

**ANALYSIS OF EXPORT TARGETING OF CANADIAN WHEATS**

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**By**

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## CHAPTER I - INTRODUCTION

### Statement of the Problem

Canada and the Upper Great Plains region of the U.S., particularly North Dakota are the primary producers of higher protein hard wheats in the world grain economy. Agronomic conditions and practices are both very similar (Wilson, 1989). Both of these regions compete in a global market comprised of many segments. The purpose of this thesis is to identify and evaluate factors influencing the target market decisions of the Canadian Wheat Board (CWB) and how they have changed over time.

Wheat class consumption patterns differ and vary throughout the world as well as through time as postulated by Wilson (1994):

*“Wheats produced in different regions have end-use characteristics, which vary due to varieties, climate, soils, and cultural practices, and are used for many purposes, ranging from pan bread, noodles, pasta, and couscous to animal feed. Consumption of different wheat classes depends on a multitude of factors, including income, relative prices, and tastes, which are influenced by culture and tradition.”*

The world wheat market is a complicated oligopolistic economic system comprised of five major exporting countries with Canada and the United States (U.S.) comprising of approximately 60% of the market, over 100 importing countries, trade barriers, aid programs, and trade agreements (Ryan, 1993). Higher quality Canadian hard wheats are: Canadian Western Red Spring (CWRS), Canadian Western Amber Durum (CWAD). Comparatively, U.S. competitive wheats are: U.S. Hard Red Spring (HRS), U.S. Hard Red Winter (HRW), and U.S. Hard Amber Durum (HAD) - all generally grade 2 or higher.

For now, two distinct market segments may be specified: high quality/low price sensitivity and high price sensitivity/lower quality (Wilson, 1994). Typically, the former

was the large and growing segment of the world wheat market and included countries, such as the United Kingdom, Japan, and the Philippines and appears to be the predominant CWB target market. Examples of the latter include Egypt, the Former Soviet Union (FSU), and People's Republic of China (PRC).

Four primary factors have impacted these segments over the past 25 years. First, growth in European Community (EC) wheat production has led to a demand reduction for imported wheats in Europe. Second, increased production in many other wheat-importing countries has further reduced demand for wheat imports. Third, changes in baking and milling technologies have lessened the demand for high gluten wheats. Lastly, the use of credit. During the 1985 to August of 1995 period, the use of the U.S. Export Enhancement Program (EEP) focused competition principally with EC wheats. Additionally, the use of credit programs has addressed importing countries' credit requirements (GAO, 1992). Canada consequently has diversified its customer base, developed targeting strategies, focused on quality, priced competitively, and entered new markets. Many of these new markets are direct competitors with U.S. HRS and HAD wheat producers of North Dakota.

Progression of this competitive environment has critical implications for North Dakota. For export development to be effective, markets as well as their demand characteristics must be identified. Second, the reaction to longer-term market trends may motivate variety development programs. Third, while various methodologies<sup>1</sup> have been applied in many studies on competition among exporters in aggregate, few have been

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<sup>1</sup> Grennes, Johnson, Thursby; Alston, Carter, Green, and Pick; Oleson; Chai; Konandreas, Bushnell, and Green; Gallagher, Lancaster, Bredahl, and Ryan.

developed and documented on competition in these market segment<sup>2</sup>.

### **Time period analyzed**

The time period covered in this thesis is constrained by the years CWB export data is available (1973-91) and is divided into three distinctly different environments.

The first, a period of robust and thriving demand and trade in cereal grains around the world, encompasses the years of 1973 to 1979. During this period world production was challenged in keeping up with the rapid expansion of consumption of developing countries. This demand was in part stimulated by higher export earnings, a desire by the FSU and eastern European countries to improve consumer diets, enormous lending programs from international banks, and a declining U.S. dollar (GAO, 1992). The increased demand was accommodated by an increase in production. By the end of the 1970's, three developments had affected global wheat trade:

- 1) an unprecedented expansion of U.S., Canadian, and Australian wheat exports of 108 percent, 38 percent, and 17 percent respectively;
- 2) a profound growth in EC wheat exports of approximately 400 percent;
- 3) a domination of the world wheat export market by - the U.S., Canada, Australia, Argentina, and the EC, which combined commanded 95 percent of the world wheat market (GAO, 1992).

The second period, 1980 to 1984 is characterized by a slowing in the growth of the world's grain market. Global recession, the Third World debt crisis, fluctuating grain imports by centrally planned economies, as well as increased food self-sufficiency in some developing countries hampered growth in the demand for grain (GAO, 1992). The world

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<sup>2</sup>Wang; Chai; Chang; Wilson, 1989; Wilson and Preszler; Veeman; Uri, Hyberg, Mercier, and Lyford.

wheat trade was realigned as the FSU, North Africa, the Middle East, and parts of Asia became major import markets while Eastern Europe, Japan, and Latin America lessened, steadied, or diversified their imports and the United Kingdom and India became net wheat exporters.

During this period, the prosperity of producers in major exporting countries became threatened as grain production remained relatively unchanged and imports diminished. Prior to the advent of the EC as a major exporter of wheat in the 1970's, government involvement in the grains industry in the U.S., Canada, and Australia concentrated on improving farm income and alleviating rural poverty. Many wheat-exporting countries aspired to safeguard the interests of their producers by executing protectionist policies and export assistance programs to help sustain and augment market shares. The response to the lost market share by the three countries was increased support for their farm programs. For the U.S., the response was EEP. For Canada and Australia, the response was increased government support and was supplemented with respective searches for niches in the more profitable, higher-quality wheat export markets as well as increased export credits to riskier markets.

The third period, 1985 to 1991 is one characterized by heavy export subsidization: the EC export restitution program; and the 1985 retaliatory measure by the U.S., EEP, as well as increased volatility in the world wheat market (Kraft et al., 1996). The outcome of the decision by the U.S. to use EEP has resulted in increased tension between the U.S., Canada, and Australia as they have argued that the subsidy has been an ineffective countermeasure to the EC's subsidization program (GAO, 1992). Whereas, they argue that

EEP lowers prices in targeted markets and that these lowered prices consequently affect other non-EEP markets.

The net result of these policies as well as the dynamics of importing country behavior have lead to increased world market volatility and decreased efficiency in the world agricultural trading system as the principal wheat exporting countries have had to rely on their “acumen” to maintain and/or recapture market shares (GAO, 1992). Canadian officials have indicated they have not launched new export programs to retaliate against EEP. Absence of a government program to counter EEP has forced the CWB to concentrate their marketing efforts on the high-quality wheat market. In addition, they have asserted that they do not concentrate on market share but rather market service and total revenue (GAO, p.18, 1992). The net result of the U.S. export subsidy is that the CWB has been forced to compete against the EC, as well as Argentina and Australia, who have also been forced to pursue customers not eligible for EEP (Kraft et al., 1996).

This consequence augments an overall decline in world prices and in total export returns, particularly those of export-dependent Canada and Australia. The U.S. contends that EEP is a targeted export subsidy conceived to compensate unfair trade practices of the EC and does not target higher-quality hard wheat markets. In response to the EC and U.S. export subsidy programs, Canada, Australia, and Argentina have changed their trade and production practices. The U.S., Canada, and the EC have increased income support for farmers while neither Australia nor Argentina have done so (Kraft et al., 1996). As a result, Australian and Argentinean acreage and exports have declined.

## The Canadian grain marketing systems

The fulcrum of the Canadian grain marketing system is the Canadian Wheat Board (CWB). The CWB is a single-seller marketing agency. The CWB maintains a monopoly in the Canadian domestic wheat trade for human consumption as well as for export. The use of a single-seller marketing agency facilitates rent-seeking behavior as a member of the world wheat trade oligopoly (Wilson et al, 1996; GAO, 1992). As a single-seller marketing agency, the CWB identifies and targets markets for export sales and uses longer-term marketing and sales strategies (Wilson et al, 1995). The major functions of the CWB include:

- 1) On behalf of producers, the CWB accepts, prices, sells and coordinates movements of wheat and barley for export and domestic human consumption;
- 2) annually operates a revenue pooling and producer payment system;
- 3) market development for CWB grains;
- 4) preserve market intelligence and forecast conditions;
- 5) on behalf of the Canadian Government, administer cash advances and for the Western Grains Research Fund, collect research levies (Loyns and Kraut, 1995).

