	(.692)	(2.443)	(1.300)	(1.512)
$CR4^2$	.007	-	-	-0.005	0.008	-
	(3.75)			(2.443)	(1.752)	
USCR4	-	-	-	-	-	n.s
ADS	-	3.70	-	0.909	2.744	-2.468
		(3.64)		(1.626)	(3.901)	(1.358)
ADS^2	-	-0.168	-	-	-	-
		(1.80)				
TVADS	-	n.s	-	17.194	-	-
				(2.941)		
200ADS	-	-	-	0.179	-	-
				(2.665)		
MES	-	ns	-	-	-	-
KOR	0.24	0.232	-	-	-	-
	(3.68)	(5.97)				
Lnsize	-	-	-	-2.426	-	-
				(2.510)		
Log(firms)	-	-	-	-2.038	-	-
				(2.238)		
TRF	-	-	-	-	0.137	1.834
					(1.363)	(3.332)
RG	-0.121	-0.085	-	n.s	8.842	n.s
	(4.62)	(3.07)			(1.502)	
GROW	-	n.s	-	6.824	0.612	n.s
				(1.624)	(1.397)	
XPEN	-	-	-	-	-0.116	-0.444
					(1.872)	(2.643)
MPEN	-	-	-	-17.362	0.225	0.632
				(2.156)	(2.838)	(1.681)
FOR	-	-	0.146	-	-	-
			(1.99)			
IE	-	-	0.116	-	-	-
			(2.28)			
RPI	-	-	-	-	-	1.130
						(2.573)
R^2	0.8	0.77	0.377	0.72	0.73	0.58
Sample	32	41	20	41	25	23

t-statistics in parentheses; Pdiff:% private label-manufactured brand price difference ; IE:Income elasticity; FOR:foreign ownership; n.s not significant, & '-' not used.

Appendix A.

PRIMARY OUTPUT VALUE AND QUANTITY DATA FOR DERIVING THE CANADA/U.S. PRICE INDEX (PR).
Food, Beverages and Tobacco Processing - 1982.

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mil.	Pu US$	shC*(Pc/Pu)*1.21
1011 Slaughtering & Meat Processors						2011 Meat packing plants					
Beef, hanging fresh, chilled or frozen	1000 kg	507198	1442.4	2843.86	0.240		Whole Carcass beef	4943300	10397.1	2103.27	0.324
Beef-block ready,fresh,chilled or frozen	"	249716	884.7	3542.84	0.147		Primal cuts	494149	1206.4	2441.37	0.213
Ground beef & Humburger+steakettes	"	68931	220.4	3201.79	0.037		Boneless beef - including humburger	632496	1469.8	2323.81	0.059
Pork	"	839848	2062.8	2456.12	0.343		Whole carcass pork	4121110	7895.7	1915.92	0.440
Lard	"	50464	50.6	1002.03	0.009		Lard - consumer & Commercial	389731	222.5	570.91	0.015
Mutton & lamb	"	6306	27.0	4279.34	0.004		Whole carcass lamb & Mutton	94530	252.6	2672.18	0.007
Edible tallow	"	29497	29.0	984.15	0.005		Edible tallow & stearin	260455	119.1	457.28	0.010
						2013 Sausages & other prepared meats:					
Pork bellies & hams-pickled,drysalted,cured	1000 kg	2693	10.3	3835.33	0.002		Sweet pickled or dry-cured pork or salted	100200	249.0	2485.04	0.003
Hams - smoked + picnic hams	"	76579	289.6	3781.57	0.048		Hams & picnics - except canned	680985	2051.2	3012.11	0.069
Bacon - unsliced	"	5023	16.7	3327.54	0.003		Slab bacon	60555	145.6	2404.42	0.004
Bacon - sliced	"	63573	232.1	3650.59	0.039		Sliced bacon	637213	1772.3	2781.33	0.051
Sausage & similar cased products	"	182533	613.7	3362.34	0.102		sausage	1259775	3654.2	2900.68	0.118
Canned meat	"	39985	134.4	3360.88	0.022		Canned meat	520457	1548.6	2975.46	0.025
	Total		6013.7				Total		30984.1		
							Unadjusted PR*100				109.22
1012 Poultry Processing						2016 Poultry dressing plants					
Chickens - fresh, chilled or frozen	1000 kg	401163	871.5	2172.42	0.787		Wet ice pack - bulk+whole & parts	4855665	5210.7	1073.12	1.593
Turkeys - fresh, frozen or chilled	"	93243	230.7	2474.09	0.208		Turkeys - fryer roaster & young	717681	990.1	1379.58	0.374
						2017 Poultry and egg processing					
Frankfurters & wieners	"	2550	5.5	2142.07	0.005		Frankfurters & wieners	68811	98.5	1431.46	0.007
	Total		1107.6				Total		6299.3		
							Unadjusted PR*100				163.11
1021 Fish processing industry						2092 Fresh or frozen packaged fish					
Fish sticks, portions-pre-cooked:frozen	1000 kg	20839	78.1	3746.45	1.000		Frozen fish - excl. shellfish	293414	860.4	2932.38	105.59
	Total		78.1				Total		860.4		
							Unadjusted PR*100				105.59

