The Competitiveness of Canada's Poultry Processing Industry

By: Hao Liu

Degree of Master of Science

Department of Agricultural Economics

Macdonald Campus, McGill University

Montreal, Quebec

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Abstract

The economic research on competitiveness has become popular in recent years. Free-trade agreements and open-market policies provide new challenges for food processors competing in domestic and international markets. The Canadian poultry processing industry is one sector in which the competitive status needs to be investigated. The purpose of this thesis is to compare the poultry processing sectors of Canada and the United States. The study measures the competitiveness, both at the industrial level and at a firm's level, and identifies the internal and external drivers of competitiveness. Comparisons were conducted in terms of price, value added ratios, and productivity growth. Results show that Canada's poultry industry was less competitive than that of U.S. Lack of economies of scale, rigid supply system and high input prices in Canada are the main reasons for being less competitive.

Résumé

Le concept de compétitivité a gagné en popularité dans le milieude la recherche au cours des dernières années. L'accord de libre-échange ainsi que la politique libérale ont apporté de nouveau défis pour les entreprises de transformation alimentaire qui œuvrent dans les marchés domestiques et internationaux. L'industrie de transformation avicole est un des secteurs ou le niveau de la compétitivité se doit d'être étudié. Cette thèse a pour but de faire la comparaison entre les industries de transformation avicole canadiennes et américaines. La compétitivité de ces industries est donc étudiée au niveau des industries ainsi qu'au niveau des firmes, et les facteurs tant internes qu'externes déterminant la compétitivité sont présentés. La comparaison est faite au niveau des prix, du ratio de valeur ajoutée, et du taux de croissance de production. Les résultats démontrent que l'industrie canadienne de transformation avicole est moins compétitive que sa voisine américaine. Le niveau peu élevé des économies d'échelle réalisées, la rigidité du système d'offre, ainsi que le prix élevé des intrants canadiens sont les principales raisons expliquant cette différence.

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Chapter 1

Introduction

1.1 Introduction

For the food industries, creating the most efficient and productive supply system is the primary way to enhance the industry's competitive positions. Food supply systems include all levels of sub-sectors, where each sub-sector performs interdependent tasks. The overall performance of the whole supply chain will determine the final products' market positions. Recently, the food processing sector has expanded their markets by undertaking many cooking jobs once carried out in our own kitchens. Increased consumer spending on ready to cook foods or on restaurant foods provides potential market opportunities for food processors. The Canadian poultry processing industry is one of the prosperous processing sectors that has had a continuous growth in shipment value in recent years. The industry jobs included transforming live chicken into all kinds of primary products and further processed product. Compared with other red meat products, poultry products have met consumer's concerns about nutrition, health, and fast paced life style. Per capita consumption of poultry has exceeded other meats (beef, veal and pork).

Historically, meat processing sectors have been often associated with monopolistic or oligopolistic markets. In order to limit this market power,

many government programs were introduced to protect small farms. The Canadian supply management system was one of those programs. Under the supply management system, farm production was strictly controlled by a marketing board. Poultry processors contract with farmers individually to acquire live bird inputs. Although supply management has successfully functioned for more than two decades, considering the fact that relative smaller economies of scale and higher input cost compared with counterparts in the U.S., Canada's poultry processors need to improve their efficiency in order to balance the threat from import competition.

As a member of free trade agreements under the WTO and NAFTA, the Canadian government also needs to meet the commitment to remove non-tariff barriers and to enhance international free trade. But, on other hand, import control policies are needed to protect the domestic supply management system from competition of cheap imported products. From this aspect, the free trade trend seems to conflict with supply management programs. Farmers within the supply management system have kept pressure on the legislation officers to keep the current system, while other export orientation industries urge that government to take step to enforce free trade. The conflict among the different interests can only be solved after completely examining all parties involved.

1.2 The purpose of study

This study will carry out a comparison of the poultry processing industry between Canada and the U.S. The U.S. poultry industry is a major exporter to the Canadian market. Similar cultures, consumer food taste, and a common border offer the poultry industry in the two countries common ground for a comparison of their performances. However, the structures of the poultry industries in both countries are quite different. In Canada, the supply management system was introduced to control the oversupply problem and secure incomes for producers. Federal and provincial boards allocate production quota to poultry producers. Producers supply processors with raw materials restricted by the quota system. The chicken and turkey prices are jointed determined by provincial boards and processors, in view of input costs, demand and supply conditions, storage level, and prices of other meats. Outputs of processors are therefore indirectly subject to the marketing board influences because of input control. With market regulations set by marketing boards, output and input prices are relatively stable to processors. However, the CPEPC (Canadian Poultry and Egg Processors Council) has argued that the coordination between the growers and processors needs to be improved in order to achieve better performance (CPEPC. 2002). In the U.S., processors acquire input by way of long-term contract or ownership integration. Processors also provide input or veterinary services to farms in order to control product quality. Payment is based on the actual performance

of each producer. Because of the large scale, the price and production schedules are often made by processors. There is no intermediary between them.

The distinctive market structure in the two countries indicates that both supply systems performed in their own way. The Canadian system is influenced by government policies, while the U.S. one is totally adjusted by market forces. By comparison, the different systems' effects on each processing sector will be examined.

There are other factors which will lead to different levels of performance. These factors include: demand conditions, technology, government policy, and support industries. By directly comparing the processing sectors in these two countries, the study should fulfill the following goals:

Primary:

- Measure the competitiveness of each sector and conclude which one is more competitive.
- Identify the main drivers of competitiveness; compare these drivers across countries.

Secondary:

- Clarify the definition of competitiveness.
- Determine the trend in the Canadian poultry processing industry.

- Estimate the consequence of opening the Canadian poultry market to the U.S..

1.3 The scope of study:

Before any analysis is attempted, it is necessary to define competitiveness so that a comparison can be carried out between the two countries. Since competitiveness is a relative concept, it is determined by the competitive position compared to other processors producing similar products or to producers with similar resources. It is not determined only by *its own performance.*

Following the competitiveness definitions, the measurement of competitiveness will be illustrated in several ways: 1) by measuring competitiveness at the firm level, 2) establishing a method which will provide the common ground to compare the firms with heterogeneous resources and products, and 3) measure the competitiveness at the industry level. The explanation of the main drivers of competitiveness will be continued after measurement. Both internal factors with which firms can retain their competitiveness and external factors created by certain industry structures or by macro-economic conditions and government policies helping firms to keep their competitive status will be examined.

1.4 Hypothesis

Based on the assumption that Canada has a smaller domestic market and a relative low level of economies of scale, it hypothesized that Canadian processors will be less competitive than their counterparts in the U.S. The highly coordinated supply chain in the U.S. will add an extra competitive advantage to U.S. processors.

1.5 Study structure:

Chapter 2, 3, 4: Literature review

This will cover the theory and the definition of competitiveness. The main factors affecting competitiveness will also be examined. Competitiveness at the individual firm level will be investigated first, this will include: the internal factors which will help to create and promote competitiveness at the individual firm's level. The measurement of competitiveness at the industrial level will also be examined. External factors such as government policies and industry structures determining industry competitiveness will be identified.

Chapter 5: Introduction to Canada's poultry processing industry

The Canadian poultry processing industry will be introduced by illustrating the structure of the whole production system, product information, market competition and the trend for future development.

Chapter 6 and 7: Methodology and data analysis results

Methodology: Based on the competitiveness definition from Chapter 2, a competitiveness model will be established. In order to acknowledge that Canada's poultry market is under import control, the model will be adjusted to better reflect the real situation. The productivity growth model will also be presented.

Results of the analysis: estimate the competitiveness position of the Canadian poultry processing sector. The drivers determining this relative position will be demonstrated.

Chapter 8: Conclusions and limitations

Summarizes the thesis conclusions, indicates the study limitations and providing suggestion for further research.

Chapter 2

Defining Competitiveness

2.1 Introduction

Since the 1990s, agricultural research into national level competitiveness has been increasing. The trend of decreasing trade barriers and the introduction of new technologies has resulted in a more integrated and transparent global market. The importance of enhancing national competitiveness is seen in research projects and government policy evaluation. Research analyzing the competitive positions for an individual sector or from a national perspective has been conducted by Brinkman (1987), Martin et al (1991), Barkema et al (1991), and Martin and Stiefelmeyer (2001). The government of Canada sponsored research organization, the Agrifood Competitiveness Council (1991-1994), united all levels of agricultural participants, industries and institutions to take part in this project. Since then, arguments on competitiveness remain a controversial issue.

Generally, a nation or a firm competes for sales in a domestic or an international market place. Competition is a phenomenon by which each market participant will use available resources to win market share. The number of suppliers with similar or substitute products, potential entrants, and regulation from institutes or government will shape competition intensity.

Competition is a rivalry activity forcing a firm to adopt new technology, to introduce new strategies, and to improve its efficiency. Cost control, product quality and image, customer service, market access, new product development, qualified human resource acquisition, attracting low cost capital, broad-spectrum products establishment; all of these belong to competitiveness activities. The final success to each competitor is to provide products that buyers would like to buy, at a price that is better than those of its competitors, and earn at least the opportunity cost of the resources used. In order to win the competition, it is critical for a firm to understand the buyer's demand and then commit resources accordingly to build different competitive advantages such as low price or high quality for their products. Sometimes firms might not obtain an advantage in every field. Some firms use the lowest price as a weapon and others provide high quality products with a premium price. The overall effect of a firm's performance offers useful information to evaluate a firm's competitiveness. Therefore, competitiveness is a result of competition and reflects a firm's ability to succeed in the market place.

At first glance, the definition of competitiveness needs to be clarified. Despite much research, there is no consensus on the definition of competitiveness. Based on different research goals, competitiveness has been defined in different ways. At the national level, competitiveness is a way

by which a nation could increase employment and enhance their citizen's standard of living. As pointed by Harrison and Kennedy (1997, page 2):

"A nation's competitiveness is an ability to sustain an acceptable growth rate and real standard of living for their citizens while efficiently providing employment without reducing the growth of potential and standard of living for future generations."

But Porter (1990) argued that it is industry sectors which compete with each other rather than nations and so the fundamental way to understand competitiveness is to study the industry. The achieved competitive advantage of firms would eventually provide the nation with growth and increased wealth. Some nations could provide a favorable macro-environment where competitiveness could be steadily enhanced. For the food processing industry, researchers like Martin et al (1991) and Martin and Stiefelmeyer (2001) define competitiveness as a sustained ability to procure profitable gain or maintain market share. Using the value chain theory developed by Porter (1985), they provided internal and external factors that determine competitiveness. Another group of researchers, Harrison and Kennedy (1997) and Lake (2000), addressed competitiveness at the firm level. They use management strategies to illustrate the competitive advantage which a firm can develop in order to achieve competitiveness. Harrison and Kennedy (1997, page 3) gave the following competitiveness definition:

"The ability to profitably create and deliver value at prices equal to or lower than those offered by other sellers in a specific market."

Competitiveness can be considered as the situation about relative performance or competition position. Most economic theory concentrates on productivity and efficiency, and considers that productivity growth will endow the industry with sustained competitiveness. On the other hand, management strategies investigate drivers of competitiveness, the way that a firm could adopt different strategies and better utilize available resources. Most research can be categorized into three schools: 1) Neo-classical economics, 2) Strategic management and industrial organization and 3) Resource based theory.

2.2 Neo-classical economics

Traditionally, competitiveness has been interpreted by way of trade. According to Porter (1990), Adam Smith thought that a nation gains absolute advantage if it produces an item at the lowest cost; therefore it will exploit this advantage to export this product. David Ricardo improved this notion with a new concept of comparative advantage. It is good for a nation to allocate resources to the product for which it has higher productivity while importing goods with lower productivity even though the nation has an absolute advantage compared to other nations. Both absolute advantage and comparative advantage contribute to the explanation of trade. More recently,

economists have used productivity and other criteria to illustrate competitiveness. McFetridge (1995) states that profitability, market share and productivity should be combined to indicate competitiveness. Total factor Productivity (TFP) will measure the efficiency of a firm as it converts the total set of inputs into the final product. In the TFP or MFP (multi-factor productivity) equation, labor and capital are used as inputs and output is measured by unit or sales. Higher productivity can be accomplished by economic scale, size and scope, or by continuously improving efficiency through new technology and innovation. When physical units are used as the output measurement, it must be acknowledged that productivity says nothing about product quality. Chan-Kang et al (1999) conducted a comparison of Canadian and U.S. productivity of the food manufacturing industry using data from 1963 to 1992. They regard productivity growth as the combined result of technical change, production scale, adjustment in quasi-fixed inputs, and changes in the competitiveness of firms' pricing behavior. Using a theoretical cost of production model, given the mean factor price, output and capital quantities, processing costs would be 22% lower in the U.S. than in Canada. They concluded that excessive government policies like supply management and under-investment in R&D in the Canadian food industry had caused slower productivity growth compared to that of the U.S. counterpart. Less productivity will ultimately make Canadian food manufacturers less competitiveness. Gopinath and Kennedy (2000) used comparative advantage

based on trade theory by combining the input factor effect with productivity. They found that the export share of GNP at the state level in the U.S. was highly correlated with input factors (capital, land, labor) as well as productivity (TFP). The growth in TFP is a key to competitiveness in international markets. The factor accumulation in technology and capital also gave the U.S. a comparative advantage in the international market.

2.3 Strategic management and industrial organization

Traditional strategic management and IO (industrial organization) emphasize the importance of industry structure on a firms' strategic conduct and performance. From the strategic management view, firms that gain a competitive advantage have a better perception about their environment and they pursue strategies accordingly. These adapted strategies are based on the resources the firm can use. A firm's performance is the result of internal and external factors. Internal factors refer to controllable variables such as production operations, acquisition, and advertising, whereas external factors are the structure and characteristics of the industry, as well as other macro environment conditions such as exchange rate and government policies. The IO paradigm considers that the perfect competition assumption does not provide a satisfactory explanation of actual market behavior. Structural characteristics of an industry (buyer/seller concentration, product differentiation, and condition of entry) determine most of a firm's conduct in

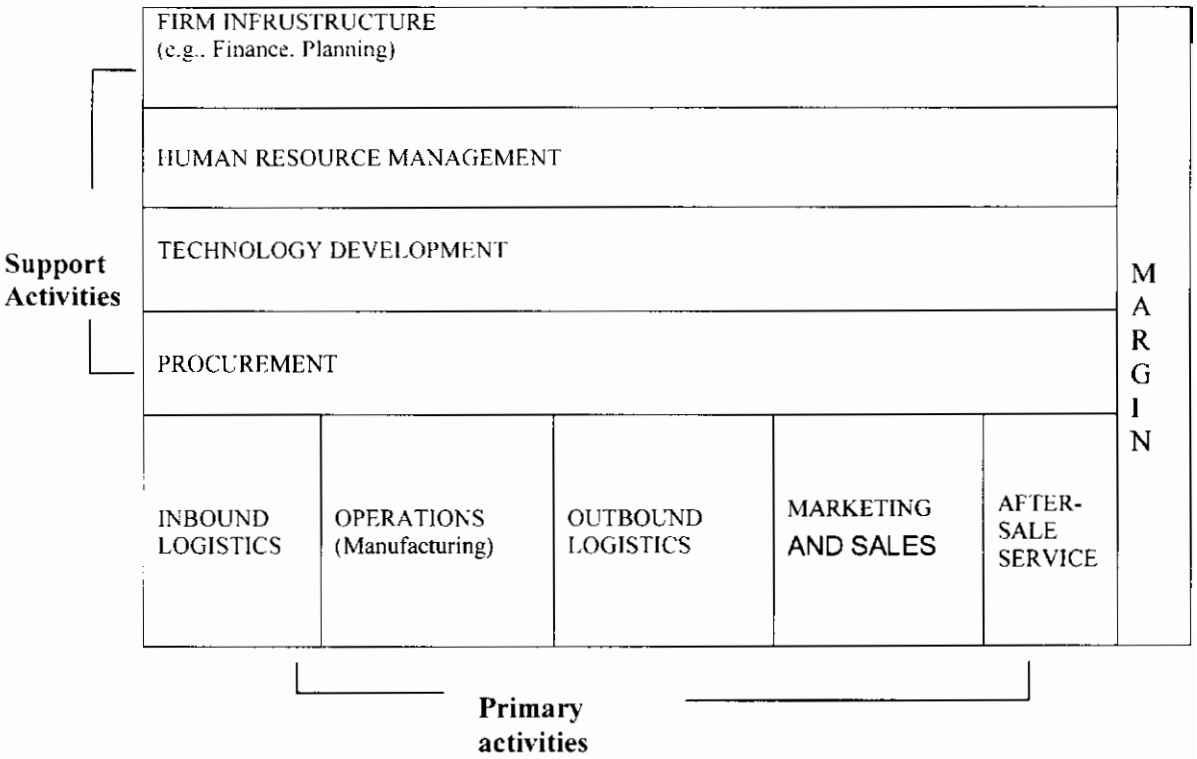
the industry (price and output policies, promotion policies, and behavior to rivals) which will determine the performance (profit, efficiency, and cost of operation). Strategic management research usually focuses on the firm level, and IO is more concerned with industry performance.

In 1985, Michael Porter, author of Competitive Advantage, considered that gaining competitive advantage is a core ingredient in all firms' activities. A firm's competitive success can be achieved through deploying different competitive advantages, such as least cost advantage or with differentiated products. Competitive advantage fundamentally grows out of the value a firm could create for buyers and the price of this created value is lower than or equivalent to that offered by its competitors. The ultimate competitive advantage of a product could only be obtained through several stages, which Porter defined as a value chain. In the value chain, a firm's activities could be grouped as primary and supportive activities. This is illustrated in Figure 1. A value chain shows the source of any cost advantage or differentiation advantage. The value that customers would like to pay comes from the producer's effort at each stage. Also, different industry structures and their relevant position in each industry will lead a firm to choose different strategies: cost leadership and/or differentiation. In 1990, the book: "The Competitive Advantage of Nations", Porter broadened the view of competitive advantage into the industry sector, and he identified the macro-environment factors existing in a nation which might contribute to success of a certain

industry in the international market. The four key factors: demand conditions, factor conditions (such as skilled labor, endowed resources), related or supporting industries, and the firm's strategy, structure, and rivalry. These four factors, which Porter termed "diamonds", will determine the likelihood that the industry will succeed. In Porter's theory, internal and external factors provide the explicit sources from which competitive advantage is formed. All these factors contribute to the understanding of competitiveness (cost advantage and differentiated products). This is compared with the comparative advantage theory, which uses input factors to determine trade patterns, and assumes that no technology gap exists among different producers. The competitive advantage enhances the success of a firm. As Porter mentioned, the comparative advantage theory says nothing about the premium which a firm could earn through higher quality or better service. This quality concern is particularly prominent in the food processing industry.

Business managers are more concerned about the products which have different characters to win consumer attention than a commodity with generic properties. Porter's framework of firm-level competitiveness was summarized by Coffin et al (1993), shown in Figure 2.