Additionally, revenue maximization is one of the primary goals of the CWB. According to Kraft et al (1996), the CWB was put into place to:

*“Jointly market wheat and barley to obtain the largest benefit for all farmers delivering to the marketing body.”*

As a single-selling organization, the CWB is the largest marketer of wheat in the world export markets. This system grants the CWB the ability to use market power through world-wide pricing strategies involving explicit price discrimination to maximize producer returns (Wilson et al, 1996; GAO, 1992; Ryan, 1993; Goodwin and Smith, 1995;

Kraft et al., 1996). The CWB intentionally discriminates among classes of customers, charging much higher prices to Canadian, Japanese, and United Kingdom customers than in Asian markets (Wilson et al., 1996). Additionally, the single-seller agency offers different terms of trade to different markets and buyers. Recently, the CWB recently disclosed that it practices price discrimination, recognizing that:

*“... the CWB sells wheat and barley at different prices in different markets depending on the competition it faces from other exporting countries.”* (CWB News Release, October 1994).

Use of this market power by the CWB has resulted in a successful collection of premiums historically from importers in the higher quality hard wheat market (Kraft et al., 1996). Differentiated pricing enables the CWB to target new and growing markets with lower prices while charging full market prices to others (GAO, 1992). If a single-seller of Canadian wheat did not exist, all buyers would be able to acquire wheat at the same FOB origin price irrespective of the value they identified with the differentiated product providing supply exceeded their demand (Ryan 1993; Kraft et al., 1996).

Unlike the United States, all aspects including transportation<sup>3</sup>, pricing, and variety release of the Canadian grain market are heavily regulated. Additionally, the CWB maintains the incentive to meet the minimum quality margins by a greater margin than individual grain firms in the U.S., thus the reputation effect (Larue and Lapan, 1992). Wheat buyers cannot observe all relevant quality characteristics prior to purchase and therefore rely on past performance. This generates repeat or loyal business which reflects concepts represented in the economics of quality and reputation as established by Shapiro

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<sup>3</sup>Canadian rail transportation was deregulated in 1995.

(1983) and Wilson (1992). Individual grain traders are also concerned with relationships, but that relationship is more likely to be transaction-based with the emphasis on the firm rather than on wheat of the particular country (Ryan, 1993). In the U.S., many export organizations compete on thin margins and generally do not export better quality than contract specifications mandate unless market forces make it cost prohibitive to do otherwise.

While specific price information is available for U.S. wheat exports, it is not available for Canadian wheat exports. This is due to the CWB's perception as a trading organization that it has rights to secrecy, much like the privately owned *Cargill* or *Continental Grain Company* (Furtan, 1995). Therefore, the issue of price transparency is controversial.

### **Objectives**

Given the above discussion, the general objective of this thesis is to analyze and explain targeting decisions of the CWB for higher quality hard wheat export during the 1979-91 period. Specific objectives include:

- 1) identification of socioeconomic factors and other elements that impact sales to targeted customers by grade/class;
- 2) analysis of how these relationships have changed through time;
- 3) description in detail of institutions involved in grain marketing in Canada.

### **Methodology**

A Tobit model will be specified to determine the factors that affect who the CWB targets. Specification of the Tobit model will facilitate the analysis of how disaggregate

socioeconomic, trade-related, region-specific factors have affected the targeting decisions of the CWB during the period 1973-91.

Quantity and region information as well as socioeconomic and financial factors such as income, population, level of urbanization, and women in the workforce will be analyzed cross-sectionally. Risk variables from *EUROMONEY* will be used as proxies for political, social, and credit risk. Region dummy variables will be used to capture geographic effects that may be difficult to measure such as location, trade and political relationships, and foreign policy objectives. Finally, EEP-subsidized exports will be included to capture effects associated with use of this subsidy.

### **Thesis Organization**

A theoretical background of target marketing and various aspects of market power will be discussed in the next chapter. Review of literature will be presented in chapter three. Alternative model specifications, empirical procedures, and data description regarding the primary objective are presented in chapter four. In chapter five the empirical results will be discussed. The summary and conclusion will then comprise chapter six.

## **CHAPTER II - THEORETICAL FOUNDATIONS OF TARGET MARKETING**

### **Introduction**

Elements of the theoretical foundations of target marketing include: market power, segmentation, positioning, and targeting; product differentiation and choice; and price discrimination. These theoretical foundations will be discussed in detail in this chapter.

In the first section, the theory of the firm is discussed. Next, target marketing theory is reviewed, thus exploring market segmentation, positioning, and targeting theory. The subsequent sections address product differentiation and choice, market power, and price discrimination respectively. The last section addresses price transparency.

### **The firm**

Due to a variety of diverse market environments, there is no single, general theory to explain firm behavior (Maurice and Phillips, 1992). To clarify firm behavior and the functioning of markets, economists classify markets into four classic groups called market structures. These groups include: perfect and monopolistic competition, oligopoly, and monopoly. These market structures are interpreted by the number of firms in the market, how much market power they have, whether the products are homogenous or differentiated, the degree of difficulty of market entrance, and the amount of interdependence among firms in the market.

A primary goal of the firm is to maximize revenue. Revenue maximization is one of the stated primary goals of the CWB (Kraft, 1996). According to Kraft et al (1996), the CWB was put into place to:

*“jointly market wheat and barley to obtain the largest benefit for all farmers delivering to the marketing body.”*

## **Target marketing**

As a single-seller agency, the CWB pursues its goal of revenue maximization through target marketing which comprises three necessary steps - market segmentation, targeting, and positioning. In theory, the firm distinguishes many major market segments, targets one or more of these segments, and then develops products and marketing programs tailored to each selected segment (Kotler, 1988).

### **Market segmentation**

Dickson and Ginter (1987) define market segmentation as:

*“Heterogeneity in demand functions exists such that market demand can be desegregated into segments with distinct demand functions.”*

Market segmentation is the act of separating a market (i.e., to identify different groups) into distinct groups of buyers who may require separate products and/or marketing mixes (Kotler, 1988). The firm may identify different ways to segment the market and develop characterizations of the resulting market segments. Due to market dynamics, it is important to re-examine market segments periodically. Markets may be segmented by demographic, geographic, psychographic, behavioral, or preference segments.

Demographic segmentation divides markets into groups on the basis of demographic factors such as income, occupation, religion, race, and nationality (Kotler, 1988). Additionally, consumer wants, preferences, and usage rates are often highly affiliated with demographic variables. Geographic segmentation classifies markets by different geographical units such as nations, regions, and population. Psychographic segmentation divides markets into different groups on the basis of respective social classes, lifestyles, and/or personality characteristics.

Behavioral segmentation breaks markets into groups on the basis of their knowledge, attitude, use, or response to a product (Kotler, 1988). A particularly powerful form of segmentation is the classification of buyers according to the different benefits they seek from the product. Markets may be segmented by user status. The segment may be comprised of nonusers, ex-users, potential users, first-time users, and regular users of a product. Additionally, markets may also be segmented by usage rate (volume segmentation). Heavy users may comprise of a small percentage of the market but account for a higher percentage of total consumption. Furthermore, markets may be segmented by consumer loyalty patterns, buyer readiness<sup>4</sup>, degree of eagerness for the product.

### **Product positioning**

Within each segment, the firm needs to develop a product positioning strategy (Kotler, 1988). The purpose of product positioning is to describe to customers how the firm's product in particular contrasts from current and potential competitors. Positioning is a venture to differentiate the firm from its competitors along real dimensions in order to be the preferred firm to certain segments of the market (Kotler, 1988, p. 27). Kotler asserts that:

*“Positioning is the act of designing the company's image and value offer so that the segment's customers understand and appreciate what the company stands for in relation to its competitors”* (Kotler, 1988, p. 308).

Furthermore, products that are most similar to one another in the position they possess provide the greatest competitive pressure on each other (Oster, 1994). Positioning

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<sup>4</sup> Some markets may be unaware, aware, informed, interested, desirous of buying, and or intend to buy.

comprises of three steps: identifying a set of possible competitive advantages to exploit;<sup>5</sup> selecting the correct one(s); and effectively signaling to the market the firm's positioning philosophy (Kotler, 1988).