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21
1031 Fruit & Vegetable canning & preservers						2033 Canned fruits and vegetables					
Beans - canned	1000 kg	91369	96.5	1056.25	0.170		Beans - fresh lima,blue lake,others	399917	156.7	391.83	0.457
Carrots - canned	"	4783	4.3	904.23	0.008		Carrots - canned	55422	36.1	651.37	0.011
Corn	"	66675	70.8	1061.59	0.124		Corn	1460983	470.5	322.04	0.410
Peas - canned	"	36732	36.3	988.77	0.064		Green peas	211370	187.4	886.60	0.071
Mushrooms	"	7360	19.4	2638.95	0.034		Mushrooms	46605	128.3	2752.92	0.033
Apple juice	"	183052	123.4	673.87	0.217		Apple juice	1161204	317.4	273.34	0.534
Orange juice	"	82443	61.0	739.47	0.107		Orange juice	1585886	520.1	327.96	0.241
Tomato juice - canned	"	97466	70.0	718.37	0.123		Tomato juice	544558	265.8	488.10	0.181
Apricots	"	610	1.0	1612.69	0.002		Apricots	28205	37.7	1336.66	0.002
Apples	"	15475	12.5	808.74	0.022		Apples	36222	40.9	1129.15	0.016
Olives	"	4602	18.0	3918.01	0.032		Olives - ripe & green	112442	189.6	1686.21	0.074
Jellies - fruit or berry	"	4805	7.3	1523.32	0.013		Jellies	148644	212.4	1428.92	0.014
Jams	"	5611	12.8	2272.50	0.022		Jams	248118	303.9	1224.82	0.042
Tomato Sauce	"	36049	36.0	1000.00	0.063		Tomato Sauce	1263320	803.6	636.10	0.100
	Total		569.3				Total		3670.4		
							Unadjusted PR*100				180.49
1032 Frozen fruit & Vegetable industry						2037 Frozen fruits and vegetables					
Straberries	1000 kg	6402	13.7	2146.03	0.047		Strawberries	142339	94.9	666.72	0.150
Beans	"	7991	10.9	1364.69	0.037		Beans-green,regular,french cut,lima	190828	190.3	997.23	0.051
Brussels spouts	"	4683	6.8	1456.47	0.023		Brussels spouts	26535	36.5	1375.52	0.024
Carrots	"	10836	6.8	624.33	0.023		Carrots	84641	48.9	577.73	0.025
Green Peas	"	31210	33.4	1069.76	0.113		Green Peas	177266	160.0	902.60	0.134
Potatoes products	"	232296	193.1	831.48	0.655		French fried potatoes	1667604	1167.8	700.29	0.778
Corn	"	27002	30.1	1113.14	0.102		Corn - sweet cut & cob	359113	316.9	882.45	0.129
Broccoli	"	3564	3.6	1000.02	0.012		Broccoli	161889	193.8	1197.12	0.010
	Total		294.8				Total		2015.3		
							Unadjusted PR*100				107.50
1041 Fluid milk processing						2026 Fluid milk					
Fluid milk whole & processed	1000 lt	1024620	721.7	704.35	0.914		Fluid whole milk-Bulk & packaged	15723504	6611.3	420.47	1.531
Fluid milk - skimmed	"	112410	68.0	604.60	0.086		fluid skim milk -bulk & packaged	2066932	635.7	307.56	0.169
	Total		789.7				Total		7247.0		
							Unadjusted PR*100				140.51