Figure 1. Value chain



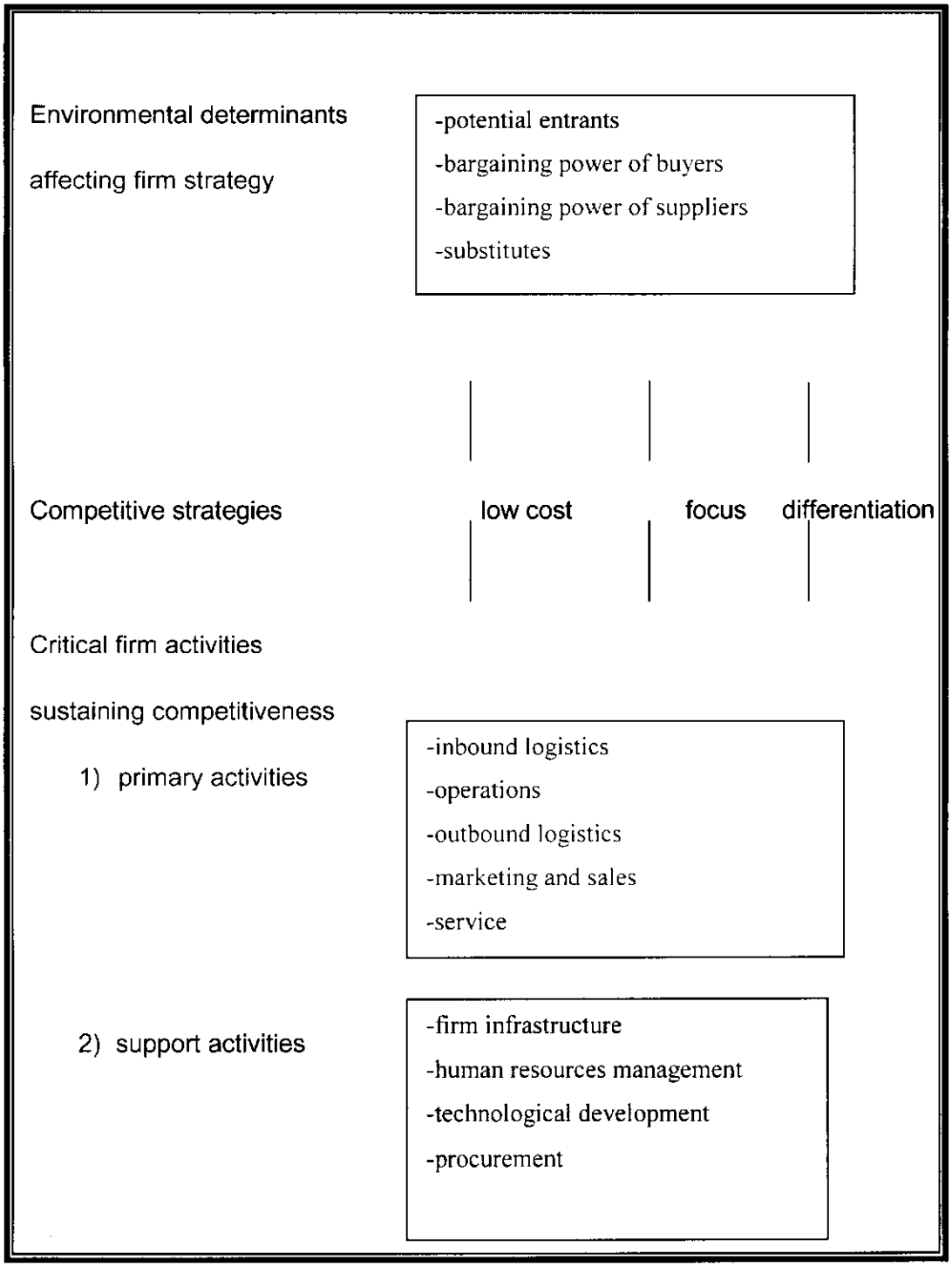
Note: **Primary activities** refer to the physical transformation until the final product reaches buyers.

Support activities refer to those activities that make the primary productivity possible, but may not be directly involved in physical production.

Margin is the net profit

Source: Porter. (1985)

Figure 2. Porter's Framework of Firm-Level Competitiveness Analysis



Source: Coffin et al (1993)

2.4 Resource based theory

Relaxing the homogeneity assumption of traditional strategy management, the resource based theory concentrates more on the heterogeneity of firms' resources and strategy. Therefore, it gives a more detailed explanation about the firm's behavior. The resource based theory stresses the idiosyncrasy which reflects the different resource endowments and ways of combining these resources. These idiosyncratic characters can explain sustained advantages which cannot be explained by homogenous theory for the reason that the homogenous resource endowment will not permit the implementation of different strategies. Idiosyncratic resource assets will be sources of firms' sustained competitive advantage.

According to the resource based theory, the firm's resources can be categorized in terms of tangibility. Tangible resources are those which can be quantified, including: 1) physical capital resources (buildings, equipment), 2) financial resources, 3) human capital resources, and 4) organization capital resources (decision making process and coordinating system). Intangible resources include technology and reputation, i.e. patents, trademarks, or licensing agreements. Managers will implement different strategies to fully utilize, leverage, and cultivate distinct resources in order to achieve sustained competitive advantage. The study by Lake (2000) on the Canadian medium size food processors focused on the flexibility a firm could command where flexibility is reflected in either an operational flexibility or strategic flexibility. A

firm will improve its performance through a high level of operational flexibility and strategic flexibility. Operational flexibility is reflected in product mix, output volume, input control, labor or equipment and new product innovation. Strategic flexibility relates to the firm's adaptability to changing market conditions or policy environment. This flexibility also coincides with the suggestion by Pace and Stephan (1996) that immediacy is also an important concern beyond productivity and quality dimensions to gain a competitive edge. Information technology has facilitated the speed that a supplier can respond to its customers' needs. Only rapid action, such as providing what customers want and in the appropriate form, can accomplish competitive success. Van Duren et al (2003) conducted a survey on broad characteristics of Canadian successful middle-sized food processors. In that survey, the managers involved were asked several questions about the internal factors which might enhance competitiveness. The conclusions of the research are, first, there are many strong points instead of a single one which will help them to succeed. Second, factors which managers gave a high ranking are highly interrelated. Among those factors, reputation, flexibility, and customer service are the most important concerns for managers.

2.5 Combination of economic theory with strategic management

Martin et al (1991) define competitiveness as: the ability to profitably gain or maintain market share in domestic or international markets. Making

profit and increasing market share are dual goals for firms. Factors determining competitiveness can be grouped into the determinants controlled by firms, and those controlled by government, and quasi-controllable or uncontrollable factors. Firms make use of these factors to achieve competitiveness. Governments support firms by providing financing, taxing, and other competitiveness enhancing environments. Profit, market share, and time (sustainability) together will indicate competitiveness. As it is noted by Martin and Stiefelmeyer (2001), interpreting competitiveness only by one of three criteria will not indicate a real state of competitiveness. High profit can be obtained by losing future market share if resources committed to R&D are given away to present profit. Vice versa, market share in the future can be sacrificed by asking for higher profit which can reduce long term competitiveness.

Unlike strategic management, which has strong descriptive power, Martin et al (1991) provide a practical definition. As profit is relatively unstable and data are hard to obtain, they use value added as the proxy to measure profit. Using value added generates two advantages over other tools. First, using value added can exclude the influence of input price variations. Secondly, the value added method provides a comparison basis even when products are highly differentiated. Furthermore, value added per worker can be taken as a proxy for productivity, which is very useful when

trade barriers cause distortion and thus market share might not reflect the true competitiveness.

Coffin et al (1993) revisited the various dimension of competitiveness. They pointed out that the time dimension in measuring competitiveness is crucial. Meaningful measures should indicate the firm's ability to compete over time under a changing operating environment. The ability to squeeze market share from its competitors without losing profit over time proves that the firm is more competitive. Therefore, the change of relative position in profit and market share, rather than the absolute level should determine the measurement of competitiveness. As the crucial condition to gain competitiveness, a firm will devote its brand name for consumer acknowledgment, learn from practice to improve quality, innovate in products and respond to buyer's (retailers and consumers) needs rapidly. The success of a firm is the result of a strong commitment to long-term strategies. Needless to say, the advantages built from experience; such as brand reputation, the accumulated effect of R&D, and experience of doing business will offer a firm exclusive advantages. But these might not be invincible barriers against other competitors over time. Adapting to changing market environments, or to take advantage of new opportunities can give a firm an advantage to retain and develop its competitiveness.

2.6 Summary:

There is a considerable history of agricultural research into competitiveness analysis for policy makers and for industries. Historically, agricultural economists adapt factor productivity, capacity utilization, and input and output prices to illustrate the competitiveness for industry sectors or at the national level. Strategy management and resource based theory outline more detailed ways to find the determinants for a firm's success. Other researchers employing Porter's theory have offered specific reasons for a firm or industrial sector to be successful. Since the food market environment has changed dramatically over the last 20 years, least cost and productivity may not be the only criteria measuring competitiveness in a heterogeneous product market. Using value added per worker or per sale as a proxy for profit, together with market share, provides a means of measuring competitiveness. Other measurements, such as capacity utilized, flexibility, and ability to successfully innovate new products also offer complementary tools. Group indicators, rather than a single scalar, are the optimal way to consider the competitiveness issue.

Chapter 3

Creating Competitive Advantage for Firms

3.1 Introduction

This chapter focuses on the theory that can be used to explain the firms' ability to be competitiveness. From an economic perspective, the productivity and efficiency a firm/plant can attain will determine competitiveness. Traditional strategic management emphasizes competitive advantage, and the firm/plant performance (market share or profit) will largely be determined by the firm's advantage over its competitors. The resource based theory emphasizes that competitiveness is the result of the firm's resources and how well the firm's managers operate and nurture these resources. The economist usually focuses on profit maximization or cost minimization. The ratio between TC (total cost) and TY (total benefit) can be used to measure performance. The idea of a duality relationship between benefit and cost optimization can also help one to understand the link between traditional strategic management and the resource based theory. Traditional strategic management develops competitive advantage based on performance of physical product (output), while the resource based theory concentrates on the resource (input). It was pointed out by Mahoney and Pandian (1992) that profit and cost are two sides of the same coin. Moreover, many competitive analyses can be divided into two categories. a)

Descriptive approaches, and b) analytical approaches. The descriptive approach offers the general nature of competitive strategies, provides factors or determinants of competitiveness, but involves few quantitative measurements and formulation. The analytical approach is based on models whose results give insight for strategy formulation and can be used for testing the validity of hypotheses.

3.2 Analysis by Economic Models

Economic models are used to determine the efficiency and productivity of specific firms and plants. The efficiency or productivity can be measured by the frontier method. Below the production frontier or above the cost frontier usually means that firms/plants are operated inefficiently. The earliest work on the frontier method was completed by Farrel (1957). He recognized that efficiency can be divided into two concepts; technical efficiency and allocative efficiency. Assuming the firm uses two inputs X1, X2, the production function Y=f(X1,X2), has characteristics of constant returns to scale (Figure 3). Given that YY' is an isoquant which represents the output set given a technology, no point below the YY'(frontier) can be realized. P1,P2 are the prices of X1,X2. If the firm is observed producing a level of output YY' at point A, OB/OA measures the technical inefficiency, since only OB is needed to produce on YY'. However what the firm uses is more than OB (OA). OC/OB measures the allocative inefficiency because point C has

the same input cost as point D (technically and allocatively efficient point), and less than input cost of point B. Therefore, OC/OA measures total inefficiency.

Farrell's approach shows that the firm tries to achieve efficiency both technically and allocatively. Technical inefficiency can be explained by input inefficiency to produce a certain level of output, whereas allocative inefficiency comes from inefficiency of profit maximization and the firm does not reach the input mix where marginal input cost equals the marginal value of product.

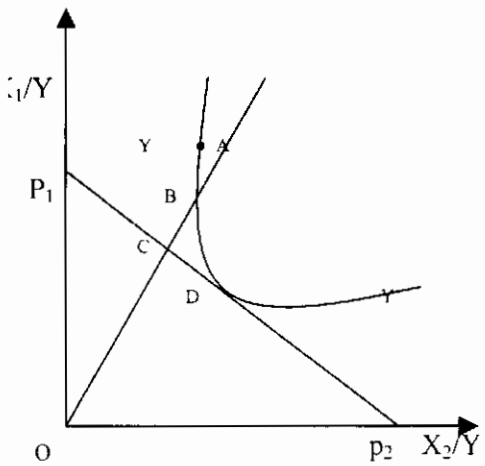
There are other economic ways to measure competitiveness. TFP and labor productivity are usually used at the industry level, but with the TFP and labor productivity model it is hard to incorporate technology differences that exist among individual firms and the constant returns to scale assumption is required

3.3 Competitive advantage from strategic management

To a strategic theorist, competitive behavior is a key activity for firms to win long-term market share. Basically, competitive advantage can be described as the ability to create value that the buyer would be willing to pay for, and this competitive advantage distinguishes the firm from its competitors due to superior performance through strategies of least cost and product differentiation. Research on competitiveness was advanced by Porter's

competitive advantage either at the individual firm or industrial level. With the difficulty of obtaining primary or secondary information from individual firms because confidential data usually are not available to independent academic researchers, conducting competitiveness research on the industry was found to be a more practical approach.

Figure 3. Efficiency Measurement



Source: Farrel (1957).

However, without an intensive and comprehensive understanding as to how individual firms create their competitive advantages, the industrial level analysis could be aimless and lack solid foundation. In a competitive market, the firm's objective is to create value that offers consumers a unique benefit

at an affordable price. Buyers would be willing to pay this value because the benefit to buyers exceeds the cost of consuming it. There are two basic competitive advantages: cost leadership and product differentiation. To pursue these two advantages, taking into account industry environments and other competitors' reactions, firms generally employ three competitive strategies: cost control, product differentiation, and target market focus. Cost control and product differentiation stem from various conducts: designing, procuring, producing, marketing, delivery, service, and coordination both internally and externally. Each of these conducts contributes to the firm's cost position and is a basis for its product differentiation. The target market strategy focuses a firm's effort into more specified markets in order to gain superior performance.

3.4 Industrial structure and competitive strategy

According to Porter (1985), industry structure is composed of five elements: industry competitors, suppliers, buyers, product substitutes, and potential buyers. These five forces determine the rules under which a firm operates. For example, the buyer's power will influence the price the firm can charge. The bargaining power of suppliers will exert influence on the raw material price. Intensity of competition from current or potential competitors combined with demand and substitute conditions would determine cost (sales promotion and advertising) and investment decisions (investment as a barrier

to entry). Strategies as well as the profit a firm could earn are largely determined by these structural forces. As industry structure keeps changing, adjusting to altered conditions is also imperative for a firm to achieve a long-term competitive advantage.

After careful analysis of these current and imminent structural conditions; the firm makes strategy decisions, which place the firm at an appropriate position in the industry. If a firm utilizes available resources more efficiently and effectively, strategies such as cost leadership, product differentiation, and market focus will provide the firm with a relative competitive advantage.

3.5 The way to control cost and to differentiate product

Various activities of a firm's performance are illustrated in figure 1. All these activities are critical for a firm to be able to create value that buyers would pay for. They are interlinked. Cost control and differentiation strategies root in these activities. Not only does a firm need to optimize or coordinate all activities within a firm's structure in order to achieve a competitive advantage, also upstream and downstream cooperation between interrelated firms is important. The suppliers and any intermediaries of the marketing channel would influence a firm's performance. Quality control, cost cutting, and a quick response to final buyers' demand require effort from all parties' and

coordination between them since the total value of the final products is contributed to by different participants at all levels in the supply chain..

Porter (1985) grouped sources of cost and product differentiation advantage as follows:

Cost drivers:

There are ten factors which determine the cost of activities: economies of scale, learning and spillovers, the pattern of capacity utilization, linkages, interrelationships, integration, timing, discretionary policies, location, and institutional factors.

Economies of scale:

Economics of scale allow a firm to amortize fixed assets and other supporting costs (advertising, R&D and management) over a greater volume produced, therefore lowering the individual product price.

Learning and spillovers:

The efficiency of value activities can be improved by the learning process. Costs of activities decline over time as the result of improved efficiency. Learning can improve capital utilization, quality control and inventory scheduling. Improved efficiency can spill over from one department to another or from a firm to its suppliers and buyers.

The pattern of capital utilization:

Better fixed asset utilization during market fluctuation caused by season or demand uncertainty will cut the allocated cost of fixed assets.

Linkages:

Linkages among value activities within a firm's structure and with upstream or downstream firms provide ways for a firm to reduce inventory cost, management cost, and the adjustment cost to changing market situations.

Interrelationships:

Interrelationships mean a firm shares resources for different production lines within its structure. Interrelationships improve total capital utilization, thus yielding cost improvement. As an example, different products could be marketed by the same sales force and share the reputation of a single recognized brand.

Integration:

A firm will integrate outside value activities into its internal structure if integration offers more benefits than costs. Integration is especially common in an industry where quality assurance is critical. By integration, a firm can avoid measuring cost or contracting cost and reduce opportunistic behavior[1] if its counterparts have greater bargaining power.

[1]According to Williamson (1979), opportunistic behaviour exists because of specific durable assets. The value of specific assets for current uses is greater than the one of alternative uses. The difference between the value of the asset to the owner and the value of the next best alternative use is quasi-rent. One party can take advantage of asset specification by offering a price higher than the value of its alternative use but lower than the value the owner would have paid for it.

Timing:

The cost of value activities will be different over time. The first mover may pay a higher developing cost than later movers. New equipment, more research and marketing costs are necessary to bring a new product to market to earn a price premium. Also, input cost may be different in different seasons. Higher costs would only be a sustainable advantage if the costs could bring more benefits.

Discretionary policies:

The policy a firm applies will determine the cost incurred. Different policies such as cost leadership or a differentiated product will involve different value activities therefore resulting in cost differences.

Location:

Geographical location influences the whole value chain. Costs of labor, input materials, inventory and transportation will be determined by the place where the plant is located. The different locations, when compared with each other, might have an influence on costs. A manufacturing plant located near a supplier's production site can bring the raw material cost down, but at the same time might raise other costs like outbound logistic costs and the coordination cost with buyers.

Institutional factors:

Many government policies: tax policy, tariff policy, unionization, local rules, and government regulation all have an impact on costs.

The analysis by Porter (1985) unveils a systematic way to find the competitive advantage related to the above cost drivers. The various cost drivers also need to be optimized or traded off among them for a firm to achieve an overall cost advantage. With consideration of different product quality and other differentiated product characteristics, cost control would be the only objective. Various policies or strategies employed would configure different value chain activities to different niche markets or buyers. The long-term benefit or profit, which is the result of cost control and premium price from differentiated products, is a broad index revealing competitiveness.