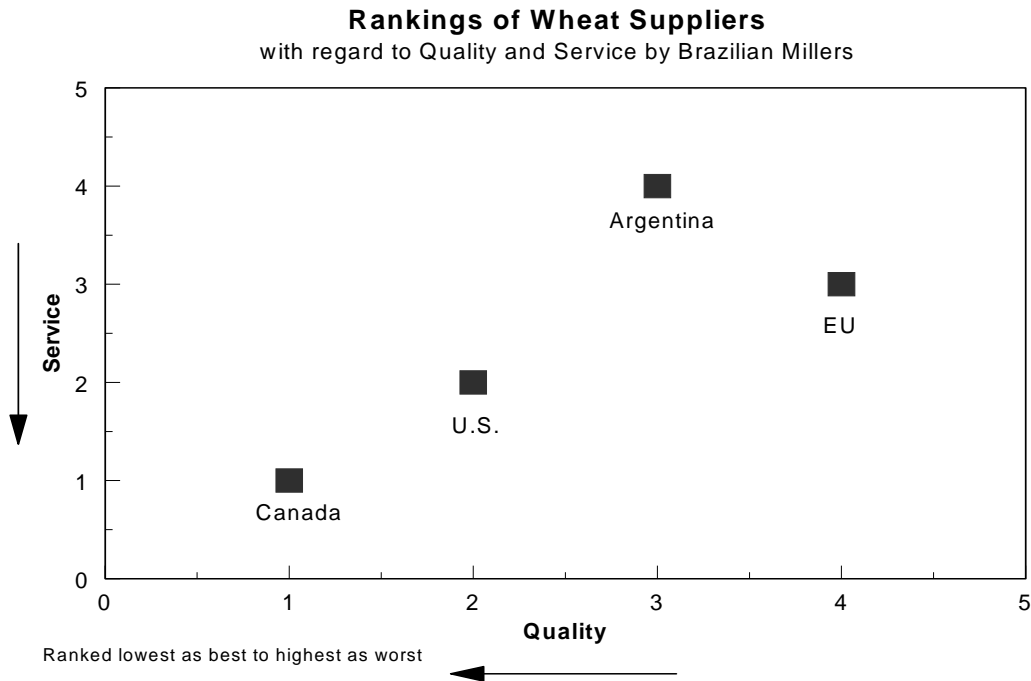
Among others, the firm may pursue a 'low price position,' a "high quality position," and/or a "high service position" (Kotler, 1988). Positioning may put the firm into a subsegment or niche within a segment. Resolving the positioning problem also enables the firm to solve the marketing-mix (product, price, place, and promotion) problem. A firm that pursues a "high quality position" understands that it must put out highquality products, levy a high price, distribute through high class distributors, and advertise through high quality media to launch a consistent and believable high quality image.

Firms that are well known for quality in other segments will find it easier to adopt their positioning strategy and will therefore enter a new segment provided there is an adequate number of quality-oriented buyers (Kotler, 1988). In cases where two or more firms go after the same positioning each will pursue further differentiation, such as "high quality for a lower cost" or "high quality with more technical service" to build a unique bundle of competitive advantages that appeal to a substantial group within the segment. A perceptual map may be used to visualize how end-users perceive products in a market based on the multiple attributes of those products (Oster, 1994). For example, in a recent survey by Kraft et al. (1996) of Brazilian flour millers, a general perception of international

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<sup>5</sup>Porter characterizes competitive advantage (cost leadership and differentiation) as the value a firm is able to create for its buyers that exceeds the firm's cost of creating it.

wheat exporters was obtained with respect to quality and service. A perceptual map (see Figure 1) was derived from the results of this survey to generally visualize these opinions.



**Figure 1.** Perceptual Map of Wheat Suppliers by Brazilian Millers

### Market targeting

Market targeting is the act of developing measures of segment attractiveness (i.e., selecting which market) and then selecting one or more market segments to target and how (Kotler, 1988). In ranking different market segments, the firm must look at three elements. First, segment size and growth must be considered. An important consideration is whether a potential segment has the right size and growth characteristics. A particular segment may have desirable size and growth characteristics and still not be attractive from a revenue maximization point of view. Secondly, segment structural attractiveness needs to be appraised. A particular segment may have desirable size and growth characteristics and

still not be attractive from a revenue maximization point of view. Third, the firm must weigh organization objectives and resources. Attractive segments may be rejected because they do not meet their long-term objectives. If the segment fits the firm's objectives, the firm must consider whether it maintains the requisite abilities and resources to succeed in that segment.

In analyzing segment structural attractiveness, Porter's five competitive forces reflect the inherent long-run attractiveness of a whole market or any segment within it.

They comprise of:

- 1.) Threat of intense segment rivalry - a segment is unattractive if it contains numerous, strong, or aggressive competitors;
- 2.) Threat of new entrant - the lower the barriers to entry or willingness to retaliate, the less attractive the segment;
- 3.) Threat of substitute products - if actual or potential substitute products exist the segment is unattractive;
- 4.) Threat of growing bargaining power of buyers - a particular segment is unattractive if the buyers maintain strong or increasing bargaining power<sup>6</sup>; and
- 5.) Threat of growing bargaining power of suppliers - a segment is unattractive if the company's suppliers are able to raise prices or reduce the quality or quantity of ordered goods and services<sup>7</sup> (Porter referenced in Kotler, 1988).

In selecting market segments, the firm may select a single segment to concentrate

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<sup>6</sup>This bargaining power increases when: buyers become more concentrated or organized; the product represents a significant portion of the buyers' costs, buyer switching costs are low; buyers are price sensitive to lower profits; the product is undifferentiated; or buyers can integrate backward.

<sup>7</sup>Suppliers are inclined to be commanding when: they are concentrated or organized; there are few substitutes; the supplied product is an important input; switching costs are high; and when suppliers can integrate forward.

on, specialize by product or market, or cover the entire market (Kotler, 1988). Large organizations may attempt to serve all customer groups with all the products they may need. This may be done through differentiated or undifferentiated marketing.

Undifferentiated marketing focuses on the common needs of the buyers rather than on what is different. Additionally, undifferentiated marketing facilitates lower costs associated with production, inventory, and transportation as well as marketing research and product management. Organizations that practice undifferentiated marketing typically develop an offer directed at the largest segments in the market.

Differentiated marketing tailors approaches for each significantly different segment (Kotler, 1988). However, differentiated marketing increases the costs of doing business through increased research and development, production, administrative, inventory, and promotion expenses.

### **Product differentiation**

A “good” or product is economically defined as bundles of characteristics which consumers have specific preferences for. In the case of international wheat trade, a class of wheat fits this definition as each generally has specific end-uses (elaborated more in Chapter 3). Dickson and Giner (1987) describe product differentiation as:

*“A product offering is perceived by the consumer to differ from its competition on any physical or nonphysical product characteristic including price.”*

More commodity-type businesses are becoming profitable by knowing how and when to differentiate their products through innovation, service, and customer partnerships as well as how and when to offer a “no-frills” product (Rangan and Bowman, 1992).

Furthermore Rangan and Bowman (1992) postulate:

*“These companies understand that commoditization can be a self-fulfilling prophecy in which lower price, profits, service, and customer loyalty interlock in a cycle of decline.”*(quote from Harvard Business School, 1994).

### **Product selection and discrimination**

A single-seller agency facing consumers with contrasting tastes would have incentive to learn which taste each particular customer has (Tirole, 1988). Additionally, differentiated consumer preferences fosters product variety (Oster, 1994). If the firm can do so, they may charge a high price for the good purchased and a low price to a consumer with a lower willingness to pay, assuming arbitrage opportunities are not available for the consumers (Tirole, 1988). Single-seller agencies will chose their products anticipating that their location in product space<sup>8</sup> will affect the intensity of price competition. The customer has strong incentive to claim that they have a low willingness to pay so that they will be charged a lower price. Furthermore, the incentive to provide quality is related to the marginal willingness to pay for quality.