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21	
1049 Other dairy products industry											
Creamery butter	1000 kg	130173	558.0	4286.76	0.316	2021 Creamery butter	556473	1850.0	3324.51	0.407	
						2022 Cheese - natural and processed					
Cheese - cheddar & others	"	156279	679.7	4349.42	0.384	Natural cheese- except cottage	1671596	5625.6	3365.41	0.497	
Process cheese	"	68154	337.2	4947.50	0.191	Process cheese	591808	2022.3	3417.16	0.276	
Cottage cheese	"	28222	58.8	2082.77	0.033	Cottage cheese	458904	669.4	1458.69	0.047	
Yogurt	"	48704	108.5	2227.27	0.061	Yogurt	294022	403.7	1373.03	0.100	
Ice cream mix - incl. noverties	"	2711	25.8	9531.68	0.015	Ice cream mix & related products	471423	3034.4	6436.68	0.022	
	Total		1768.0			Total		13605.4			
						Unadjusted PR*100					111.45
1051 Cereal grain flour industry						2041 Flour & other grain mill products					
Wheat flour	1000 kg	1102552	413.2	374.77	0.774	Wheat flour - white	10956552	2609.0	238.12	1.218	
Durum semolina & flour	"	107071	43.0	401.38	0.080	Durum flour & semolina	808215	192.9	238.67	0.135	
Whole wheat or graham flour	"	56399	17.8	316.12	0.033	Whole wheat flour	112747	27.8	246.57	0.043	
Prepared cake mixes	"	35601	60.0	1686.64	0.112	2045 Cake Mixes	398225	594.1	1491.87	0.127	
	Total		534.1			Total		3423.8			
						Unadjusted PR*100					125.86
1052 Prepared mixes & breakfast cereals						2043 Cereal breakfast foods					
Breakfast cereals	1000 kg	139141	290.0	2084.02		Ready to serve - Corn flakes+others	319922	811.2	2535.62	2589.44*	
						" Wheat flakes & others	326499	811.1	2484.23		
						" Rice breakfast foods	125102	394.2	3151.03		
						" Other preparations	131090	339.5	2589.83		
						To be cooked - Farina & other foods	53842	84.3	1565.69		
						" Other preparations	4173	7.2	1725.34		
						Total		2447.5			
						Unadjusted PR*100					66.51

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21
1053 Feeds industry						2048	Prepared feeds - n.e.c				
Poultry - complete feed	M.Tons	2225001	558.2	250.85	0.286		Complete poultry feeds	16336115	2919.6	178.72	0.401
Dairy - "	"	1418418	314.6	221.79	0.161		Dairy cattle - complete	8362605	1475.9	176.49	0.202
Swine - complete feed	"	2045686	493.6	241.27	0.253		Swine feed - complete	2558378	585.9	229.01	0.266
Beef - Complete feed	"	532341	87.8	164.84	0.045		Beef cattle - Complete	3075206	511.4	166.30	0.045
Horse - compete feed	M.Tons	56759	14.2	250.36	0.007		Horse & mule feed - complete	1048988	204.5	194.95	0.009
							Feed supplements:				
Dairy Supplement	M.Tons	291805	81.1	278.01	0.042		Dairy - supplements & concentrates	1925429	544.3	282.69	0.041
Swine Supplement	"	278491	90.5	324.84	0.046		Swine - supplements & concentrates	3399891	1113.7	327.57	0.046
Beef supplement	"	158006	35.5	224.48	0.018		Beef cattle-supplements+concentrates	2751792	607.7	220.84	0.018
Chicken feed suppl.	"	126387	39.8	314.58	0.020		poultry feed suppl. & conc.	2037649	545.1	267.51	0.024
Dog & cat food	"	290217	238.5	821.69	0.122	2047	Dog & cat - Canned & not canned	5958405	3902.8	655.01	0.153
	Total		1953.6				Total		12410.9		
							Unadjusted PR*100				99.65
1061 Vegetable oil mills						2075	Soybean oil mills & other oil mills				
Crude-Canola, soybean, sunflwr etc	1000 kg	170244	99.4	583.91	0.201		Crude-Cottonseed, soybean, Sunfl. oils	4792525	2073.6	432.67	0.271
Refined-Canola, soybean, sunflwr etc	"	121002	91.2	753.57	0.184		Refined - Cottonseed, soybean oils	1618253	822.2	508.08	0.273
Oilcake, & meal- " " "	"	1337738	304.9	227.90	0.615		Soybean, Cottonseed, sunfl. cake & meal	23497142	4878.1	207.60	0.675
	Total		495.5				Total		7773.9		
							Unadjusted PR*100				100.76
1071 Biscuit industry	1000 kg					2052	Cookies & Crackers				
Biscuits - plain & fancy	"	170519	443.6	2601.26			Cookies	1806904	4021.3	2225.52	
							Unadjusted PR*100				96.60
1072 Bread & other bakery products industry						2051	Bread, cake & related products				
Bread	1000 kg	627014	695.3	1108.97	0.778		Bread - white pan+whole wheat+rye	3794929	3579.1	943.13	0.914
Plain rolls & buns	"	126489	198.9	1572.31	0.222		Rolls - bread type	1233104	1326.4	1075.66	0.325
	Total		894.2				Total		4905.5		
							Unadjusted PR*100				102.43