Differentiation:

According to Porter (1985), differentiation is an outcome where a firm could produce their product or service differently from its competitors, and these different products or services will reduce buyers' using cost or raise the buyers' performance. In other words, different products or services can be viewed as differentiation only after buyers pay a premium price since gains from products or services exceed the additional cost; too much product differentiation without the buyer's acceptance is worthless. Usually, a buyer selects the product based on performance, as well as on the perception the buyer forms from the brand name, image, and advertisement. In the food industry, advertising and sales promotion cost is 3.5 times more per unit of sales than other manufacturing firms (Sexton and Lavoie, 2000). Some food product attributes: food safety, nutrition, environmental, and ethnic

requirements can not be recognized immediately or even after tasting. Consumers usually infer these characters from brand name, packaging, advertising, and accumulated reputation. Therefore, creating a perceptible image is also critical for food manufacturers. Differentiation can be viewed in various ways. Quality, consistent and reliable supply, product image, and unique designs all give product characteristics conforming to the buyer's desires. Sources of differentiation may come from different value activities, quality of input material, product design, operational technology, and links with downstream dealers

Creating differentiation also should take into account the cost. The cost of creating physical value and signaling product image is critical for a differentiation strategy. An efficient differentiation strategy will eliminate unnecessary differentiation cost. In the long term, the firm will strengthen sustainable differentiation by creating the unique value activities to preempt a competitor's imitation. The idiosyncratic and heterogeneous resource or competence the firm has will enable the firm to attain above normal returns for a long period of time.

3.6 Resource based theory and sustained advantage

The Resource Based Theory is based on the heterogeneous characteristic which results in sustained competitive advantage. The heterogeneous or idiosyncratic characteristics of a firm refers to resources

and their way of deployment. Superior performance or competitive advantage lies in the ability that the firm can identify, utilize, leverage, and nurture idiosyncratic resources. McGrath et al (1996) state that the premium above the normal rate of return will enable a firm to compete against its rivals and accumulates resources. Under relentless competition, firms lacking the ability to earn extra premiums are doomed to operate at breakeven or at losses. According to Peteraf (1993), there are four preconditions for resources that can be used to obtain a sustainable competitive advantage.

(1) Heterogeneity

The heterogeneity assumption is the backbone of resource based work. Under the heterogeneity assumption, firms endowed with different resources will make strategic decisions accordingly. Heterogeneous resources are valuable and should enable firms to generate two types of rent; Ricardian rents and monopoly rents.

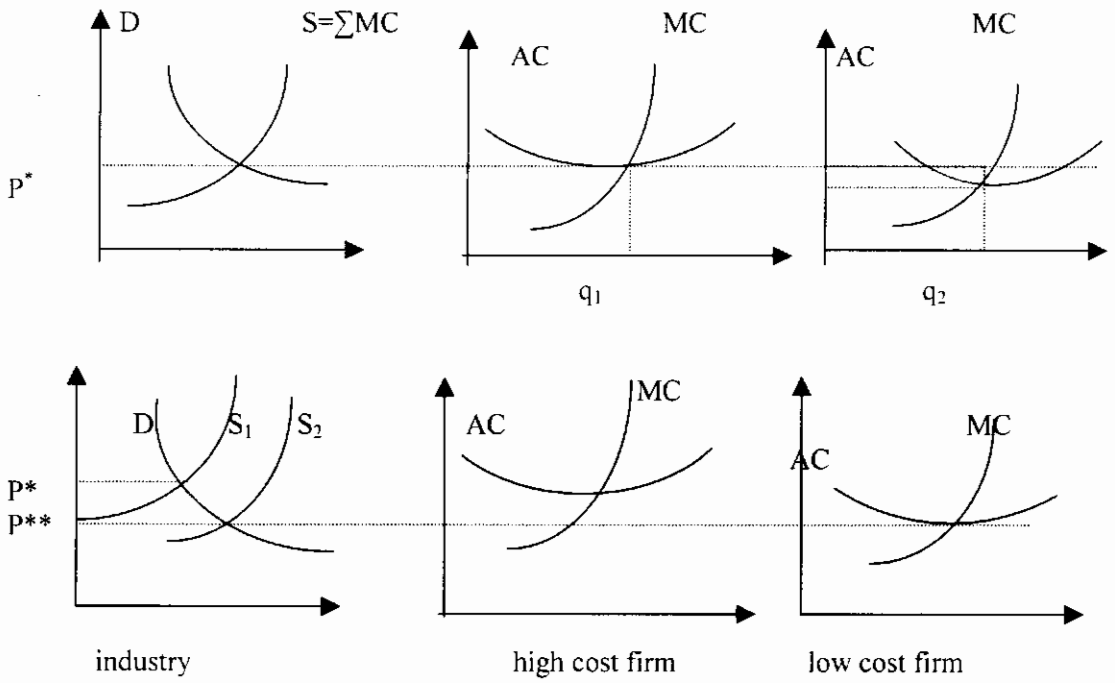
(1a) Ricardian rents

Under the assumption that productive factors usually generate rent by lowering production cost, and these production factors are limited in supply, firms accessing these productive factors would earn extra profit. This productive factor could be a quasi-fixed or fixed resource. That means a firm with lower cost cannot expand their resources immediately, which, in turn, provides an opportunity for inferior resources to be brought into production. Firms with inferior productive resources will gradually lose profit when

efficient firms with higher productive resources expand their capacities. This is illustrated in Figure 4.

(1 b) Monopoly Rents

Barriers created by accumulated investment, size prerequisites and government policies will grant a firm monopoly power. The restrained output under monopoly conditions will be less than the one under perfect competition conditions. Thus extraordinary profits or monopoly rents might occur with differentiated products or in a localized market. A firm can therefore exclude any potential competition and raise the price above the one under perfect competition.



P*= Equilibrium Price P**= New Equilibrium Price ☐ Rent to Efficient Producer
Source: Peteraf 1993.

Figure 4: Ricardian rents

(2) Ex post limits to competition

The precondition to gain rent in the long run is that the higher productive factors will not be easily dissipated during competition. "Isolating mechanisms" protect firms from imitation and preserve uninterrupted rent.

These "isolating mechanisms" may include property rights, knowledge from learning, reputation, causal ambiguity[2] and social complexity.

(3) Imperfect mobility

Various views about the value of property rights, higher transaction cost, and cospecialized assets will make transaction of scarce resources among firms more difficult to achieve. Each valuable asset may only be more productive together with other assistant assets, or the resource value to firms where it is already in use is more valuable than other alternative uses. This specific immobility will prevent resources from moving out of a firm's domain and provide the firm with sustained rents.

(4) Ex ante limits to competition.

Before any firm can gain a competitive advantage, there must be some limited competition created for positions which enable them to access higher productive resources. In other words, competition intensity will determine how many participants will compete. Fierce competition will increase the cost of strategy applications, competing away potential rent of superior locations or resources.

For a scarce resource to provide a sustainable competitive advantage, the basic cornerstones in Figure 5 should be satisfied. This includes all four factors: heterogeneity, ex post limits, imperfect mobility, and ex ante limits to competition.

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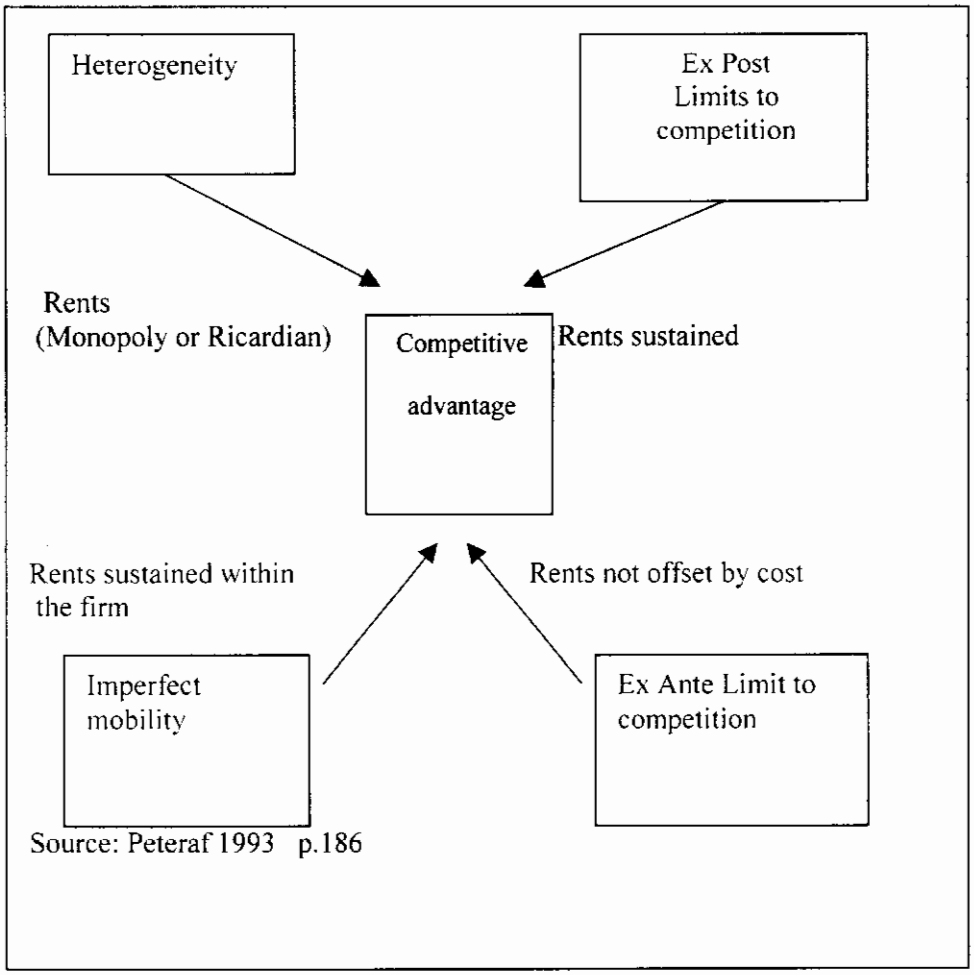
[2] The connection between resources a firm has and its performance is unclear.

3.7 The route from resource to competitive advantage.

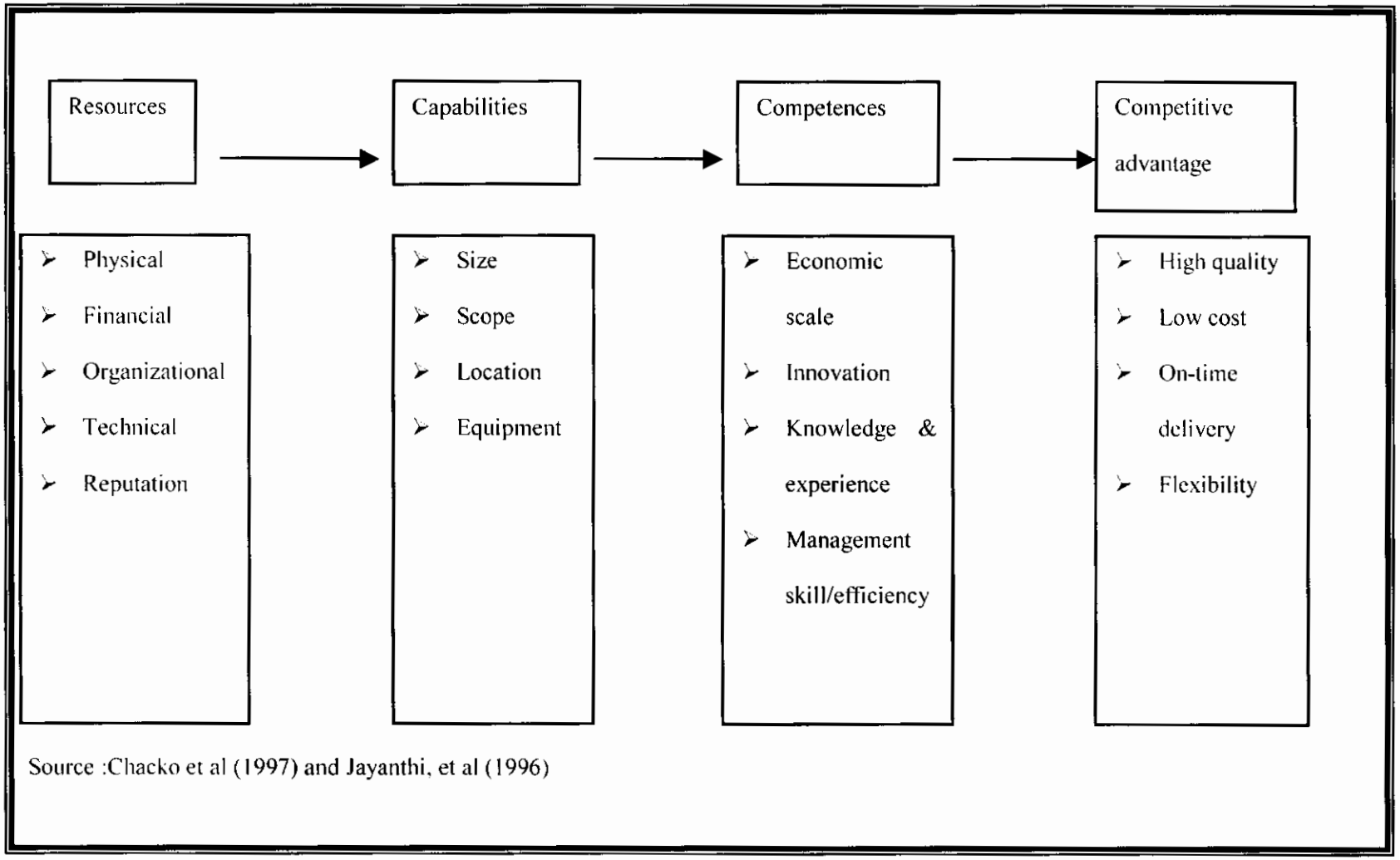
Heterogeneous and productive resources are useful only after being transformed into capacities. Capacities mean a set of activities firms can perform given endowed resources. Some activities are inferior to their rivals, and some are equivalent to or better than competitors. Superior activities can be referred to as the firms' competences. As mentioned by McGrath et al (1996), competences will be the necessary condition for creating competitive advantages since competitive advantage also depends on other external factors. The route from heterogeneous resources to competitive advantages is presented in the Figure 6.

Figure 5. The cornerstones of competitive advantage



Source: Peteraf 1993 p.186

Figure 6. The route from resources to competitive advantage.



Source :Chacko et al (1997) and Jayanthi, et al (1996)

3.8 Summary:

In this chapter, determinants of an individual firm's competitive advantage are demonstrated in three domains. The economic view on competitive advantage uses productivity and efficiency as measures. The frontier method shows that inefficiency can be presented in two ways, technical and allocative inefficiency. The traditional management theory, like Porter's work (1985, 1990), emphasizes factors which lead to competitive advantage. From Porter's work, firms gain competitive advantage by way of least cost and differentiated products. The resource based theory contends that competitive advantage is based on valuable idiosyncratic resources firm's possess and how efficient firms nurture and use these scarce resources. The economic method is more concerned with the use of quantitative models to measure productivity, while strategic management describes factors creating competitive advantage. Above all, analyses at the firm level clarify the way to view competitive advantage. Systematically, high productivity, least cost or differentiated product, and higher return on deployed resources through efficient activities all can be used as criteria for evaluating competitive advantage.

Chapter 4

Competitiveness at the Industry Level

4.1Introduction

In this chapter, competitiveness will be analyzed at the industry level. Porter's (1990) four determinants of industry structure and government policy will be looked at in detail. The main purpose of this chapter is to determine important factors influencing industrial competitiveness between Canada and the U.S.

4.2 Factors influencing competitiveness at the industry level

When analyzing competitive advantage, Porter (1990) argued that it is better to do research on competitive advantage at the industry level rather than at the national level. Various industries, or the same industry in different nations, operate in quite different operational environments. Each nation contributes to competitive advantage or disadvantage through stimulating innovation and improving or providing skills and resources. Porter (1990) comments that nations have four attributes that shape the environment in which the industry will compete.

Factors: including endowed resources and infrastructures such as capital, skilled labor, land, water, energy, weather, geographic locations, transportation, and communication facilities.

Demand: conditions of the home or targeted market demand that could shape the industry.

Related and supporting industry: advantage from the supporting industry or benefit from coordination with upstream or downstream sectors can strengthen competitiveness.

Firm strategy, structure and rivalry: are conditions that explain how companies are created, organized and managed in the nation, and how the domestic competition environment is formed through rivalry.

All four determinants, named "diamonds" by Porter, create the overall context where firms operate and compete. Competitive advantages for an industry can be explained on the basis of available resources, investment directions of these resources, and efficiency achieved through entrepreneurship or competition.

How these determinants work:

Factor conditions: resources applied in production will relate to the quality and cost of inputs. Resources include: Human resource, input materials, capital resources, knowledge resources, and the social and economic infrastructure. A low cost of natural or labor resources can bring a nation's firms cost advantages, but these advantages also might lessen the need to develop higher level competitive advantages, such as product differentiation, which is characterized by unique product development and intense utilization of technology and capital.

Demand conditions: The domestic or targeted market demand will define how big the industrial sector will be. The growth rate of demand is the main factor for new investment that an industry can attain. A sophisticated domestic consumer would help to design and develop new generations of products that grant leading product-development advantages. High standard products in term of quality, variety, and safety required by sophisticated domestic consumers would award a firm valuable competence to enter new markets. In the agri-food industry, consumer concerns beyond price have been widely identified. Because of increased income, consumers are willing to pay a premium for good quality (safe, tasty, nutritional, and organic products). Consumer demand has changed food supply structures. According to Streeter et al (1991), the final product's attributes and improvements in processor efficiency will start from the breeding stage. Information technology and biotechnology enable tailored products to reach consumers through the effort of different food chain participants under close coordination.

Related and supportive industry: Since industrial specialization has occurred in almost all sectors, there are many stages and participants involved. The final product is the combined effort of the equipment manufacturer, raw material provider, product designer, and internal cooperation among various levels of a firm. A quick response to market conditions and the timely development of new products are the primary tasks

for winning market share. This task needs coordination and a joint effort among different levels either inside or outside the firm's structure. In meat production, vertical coordination or integration are important ways to improve efficiency of processors by obtaining input materials with specific traits, arranging timely supply to cut equipment idle time and maintenance expense, and to reduce food contamination during processing and transporting (Boehlje,1999).

Firm strategy, structure and rivalry: Rivalries, from the same industry sector, create pressure on firms to improve and innovate. Rivals force each other to lower costs, improve quality and service, and create new products and processes. Trade barriers and geographical distance will limit competition from foreign producers. The industry structure formed by market conditions such as intensity of rivals and substitute products, potential entrants, and government regulations will limit the firm's possible strategy set.

These four determinants shape national competitiveness. Government policy was not included as a fundamental factor, but rather has a broad effect on these four factors. Coffin et al (1993 p 461) state: "the role of government is to condition the four determinants and thus create the necessary linkages to stimulate entrepreneurship and competitiveness." Government funds for agricultural commodity research can indirectly enhance the competitive advantage of the processing sector through lower costs of input materials or

by improving input quality. Other government programs will encourage firms to pursue appropriate strategies to compete on international markets. For example, the government will provide financial and tax incentives for investment and export of technology or export oriented products.