Quantity and quality-based purchases lead to a justification of “non-linear tariffs” (Tirole, 1988). A single-seller that can fully prevent commodity arbitrage may increase their profit beyond that of a linear pricing methodology by employing a more complex strategy. Under non-linear pricing, a firm may be able to extract some of the high-demand consumers’ net surplus while still selling to low-demand consumers.

### **Horizontal differentiation**

Price variation across different goods is an indication that differentiation exists

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<sup>8</sup>Consumers have heterogenous tastes that lie on a continuum; i.e: a consumer’s “location” may represent the degree of sweetness most preferred.

(Greenway, D., 1984). Consumers find it convenient to go to a competitor if they do not find the preferred product (Tirole, 1988). Therefore, a strong economic incentive exists for firms to differentiate in order to soften price competition. Additionally, firms may wish to maximize demand rather than profits (i.e., case of huge stocks of commodities).

Furthermore, firms may choose to differentiate and compete with respect to price.

The principal of horizontal differentiation is that firms generally do not want to locate at the same place in the product space due to the Bertrand Paradox<sup>9</sup> (Tirole, 1988). Two firms producing perfect substitutes face unbridled price competition. By differentiating their offer from that of a competitor, the firm moves from a homogenous to a heterogenous product. A homogenous product is one that the firm may not raise their price above marginal cost without losing its entire market share. Conversely, a heterogenous product enables the firm to raise their price above marginal cost and maintain market share. Therefore, product differentiation initiates “market niches” and permits firms to enjoy a degree of market power over their customers.

### **Vertical (Product Quality) differentiation**

*“The primary incentive to provide quality is the possibility of repeat purchases by consumers, which induces firms to sustain quality so as not to hurt their reputation and lose future sales (Tirole, 1988, p. 95).*

Providing a superior (inferior) product at equal prices is simply an inverted way of decreasing (increasing) prices (Abbott, 1953).

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<sup>9</sup>Two or more identical firms producing a homogenous good with constant-returns-to-scale technology in equilibrium sell at marginal cost and make no profit (Tirole, 1988, pp. 205-206).

A good reputation of a firm may be adequate advertising (Tirole, 1988). In a repeated game, the consumer can react to the agent's choice of low quality by not repeating the purchase. Fittingly, the CWB has a reputation to protect in that it represents the entire Canadian wheat market as opposed to the U.S. where individual grain companies act as reputational free riders. Arguably, individual firms have reputations to protect but are constrained by market pressures in offering better than specified quality. This is in contrast to a single-seller marketing agency like the CWB which is known for delivering a product that is oftentimes better than contracted (Wilson, 199X).

### **Informational product differentiation**

Information is the critical issue with quality (Tirole, 1988). The CWB therefore has incentive to provide information to prospective markets to provide incentive to purchase wheat. Consumer information, repeat purchases, warranties and advertising by the agent may reduce this informational problem.

Quality product differentiation results from consumers' asymmetrical information about the characteristics of various products (i.e., existence, price, and quality) (Tirole, 1988). Competition in advertising is one of the main methods of non-price competition. Advertising announces product existence, price, and quality. It can be argued that advertising may promote competition by increasing the elasticity of demand through reduction of consumer search costs. Additionally, advertising increases product differentiation associated with lack of information about products. Furthermore, advertising facilitates entry of new firms with deep marketing budgets and encourages production of high quality goods. Similarly, advertising may increase barriers to entry

through higher costs of market development. According to Oster (1994):

*“Advertising message strategy is harder to match than change in prices.”*

Lastly, advertising may succeed in differentiating products that are physically almost identical.

The link between consumer information and product differentiation exists through credence, experience, and search goods as well as moral hazard (Tirole, 1988). Credence goods may require government intervention. Heavy regulation of the Canadian wheat industry provides an excellent example of a credence good. For experience goods, the main issue is information. Search or “warranty” goods provide recourse if the product does not meet specified quality specifications (Tirole, 1988). For example, Asian countries import strict quality-specified wheat from the U.S. and Canada. If the quality doesn’t match the contract specifications, heavy discounts are applied. If a full “warranty” is given, the producer internalizes any consumer misperceptions and suppresses informational problems. Failure to give a warranty may cause consumers to become suspicious.

A distinction between experience and search goods must be made (Tirole, 1988). Assume that agencies cannot directly inform consumers about product quality through advertising and that consumer learning develops during consumption. Therefore, a consumer may fail to recognize two goods that are identical in quality and not differentiated on other characteristics as perfect substitutes because they tried and comprehend the quality of only one of the goods. Experimenting is costly, therefore consumers do not treat products they have experienced and products they have not experienced as identical even if the products are the same. Consumers who have observed

high quality in a product may not try a rival product unless it is considerably cheaper.

A moral hazard exists when an agency who sells an experience good to one-time consumers (i.e., U.S. grain trade) does not have incentive to offer higher than stated quality to the buyer (Tirole, 1988). Informed consumers exert a positive externality on the those who are uninformed. By being more demanding, they drive up the quality thus driving the price associated higher. Informed consumers are those who prevent the agency from cutting quality.

Repeat purchases offer a means of monitoring quality assuming current purchases are indicative of future quality (Tirole, 1988). Consumers are not averse to trying new products if the psychological cost of trying is low and the prospect of many future purchases high. Cost may be considered high even if the trial reveals the true quality. The producer (agent) may use a pricing strategy to offer a low price to encourage wary consumers to experiment. Offering low prices may act as a signal to indicate long-term staying power of the agent.

### **Product choice**

If a firm can produce a product which most closely matches the ideal points of each distinct type of consumer, revenues will be maximized (Oster, 1994). Each consumer will pay the most for the product that most closely matches their preferences. Differentiated consumer preferences encourage product variety.

Tradeoffs exist with increased product differentiation as marketing costs may increase substantially (Oster, 1994). For a single-seller or monopolistic agency, demand side considerations sanction a broad product line (i.e., multiple specialty varieties of hard

wheat) while cost considerations narrow the product line. Implementation of one's own product strategy is dependent upon the behavior of current and potential rivals.

Environmental factors may inhibit ability of rivals to copy product strategy.

### **Market power**

Market power is the ability to influence market prices through actions (Goodwin and Smith, 1995). A useful measure of market power maintained by firms in a given market is the cross-price elasticity of demand<sup>10</sup>. The theory of monopoly contributes an excellent benchmark of comparison with perfect competition (Maurice and Phillips, 1992). Perfect competition is symbolized by no market power or control over price. Monopoly is the market structure distinguished as having the most market power due to their control over the price charged for their products. There are no good substitutes for the good or service. Quantity to supply as well as the price to charge must be determined by the monopoly.

Other firms with market power also resolve the quantity to sell and price to charge. Non-monopolistic firms have less market power due to the availability of substitutes for the products they market (Maurice and Phillips, 1992). If good substitutes are readily available, the firm will enjoy little market power. Conversely, if no good substitutes for the firm's product, it will enjoy a great deal of market power. A source of market power is market share within a broadly defined product category.

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<sup>10</sup>Percent change in quantity of good X demanded divided by the percent change in price of good Y.

## **Price discrimination**

When the producer sells two units of the same good/service at two different prices either to the same consumer or different consumers price discrimination results (Tirole, 1988). No price discrimination exists when differences in prices between consumers exactly reflect differences in the costs of serving these consumers or when differentiated products are sold to different consumers (i.e., quality or logistical cost differences).

Price discrimination is an attempt to capture consumer surplus. Firms have long recognized that if buyers can be classified into separate groups with different elasticities of demand, a firm with monopoly power can charge different prices for the same product and increase profits over what could be obtained if the same price were charged to all buyers (Maurice and Phillips, 1992). Generally, the more the seller knows about buyer preferences and the less easily buyers can trade among themselves, the greater the possible revenue gained from setting distinct prices for the same product. Analogously, the ability to trade in the international wheat market amongst selves is difficult due to low number of trading companies, trade barriers, and lack of information due to CWB secrecy.

**Arbitrage efforts** Possibility of price discrimination leads to the potential for two types of arbitrage: transferability of the commodity and demand (Tirole, 1988). Transferability of the commodity exists when transaction or arbitrage costs between two consumers is low, thus enabling the low price consumer to resell the good to the high price one. This type of arbitrage tends to prevent price discrimination. The second type of arbitrage is the

transferability of demand between different bundles offered to the consumers<sup>11</sup>. This type of arbitrage tends to promote price discrimination.