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21
1081 Cane & Beet sugar processing						2062/3	Cane and beet sugar refining				
Granulated cane & beet S.	M.Tons	696211	395.2	567.58	0.767		Granulated cane & beet sugar	6747891	3346.7	495.96	0.878
Icing sugar - packaged - cane & beet	"	39752	27.2	683.03	0.053		Confectioners powdered sugar	345732	205.9	595.55	0.060
Granulated yellow & brown	"	52680	35.2	668.43	0.068		Soft or brown sugar	244489	163.7	669.56	0.068
Invert sugar	"	100787	57.5	570.67	0.112		Invert sugar - cane & beet	395174	234.5	593.41	0.107
	Total		515.0				Total		3950.8		
							Unadjusted PR*100				92.08
1082 Chewing gum industry						2067	Chewing gum				
Chewing gum	1000 kg	19714	109.0	5529.02			" nondietic	179443	739.0	4118.30	
							Unadjusted PR*100				110.95
1083 Sugar & chocolate manufacturers						2065	Confectionary products				
Chocolate confectionery	1000 kg	74108	470.8	6353.09	0.738		Chocolate & Chocolate type conf.	880160	3759.7	4271.61	1.098
Sugar confectionery	"	62185	167.0	2685.42	0.262		Non-chocolate type conf.	714778	1593.7	2229.64	0.315
			637.8				Total		5353.4		
							Unadjusted PR*100				116.80
1091 Coffee & tea industry						2095	Roasted coffee				
Coffee Roasted	1000 kg	51892	328.1	6322.36	0.767		Roasted coffee - ground	667014	3330.7	4993.45	0.971
Tea - blended, packed	"	16405	99.7	6077.77	0.233	2099	Tea - packed in tea bags, powder.	123016	743.5	6043.95	0.234
	Total		427.8				Total		4074.2		
							Unadjusted PR*100				99.62
1092 Dry pasta products						2098	Macaroni & Saghetti				
Macaroni, spaghetti, Vermicelli, noodles	1000 kg	112859	129.3	1145.59			Macaroni & Saghetti & egg noodles	956409	1143.9	1196.04	
							Unadjusted PR*100				79.16
1093 Potato chip, pretzel & Popcorn						2099	Food preparations n.e.c.				
Potato chips,flakes, frills & other pdcts	1000 kg	59056	307.0	5197.83			Potato chips & sticks	442711	1545.4	3490.77	
							Unadjusted PR*100				123.06