Government policy can have both short term and long term effects on agricultural competitiveness. For reasons of national food security, government might support the domestic agricultural industry through subsidization and tax exemptions, thereby lowering the input cost for the processing industry. "Lower priced inputs lead to decreased costs for the downstream firms and an increase in their competitiveness relative to foreign rivals." Harrison and Kennedy (1997 p7). Similarly, export subsidies also have a direct effect on industries. Government export subsidies decrease the price at which domestic industries are willing to sell various quantities of their product. Such a policy enables the subsidized industries to expand their share of the world market. At a higher level of competition, which is symbolized by innovation and capital investment, government policy might strengthen an industry's sustainable competitive advantage by way of facilitating factor accumulation and increasing factor productivity, removing the impediment of developing a financial structure, and a technology structure.

Effects of government policies are mentioned in Sharples, (1990) research on the wheat industry. He illustrated various ways that government

policy can influence commodity supply. These include: 1) accumulating fixed resource stock for production and marketing, 2) increasing the efficiency of the firm, 3) reducing the input price, 4) lower interest rate, 5) lower taxes or increase subsidies, and 6) undervalue the domestic currency. Above all, keeping and attracting capital goods into a production system, regulating the system to improve efficiency, and helping producers survive in cases of adversity are purposes of government policy.

As to the government's policy influencing the industrial environment, Van Duren et al (1991p 730) state:

"Government has an impact on competitiveness because it controls a nation's business environment, through fiscal and monetary policy, research and development policy, market structure (through competition policy), education, training and labor policy..."

Government policy, together with other factors such as input price and demand conditions, form an external environment in which firms operate.

Martin and Stiefelmeyer (2001) perceived the negative effect of government policy on the food processing industry. The higher tax level and onerous regulatory burden in Canada contribute to a negative competency for Canadian food processing firms compared with those in the U.S.

4.3 Measurement of competitiveness at the industry level

The competitive position of the processing industry has been measured from different perspectives. The most common view of competitiveness is that market share will reflect the firm's or the industry group's competitive position. But, in some situations, firms can win market share by way of a low price strategy while cutting the expense of R&D, which would sacrifice long term development for present benefit. Government policies also help firms acquire a share of domestic and international markets through trade policy, even though firms might be less competitive both in terms of cost and product differentiation. Therefore, competitiveness should be measured from the following points of view: market share, profit, and the ability to maintain and enhance these positions, Competitiveness may also be measured by way of productivity. Higher productivity provides an advantage for firms to be successful.

Martin et al (1991) evaluated the competitive status of the Canadian food industry against U.S. counterparts from 1980 to 1988. They used value added per unit (sales, plant, worker, and wages) as a proxy for profit, and the net export orientation ratio as a proxy for market share. They found average value added per worker (which represents labor productivity) of the Canadian poultry industry was higher than in the U.S., but this advantage had gradually disappeared by the end of the 1980s, while value added per plant in the U.S. was higher than in Canada. They explained that the U.S. industry's

expansion and consolidation had contributed to the large economic scale of production and lower cost of operation. As to market share measurement, Canadian figures are less than those in the U.S. Due to protection from high tariffs and Canadian import quotas, the market share comparison is meaningless as an interpretation of competitiveness if the free market assumption is not valid. Overall, they concluded that the whole food industry in Canada is less competitive compared to the U.S. industry. Martin and Stiefelmeyer (2001) revisited the competitive situation between the Canadian and the U.S. poultry processing industry. The results show productivity (measured through three ratios of value added: per employee, per dollar of wages and salaries, and per dollar of sales) of the Canadian poultry industry had doubled but U.S. productivity more than tripled over the same period. Labor productivity in the U.S. had grown at more than double the rate of Canada; 8.1% to 4.1% respectively.

Chan-Kang et al (1999) measured productivity growth of Canadian and U.S. food manufacturing. They determined that an ability to maintain and improve productivity is critical for firms to succeed in a competitive market. The primary and dual rates of productivity of the U.S. were higher than those of Canada from 1963 to 1992. They attribute lower productivity growth in Canada to less capital utilization (the capital shadow price is lower than the corresponding market price) and underinvestment in technical change. Also,

materials saving technologies adapted from abroad fail to take advantage of relatively lower manufacturing wage rates in Canada.

4.4 Summary

In this chapter, factors influencing industry competitiveness are identified. There are many external factors at the industrial level that will influence a firm's performance. Various local market conditions in different nations will endow firms with different resources and therefore enable firms to undertake different strategies to be competitive. Porter (1990) classified sources of industry competitiveness into four determinants. Government policies have broad impacts on each of these four determinants. In the Agri-food industry, food products go through several stages until the final products reach the consumer. Coordination among different stages is necessary to improve product quality and to lower cost. Macro economic conditions will affect an industry's ability to adapt new technology and attract capital investment, which is critical for firms to remain competitive. The context of market structure and government policy should be taken into account when assessing competitiveness at the industry level.

Chapter 5

Review of Canadian Poultry Processing Industry

5.1 Introduction

This chapter presents the Canadian poultry processing industry's profile, structure, development, and policy issues. The objective of this chapter is to provide a descriptive analysis of the poultry processing market. The profile of the sector contains general information on poultry processing. The structure of the sector provides more detail on the production and marketing. In the development sector, the trend of the industry structure and conduct will be presented. Because industry competitiveness is a comparison of performance, it will be determined by how well one industry's performance is compared to its competitors. Thus, there is a need for an understanding of the market environment and production factors in those markets.

5.2 Industry profile

The Canadian poultry processing industry is one sub-sector of the food manufacturing industry. It includes any manufacturing activities required to transfer raw and live poultry into intermediate and final product. Poultry processing is one of the most highly mechanized sectors in the agriculture and food system. Most processing jobs are done by machines, such as killing, defeathering, eviscerating, chilling, and packing. Semi-automated jobs

include cutting, deboning and inspecting. According to NAICS (North American Industry Classification System, Statistics Canada, 2003), in 2000, the industry was composed of 156 active establishments with total revenue over $30,000 a year. The total number of employees was approximately 19,000 in 2000. The poultry product category includes chicken, turkey, ducks, geese, and game birds.

In 1996, chicken accounted for 76% of total poultry meat shipments, turkey, and other species accounted for 13% and 10% respectively. The primary processors are engaged in grading, slaughtering, eviscerating, cutting, and dressing birds. The products from the primary stage are chicken parts, and whole fresh or frozen chicken or turkey. Further processors add value to the primary product by providing cooked products like nuggets, sausages, entrees, and fingers. Most poultry products are sold in parts. For the Chicken industry, part products accounted for 60% of total volume, while 10% was sold as whole birds and 30% was used in further processing (AAFC, 1998). Convenient cut-up parts were sold more than whole birds.

The poultry processing industry has undergone rapid growth; the value of shipments increased from $2.36 billion in 1990 to $3.39 billion in 1999, an increase of 43.6%. (Table 1). The average value-added[3] growth rate in the Animal Slaughtering and Processing sector was 4.7% annually, and for the

[3] "*Manufacturing value-added, a measure of net output, consists of manufacturing shipments plus net change in inventory of goods in process and finished goods, less cost of purchased inputs (which are the cost of materials and supplies used and the cost of fuel and electricity) for manufacturing activities*"-- ***Industry Canada***. *Definition of value added. 2003*

poultry processing industry, the growth rate was 5.9%. In other words, the poultry processing industry expanded its market by adding more value to its products than the average value of the whole meat processing industry.

In the food market, poultry products compete with pork and beef for shares of the meat market. Poultry consumption has replaced beef and pork as the consumers' primary choice. Annual per capita consumption of poultry meat increased 64% to 36.5kg in 2002 compared to 22.3 kg in 1980, whereas other meat products (beef, veal, pork) decreased approximately 18% over the same period. Total meat consumption per capita remained unchanged. This can be seen in Figure 7.

5.3 Industry's structure

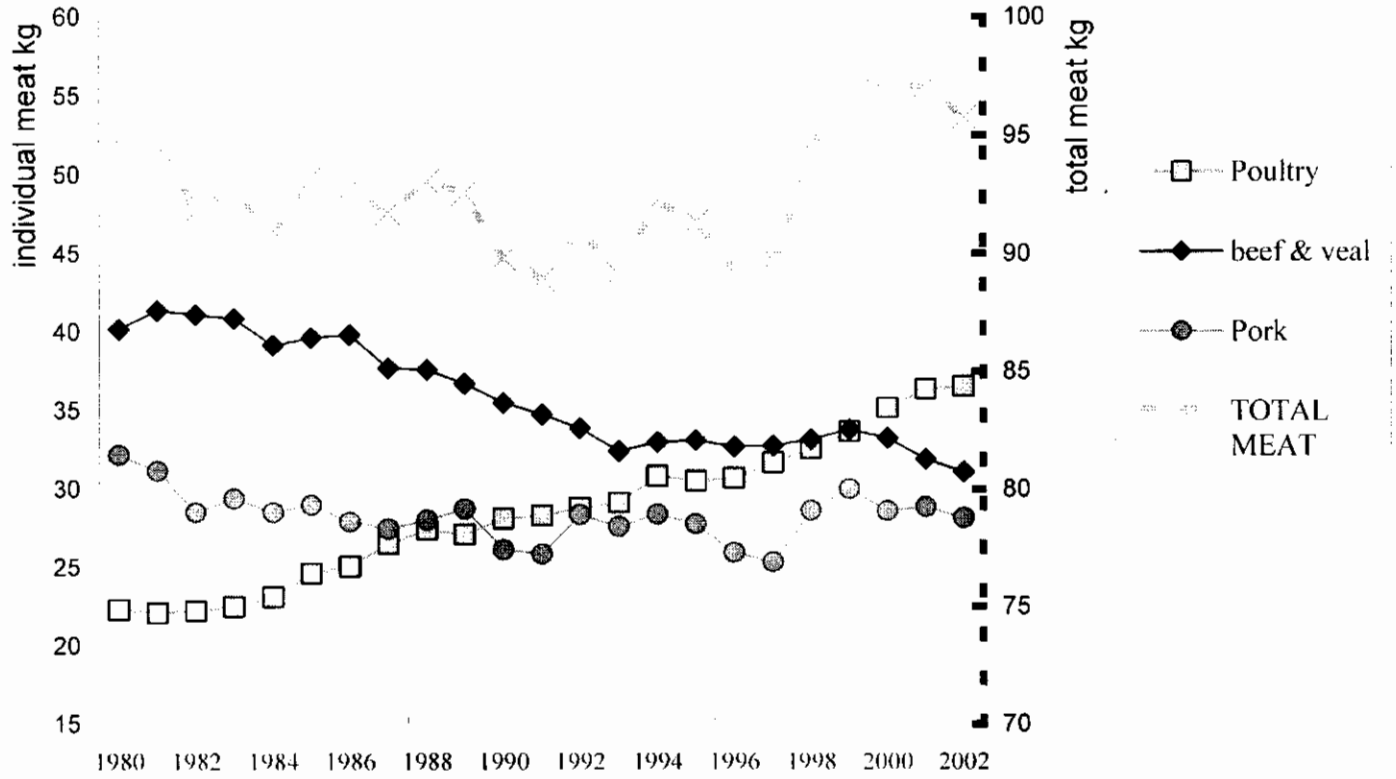
The poultry processing industry has followed the industrialization trend of becoming more concentrated. The market shares of the top eight processors (C8) were 47%, 55%, and 59% in 1990, 1995, and 1999 respectively. (Unpublished ASM micro data, Statistics Canada 2004).

Table 1. Manufacturing shipments of the Canadian poultry processing industry

Principal statistics (Dollars)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Manufacturing shipments (x 1,000)	2,361,998	2,368,215	2,436,450	2,597,733	2,645,792	2,616,047	2,922,626	3,239,545	3,431,638	3,391,668

Source: Statistics Canada. ASM 2013 (2003)

Figure 7. Annual Canadian meat consumption per capita (kg)



Source: Agriculture and Agri-food Canada 2003.

This trend might reflect structural adjustments due to technological change and economies of scale and scope. A high C8 ratio also indicates the situation where large firms can influence the market and raise their profit level by charging an output price higher than their marginal cost. The cost efficiency gained from increasing economies of scale together with higher profits as the result of market power will have a mixed effect on output price. Material and labor saving technologies are widely used in the poultry processing sectors. The average capital stock per worker in the meat processing industry was around $ 60,000 – 65,000 during the 1990s (Statistics Canada 2003 table 031-0002). The capital and technology invested will substitute for a plant's labor and save on input materials and therefore raise performance efficiency. This growth in efficiency is reflected in the shipments per worker or value added per worker and is shown in Table 2. Other benefits from capital and technological investment are improvements to food quality (uniformity, nutrition, taste, appearance, shelf life and consumer convenience) and safety. Information technology enables a firm to improve product quality at different stages of production, and to programs on mandatory safety control – like HACCP (Hazard Analysis and Critical Control Point) are also important factors associated with new technology adaptation. Plants are required to follow HACCP and to adopt improved practices and equipment to meet safety conditions.

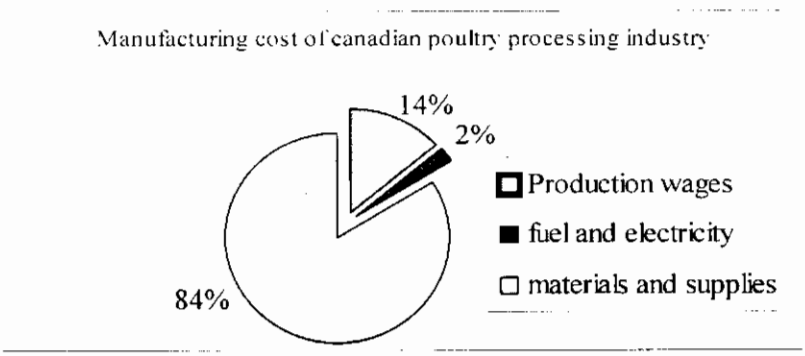
According to Industry Canada, the manufacturing cost of the Canadian poultry processing industry includes the costs of materials and supplies, energy costs and wages. The input materials include farm products and packaging. The manufacturing cost doesn't include investment in fixed assets and other costs of non-manufacturing activities. Manufacturing cost is shown in Figure 8. The information from Figure 8 indicates that input materials account for the largest proportion of total operation costs. Manufacturing costs are subject to fluctuation in input price. The output price trend can be shown by the industry product price index (IPPI) in Figure 9. Figure 9 shows that the chicken price index remained below the index levels of other meats except for Pork before 1997. Compared to the pork price index, Chicken price remained flat over time. A cheaper price, as shown in Figure 9, and increased production enable poultry products to retain a competitive positions in the marketplace.

Table 2 Output and value added per employee in Canada (NAICS 311615)

Output Per Employee Principal Establishments** Manufacturing Shipments and Manufacturing Value-Added 1992-2001 Poultry Processing National Industry (NAICS 311615)				
Type of Output	Value in $thousands		CAGR* 1992-2001	% Change 2000-2001
	1992	2001		
Manufacturing Shipments per Employee	166.0	218.1	3.1%	7.9%
Manufacturing Shipments per Production Worker	189.2	240.8	2.7%	9.0%
Manufacturing Value-Added per Employee	48.3	62.0	2.8%	0.4%
Manufacturing Value-Added per Production worker	55.1	68.4	2.5%	1.5%
Notes: * Compound annual growth rate ** Incorporated establishments with employees, primarily engaged in manufacturing and with sales of manufactured goods equal or greater than $30,000				

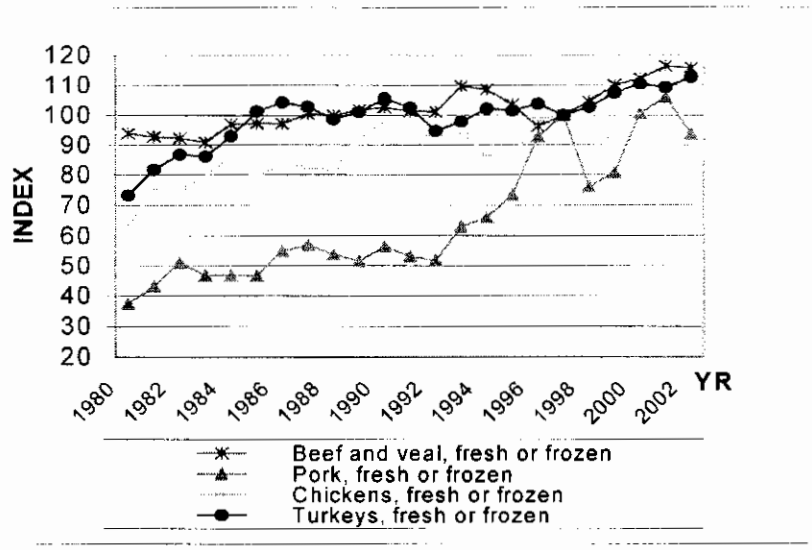
Source: Industry Canada 2003

Figure 8. Manufacturing cost activities in 2001



Source: Industry Canada. Manufacturing cost. 2003.

Figure 9. Main Meat Product IPPI (1997=100)

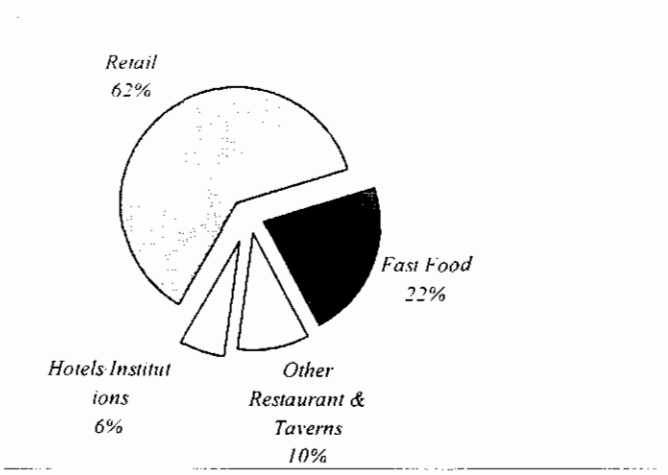


Source: Statistics Canada IPPI. 2003

Ontario and Quebec are the main poultry production areas in Canada, accounting for 60% of national output (AAFC. 1998). The primary processing plant is usually located near the live bird production site because of weight and quality losses of live birds during transportation, such as body bruising and death. The primary products include the eviscerated whole bird and cut up or deboned parts. Approximately 30%-40% of primary processed products go for further processing. Cut up parts have exceeded whole birds to be the main primary processed outputs. According to ASM micro data on input and output from Statistics Canada, fresh or chilled cuts and offal accounted for about 59% of total chicken shipment value in 2001. Channels between processor and consumers are composed of food retailer and food service (restaurants, hotel and institutions). These are illustrated in Figure 10.