Consumers in low elasticity markets are adversely affected by price discrimination and would prefer a uniform price. Conversely, consumers in high-elasticity markets prefer discrimination. Through the use of non-linear pricing, the producer may extract some of the high-demand consumers' net surplus while still selling to low-demand consumers (Tirole, 1988). Through linear pricing, the producer may stop selling to the low-demand consumers in order to extract the high-demand consumers' surplus.

**Degrees of price discrimination** Pigou (1920) described various degrees of price discrimination commonly known as first, second, and third degree price discrimination. First degree or "perfect" price discrimination exists when the producer succeeds in capturing all of the consumer surplus and is able to prevent arbitrage efforts. First degree price discrimination is unlikely due to imperfect information and arbitrage efforts as well as the likelihood of consumer recognition that the price of the good/service will increase if they reveal that they value it at a higher price than they are currently paying.

Second degree price discrimination or "personal arbitrage and screening" exists when the extraction of consumer surplus inferiorly by using self-selection devices that are selected indirectly between consumers through their choice between different bundles of goods/services. If the producer knows each consumer's tastes, they can offer personalized bundles (i.e., price and quality, price and quantity, etc.) to consumers, thus resulting in

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<sup>11</sup>i.e., train or airplane accommodations - low fares are designed for lower income individuals; higher income individuals may purchase low fare tickets to save money.

perfect discrimination. To facilitate this, the producer can offer a menu of bundles to choose from.

Third degree price discrimination or “multi-market or imperfect” price discrimination exists when the producer examines some signal that is associated with the consumer’s exogenous information or preferences (i.e., age, occupation, location) and acts as a signal to price discriminate. This signal is that of demand. Consumers with common preferences or attributes will be effectively placed in groups or markets. Optimal pricing suggests that the agency should charge more in markets with the lower elasticity of demand.

### **Price and operational transparency**

*“Transparency” alludes to the degree to which information regarding the operations of a company, government, or other institution is made available to the public (Furtan, 1995).*

Price and operational transparency are the two principal types. Price transparency refers to the magnitude aspects of transactions made by a purchasing or selling agent are obtainable by the public. Such transaction details may encompass unit selling prices and acquisition costs, volumes purchased and sold, and any other contract terms secondarily affecting the transaction such as financing and transportation arrangements, commodity specifications, as well as other designations.

Operational transparency alludes to the degree to which information regarding an institution’s operating procedures is available to the public. Particular considerations that may be included are: financing arrangements, research and development funding, contract stipulations that do not directly affect price, and marketing practices.

## **Conclusion**

Understanding the theoretical foundations of the firm is important in appreciating why an organization such as the CWB behaves as it does and the competitive implications in the world wheat market. Secondly, comprehension of aspects of target marketing and transparency is meaningful in the increasingly heterogenous international wheat market, particularly with respect to strategic implications of CWB behavior. By considering these theories and their implications, a better understanding of the increasingly competitive international wheat trade becomes possible. In the next chapter, background information regarding the Canadian wheat marketing system is presented as well as the review of literature.

## **CHAPTER III - PREVIOUS STUDIES AND BACKGROUND DESCRIPTION OF THE CANADIAN WHEAT BOARD**

### **Introduction**

In this chapter, a background description of the CWB will be reviewed. Particularly, implications of activities of the CWB as well as the Canada Grains Commission (CGC) will be discussed. Additionally, various end-uses of wheat will be discussed as well as where they are predominantly produced. Furthermore, previous studies pertaining to the international wheat market, CWB market power, quality reputation, and lack of transparency will be surveyed.

### **The Canadian grain marketing system**

#### **Background description of the CWB**

In terms of marketing patterns, Canadian wheat is produced primarily in the western prairie provinces and shipped largely by rail to both West and East coasts for domestic and export use. As indicated previously, the fulcrum of Canada's wheat export marketing system is the CWB. The CWB operates as an independent, government-supported, centralized marketing agency. All wheat for human consumption is mandated by the Canadian government to be sold to the CWB. With respect to domestic sales and exports, the CWB is a monopolist, and acts as an oligopolist in the world wheat market. The CWB is the largest single merchandiser of wheat and barley in the world (GAO, 1992). The use of a single-seller agency facilitates the ability to:

- 1) manage the orderly withdrawal of crops from the farm for delivery to export locations and for domestic consumption;
- 2) sell crops without frequent taxpayer-funded direct export subsidies;

- 3) break the link between the price producers receive for their crops and the time the crops are brought to the market;
- 4) identify and target markets for export sales;
- 5) use longer-term marketing and sales strategies;
- 6) characterize ideal customers as preferred (those willing to pay a premium for quality with potential or current large markets);
- 7) offer differentiated prices in key and segmented markets in order to capture new and growing markets by offering to sell grain at lower-than posted prices while charging full market prices to established customers;
- 8) maximize returns to all producers collectively, even if some producers may be subsidizing others; and
- 9) sell both in the domestic and export markets which permits losses in one sector to be offset by revenues in another (GAO, 1992).

While the Canadians contend that the CWB is a “cooperative;” others maintain that it is a state agency (USITC, 1989). Nevertheless, its mandatory relationship with wheat farmers sets it apart from the usual understanding of a voluntary cooperative.

Due to the similarities in their structure, marketing boards have a tendency to enter into longer-term sales agreements with centralized buying authorities of importing nations (GAO, 1992). In addition, the use of marketing boards also makes long-term sales agreements with importing governments easier to attain. Furthermore, the capability to evaluate competitor FOB origin prices plus freight and determine the landed price that a buyer may receive from various buyers throughout the world is a clear advantage (Kraft et al., 1996).

The CWB’s mandate is:

- 1) to market as much grain as possible at the best price that can be obtained;

- 2) to provide prairie grain producers with price stability; and
- 3) to ensure that each grain producer gets their fair share of the available markets each year (Canadian Wheat Board).

To meet this mandate, the CWB is involved in many aspects of the sale of wheat and barley. This includes determining farmer delivery quotas, managing the pooling process, and pricing and selling of grain. In addition, the Canada Grain Commission (CGC) extensively regulates rates country elevators levy for handling and storage. The CWB does not own any marketing or transportation facilities, but rather contracts these services with the railroads as well as cooperative and private elevator companies. Therefore, the CWB's role in this function is primarily administrative.

The CWB is not directly involved in input and production decisions but rather takes possession of grain after it is produced. Therefore, production costs are not applicable to pricing decisions (Goodwin and Smith, 1995). The role of the CWB is to maximize producer revenue from sale of their grain. It is therefore quite conceivable that sales in some export markets occur at prices that are lower than costs of production which include shipping, insurance, and other handling costs as well as on farm production costs. On occasion, the CWB may be forced to match EEP prices which often are well below the Canadian cost of production (Furtan, 1995).

CWB revenues come from two sources: revenue from grain sales and earned interest on undistributed producer funds. In marketing grain, the CWB develops marketing strategies and plans (Furtan, 1995). In each market, the CWB seeks to maximize returns, subject to a general maximum return to producers.

CWB expenditures may be grouped into three classes (Loyns and Kraut, 1995). First, producer payments and payment costs such as initial, interim and final payments as well as costs of issuing payments. Interest, depreciation, and carrying costs comprise the second class. The third class includes demurrage, special freight, and drying costs. No public funds are used in the pool accounts with the exception of pool deficits. One potential source of indirect public fund contributions is through credit sales guaranteed by the Canadian Government where interest and default costs are their responsibility.

**Delivery contracts** For many years the CWB utilized quotas throughout the crop year as their shipping program culminated. Delivery quotas were necessary in order to control the flow of grain from the farm through the limited storage and transportation facilities. Eventually the quota system was adjusted partially to exhibit productivity and grade differences that endure throughout the various regions of the prairies. This has since developed into a contracting approach (Loyns and Kraut, 1995).