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21
1099 Other Food Industries						Other food Industries					
Eggs - frozen	1000 kg	5951	7.7	1290.04	0.008	2017	Frozen eggs	106505	97.1	911.70	0.011
Peanut butter	"	32866	98.7	3003.94	0.104	2099	Peanut butter	333258	796.7	2390.64	0.131
Corn starch - (+wheat & other grains)	"	123268	56.3	456.52	0.059	2046	Corn starch (wheat, rice & others)	2485213	626.7	252.17	0.108
Peanuts - roasted , salted etc	"	26568	101.3	3814.66	0.107		Peanuts & other nuts	554613	1481.1	2670.51	0.153
Shortening + margarine + lard	"	416029	474.3	1140.18	0.501	2079	Shortening & cooking oils	2269255	1870.3	824.19	0.693
Margarine	"	155874	207.9	1333.94	0.220		Margarine	1296108	1217.0	938.96	0.312
	Total		946.3				Total		6088.9		
							Unadjusted PR*100				116.43
1111 Soft Drinks						2086	Bottled & Canned soft drinks				
Regular - bottled	1000 lt	1815944	1067.0	587.56	0.701		Non-dietic - bottled	1206753	733.1	607.50	0.678
Regular - canned	"	389645	299.0	767.40	0.196		" - canned	7790666	4515.2	579.57	0.260
Low calorie - bottled	"	89685	55.1	614.44	0.036		Low calorie- bottled	1405181	850.7	605.40	0.037
Low calorie - canned	"	62688	56.4	899.51	0.037		Low calorie - canned	1680256	967.1	575.57	0.058
Premixes - bulk (low calorie & regular)	"	90459	45.2	499.52	0.030		Drinks in bulk (+premixes)	1320965	517.4	391.68	0.038
	Total		1522.7				Total		7583.5		
							Unadjusted PR*100				88.45
1121 Distillery products:						2085	Distilled liquor, except brandy				
Whisky	1000 lt	130377	543.3	4167.27	0.891		Whisky	549961	1157.4	2104.51	1.763
Gin	"	5554	32.5	5855.21	0.053		Gin	116578	162.0	1389.63	0.225
Vodka	"	1345	1.2	924.63	0.002		Vodka	379636	462.9	1219.33	0.002
Liqueurs & Cordials	"	3681	33.0	8970.77	0.054		Liqueurs & Cordials	151779	253.0	1666.90	0.291
	Total		610.1				Total		2035.3		
							Unadjusted PR*100				188.50
1131 Brewery industry						2082	Malt beverages				
Beer, Ale etc - bottle	1000 lt	2043108	1549.7	758.52	0.913		Beer & Ale - bottled	9213377	3964.6	430.31	1.609
Beer, Ale etc - canned	"	239935	148.5	618.86	0.087		Beer & Ale - canned	14302960	5984.9	418.44	0.129
	Total		1698.2				Total		9949.5		
							Unadjusted PR*100				143.63

Appendix A ... continued

C A N A D A						U. S. A.					
SIC	Unit	Quantity	Value C$ mil.	Pc C$	Weight (shC)	SIC	INDUSTRY	Quantity	Value US$ mill	Pu US$	shC*(Pc/Pu)*1.21
1141 Wineries						2084	Wines, brandy & brandy spirits				
Wines - matured, still, grape fruit	1000 lt	83443	153.4	1838.66	0.706		Grape wine - white, red & rose	2365625	1772.2	749.15	1.733
Sparkling wines	"	23373	53.9	2307.76	0.248		Sparkling wines - natural & carbonated	117714	247.3	2100.86	0.273
Wines -matured, still, other than grape	"	1081	2.0	1809.60	0.009		Other fruit,berry+specialty+Dessert wines	389477	345.7	887.60	0.018
Cider	"	5112	7.9	1550.18	0.036	2099	Cider	68887	46.7	677.92	0.083
	Total		217.2				Total		2411.9		
							Unadjusted PR*100				174.20
1211 Leaf tobacco processing						2141	Tobacco stemming & redrying				
Flue-cured:whole leaf	1000 kg	1244	5.4	4341.64	0.017		Unstemmed leaf tob.	18824	98.4	5227.29	0.014
Lamina	"	61826	312.6	5056.34	0.983		Stemmed Tob. & packaged	523451	2733.0	5221.12	0.952
	Total		318.0				Total		2831.4		
							Unadjusted PR*100				79.84
1221 Tobacco products						2111	Cigarettes				
Cigarettes - regular	1000's	35578272	562.4	15.81	0.502		Cigarettes - regular	319444000	5544.4	17.36	0.457
Cigarettes - kingsize	"	30504852	499.1	16.36	0.446		Cigarettes - kingsize	231344000	3959.7	17.12	0.426
						2131	Chewing & smoking tobacco				
Smoking tobacco	1000 kg	5974	58.7	9817.29	0.052		Smoking tobacco	16375	129.2	7890.15	0.065
	Total		1120.1				Total		9633.3		
							Unadjusted PR*100				78.37

Source: Census of Manufactures Reports - Canada and U.S. (1982).