The Canadian poultry industry is protected from import competition by high TRQs (Tariff Rate Quotas). Approximately 7.5% of domestic chicken production and 3.5% of domestic turkey production on the ICI (Item Control

Figure 10. Chicken retail and food service channels



Source: Chicken Data Handbook (2003). CFC

List) can be imported without high import duties. Products on the item control list include most primary processed products such as eviscerated whole birds and prepared parts. Highly processed products with less poultry content can be imported without constraints. Imports over quota are subject to a high rate, around 240% tariff (Myles 2003). According to Huff et al (2000), the price preserving tariff for Canada's wholesale chicken products was about 28% from 1995 to 1999; that means the minimum tariff rate can be applied to import product, without changing domestic price levels. This estimated tariff rate (28%) is far below the current tariff rate of 240%. The import and export values are shown in Table 3.

Canadian poultry production is controlled by Marketing Boards. Since the 1970s', the CFC (Chicken Farmers of Canada) and the CTMA (Canadian Turkey Marketing Agency) together with provincial marketing boards have regulated the market through production quotas allocated to producers. Primary processors are permitted a certain base level to purchase their live bird inputs, and this base level will adjust by total industry production each year. Processors can contract with individual farmers to ensure product specification and input qualities. The live bird price is jointly decided upon by representatives from farms and processor groups. Although the supply management system stabilizes the input price of processors and ensures the guaranteed income for farm producers, but, on the other hand,

Table 3.Value of Imports and exports for Canadian poultry processing industry in Canadian dollars

	1998	1999	2000	2001	2002
EXPORT	112,528,000	96,154,000	124,813,000	169,184,000	180,997,000
IMPORT	309,307,890	288,346,816	310,483,282	367,876,911	377,609,856

Source: Industry Canada. Trade Data online. 2003

argued by CPEPC (The Canadian Poultry and Egg Processors Council), higher input cost and less coordination to improve quality and efficiency make Canada's poultry processors less competitive compared to competitors in the U.S.

resource utilization. This will increase the speed with which the industry can respond to consumers. In the U.S. poultry industry, most big integrators own their own breeding flock and use the specified breed and size as the input for different processed products. Boehlje (1999) indicated that competition will not be conducted by individual firms, but by different supply chains.

The trend toward global free trade also affects the poultry industry. Under the WTO (World Trade Organization) and NAFTA (North American Free Trade Agreement), the current supply managed system is under pressure to be modified. Canada has committed to gradually open its food market. Higher costs of live birds in Canada relative to the cost for U.S. processors will endanger the whole poultry industry if the market is opened to U.S. competitors. To face the competition, Canada's poultry producers and other sectors within the industry should develop strategies to narrow the cost gap. The processing plants also need to improve their cost efficiency, increasing production line speed, inspecting speed, adopting labour saving and information technology, reducing the contamination rate and wasted byproducts, and provide the market with a more differentiated and value added product.

Chapter 6

Methodology

6.1 Definition of competitiveness

Using the 1990 agri-food task force definition, competitiveness is the sustained ability to profitably gain or maintain market share (Martin and Stiefelmeyer 2001). By this definition, there are three ways to measure competitiveness; Profitability, Market share, and Growth. Each element is represented by various indicators (Table 4).

6.2 Profitability measurement

Among these three elements, profit measurements need to be read with caution. It might be straightforward that profit data can be obtained from a firm's financial reports. The meat processing industry's profitability information can be obtained from a recent research paper by Burroughs and Harper (2002) for Canada and Schumatcher (2003) for the U.S. The average ROR (rate of return) on long term capital for Canada's meat processing sectors is around 10.5% (1990-1998). The U.S. meat industry has a ROA (Return on Assets) rate around 10.4% (1980-2001), thus the profitability (based on these measures) looks very similar for the meat industry in these two countries. However, since many meat processors generally operate many different plants and deal with various animal species, it is hard to break

down profit information into just the poultry processing sector. Profits from consolidated financial reports reflect the overall performance. It is not an easy task to isolate poultry processing performance from other meat processing jobs. Furthermore, different methods of fixed asset depreciation (straight line or declining balance) can also alter the cost of fixed asset allocation. Also, an optimized tax treatment makes the reports less accurate to reflect true economic performance.

Table 4. Competitiveness measurement.

Profitability	Market share	Growth
• Value added per dollar of sales • Value added per wage dollar • Value added per worker	Net export orientation ratio	Change in growth rate along time path

Note: Net export orientation ratio = (export – import) / total domestic production

Value added data provides an alternative way to measure and compare profit at the industry level. According to industry performance of poultry processing by Industry Canada (2003), manufacturing value added is usuallyreferred to as gross margin: revenues after variable costs and net change of inventories of in-process and finished goods are taken into

account. The value added data includes other paid inputs, such as labor and capital service. By subtracting input materials costs and energy costs from the value of shipment, value added data excludes any effect of input price fluctuation on shipments and cover labor cost, non-variable costs and profits. According to Adelaja (1992), raw materials are the major cost of the food processing industry, where 60% of production expenses of food processing was on farm products in the U.S. Results from Ollinger and Milton (2000) showed the cost structure of the U.S. poultry slaughtering sector. For the chicken sector, labor, capital and other material inputs together only accounted for about 30% of total cost. A large share of animal inputs indicates that it is the dominant force driving the manufacturing costs and whole-sale price. They also found that if the whole bird share of output rises, the cost will decline. The information on cost structure of Canada's poultry sector shows about 84% of manufacturing cost (including materials, labor and energy expenditures) was on materials and supplies; see Figure 8. It is also known that the value added for the poultry processing industry in Canada accounts for about 30% of total shipment value (Statistics Canada Annual Survey of Manufacturers 2003). Of this value added, about half of it is for salary payments. The value added after salary will be around 15% of total shipment value, which is fairly close to the profit margin. The second reason for using value added data is that information from value added data also reflects the level of differentiation. As the food processing industry

changes its products from homogenous to differentiated ones, a percentage of value added in total sales represents the level of product differentiation. The poultry processing plant outputs have changed from whole bird to more cut-up, from bulk package to smaller tray pack, from fresh meat to further prepared products. To this perspective, competitiveness is measured differently from the traditional view where the price is the only factor determining the extent of industry or firm success.

According to Martin and Stiefelmeyer (2001), the explanations for the value added ratios are given below:

Value added per dollar of sales. This ratio represents an approximation of gross margin. If free market competition exists, the growth of this ratio implies that the industry product mix is changing from a homogeneous commodity to more differentiated and valuable ones. This value added ratio reflects the income generating ability of the industry. However, the market structure also consists of a competitive environment. If monopoly or oligopoly market conditions exist, the high ratio of value added per sale might also include profits which are above normal levels.

Value added per wage dollar. The information from this ratio indicates the effect of industry scale. If this ratio increases, the industry will generate more revenue to pay for capital cost and other fixed costs after paying for labor.

Value added per worker. This ratio is referred to as "labor productivity". It represents value created by each worker. However, this ratio is more about "capital productivity". The capital stock allocated to each worker and the labor knowledge required to run equipment and technology will have a synergistic effect on this ratio. Economies of scale and levels of technology are the main ways to improve this ratio.

6.3 Rethink the value added methods

Using value added data to evaluate industry performance will be subjected to problems if the comparison is done for the same industry in different countries or between different industries in the same country. In cases of comparison of the poultry processing industry between two countries, the value added ratio can be influenced by the following factors.

1) The extent of service provided.

One reason for poultry products becoming popular is their versatility. Characteristics such as requiring less time for preparation result in chicken being the main choice for the fast food industry. Chicken nuggets and BBQ chicken are widely served in restaurants and are marketed in pre-cooked packages in grocery stores. Thus, the proportion of further processed poultry products in total poultry sales will likely keep increasing. The level and form of service or value-added are determined by different consumer preferences and their income. Theoretically, the price for value-added will not exceed the

consumers' contingent costs if the same food can be prepared at home. In this case, contingent costs are determined by consumer income and leisure time. Generally, with high income and fast life style, consumers will likely outsource food preparation to processors. Also, the consumer's attitude to different meat products will determine ways of allocating the food dollar to different products and their added value.

"The National Chicken Council also released the results of a survey showing that chicken outscored beef and pork on every attribute explored in the survey, which included versatility, taste, ease of preparation, being healthful and nutritious, price, and consistency of quality.

Chicken's strong showing in the survey helps confirm that consumers have great confidence in a variety of chicken's attributes," said William P. Roenigk, NCC senior vice president and chief economist.

(Source: http://www.eatchicken.com/statistics/pr_050100.cfm)

2) Cost of input and profit level.

The product's value added is highly correlated with the input price. For example, increasing raw material price or labor cost might result in an increased output price. Under the same demand condition, consumers will buy less when facing a higher price. In the short term, when facing declining revenue, firms might lay off workers or reallocate productive resources for other uses, which, in turn, will reduce the total inputs and the firm may turn to products for which the demand is less elastic. Inelastic products usually are

raw commodities or less differentiated commodities. As a result, the amount of shipment value and value added will decrease. The changing direction of value added ratios will be decided jointly by reducing rates of shipment value and value added. Or, as was the case in Canada, the higher concentration at the retail level will force processors to absorb increased input costs by reducing their value added level (Lake 2000). The profit processors can make will depend on demand conditions and market competition. Under some circumstances such as market monopoly, higher profit also implies high value-added levels.

3) Different market structures

In different marketing systems, dissimilar cost combinations might make the method of value added a useless tool for profit comparison. Food industries such as cereals spend about 60% of sale revenues on advertising, sales promotion, overhead as well as profits. Higher value added ratios per sale mean higher non-materials inputs in this case. For the poultry processing industry, the structure of the industry in Canada is quite different than in the U.S. In Canada, the production sector is regulated by Marketing Boards where the quantities are planned and allocated in advance by the federal council and provincial agencies. Imports are strictly controlled through high tariffs and quotas. Although the regulated market can stabilize input prices, it may cause inflexibility for processors to cope with market fluctuations. The processor's difficulty of acquiring raw material would likely

lead to lower capital utilization. In the U.S., a high degree of vertical coordination in the poultry sector synchronizes production and processing activities by way of contract or ownership integration. The reasons for vertical integration lie partly in location and equipment specialization. This specialization ties buyer and seller together, making other alternative business arrangements hard to achieve in the short run. The importance of quality improvement and product reputation also add to the rationale for vertical integration. In case of ownership integration, processors also provide extra services such as feed supply and veterinary services which do not belong to the processing operation. All these extra services will generate more income and more value added for processors.

Above all, when value added data are used for profit measurement, different components of value added should be carefully disaggregated and factors leading to different levels of added value should be taken into consideration. To compare the poultry processing industry between Canada and the U.S., the most important consideration is the wholesale price difference of the processed product. Canadian wholesale prices are much higher than those in the U.S. In spite of other considerations such as quality issues, the wholesale price in Canada will probably lead to shipment value and value-added ratios higher than those if wholesale prices and input prices were the same as in the U.S. In this case, the higher added value is simply the result of a higher market price if product quality is similar.

The value added comparison method can be used to compare two industries which have similar product composition, similar scale, and similar market structure under free market conditions. In other words, only if the cost structures of operations and demand conditions are the same, the ratio of gross margins can represent the ratio of net profit. Otherwise, the value added comparison should incorporate an efficiency analysis if different cost structures exist. According to the definition of competitiveness, the competitive industry should retain a sustainable profit and market share under free competition. Among various competitiveness drivers, government policies protecting the domestic production system from import competition can hardly be treated as a sustainable means of enhancing profitability and market share.

6.4 Adjustment of value added to make comparison more reliable

In cases of any differences of cost combinations and market structures, there are two ways to refine the value added ratio analysis.

A. Efficiency comparison

Efficiency analysis is necessary to compare two industries operated in different systems. It compares the industry efficiency of transferring raw materials into marketable products. Economies of scale, capital utilization, technology level, and inventory control can be selected as variables to

investigate different efficiency levels. The indicators of efficiency are as follows:

- Shipment value per plant
- Capital stock per worker
- Capacity utilization ratio
- Inventory / total shipment value ratio
- Physical output per worker

Shipment value per plant represents economies of scale, where large economies of scale will lower unit cost. The capital utilization ratio and inventory control represent management practices to fully utilize available resources. Capital stock per worker and physical output per worker can be used as indicators of technology and efficiency in two different marketing systems. The physical output per worker also should be jointly analyzed with the output product mix. The operation costs of small tray pack products and further processed products will be higher than those of whole bird and bulk packages, and these further processed outputs require more labor and capital input. The factor of different output mix should also be taken into account when analyzing output per worker.

The results of an efficiency comparison between two countries will provide reliable information in addition to a value added ratio comparison. At the same level of value added per unit, if efficiency indicators for one industry are lower than its comparators, it will suggest that the industry with lower

efficiency will make less profit than its counterpart if the output prices are the same, because value added per unit for the less efficient industry includes extra costs compared to the competitor.

B. Adjusted value added data using the U.S. price spread between farm and wholesale.

Wholesale prices are different for the two countries, with the Canadian price being higher than that in the U.S. The value added comparison needs to exclude any price disparity which is not the result of free market competition. In other words, the higher wholesale prices can raise the total value added. In order to exclude the price difference effect between the two countries, simulated prices are composed by adding Canadian current input material prices (live bird input) to the U.S. price spread between farm and wholesale price. This adjustment is based on the assumptions that (a) the qualities of poultry products between the two countries are similar, (b) the Canadian poultry processing industry can adapt to the same level of economies of scale as the U.S and use similar technologies, and (c) have access to similar productive factors at the same cost.

6.5 Market share measurement

The second dimension of competitiveness is market share. Here, market share should be considered under free market conditions. Because the Canadian poultry market is protected by government policies from foreign

competition, tariffs on chicken cuts, either fresh or frozen, range from 238% to 249% if imports exceed TRQ[4]. Taking into account that export value is much less than import value, any change of net export is mainly the effect of tightening or loosening import control.

6.6 The growth measurement

The third dimension of competitiveness is the industry's ability to remain competitive or to improve competitiveness. The productivity growth rate comparison shows an over-time competitive position for both countries.

There are many ways to measure productivity. Basically labor productivity, a primary indicator of productivity, is measured by units of output per worker or units of output per wage dollar. However, labor productivity is often associated with capital stock. Skill levels of workers and capital stock have a synergistic effect on labor productivity. The TFP (Total Factor Productivity) index includes all input factors (labor, capital, and materials) and represents overall productivity. Traditionally, the Productivity Growth Model was based on an assumption of perfect competition, CRS (Constant Return to Scale) and instantaneous adjustment to inputs. According to Morrison (2000) and Adelaja (1992), the production function and cost function are specified as follows:

$$Yt = F_T (X_t, T_t) , \quad TC = TC(p,t,Y) \qquad (1)$$

[4] Tariff Rate Quota, which is assigned 7.5% of domestic production of the previous year (Myles 2003).

Y_t output at time t.

X_t input at time t, usually containing three categories: labor inputs(X_L), capital inputs (X_K), material inputs (X_M).

P is price vector.

T_t is value of trend variable (technology proxy) for time period t

TC is total cost for production level Y.

For $Y_t = FT(X_t, T_t)$ Differentiate t with respect to Y,

$$(\partial Y/\partial t)*dt = F_{Tt}*dt + \sum(\partial Y/\partial Xi)*(\partial Xi/\partial t)*dt \quad (2)$$

Under profit maximization and perfect competition assumptions, the marginal benefit of input i will equal the marginal cost (market price), $PY(\partial Y/\partial Xi) = Pi$

$$(\partial Y/\partial t)*dt = F_{Tt}*dt + \sum(P_i/P_y)*(\partial X_i/\partial t)*dt \quad (3)$$

or

$$(\partial \ln Y/\partial t)*dt = (F_{Tt}/Y)*dt + \sum(S_i)*(\partial \ln X_i/\partial t)*dt \quad (4)$$

so the primary productivity growth index

$$e_{Yt} = (F_{Tt}/Y)*dt = d\ln Y/dt - \sum S_i*(d\ln X_i/dt) \quad (5)$$

Si is the share of input j in terms of the value of total output (Pj*Xj/ PY* Y)

Similarly, The dual productivity growth index

$$e_{Ct} = \partial \ln TC/\partial t = d\ln TC/dt - d\ln Y/dt - \sum M_j(d\ln P_j/dt) \quad (6)$$

Where c is unit cost derived by (total cost/ output) under CRS,

From equation (8), the output price is determined by multiple explainable variables: markup over marginal cost, where marginal cost is determined by economies of scale and average cost.

$$\Delta P = \Delta \varnothing + \Delta \varepsilon + \Delta C - \Delta Q \quad (9)$$

Where ΔC is the change in input cost, ΔQ is the change in output quantity.

The growth of output price is dependent on the markup, economies of scale, production cost, and quantities supplied.

From the dual cost function, the rate of change in cost is

$$\Delta C = \varepsilon \Delta Q + \sum Ki\, \Delta Wi + \Delta T \quad (10)$$

Where Ki is the share of the ith input, and ΔWi is the input price

Substituting (10) into (9), the growth of output price is

$$\Delta P = \Delta \varnothing + \Delta \varepsilon + (\varepsilon - 1)\Delta Q + \sum Ki\, \Delta Wi + \Delta T \quad (11)$$

From the perspective of market supply and demand, the output demand growth rate ΔQ is

$$\Delta Q = \lambda + \eta\, (\Delta P - \Delta D) + \gamma \Delta Y \quad (12)$$

Where λ is the demand time trend, η is the price elasticity of demand, γ is the income elasticity and D is a deflator.

The Total Factor Productivity Growth can be calculated by

$$TFPG = A\, \Delta Q - (1/\theta)\, \Delta T \quad (13)$$

Where $A = (\theta - \varepsilon)/\theta = (P - MC)/P$ (Lerner index of oligopoly power),

$\theta = P/AC$.

The first right hand side item in equation (13) is the scale markup effect and the second is the technology change effect. If the industry is perfectly competitive and returns to scale exist, MC = AC = P. Thus, A becomes zero, and TFPG is therefore just equal to ΔT.

Substituting equation (12) into (11) solving for ΔQ and substituting the result into equation (13), yields

$$TFPG = B\eta\Delta\emptyset + B(\lambda + \gamma\Delta Y) + B\eta\Delta\varepsilon + B\eta[\sum(Ki\,\Delta Wi - \Delta D)] + (B\eta - 1/\theta)\Delta T \qquad (14)$$

Where $B = A/[1 - \eta(\varepsilon - 1)]$

In equation (14), TFPG further decomposes the source of productivity growth. Where $B\eta\Delta\Phi$ refers to the markup effect, $B(\lambda + \gamma\Delta Y)$ refers to the demand effect, $B\eta\Delta\varepsilon$ refers to economies of scale, $B\eta[\sum(Ki\,\Delta Wi - D)]$ refers to effects of input factors, and $(B\eta - 1/\theta)\Delta T$ refers to technology change. In order to solve equation (14), the information on markup level ($\emptyset$), factors from demand structure (η, γ, λ), and the cost structure (ε, T) for each year will be determined by conducting the followed regression.