The contract approach constrains the producer to consign a specific amount of the grain expected to be provided to the CWB. The CWB then pledges to market a minimum amount of the consigned grain. Producers with contracts furnish samples of grain for grading and an estimate of the volume available at the end of the harvest. The CWB hopes that full exploitation of these contracts will allow the CWB to evaluate the quality and quantity of the crop earlier in the crop year, thereby enabling them the ability to make sales with more certainty than under the conventional quota system (Loyns and Kraut, 1995).

**Pooling** The objective of pooling returns from grain sales is to ensure that producers receive a price for their product that is representative of the market's valuation of the value

of quality over the course of the crop year (CWB Planning Directorate, 1990). Pooling in and of itself does not guarantee higher prices. It disseminates annual market risks and enables the CWB to segment markets corresponding to buyer preferences and characteristics while maximizing return to pool participants (Furtan, 1995). Pooling of revenue factors out any bias that alters the price relationship between grades during the crop year which include:

- 1) timing of sales;
- 2) range of sales opportunities that exists for various grades;
- 3) direction of sales to either east or west coast ports; and
- 4) costs of operating a sales program (CWB Planning Directorate, 1990).

Through the pooling process, separate pools are maintained each year for each grade and class of grain. Thus the CWB can distribute market risks and maximize producer revenue. Farmers deliver their grain to country elevators where it is graded and binned with similar grades awaiting CWB access to the marketing system for grain export. At the time of delivery, initial partial payments of approximately 80 percent of the expected sales value are received by the farmer from the elevator. If the pools operate at a deficit at the close of the pool the deficiency is made up with public funds. Deficits have occurred since 1980 in durum (\$69.6m) in 1990/91 and two in wheat (\$22.9m and \$673m) in 1985/86 and 1990/91. All fees for transportation and handling are initially shouldered by the CWB as operating costs to be charged to the pool accounts which are maintained as distinct entities.

Operating costs are deducted from its gross returns when the CWB prepares to close out a pool account with the applicable average discounts for the various grades being applied. Every ton of grain in the pool account compensates an equal amount of the cost of pool account operation. Operating costs are: carrying charges on stored grain, interest and other bank charges, demurrage and despatch, additional freight, handling and stop off charges, interest and depreciation on CWB railcars, as well as administrative and general expenses (CWB Planning Directorate, 1990). A per-unit net return is determined for each grade based on average discounts and tonnage sold. Each farmer then receives a final payment based on the average price for the grade of wheat delivered less the initial payment received previously in the crop year as well as operating costs. Final payments are made to the farmers to distribute remaining revenues when the pool accounts are closed each year.

CWB price pooling was not intended to pool grain quality among producers. Producers are paid on the basis of the quality of their grain and are assessed for costs related to guaranteeing grain grade standard satisfaction for dockage and maximum moisture levels (Canadian Wheat Board Planning Directorate, 1990).

Pooling removes the timing of sales as a decision factor for farmers who receive equalized payments that are independent of the timing of delivery. Theoretically, the farmer receives the average relative price of their grade of wheat regardless of the particular price at which the farmer's crop may have sold at time of delivery, thereby reducing market risks. While pooling distributes market risks by allocating each farmer an average price of all sales of grade of grain sold by the CWB, pooling by itself does not

insure higher prices for the farmers (Furtan, 1995). Nevertheless, the CWB can segment its market accordingly to buyer characteristics, accommodate the risks and benefits of large inventories, and therefore maximize the revenue to pool participants. It may take up to 18 months for a producer to receive their final payment.

**Pricing** Pricing constitutes the primary aspect of the CWB's selling operations (Capel and Rigaux, 1974). With respect to pricing, the CWB exercises sole authority, thus enabling it to differentiate prices based on markets in order to initiate new business or expand its market. By virtue of acting as a monopoly in the sale of Canadian wheat, the CWB enjoys a distinct advantage as multiple sellers are limited in their ability to differentiate between buyers in terms of willingness to pay (Kraft et al., 1996). The CWB's pricing policies are kept in check by the concern for pool return deficits which would require Canadian government intervention and reimbursement. The CWB has generally attempted to price to move grain rather than function as an element of government policy to enhance producer income (McCall and Schmitz, 1979). Credit and concessional terms are also critical in some markets and may reduce the role of price (Capel and Rigaux, 1974)

The CWB maximizes producers' revenues by segmenting its market according to buyer characteristics, experiencing the risks and benefits of large inventories, and extracting higher prices in some markets in order to counteract losses in others (GAO, 1992). It is important to view revenue maximization in the "proper light" as a long-term objective. CWB negotiators must be cautious not to exploit their position in the short-term at the expense of Canadian producers' longer-term interests (Gilmour and Fawcett, 1987).

Additionally, the CWB is authorized to make credit sales.

These endeavors are facilitated by the CWB's treatment of pricing information as proprietary (lack of price transparency), much like a large grain-exporting company in the U.S.. Furthermore, the CWB is unwilling to disclose even very old prices principally because of its interest in protecting its customers who have learned to trust the CWB and its reputation for keeping purchase prices confidential. This strategy has resulted in criticism by the U.S. and other exporting countries due to the lack of price transparency. As discussed in Chapter Two, price transparency alludes to the availability of price information. Lack of price transparency makes it difficult to prove or disprove predatory pricing claims.

Kraft et al. (1996) maintain that the CWB has been successful in achieving premiums over competitive wheat prices. They argue that some countries may desire to diversify their source of supply and may therefore be prepared to pay a premium for Canadian wheat. Factors including technical support, ocean freight spreads, credit availability, reliability and consistency of supply may lead to brand loyalty premiums in a competitive market. These premiums were found to increase with the level of quality. Additionally, they argue that a single-desk agency is able to maintain higher prices in the non-subsidized market and discriminating with respect to which subsidized market to sell the remaining supplies of wheat. Wilson, (1995) argued that in order to capture premiums as a monopoly it is crucial that the CWB maintains mechanisms to: discourage wheat blending, maintain segregations for exporting potentially heterogenous commodities (between grades and factors), and ship quality levels greater than their factor limits to

assure buyer satisfaction (reputation effect).

**Sales Opportunities** The CWB sells grain to a large number of customers each year who have a wide range of requirements and vary in their willingness and ability to pay for quality (CWB Planning Directorate, 1990). Some countries maintain very exact requirements and are prepared to pay for only the highest quality product on the market. On the other end of the spectrum, other countries either do not demand top quality grades, are less resolved or able to pay a premium for higher quality grain. In the middle, some countries may be in the market for a wider range of grades and would be willing to receive a lower quality grade at a designated discount. In making a marketing decision, the CWB reviews the relative price spreads in other markets and selects the combination of grades and markets as well as direction that result in the highest total revenue in the pool account. When several customers are in the market for the same range of grades, the CWB will consistently strive to sell the lower quality grain into the market with the smallest price spread between the two grades, regardless of the price level in the markets (CWB Planning Directorate, 1990).

**Exports** Multinational grain companies play a role in Canadian grain marketing by acting as the CWB's export agents. In addition, they may purchase grain from the CWB as principal, thereby assuming the full risks of ownership and finding foreign markets. However, private traders are not permitted to purchase wheat directly from producers.

**Direction of sales** The cost to the pool account of moving grain to a seaboard position on the east coast is significantly higher than moving grain to an export position on

the west coast (CWB Planning Directorate, 1990). Considering current returns from sales at port as well as prevailing costs of moving the grain to port, the CWB can realize a substantially higher net return (by approximately the cost of lake trans-shipment) on west coast sales relative to those through the St. Lawrence.

**Producer risk** The most important risk to the producer in the CWB system is that of price risk - the total price received at the end of the pooling period (Loyns and Kraut, 1995). The individual producer solely encounters risk up to the point the grain is unloaded into the country elevator and a satisfactory grade appraisal is made. After that point in time the producer experiences collective risk with all other producers taking part in the pooling of returns.

Another type of risk faced by producers taking part in the CWB is regulatory uncertainty (Loyns and Kraut, 1995). The quota allocation and contracting methods employed by the CWB foster an environment of cash flow uncertainty for grain producer. Uncertainty with unknown quota allotments or when a contract will be called serves as a handicap to effective financial planning. Through time, various counteracting government assistance programs have been used to overcome this handicap.