According to the modified generalized Leontief production function

$$C(q, w) = qj \sum i \sum j\, \alpha ij\, wi\, 1/2 wj\, 1/2 + q\, t \sum i\, \gamma i\, wi + q2 \sum i\, \beta i\, wi . \qquad (15)$$

According to Azzam et al (2002), the aggregated Industry output price can be determined by

$$P = -[H(1+\Phi)]/\delta+\sum i\sum j\alpha ij\ wi1/2wj1/2+t\sum i\ \gamma iwi+2HQ\sum i\beta iwi\ . \qquad (16)$$

$H = \sum j\ sj2$ is the Herfindahl index, $\Phi = Sj^*\ \Phi j = Sj * d \sum i\neq j\ qi\ /dqj$ is the industry (weighted) conjectural variation, $\delta$is the semi elasticity of demand, and Wi is the input factor Xr's price (r : labor, materials, capital).

The factor demand equation:

$$Xr/Q = \sum i\ \sum j\ \alpha\ ij\ (wi/wj\ )1/2 + t\gamma i + HQ\beta i \qquad (17)$$

Where Xr is the input (labor, materials, capital)

Also, the Demand equation is developed by market conditions.

$$lnQ = do + \delta P + d2Y + \lambda t \qquad (18)$$

where $\eta = \delta P$ is the elasticity of demand and $\gamma = d2Y$ is the income elasticity. Y is the income and λ is the time trend.

The mark up capability Ø is equal to

$$Ø = P/MC = P / (D + 2HQE) \qquad (19)$$

Where $D = \sum i\ \sum j\ \alpha\ ij\ wi\ 1/2wj\ 1/2 + t\ \sum i\ \gamma i\ wi$ and $E = \sum i\ \beta i\ wi$

The ratio of output price to average cost θ is

$$\theta = P/\ AC = P / (D + HQE) \qquad (20)$$

Economies of scale

$$\varepsilon = MC / AC = (D + 2HQE) / (D + HQE) \quad (21)$$

Equations (16), (17) and (18) contain 5 main regression functions that will provide coefficients α ij, γi,, βi, η, λ, d. Demand Q and price P, input factor Xr are endogenous variables. Input factor prices Wi , income elasticity d2Y, time trend T, and the Herfindahl index H are exogenous variables.

The data used for (16), (17) and (18) were collected from Statistics Canada ASM micro level files. Data for material inputs and labor inputs at the industry level are available from the Statistics Canada online service. The capital input, according to Statistics Canada, is equal to the capital depreciation and capital opportunity cost. The aggregated capital input data only exist at the meat processing industry level (p level). The fixed asset data for the poultry processing sector is collected and aggregated through tax files. The relationships between depreciation costs related to fixed assets are calculated through regression techniques using individual firm data for 2001. The opportunity cost of capital is defined as the rate of return of 10 year government bonds. Some firms include operations other than poultry processing, therefore their fixed asset data are weighted by the share of poultry products'value among the firm's total shipments value. The income data is the Canadian family income index. Prices of poultry outputs are represented by the basket content index of fresh or frozen poultry meat. The

period covered is 1990-2001. The value of the time trend T is assigned from 1 to 12 to represent 12 years. Deflators for material inputs, shipment value, and capital input are used for the farm poultry price index, industry price index, and consumer price index respectively.

6.7 Competitiveness drivers

According to Martin et al (1991), there are seven "drivers" which can be used to explain the state of competitiveness between Canada and the U.S..

- Productivity
- Technology
- Product
- Inputs and Cost
- Industry Structure
- Demand Conditions
- Linkage

Based on the results of a questionnaire collected from approximately twenty senior managers in three food-processing industries (poultry, wheat-based products, and horticulture), Martin et al (1991) found:

a. Canadian productivity is lower than in the U.S. because of its smaller plants and a less intensive use of technology and R&D.

b. The Canadian industry spends less than its counterpart on R&D.

c. U.S. industries have advantages in term of products and marketing.

d. Most commodity prices in Canada are higher than in the U.S.

e. The firm concentration is higher in Canada than in the U.S.

f. The demand condition is different across the two countries, but this difference did not have a clear relation with competitiveness.

When competitiveness drivers are put together, Martin et al (1991) concluded that the Canadian industry is at a disadvantage compared to the U.S.industry. The Canadian industry needs to adjust to a larger size or build strength in flexibility in order to survive in new integrated markets. More than ten years have passed since the Martin et al (1991) study and these drivers need to be revisited to see if any changes have happened in Canada and the U.S.

Chapter 7

Results

7.1 Introduction

In this chapter, the results of analyzing the competitiveness of the Canadian poultry processing industry will be illustrated. Then competitiveness drivers explaining the cause of competitiveness will be compared between the two countries.

7.2 State of competitiveness

According to Martin and Stiefelmeyer (2001) competitiveness can be measured in three ways: Profitability, Market share and Growth. Each one can be represented by different variables.

Profit measurement: industry profit can be measured by the following ratios.

- Value added per dollar of sales
- Value added per wage dollar
- Value added per worker

The data for measuring these three ratios were compiled from ASM (Annual Survey of Manufacturers). From 1990 to 1996, the industrial data series were collected based on the definition of SIC 1987 (Standard Classification System). From 1997 to 2000, the data collected were in the

definition of the NAICS 97 (North American Industry Classification System). The shipment value and value added are measured as current prices. In order to measure the real growth, the IPPI (Industry Product Price Index) in Canada and PPI (Producer Price Index) in the U.S. are used as deflators. Because of data limitations, the base year for the price index is different for each country. For Canada, the IPPI base year is 1997, and for the U.S., the base year is 1982. This will impact a direct comparison between the two countries, although a comparison on growth rate can be carried out. Also, all values from the ASM are represented in their own currency. During the covered period, the exchange rate of the two currencies changed radically (one U.S. dollar increased from 1.17 in 1990 to 1.49 in 1999 in Canadian dollars). If U.S. prices are converted to Canadian dollars, the effect of exchange rate fluctuations will cause a direct comparison to be liable to factors beyond the industry's performance. Therefore, the value from two industries will remain in their own currency.

In Table 5, the data for the three ratios representing profitability are calculated based on ASM data. The price index and deflated price are also included to facilitate the comparison.

1) Value added per dollar of sales

As shown in Figure 11, value added per sale for both countries remained around 30% from 1990 to 1994. Since 1996, the figure in the U.S. outpaced the one in Canada and increased to around 43%, while the

Canadian figure remained at the 30%-35% level. The increased percentage of value added per sale means that a lower proportion of sales revenue is spent on input materials and energy, and increased shares of labor, capital cost, profit, and other fixed expenses. If all fixed costs and wage costs remain the same, the higher percentage of value added per sale means the industry creates more profit than was the case before.

2) Value added per wage dollar

As shown in Figure 12, value added per wage dollar is much different between the U.S. and Canada. Every wage dollar in the U.S. generates more added value than in Canada. The value added per wage dollar gap between the two countries has expanded since 1996. The fast growth rate of value added per wage dollar indicates that the U.S. has increased the share of other fixed costs (capital expense, other fixed costs) or profit. In Figure 13, the Canadian poultry processing industry's value added per wage dollar remained relative stable compared to the U.S in these ten years. The highest ratio for the Canadian industry appeared twice in 1994 and 1999, while the U.S. ratio kept an upward trend over time. Also, the deflated prices for both countries over time confirmed that the gap has enlarged since 1996.

Table 5. The result of profit measurement in Canada and in U.S.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
value added per sale	Canada	29%	29%	28%	32%	32%	28%	31%	29%	30%	34%
	U.S.	31%	30%	28%	30%	30%	36%	31%	38%	43%	44%
value added per wage dollar	Canada	1.85	1.80	1.68	2.01	2.08	1.71	1.97	1.86	1.99	2.16
	IPPI (1997=100)			92.7	94.7	89.8	89.4	99.1	100	98	94
	Canada deflated value			1.81	2.12	2.32	1.91	1.99	1.86	2.03	2.30
	U.S.	2.48	2.30	2.15	2.32	2.31	2.83	2.47	2.98	3.29	3.14
	PPI 1982=100	113.6	109.9	109.1	111.7	114.8	114.3	119.8	117.4	120.7	114.0
	US Deflated price	2.18	2.09	1.97	2.08	2.01	2.48	2.06	2.54	2.73	2.75
value added per worker	Canada	47.93	49.46	46.16	54.98	58.07	49.44	57.90	55.73	58.32	65.42
	IPPI (1997=100)			92.7	94.7	89.8	89.4	99.1	100	98	94
	Canada deflated value			49.80	58.06	64.67	55.30	58.43	55.73	59.51	69.60
	U.S.	36.49	34.14	34.35	37.35	38.54	48.19	43.13	53.88	61.78	62.14
	PPI 1982=100	113.6	109.9	109.1	111.7	114.8	114.3	119.8	117.4	120.7	114.0
	U.S. deflated value	32.12	31.06	31.48	33.44	33.57	42.16	36.00	45.89	51.18	54.51

Source: Statistics Canada. ASM 2103 and Table 329-0038 - Industry product price indexes
U.S. Department of Commerce. ASM. Bureau of Labor Statistics, U.S. Department of Labor. Producer Price Index

Figure 11 Value added per dollar of sales

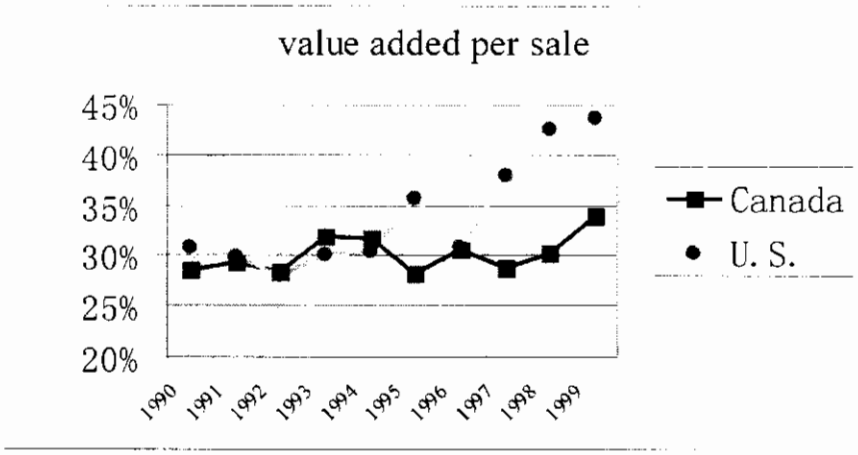


Figure 12. Value added per wage dollar

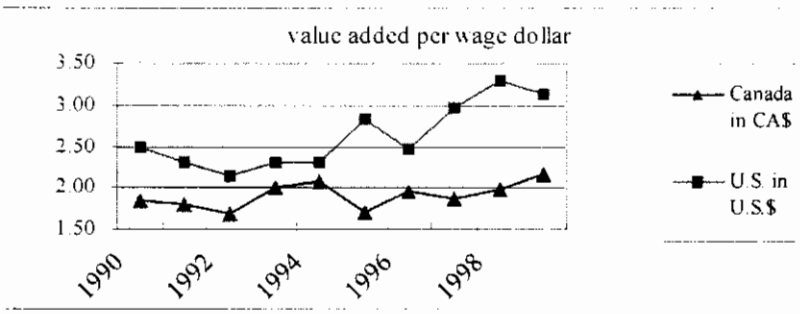
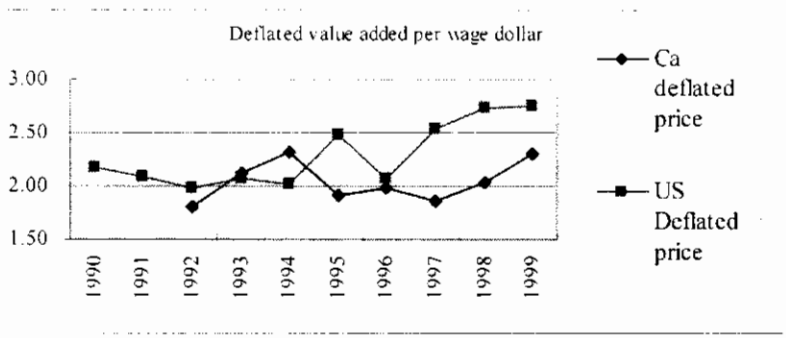


Figure 13. Deflated value added per wage dollar (in Canadian and U.S. dollars respectively)



3) Value added per worker

The value added per worker went up for both countries. From Figure 14, the value added per worker in the U.S. since 1995 is higher than in Canada if it is measured in Canadian dollars. If value is measured with deflated prices, as shown in Figure 15, ratios in the two countries have grown over time, but the compound growth rate of value added per worker in the U.S. is 6% per year compared to 3.8 % in Canada. Since 1996, the value added per worker in the U.S. has increased more rapidly. This phenomenon also coincides with the change in the value added per wage dollar. If the value added per worker represents productivity, labor productivity is higher in the U.S. than in Canada.

According to the above three comparisons, the Canadian poultry processing industry has lagged behind the U.S. counterparts. Since these three indicators are used as proxies for profit, the result from a comparison of these three value added data series implies that the Canadian industry is less profitable than that in the U.S. Notably, all three indicators show that the differences between the two countries has widened since 1996.

7.3 Market share measurement

According to Martin and Stiefelmeyer (2001), market share is represented by the Net Export Orientation Ratio (NEOR), which can be calculated from following formula.

Net Export Orientation Ratio (NEOR) = (export – import) / total domestic productions

In Table 6, the NEOR for the poultry processing industry in Canada is approximately -5%. This means that the Canadian poultry processing industry is in a trade deficit position. The U.S. NEOR ratio for the poultry processing industry has kept increasing since 1990. It has remained around 5% since 1993 (Table 7). From Table 6, over 99% of Canadian poultry imports are from the U.S., thus the U.S. industry is the main competitor to the Canadian industry. Although Canada also exports some poultry products, the amount of exports is relatively small compared to imports. The negative numbers for the NEOR and the large import proportion from the U.S. reflect the fact that U.S. poultry products are more competitive than products from

Figure 14. Value added per worker

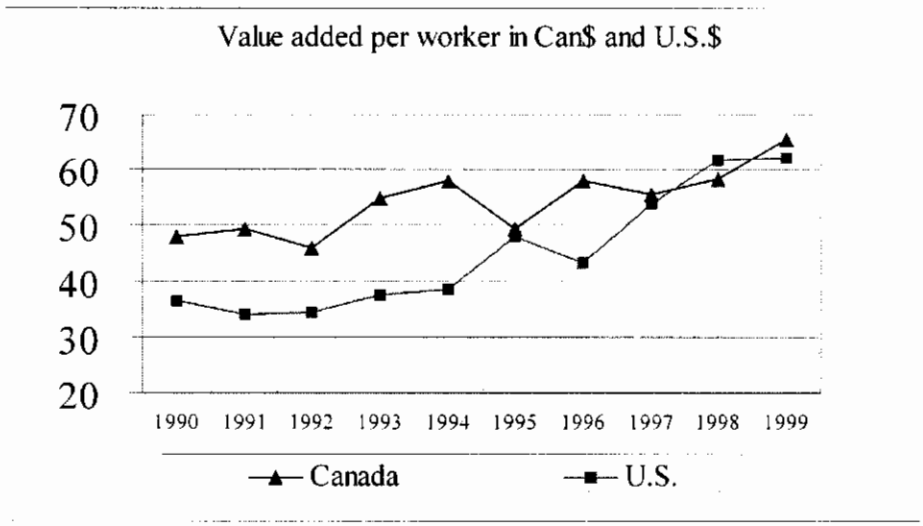


Figure 15. Deflated value added per worker in Ca $ and U.S. $

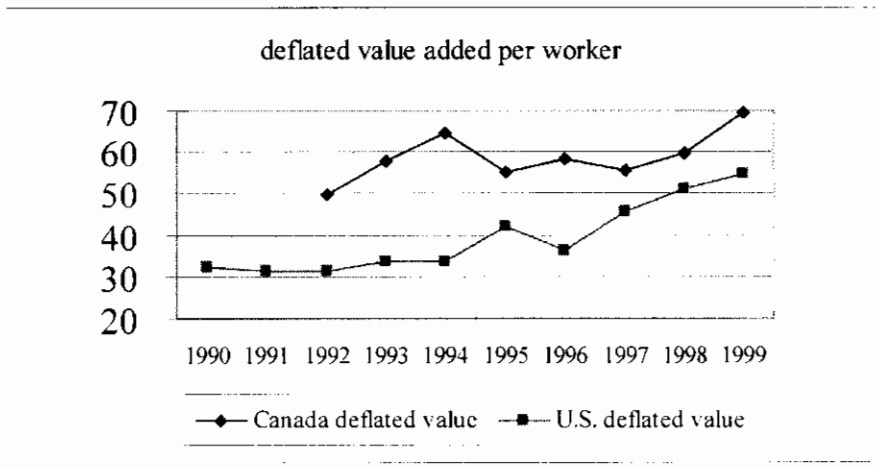


Table 6 Net Export and Orientation Ratio (NEOR) for the poultry processing industry in Canada.

		1992	1993	1994	1995	1996	1997	1998	1999
IMPORT	From US	157.9	188.9	199.5	223.2	211.6	262.3	308.9	287.7
	Total Import	158.2	189.2	199.8	223.7	211.9	262.7	309.3	288.3
	Ratio of import to domestic production	6.0%	6.7%	7.0%	7.8%	6.7%	7.5%	8.3%	8.0%
EXPORT	To US	10.2	10.7	9.8	13.2	16.3	21.7	29.7	41.5
	Total export	19.6	22.7	35.6	67.8	79.5	101.7	112.5	96.2
	net export	-138.6	-166.6	-164.2	-155.9	-132.4	-161.0	-196.8	-192.2
	Value of shipment	2621.9	2820.1	2840.2	2859.5	3185.2	3504.9	3738.7	3585.0
	Canada NEOR	-5.3%	-5.9%	-5.8%	-5.5%	-4.2%	-4.6%	-5.3%	-5.4%

Source: Statistics Canada. Table 002-0010

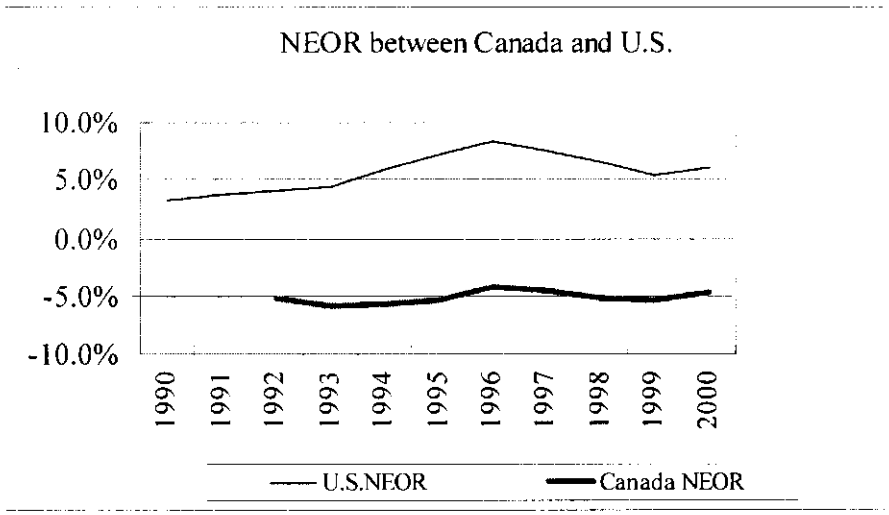
Table 7 U.S. Import and Export of processed poultry products in U.S. dollars (millions)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Import	29.7	35.7	25.8	29.9	25.3	30.5	44.7	41.6	49.6	59.6
Export	717	879	990	1157	1633	2097	2585	2449	2197	1811
value of shipment	21418	22379	23965	25501	27415	28929	30160	31,878	32,674	32,326
NEOR	3.2%	3.8%	4.0%	4.4%	5.9%	7.1%	8.4%	7.6%	6.6%	5.4%

Source: U.S. Department of Commerce Bureau of the Census; International Trade Administration (ITA).