Other types of regulatory uncertainty pertains to the CWB's strict attention to infected and new varieties of wheat. An example is reaction to infected wheat is the fusarium head blight (popularly known as Tombstone). When the CWB refused to market wheat infected with fusarium heat blight, it had no value. During the late 1980's a temporary registration was accorded to the Grandin wheat variety. This variety was reported to have comparable milling characteristics to the current registered Canadian hard

red spring varieties but with a higher yield. In 1993, the CWB accepted Grandin only as feed wheat. Contract licensing has not occurred.

### **The Canadian government assists its wheat industry**

The Canadian government provides support to its wheat producers by assuming liability for any pool deficits that cannot be financed by the CWB (Loyns and Kraut, 1995). In addition, the Canadian government also guarantees export credit for grain sales made through the CWB. The net result of this assistance is customer diversification and market expansion. While CWB obligations represent possible liabilities of the Canadian government, the CWB has respectable control and independence and exerts great control over national agricultural policy. The CWB has unlimited pricing and relatively autonomous credit authority to handle the sale of Board grains.

With respect to direct farmer support, the Canadian government provides several types of assistance (Loyns and Kraut, 1995). The Farm Income Protection Act provided for the Crop Insurance Program, the Gross Revenue Insurance Plan (GRIP), and a Net Income Stabilization Act (NISA). GRIP focuses on a guaranteed revenue flow based on a long-term average price and individual crop yields. NISA enables producers and the government to each advance three percent of the producer's "Qualified Income" into a fund. This fund can reach a maximum of three hundred thousand dollars before monies must be withdrawn with a purpose of stabilizing current year farm income relative to the preceding five years.

In response to an assortment of significant financial hardships over the past decade, the Canadian government has furnished emergency assistance under the Special

Agriculture Measures I and II (Loyns and Kraut, 1995). Developments include: a revenue insurance program, the federally, provincially, and producer-funded GRIP; the Western Grains Stabilization Program and the Agricultural Stabilization Act were dissolved; and the introduction of the federally, provincially, and producer-funded NISA. Until 1995, a freight rate subsidy, known as the “Crow’s Nest Pass Agreement,” was also provided. In addition, government liability for pool deficits are also a form of support. Furthermore, Canada supports its grain industry through research, advisory services, and the development of transportation facilities.

### **The wheat marketing systems of the U.S. and Canada differ**

The wheat marketing systems of the U.S. and Canada differ in many key aspects in the higher quality hard wheat market. The U.S. marketing system functions with relatively few regulations and with transparent price discovery mechanisms using cash and futures markets where prices for spot and contract transactions are negotiated or settled in the open market (Wilson, 1995).

In the U.S., regulations operate with “various degrees of formality,” particularly regarding quality. Variety release mechanisms are not regulated nationally but are subject to intense examination from breeders, industry, and administrators. The net result of this non-regulation has appeared to result in the release of more varieties. Grades, standards, associated trading practices, and prices customarily permit quality parameters to be established through buyer-seller negotiation. This practice results in few grades traded and exported. Canadian wheat quality is regulated to a greater extent regarding variety development, grades and standards (Wilson, 1995). Variety release mechanisms are

similar to that of the U.S., but complete release requires visual distinguishability. The result is the release of fewer varieties.

In the U.S., the large domestic market is very demanding of higher quality hard wheats (Wilson, 1995). The result is a reduction in available higher quality hard wheats for export. The ability to export a large quantity of higher quality hard wheats as well as maintenance of rigid grain regulations fosters Canada's reputation as a quality-oriented exporter.

The use of specification of grade and nongrade factors is becoming a growing custom and appears unavoidable as the increasingly competitive environment within the U.S. grain industry and that between increasingly sophisticated purchasing behavior of importing countries heats up. Both Canada and the U.S. use the least factor approach in grading grains with Canada having more factors. In Canada, the existence of a smaller domestic market relative to the U.S. increases the proportion of higher quality graded wheat available for exports.

### **The Ontario Wheat Board**

The Ontario Wheat Board (OWB) dominates the wheat market in central Canada (Loyns and Kraut, 1995). In distinction to the CWB, the OWB is a producer-run board. In terms of higher quality hard wheat, the OWB markets hard spring types. Similarly to the CWB, the OWB provides initial payments that are guaranteed by the federal government and operates a pool for each type of wheat. Although the OWB does not have the large volume of production market as the CWB, it fulfills a large portion of the Ontario requirements for the pastry and cookie market as well as exports to the U.S. and the rest of

the world. Furthermore, the OWB uses CWB pricing as a basis for setting its prices. Unlike the CWB, the OWB uses commodity markets in Chicago for hedging producer returns.

### **Grain grading and regulation - The Canada Grain Council (CGC)**

The heart of the quality standards and grading system for Canadian wheat is its end use in breads, pastries and pasta markets (Loyns and Kraut, 1995). Varieties are developed in accordance with strict quality standards which are expected to produce the processing characteristics associated with these end uses. The Canadian grading system accomplishes quality segregation and uniformity and accentuates high-end quality markets. There is no skepticism that the Canadian system has targeted the quality end of the market for decades.

The CGC is the certifier and protector of quality throughout the entire Canadian grains system (McLaughlin, 1994; Loyns and Kraut, 1995). The CGC is a special operating agency of the Canadian government reporting through the Minister of Agriculture and Agri-Food by virtue of the Canada Grain Act and Grain Futures Act. The CGC is responsible for all Canadian grains, being most concentrated in the prairie grain industry. Important purposes are:

- 1.) quality standards determination, inspection, certification;
- 2.) license and monitor country elevators and grain dealers, assure financial integrity;
- 3.) arbitrate producer complaints on grain transactions;
- 4.) supervise grain futures trading on the Winnipeg Commodity Exchange (WCEX);

- 5.) collect and publish statistics and reports on grain, handling, storage, and movement; and
- 6.) monitor health and safety characteristics of grain (Loyns and Kraut, 1995).

CGC operations are headed by an Executive Director who administers the activities of the Commission's three divisions; the Industry Services, Corporate Services, and the Grain Research Laboratory (McLaughlin, 1994).

The Industry Services Division provides inspection and weighing services as well as quality standard development for domestic and export grains. Additionally, the division supervises and controls grain segregation, sanitation, and treatment, monitoring of condition of inspection equipment and facilities used in licensed elevators, protein determination of CWRS, entomology, and protein identification services. Final form of certification transpires at the export point if sales are made basis official grades (Loyns and Kraut, 1995). Grain is continuously sampled as it is loaded on vessels and a CGC export certificate is issued based on the instituted standards where the sample is required to be certified as representative.

The Grain Research Laboratory is the primary Canadian center for applied and basic research of a variety of grain. With regard to Canadian cereals and oilseed, the laboratory conducts annual harvest surveys, monitors the quality as the grain moves through the handling system, assesses the quality of plant breeders' new lines, conducts studies on commercial processing of grains, and conducts basic and applied research on grain and grain products.

Quality is evaluated relative to well-established varieties and in some cases, against varietal standards of quality established by the Canada Grain Regulations

(McLaughlin, 1994). Quality measurements include an evaluation of the intrinsic properties of a new cultivar as well as evaluation of the kernel visual distinguishability as class grain for which they were developed. CGC quality control program may be summarized in the following key points:

- 1.) varietal control ensures that producers will grow varieties with intrinsically high quality;
- 2.) licensing of elevators assists the CGC to ensure that elevator operators follow grain handling regulations;
- 3.) inspection ensures that grain is segregated correspondingly to quality characteristics and cleaned to export standards;
- 4.) weighing safeguards that the quantity of grain is shipped;
- 5.) a sanitation program protects the quality of grain as it moves through the handling system; and
- 6.) quality monitoring by the Grain Research Laboratory contributes information on each class of grain as it moves from farm to market (McLaughlin, 1994).

**“Cornerstones” of the Canadian grading system** The “cornerstones” of the Canadian grading system are: variety control, grade definitions, and standard samples (McLaughlin, 1994). McLaughlin (1994) argues that varietal control is analogous to quality control. The mandate of the varietal control system is to ensure: new varieties meet current requirements for resistance to economically important diseases and high quality products for processors and consumers; and agronomically inferior or unadapted varieties are excluded from the Canadian marketplace (CGC, 19XX). Grain exported from Canada must be commercially clean unless the CGC has been advised that the buyer is contractually willing to accept grain containing dockage. One of the major goals of the

CGC's quality assurance program is to offer consistency from cargo to cargo as well as to maintain uniformity within a shipment.