Canada, although the current import control system favors the Canadian producers and processors. The constant NEOR ratio in Canada in Figure 16 also implies the effect of Canadian trade policies which limit imported products on the controlled list through quotas which are 7.5% of previous year's domestic production.

Figure 16 NEOR for the poultry processing industries in Canada and U.S.



7.4 The price difference and adjusted value added data

1) Wholesale price difference and growth rates:

As noted in Chapter 6, the price difference will make the value added method less useful for competitiveness measurement. It is necessary to look at the wholesale price of the main poultry products. Quebec prices and prices in 12 eastern cities of the U.S. are used as representative data for both countries.

From Table 8, most prices in Canada have decreased or remained the same. While most prices in the U.S. have increased. The trend of an increasing price could give the U.S. industry more opportunity to increase the value added ratio.

Table 9 shows the real price difference between the two countries if using Canadian currency. The exchange rate of each year has been used to convert U.S. dollars to Canadian dollars. The results show that prices of major processed products in Canada are higher than in the U.S. Table 10 shows the Canadian prices as a percentage of U.S. prices. The price difference for each product shows the price gap between the U.S. and Canada has diminished. The trend can be explained with two reasons: a) the exchange rate, and b) decreased real price for most Canadian poultry products. During the 1990's, the value of the Canadian currency decreased about 27% against the U.S. (from 0.857 to 0.673. Statistics Canada.).

Table 8 Wholesale prices (cents/kg) in Quebec and U.S. 12 eastern cities in its own currency

	Chicken Live weight Price		Chicken Eviscerated weight price		Chicken Leg quarter price		Chicken Wing price		chicken bone in breast price		turkey live weight price		turkey eviscerated weight price	
YEAR	Ca $	U.S.$	Ca $	U.S.$	Ca$	U.S.$	Ca$	U.S.$	Ca$	U.S.$	Ca$	U.S.$	Ca$	U.S.$
1990	121	71		121		69		142		211	180	85	275	121
1991	117	68		115		64		129		198	170	83	276	117
1992	115	70	241	116	151	54	252	104		222	162	83	246	115
1993	116	76	251	122	150	55	256	102		221	164	86	257	116
1994	110	77	219	123	117	73	247	136		191	166	90	277	110
1995	110	76	225	124	120	80	262	163	361	188	167	91	267	110
1996	126	85	263	135	148	89	300	133	445	194	183	96	267	126
1997	126	81	258	130	141	69	274	146	426	189	182	88	277	126
1998	122	88	255	139	122	61	296	182	424	204	179	84	291	122
1999	115	81	236	128	107	41	258	145	365	179	172	90	315	115
Change	95%	114%	98%	106%	71%	59%	102%	102%	101%	85%	96%	106%	115%	95%

Source: Agriculture and Agri-Food Canada. Poultry industry-Statistics.2003
ERS-USDA Poultry Yearbook 2001

Table 9 Wholesale prices (cents/kg) in Quebec and U.S. 12 eastern cities in Canadian currency.

	Chicken Live weight Price		Chicken Eviscerated weight price		Chicken Leg quarter price		Chicken Wing price		chicken bone in breast price		turkey live weight price		turkey eviscerated weight price	
YEAR	Ca	U.S.	Ca	U.S.	Ca	U.S.	Ca	U.S.	Ca	U.S.	Ca	U.S.	Ca	U.S.
1990	121	83		141		81		165		246	180	99	275	161
1991	117	78		131		74		148		227	170	95	276	156
1992	115	85	241	140	151	65	252	126		269	162	100	246	166
1993	116	98	251	157	150	72	256	132		285	164	111	257	175
1994	110	105	219	168	117	99	247	186		261	166	123	277	191
1995	110	105	225	171	120	110	262	224	361	258	167	124	267	184
1996	126	116	263	184	148	122	300	181	445	265	183	131	267	219
1997	126	113	258	180	141	96	274	203	426	262	182	122	277	210
1998	122	130	255	206	122	91	296	269	424	302	179	124	291	203
1999	115	120	236	190	107	61	258	216	365	266	172	133	315	187

Source: Agriculture and Agri-Food Canada. Poultry industry-Statistics.2003
ERS-USDA Poultry Yearbook 2001

Table 10 Quebec wholesale prices as percentage of 12 U.S. eastern cities.

Year	Chicken Live weight price percentage	Chicken Eviscerated weight price percentage	Chicken Leg quarter price percentage	Chicken Wing price percentage	Chicken bone in breast price percentage	Turkey live weight price percentage	Turkey eviscerated weight price percentage
1990	145%					182%	171%
1991	149%					179%	177%
1992	135%	172%	231%	200%		161%	148%
1993	119%	160%	210%	194%		148%	147%
1994	105%	131%	118%	133%		135%	145%
1995	105%	132%	109%	117%	140%	135%	145%
1996	109%	143%	121%	165%	168%	140%	122%
1997	112%	143%	147%	135%	162%	149%	132%
1998	94%	124%	134%	110%	140%	144%	143%
1999	95%	124%	174%	120%	137%	129%	168%
2000	102%	127%	151%	117%	164%	127%	154%

Source: Agriculture and Agri-Food Canada. Poultry industry-Statistics 2003.
ERS-USDA Poultry Yearbook 2001

The "cheaper" Canadian dollar made prices of Canadian poultry products less expensive. Therefore currency devaluation also contributes to a diminished price gap. The real price for most Canadian poultry products (Table 5) also decreased, while most product prices went up or remained steady in the U.S.

2) Adjustment to value added data

The difference in wholesale price will contribute to differences in the value added ratios. Table 11 and Table 12 show chicken and turkey price spreads measuring the price gap between farm gate and wholesale price in the two countries. In the meat processing industry, farm inputs account for about 80% of total processing cost. It is appropriate to set the farm price as a base for the price spreads. In these two tables, the simulated price is calculated by adding U.S. price spreads to the Canadian farm price. The comparison between actual wholesale prices in Canada and simulated wholesale prices will reflect the change in shipment value and value added if the Canadian industry can adapt to the U.S. price spread level[5].

The data from Table 11, and Table 12 show that the price spreads for broiler and turkey in Canada are much higher than those in the U.S. If the Canadian processing industry has the same price-spreads as in the U.S.,

[5] The comparison of price between two countries was carried out on a whole bird price basis. The result should be interpreted with caution as the whole bird products only account for around 10% of total output.

given the Canadian farm gate price stays the same, simulated prices are lower than actual price, which in turn, will reduce the value of shipment if it was calculated based on simulated wholesale prices. The figure of value added will also be much less after adjustment, which in turn, will change the ratios of value added per wage or per worker. The differences between actual wholesale prices and simulated wholesale prices indicate how far the Canadian poultry processing industry has lagged behind the U.S. counterparts in terms of price spread.

Table 11. Differences of price spread of chicken (whole bird) in Canadian dollar

	Farm Price	Canada Actual price spread	Canada current wholesale price	U.S. price spread in U.S.$	U.S. price spread	Simulated price of Canada	% simulated to actual price	% price spread of U.S. to Canada.
	(1)	(2)	(3) = (1) + (2)	(4)	(4)'	(5) = (1) +(4)'	(5) / (3)	(4)' / (2)
1990	121.0			49.3	57.6	178.6		
1991	116.6			46.6	53.4	170.0		
1992	114.9	126.1	241.0	45.7	55.2	170.1	71%	44%
1993	116.4	134.6	251.0	45.8	59.0	175.4	70%	44%
1994	110.1	108.9	219.0	45.8	62.5	172.6	79%	57%
1995	109.6	115.7	225.3	47.8	65.7	175.3	78%	57%
1996	125.9	136.9	262.8	50.2	68.5	194.4	74%	50%
1997	126.3	131.2	257.5	48.3	66.8	193.1	75%	51%
1998	122.3	132.6	254.9	51.1	75.9	198.2	78%	57%
1999	114.7	121.5	236.2	47.0	69.9	184.6	78%	57%

Source: Agriculture and Agri-Food Canada. Poultry industry-Statistics 2003.
ERS-USDA Poultry Yeabook 2001

Note: the price spread is calculated between live weight price and eviscerated price. The price spread is calculated from price information in Quebec and 12 U.S. eastern cities.

Table 12. Differences of price spread of turkey (whole bird) in Canadian dollar

	Farm Price	Canada price spread	Canada Actual wholesale price	U.S. price spread in U.S.$	U.S. price spread	Simulated price	% simulated to actual price	% price spread of U.S. to Canada.
	(1)	(2)	(3) = (1) + (2)	(4)	(4)'	(5) = (1) +(4)'	(5) / (3)	(4)' / (2)
1990	179.6	95.1	274.6	53.4	62.3	241.9	88%	66%
1991	170.2	106.3	276.5	53.3	61.1	231.3	84%	57%
1992	161.7	84.8	246.5	54.6	65.9	227.6	92%	78%
1993	164.4	92.4	256.8	49.4	63.8	228.2	89%	69%
1994	166.2	111.2	277.4	50.0	68.2	234.4	85%	61%
1995	167.2	100.2	267.4	43.5	59.7	226.9	85%	60%
1996	183.3	83.7	267.0	64.8	88.3	271.6	102%	105%
1997	181.9	94.6	276.5	63.1	87.4	269.3	97%	92%
1998	178.7	112.2	290.9	53.4	79.2	257.9	89%	71%
1999	172.3	142.2	314.5	36.2	53.8	226.1	72%	38%

Source: Agriculture and Agri-Food Canada. Poultry industry-Statistics.2003
ERS-USDA Poultry Yearbook 2001

Note: the price spread is calculated between live weight price and eviscerated price
The price spread is calculated from price information in Quebec and 12 U.S. eastern cities.

3) Physical output per worker:

Outputs of the poultry processing industry include many different products: whole birds, different cuts, deboned parts and further processed products. Various products and different product mixes make an efficiency comparison of two countries difficult. If the comparison is conducted on current market value, two different price systems will bias the result. However, there is an alternative measure; efficiency can be measured by the amount of output per worker. If the poultry industries in both countries have the same output mix and go through the same processing levels, the amount of output per worker can be treated as one of the efficiency indicators.

In the U.S., outputs are measured by Ready to Cook weight. In Canada, outputs are measured by Eviscerated Weight. For broilers, both weight measurements are about 73.5% of live weight. For turkey, both weight measurements are about 80% of live weight.

From Table 13, the output per worker in the U.S. was higher than that of Canada. It implies that the physical productivity index for U.S. workers on average is higher than Canadian workers. Because comparable product statistics for both countries are not available, details of output mix for both countries are assumed to be the same. One explanation is that U.S. plants have a greater advantage with respect to economies of scale. This advantage enables them to increase output per worker by investing in equipment for large scale operations.

4) Conclusion on value added comparison

Based on the comparison of value added, market share, growth, and adjustment of value added data, the Canadian poultry processing industry lagged behind the U.S. for each indicator. Table 14 shows the result.

The Canadian competitiveness state has changed over this period. From the value added ratio and NEOR point of view, the gap has widened. However, wholesale prices of various chicken and turkey parts dropped from higher levels and wholesale price differences between the two countries has narrowed. The analysis was conducted on the price or quantity basis, the

product quality difference which is another major driver of added value is not considered. Because of the many poultry products, experiments such as taking samples and comparing them with those products from across the border through independent surveys are hard to arrange. Although this analysis lacks product quality information, for most poultry processed products, especially the primary processed products, most of them are at a low level of differentiation. Price is the primary factor to determine the competitive position for less differentiated products. To some extent the result in this analysis reflects the real competitiveness position for the Canadian poultry processing industry.

Table13 Output per worker (eviscerate weight or R-T-C weight) in Canada and in the U.S. (1000kg)

Canada				U.S.			
	Total poultry (1000kg)	Employee	Output per worker (1000kg) <A>	Total poultry (1000kg)	Employee	Output per worker (1000kg) <B>	<A>/<B>
1997	917063	16693	55	15137506	224309	67	82%
1998	962654	17803	54	15324775	224898	68	80%
1999	1005754	17635	57	16196246	227785	71	80%
2000	1056585	19139	55	16579625	231140	72	77%

Source: Employment data is from NAICS for both countries.
The Canada's input data is from Statistics Canada, Table 003-0018.2003. It is measured in eviscerate weight.
The U.S. input data is from ERS/USDA, Poultry Yearbook. Table167. 2001. It is measured in R-T-C weight.

Table 14 The indicator of the competitiveness of Canada's poultry processing industry compared to the U.S.

Value added per sale	Value added per wage dollar	Value added per worker	NEOR
NG	NG	NG	NG
	Adjusted by price spread difference "DOWN"	Adjusted by price spread difference and inputs per worker "DOWN"	
	NG → NG +	NG → NG +	

Note: the NG (negative) means Canadian industry is being outperformed by U.S. counterparts.
NG+ mean the Canadian industry is been further outperformed by U.S. counterparts after adjustment

7.5 Productivity growth

The data used for measuring the TFPG are from the Statistics Canada micro level data for this sector. The input factors include the material and service input, labor input, and capital input. The input factors and output were deflated by relevant indexes. The conventional model (Morrison 2000) and a more comprehensive model (Azzam 2002) have been calculated independently.

Experimental results reported in Table 15 and Table 16 show that the productivity growth rates are different between the NEIO and the conventional productivity models. The NEIO results show that the Canadian poultry processing sector underwent moderate total factor productivity growth; the average rate is 1.23%. The conventional model results show that

productivity grew at a positive rate of 4.24% on average. The productivity growth from the NEIO model accounts for about one third of the conventional numbers. Because positive mark ups and economies of size exist, so the NEIO model relaxes the assumptions of constant return to scale and perfect competition. The Solow residue from the conventional model is not well explained as a source of productivity growth, but the NEIO model attributes the source of productivity growth to mark up ability, economies of scale, demand, input factors, and technology change.

The most significant contributions to TFPG are demand growth and exogenous technology change, with an average rate of 0.49% and 0.37% respectively. Change in demand conditions exceeded other factors to be a primary factor leading to TFPG. However, as a special case from other food processing industries, the Canadian poultry supply is constrained by the supply management system. Conditions of demand, like income and price, are not main determinants on the output that the poultry industry will supply. The weak price elasticity of demand η (-0.30) and income elasticity shows that the demand conditions had limited effect on output levels. On the other hand, the live poultry input variation shows a close relationship with the rate of TFPG due to demand change (table 17). From that table, the increased TFPG due to demand change was usually accompanied by a change of farm production in the same year or one year before. Farm production of live poultry is decided by supply management policy. In 1994 and 1999, the CFC

(Chicken Farmers of Canada) and CFO (Chicken Farms of Ontario) reformed their supply control policy; and adjusted the production quota allocation higher. Therefore, the production policy at the farm level did have some negative effect on TFPG in the processing sectors.

The influence of mark up ability also made some positive contribution to TFPG on average, about 0.36%. The Lerner index of oligopoly power is around 0.08 (Table 15). Different market structures will have different Lerner indexes. The Lerner index is 0 for a competitive market and is 1 for a monopoly market. The average Lerner index for the Canadian poultry processing market indicated that the market was relatively competitive. The productivity growth from mark ups peaked in 1994 (Table 16). In that year and the subsequent year, the poultry sector underwent dramatic market reconstruction and consolidation. The Lerner index also reached a high point at 1993 (Table 15). The contribution from input factors and economies of scale only had a negligible effect on TFPG. The economies of size, $\varepsilon>1$, demonstrates that the industry as a whole operated less dependently on economies of scale (Table 15). Since research on the NEIO TFPG model related to the U.S. poultry processing was conducted by Azzam et al (2002) only for the period during 1973-1992. A benchmark comparison isn't possible to. The result that the NEIO model reduces Canada's conventional productivity growth number by two thirds confirms the same result for the

U.S. For both sides, poultry products are demand inelastic and productivity growth shows positive development.

Table 15 Selected parameters of TFPG model

year	T	H	Φ	E	H	Φ	λ	A=(P – MC)/P	B=A/ [1- η (ε-1)]
	time trend	Herfindahl index	industry conjectural variation	MC/AC	demand elasticity	P/MC	Income elasticity	Lerner index of oligopoly power	
1991	1	0.030507	-0.01857	1.01984	-0.30329	1.033453	0.887226	0.03237	0.032177
1992	2	0.069002	-0.2383	1.04427	-0.2956	1.058942	0.8844	0.055662	0.054943
1993	3	0.066852	1.3275	1.04676	-0.30181	1.172271	0.861796	0.146955	0.14491
1994	4	0.072971	0.7534	1.04880	-0.28703	1.147366	0.877336	0.128439	0.126665
1995	5	0.09186	-0.033	1.05917	-0.28585	1.100773	0.880162	0.091547	0.090025
1996	6	0.071319	-0.1684	1.05266	-0.31688	1.062198	0.866034	0.058556	0.057594
1997	7	0.070121	-0.5072	1.05625	-0.31866	1.036652	0.887226	0.035356	0.034734
1998	8	0.060184	1.0775	1.05143	-0.31245	1.139788	0.922545	0.122644	0.120704
1999	9	0.06452	0.1242	1.05262	-0.30063	1.084115	0.933847	0.077589	0.07638
2000	10	0.130662	-0.1245	1.11310	-0.29412	1.119639	0.966341	0.106855	0.103415
2001	11	0.056	0.782	1.05342	-0.31011	1.113914	0.987533	0.102264	0.100598

Table 16. TFPG result for poultry processing sectors.

Year	$B\eta\Delta\Phi$	$B(\lambda+\gamma\Delta Y)$	$B\eta\Delta\varepsilon$	$B\eta$INPUT	$(B\eta-1/\theta)*\Delta T(B\eta-1/\theta)$			
	MARK UP	DEMAND	SCALE	INPUT	TECH		NEIO TFPG	CONV TFPG
1991					0.43%			
1992	-0.04%	0.23%	-0.04%	0.12%	0.37%		0.63%	1.95%
1993	-0.05%	0.31%	-0.01%	-0.36%	0.41%		0.30%	4.88%
1994	1.27%	0.75%	-0.01%	0.31%	0.34%		2.67%	-0.61%
1995	0.72%	0.42%	-0.03%	-0.04%	0.34%		1.42%	-4.02%
1996	0.36%	0.17%	0.01%	-0.11%	0.40%		0.83%	9.30%
1997	0.15%	0.23%	0.00%	0.06%	0.39%		0.82%	9.29%
1998	-0.16%	0.96%	0.02%	0.11%	0.38%		1.29%	5.67%
1999	0.63%	0.42%	0.00%	0.10%	0.35%		1.50%	-2.84%
2000	0.22%	0.79%	-0.18%	-0.07%	0.29%		1.05%	11.41%
2001	0.48%	0.66%	0.19%	0.09%	0.36%		1.77%	7.37%

Table 17. Relationship between farm production and TFPG due to demand

Year	farm production	farm production growth	TFPG due to demand
1990	555133		
1991	559522	0.79%	
1992	562684	0.57%	0.23%
1993	601854	6.96%	0.31%
1994	685109	13.83%	0.75%
1995	685894	0.11%	0.42%
1996	713515	4.03%	0.17%
1997	748580	4.91%	0.23%
1998	787831	5.24%	0.96%
1999	847602	7.59%	0.42%
2000	880738	3.91%	0.79%
2001	930145	5.61%	0.66%

7.6 Drivers of competitiveness

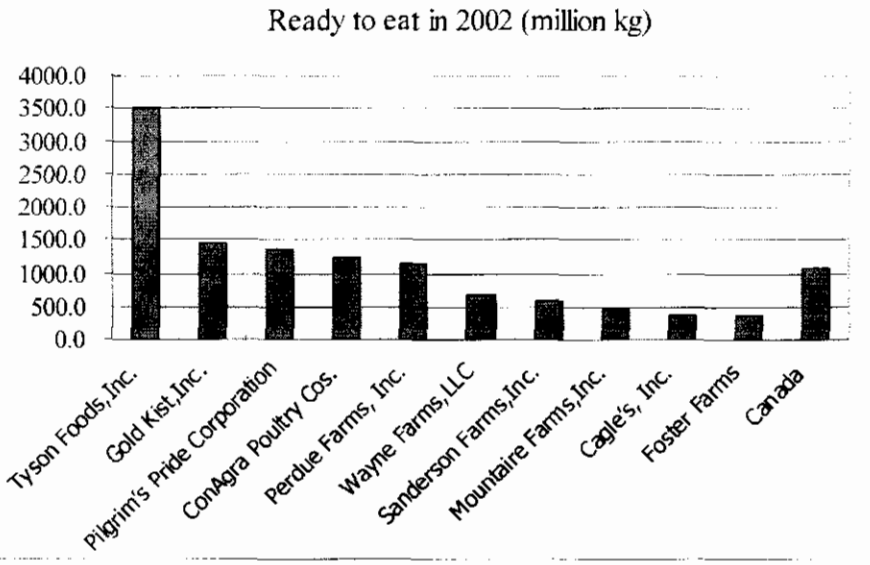
The state of competitiveness can be affected by:

- Productivity
- Technology
- Product
- Inputs and Cost
- Industry Structure
- Demand conditions
- Linkage

Productivity and technology

The Canadian industry is smaller than its U.S. rival. As is shown in Figure 17, the total input of the Canadian poultry processing industry as a whole was less than each of the largest five companies in the U.S. in 2002. In 2000, the total revenues of the Canadian poultry processing industry were 4 billion Canadian dollars, while the chicken revenue of Tyson, the largest poultry firm in U.S., was 7.2 billion U.S. dollars. In 2001, the largest Canadian independent processor, Maple Lodge Farms Limited, processed about 2.5

Figure 17. Input of U.S. firms and Canadian industry



source: WATT Poultry USA, 2003.

million kg of live weight a week. This amount is only 1/6 of the input of the second largest U.S. processors, Gold Kist, at about 14 million kg. According to Baldwin and Sabourin (2002), technology improvements are critical to increasing productivity. Larger plants are more likely to adopt advanced technologies and to utilize economies of scope. The smaller production scale will limit the Canadian industry's ability to adopt advanced technologies. Another factor to enhance productivity is the capacity utilization ratio. The U.S. capacity utilization was approximately 90% from 1997-2000. The Canadian industry capacity utilization was not known. Larger production scale and higher capacity utilization give the U.S. industry an advantage to improve their productivity.

Product, input and cost

Live poultry in each country are raised in feeder barns. The chickens are raised for 6-7 weeks before being sent to the slaughtering plant. The farm-gate price of live birds in Canada is higher than in the U.S. The wholesale price of processed products in Canada is also higher. It should be noted that the farm gate price and whole-sale price difference between the two countries is narrowing[6]. The average chicken live weights per head for both countries are similar, as shown in Table 18.

[6] The live weight price in the U.S. is the estimated price. There were few transactions through the spot market as live birds production are mostly prearranged under contract or vertical integration.

In a modern processing plant, production line speed is important to improve efficiency. The most recent production speed is approximately 140 -200 birds per minute in the U.S. Input materials are required to meet specific needs in order to increase the production line speed and enhance product uniformity. According to Martinez (2002), in the mid-1960, most broiler products in the U.S. were homogeneous and ready –to –cook whole birds. Since then, the processors have focused on developing product differentiation through further processing and brand labeling. In the 1980's, sales of cut-up together with further processed chicken exceeded whole bird sales. By 1995, 63 percent of the volume was sold as cut-up or parts, while 11 percent were sold as further processed products. The recent data published by WATT POULTRY (2001) in the U.S. show that the cut-up or deboned and further processed volume percentage rose to 80% and 40% respectively. The product differentiation begins with bird breeding until the final processed stage and these differentiation-oriented products enable firms to compete on more than a price basis. The Canadian poultry processing sector did not have much detailed information on output mix. There is an alternative way to investigate the output mix through inventory information (Figure 18) published by Agriculture & Agri-Food Canada. From Figure 18, the volume of further processed products and cut up are greater than the volume of whole bird. The reduced output proportion of whole birds also shows that the same trend as in

the U.S. In summary, the poultry products for both countries have evolved into more value added levels.

Industry structure and linkage

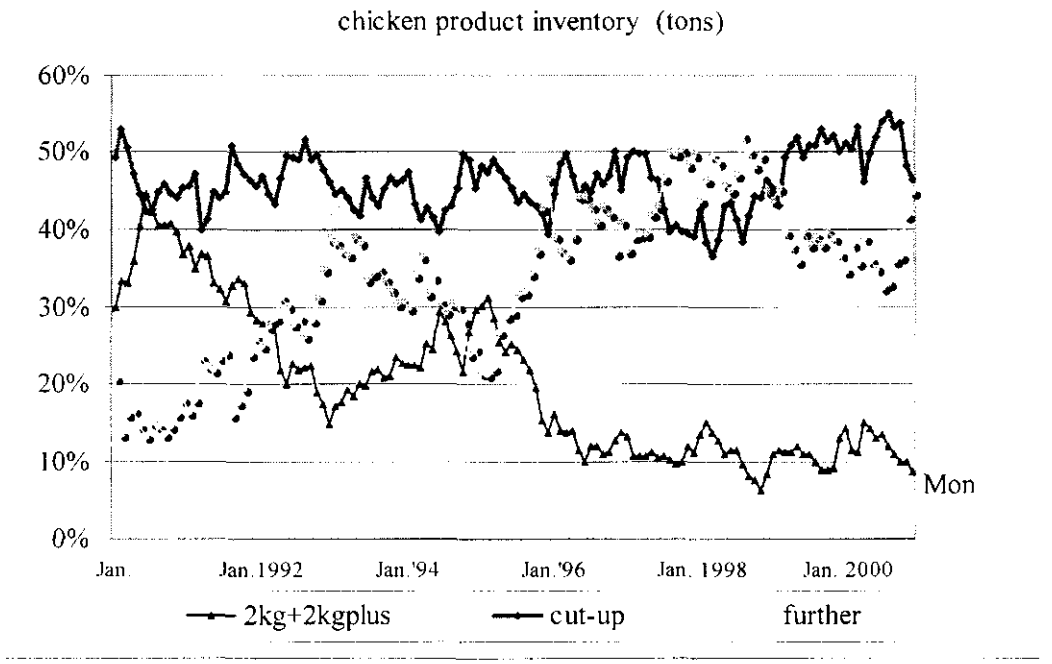
The connections between poultry farmers and processors in the two countries are different. In the U.S., over 90% of production is under contract or integration. The contractor or integrator offers the farmer feed, chicks, management, and veterinary services. The farmer provides the buildings,

Table 18 The average live weight in Canada and in the U.S. (KG)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	2.04	2.03	2.04	2.06	2.05	2.05	2.05	2.06	2.08	2.10	2.13
U.S.	1.98	2.01	2.05	2.07	2.10	2.11	2.17	2.18	2.20	2.26	2.27

Source: Agriculture & Agri-Food Canada. Poultry sector.2003
ERS-USDA Poultry Yearbook 2001

Figure 18. Chicken output inventory information in Canada



Source: Agriculture & Agri-Food Canada. Poultry sector. 2003

equipment, and labor. Farmers are paid based on their performance relative to other growers. The highly coordinated system enables the processor to control product quality and timely supply. In Canada, the connection between farmer and processor is influenced by the marketing boards. The price is negotiated at the provincial level among poultry producers and processors. The purpose of marketing boards in Canada is to control oversupply and protect the farmer's interest. However, members of the CPEPC (Canadian Poultry and Egg

Processors Council) state that the rigidity of the system makes them less successful than their U.S. counterparts.

The concentration ratio in both countries is high. In 1997, market shares of the top 4 and top 8 firms in the U.S. were 41% and 54% respectively (ASM 1997). In 2001, the top four firms' shares increased to 49% (Watt Poultry USA 2003). The information from Statistics Canada unpublished ASM micro level data shows the market share of the top eight processors (C8) were 47%, 55%, and 59% in 1990, 1995, and 1999 respectively. A concentrated market means a few big firms will have more power to influence the market. Firms with oligopoly power will raise the price above their marginal cost. On the other hand, more concentrated markets also enable firms to increase their production scale and lower their unit cost, therefore increasing their profit. Results from the NEIO TFPG model show that mark up ability in the Canadian industry has some positive effect on productivity growth.

Demand conditions

Poultry meat consumption per capita has passed beef and pork in both countries. The shipment value of Canada's poultry processing industry increased 72% from 1990-2000 (Statistics Canada 2003). The U.S. counterpart increased their shipment value about 96% (Dept of Commerce 2001). In 2000, the per capita poultry consumption in Canada was 35.1kg. The U.S. figure was 49 kg.

The combined effects from the bigger domestic market in the U.S. and its export market endow the U.S. processor with more opportunity to increase their competitiveness status. The NEIO TFPG results show that demand had the greatest effect on productivity growth in both countries.

7.7 Summary

In this chapter, the competitiveness state of the Canadian poultry processing industry vs. its U.S. counterpart is looked at in terms of their value added ratio and market share. Because the Canadian poultry market is protected by high tariffs and import quotas, prices of Canadian products are much higher than in the U.S. These higher prices will lead to an increase in the value added ratio of the Canadian industry and bias upward any comparison. Adjustments are made to check differences of price spread and input per worker. The value added ratio after adjustment shows the situation is even worse than before. The productivity growth from the NEIO TFPG model shows steady and positive productivity growth rates. Almost all results except TFPG show that Canada's poultry processing industry is less competitive than the U.S. industry. The drivers explaining the state of competitiveness are illustrated in different ways. The reasons for the Canadian industry being less competitive are the smaller production scale, higher input price, and rigid supply system.

Chapter 8

Summary and Conclusions

8.1 Overview the thesis

The purpose of this research was to find out the status of the Canadian poultry processing competitiveness related to its U.S. counterpart. The competitiveness theory has been presented. Theory has been highlighted at the firm level, industrial level, and national level respectively. The main issues are how to interpret and measure competitiveness, what are the drivers of competitiveness, and how to improve competitiveness. The second part of the study continued with a detailed analysis of the Canadian poultry processing sector. The market structure, method of measuring competitiveness, and conclusion concerning the competitiveness comparison were presented. The final results show that the Canadian poultry processing industry's performance needs to be improved in order to compete with the corresponding sector in the U.S.

The second chapter of the thesis presents the competitiveness concept, as it is necessary to refine the concept in order to lay the foundation for further research. Also, to find out the way to improve the competitiveness position, understanding generic drivers of competitiveness will be useful to identify any factors determining the specific industry competitive status.

There are three schools of thought which offer a different interpretation on competitiveness. Neo-classical economic theory identifies productivity growth as the ultimate source of competitiveness. TFP (Total Factor Productivity) is the way to identify the state of competitiveness. The Strategic Management and Industrial Organization literature use industry structure to explain a firm's conduct and performance. Therefore, the industry structure will be the primary factor determining competitiveness. Also, according to Porter (1985), the set of competitive advantages will form the overall competitiveness. These competitive advantages are obtained mainly from least cost or high product quality, and the value chain is the way to achieve this competitive advantage. The resource based theory explains competitiveness by how well the firms utilize their heterogeneous resources. Factors like reputation, flexibility and customer service will be key factors to enhance competitiveness.

Chapter 3 and Chapter 4 continue with a presentation of the methods used to measure and develop competitiveness at both the firm level and the industrial level. At the firm level, the Economic Efficiency Model was introduced. According to this model, competitiveness depends on technological efficiency and allocative efficiency. The Strategic Management Model presents the way to achieve least cost and a differentiated product. The third approach, the Resource Based Theory, showed how firms can attain a sustainable competitive advantage

through identifying, utilizing, leveraging, and nurturing idiosyncratic resources. The model by Chacko et al (1997) shows the systematic way to analyze competitiveness. From Chapter 4, competitiveness at the industry level was developed mainly from Porter's Four Factors hypothesis which determines the overall structure and performance. Other research relating to the Canadian poultry processing or Canadian food industry compared with the U.S. was also reviewed.

Chapter 5 introduced the Canadian poultry processing market structure. Characteristics of poultry output, demand, operation information of processors and market regulation were reviewed for the last decade. Forecasting the trend of poultry processing development was attempted. Chapter 6 describes the method used measuring competitiveness. The value added ratios per sale, per wage dollar, and per worker were implemented to measure competitiveness. Factors influencing the value added ratio were considered in order to conduct a comparison between the two countries since a different price system exists in the two countries. Adjustments to the conventional value added ratio comparison were proposed. The productivity growth measurement, which is considered by economists as the ultimate source of competitiveness, was reviewed and mathematical equations for these models were presented. The methodology of competitive drivers developed by Martin et al (1991) was also reviewed.

In the next chapter, Chapter 7, the results were presented. According to the methods developed in Chapter 6, the valued added ratio before adjustment shows the growth rate for the Canadian sector being lower than the U.S. after 1996. The value added ratio after a price difference adjustment further demonstrates the unfavorable position of the Canadian sector. From another perspective, the productivity growth using the NEIO model shows that the Canadian productivity growth is positive but moderate. Among factors contributing to productivity growth, the demand condition, and exogenous technology change were the main causes. Also, the NEIO model results show that oligopoly power in the Canadian poultry market was not significant and the poultry processing sector functioned competitively in the last decade. The competitiveness drivers were listed. It was concluded from the competitiveness comparison that high input prices, the smaller production scale, and rigid supply system in Canada were the main reasons for being less competitive.

8.2 Proposals for further research

According to the study's findings, the Canadian poultry processing sector is less competitive than the U.S. Although the market operates differently in each country, it is necessary to address the importance of vertical cooperation among the supply chain. Unlike a vertical contracted or integrated relationship between farms and processors, the Canadian market operates under a supply

management system. Finding the best way to respond to the market demand in a timely fashion is the most important goal. Research on cooperation or coordination between processors and farms under the current supply management system would be useful. A comparison based on big plants between the two countries would provide further information on competitiveness. Above all, the competitiveness analysis should look at the information from various perspectives such as resources applied for production, operation efficiency and flexibility, output price, as well as quality, and cooperation between different stages of the supply chain. Preparing the information on the competitiveness analysis would be another important task to be pursued.

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Appendix

a). The performance of Canada poultry processing industry in Canadian dollar

Year	Employees (Persons)	Salaries and wages (x 1,000)	Manufacturing Shipments (x 1,000)	Value added (x 1,000)	vship/ emp	vadd/ emp	vadd/ wage
1990	13359	345825	2239917	640316	167.67	47.93	1.85
1991	13758	378628	2315638	680452	168.31	49.46	1.80
1992	13932	383530	2271422	643121	163.04	46.16	1.68
1993	14270	391273	2457246	784631	172.20	54.98	2.01
1994	14100	393122	2572427	818836	182.44	58.07	2.08
1995	14431	417310	2532880	713530	175.52	49.44	1.71
1996	15329	451276	2893925	887490	188.79	57.90	1.97
1997	16693	500950	3239545	930226	194.07	55.73	1.86
1998	17803	522093	3431638	1038232	192.76	58.32	1.99
1999	17635	535268	3391668	1153746	192.33	65.42	2.16
2000	19139	575431	3869263	1209317	202.17	63.19	2.10

Source: Statistics Canada. ASM. 2003
Note SIC 1012(1990-1996), NAICS 311615 (1997-2000)

b). The performance of the U.S. poultry processing industry in U.S. dollar

Year	EMPLOYEE x1000	TOTAL SALARY (million)	VSHIP (million)	$VADD (million)	VSHIP/ EMP x1000	VADD / EMP X1000	VADD/ WAGE
1990	176.80	2596.80	24417.77	7528.37	138.11	42.58	2.90
1991	189.60	2817.10	24866.15	7415.71	131.15	39.11	2.63
1992	193.80	3091.50	28715.75	8045.86	148.17	41.52	2.60
1993	205.30	3312.20	32898.79	9893.55	160.25	48.19	2.99
1994	216.00	3605.30	37439.80	11368.14	173.33	52.63	3.15
1995	214.30	3645.90	39703.48	14172.83	185.27	66.14	3.89
1996	215.30	3755.10	41124.09	12660.71	191.01	58.80	3.37
1997	224.31	4055.87	44137.79	16733.97	196.77	74.60	4.13
1998	224.90	4224.15	48471.67	20613.4	215.53	91.66	4.88
1999	227.79	4506.96	48027.08	21029.64	210.84	92.32	4.67
2000	231.14	4521.37	48069.83	20440.94	207.97	88.44	4.52

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Note1. SIC2015 (1990-1996), NAICS 311615 (1997-2000)

c). Table Exchange Rate (1990-1999) between the U.S. dollar and Canadian dollar

Type of currency	United States dollar								
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1.166774	1.145726	1.208723	1.290088	1.365673	1.372445	1.363522	1.384598	1.483505	1.485705

Source: Statistics Canada

d). Concentration Ratio (CR8)

The concentration ratio is a measure of an industry's concentration level and expresses sales of a set number of the top firms in the industry as a percentage of total industry sales. CR8 is the acronym for the concentration ratio of the top 8 firms in the industry. (An Overview of the Canadian Agriculture and Agri-Food System)


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