**Varietal purity and control** Varietal purity and control ensures that producers grow varieties with intrinsically high quality (Wilson, 1995). Quality is measured relative to established varieties and in some cases the quality established in the Canada Grain Regulations. Quality measurements include the measuring of the intrinsic properties as well as the evaluation of the kernel visual distinguishability. The objective of variety release and control mechanisms is to provide a means to regulate quality for characteristics that are not easily measured in the market system, in addition the use of this type of regulation reduces the magnitude of lack of uniformity in end use.

**Principal factors of Canadian wheat grading** Principal factors considered when grading Canadian wheat are test weight, varietal purity, vitreous kernels, soundness, and maximum limits of foreign material (McLaughlin, 1994). Grading is objective due to assignment of grades on the foundation of measured tolerances and specifications and subjective as grades are based on visual examination by individual grain inspectors. Those involved with the evaluation of quality visually examine factors and make assessments that result in the assignment of a grade to a sample of grain. Grades reflect intrinsic quality as it is often said:

*“if the sample looks good - it is good”* (McLaughlin, 1994).

The CGC grading system relies on the “basic premise” that grain that is sound in physical appearance is sound in terms of end-use quality (CGC, 19XX). Prior to the issuance of the *Certificate Final*, Canada's guarantee of quality and quantity, an official

composite sample and documentation are reviewed by senior regional staff. Five principal reasons for the design and implementation of the CGC grain grading system:

- 1.) provide a producer with a price that is relative to the quality produced;
- 2.) to facilitate grain handling;
- 3.) to simplify trading by relating price to quality;
- 4.) to enable a customer to procure the same quality on a consistent basis over time; and
- 5.) to provide sufficient quality divisions to permit buyers to choose according to their needs (McLaughlin, 1994).

**Product positioning and variety control** Control over the varietal registration process has contributed significantly to protecting the quality of Canadian grain and its various classes. Only registered varieties are eligible for the top grades of any class of grain. The result is that Canadian wheat tends to be standardized across the prairies (Carter et al, 1986). One of the major goals of the CGC quality assurance program is to offer consistency from cargo to cargo and to preserve uniformity within a shipment (McLaughlin, 1994). Canadian grain grades are world-recognized for the uniform and consistent quality of the grain packages they describe and are for the most part visually based.

**Primary and export standards** Two standard samples in terms of specifications and physical samples are used: primary and export standards (McLaughlin, 1994). The primary standard samples reflect the minimum acceptable visual quality for each grade of grain for receipt into primary and terminal elevators (domestic use).

Export standard samples are prepared for the major grades of grain exported from Canada. Export standard samples reflect a higher statistical average for the grade and are therefore slightly better than the primary standard. Thus reflecting the quality enhancement that occurs as grain moves through Canada's bulk handling system. In order to uphold this quality enhancement, terminal elevators are prohibited from mixing the top two grades of spring wheat without CGC supervision. Additionally, export standards require enhanced visual quality over primary standards as well as lower allowable limits of foreign material and other grading factors.

### **Previous Studies**

#### **Wheat is heterogenous in nature**

Wheat classes can vary significantly in their physical and chemical attributes and consequently in their end uses (Gilmour and Fawcett, 1987). Wheat is grouped by whether it's hard or soft (Wheat Flour Institute, 1981). Hard spring and winter varieties are typically higher in protein and principally used in bread flour. Softer wheats, both white and red types, contain lower protein and are milled into flour for cakes, cookies, pastries, and crackers. Durum wheat, which is very hard, is milled into semolina for pasta products. Quality differences are perceptible between exporters as each exporter country produces different types of wheat. Grading specifications such as test weight or percent of damaged kernels are predisposed to dispense direct information regarding physical wheat quality (Stiegert and Blanc, 1995). Grading information is important to wheat millers because it contributes to expected cost, time, and flour yield from the wheat they purchase.

Wilson et al. (1987) argued wheat to be nonhomogenous. Thus indicating that buyers are not indifferent between wheats of different origins. Additionally, the degree of differentiation has increased since 1975 (Wilson, 1989). Furthermore, Uri and Hyberg (post 1993) demonstrates that wheat has variations in quality, variety, physical characteristics, and end-uses. Thus making it heterogenous. Lastly, Wilson et al. (1987) argues that important indigenous differences exist in the wheat produced by the five major exporters (Argentina, Australia, Canada, EC, and the U.S.).

Exports from Argentina and France are primarily hard and soft wheat respectively. Australia exports standard white while Canada exports hard red spring and durum (CWRS and CWAD). The U.S. exports all of the above classes. With regard to durum, the U.S., Canada, and the EC (France, Italy, and Greece are the primary producers) comprise of approximately 95 percent of wheat referred to by the pasta industry as “pasta grade” durum (USITC 2274, 1990).

Demand for wheat is prevalently a derived demand (Uri and Hyberg citing Stigler, (1966) post 1993). Demand for wheat is based on the need to use the flour resulting from the milling of the wheat to produce bread, pastas, rolls, pastries, etc. In other words, the demand for wheat is governed in the final markets by the supply and demand for wheat-derivative products being sold. The demand side of a market is best characterized by a set of heterogenous customers, thus supporting the sale of a variety of qualities (Shapiro, 1983). A variety of forces function to assign a price to wheat that reflects the presence and relative calibers of important characteristics. Price differentials

between similar grains with varying characteristics represent the distinction in value associated with the inherent differences between them.

### **Increasing sophistication of higher-quality wheat markets**

In recent years, a prevalent trend in international grain procurement has been the privatization of grain import functions (Wilson, 1995). One of the principal results of this trend has been a inclination for private buyers to have elevated specificity with respect to quality requirements as well as price sensitivity. In contrast, countries with government procurement agencies have exhibited concern principally with respect to price.

This trend is likely to continue as developing nations and traditional wheat importers in Eastern Europe are quickly moving to market economies, thus increasing the number of wheat purchases that are likely to be more closely aligned to end-user demands (Steigert and Blanc, 1995). The increasing role of quality is evidenced by the following observations from a 1993 USDA ERS report on quality:

- 1.) 20-30% of the world market is quality, as opposed to price sensitive and the proportion is increasing;
- 2.) reductions in subsidy levels suggests quality will become more important;
- 3.) Canada and Australia emphasize quality throughout the entire system; and
- 4.) grain quality encompasses intrinsic and end use characteristics, as well as uniformity of shipments (USDA, ERS, 1993).

**Increased quality differentials** As the competitive environment in the international wheat market escalates, differentiation of wheat by quality characteristics has become increasingly important (Wilson, 1989). During the 1974-89 period the degree of differentiation by quality characteristics has increased (Wilson, 1989). Thus reflecting

increased product differentiation in the international wheat market. Wilson and Gallagher (1990) argued that preference structures for individual wheat classes are shifting over time and that quality differentials and prices both are important competitive factors in international markets. Some quality-conscious markets are inclined to prefer strong wheats, while others prefer typically less expensive wheats. Strong and relative preferential stability for U.S. hard red winter (HRW) persist in the U.S. domestic market. In Asia, growing preferences for U.S. soft red winter (SRW), HRS, and CWRS relative to Australian standard white (ASW) have become evident, whereas HRW is losing. In Japan, HRW and CWRS are both losing preference to U.S. white (WHI), whereas ASW and HRS are gaining.. The Latin American market has strong preferences for HRW relative to Argentinean hard (ARG). Additionally, Wilson and Gallagher (1990) argued that in general, quality differentials are important in some international markets while in others, relative prices are more important in determining market shares.

**Increased price differentials** Prior to 1973/74, price differentials in international markets were relatively small (Wilson, 1989). Since 1974, price differentials have increased in practically all markets, thus reflecting increased differentiation in the international market. Particularly, increases have developed in stronger wheats such as HRS and CWRS relative to all other classes with CWRS surpassing that of HRS. Additionally, an implied value exists for spring-planted wheats relative to winter. Considerable implicit premiums exist for Canadian wheat. Implicit premiums for hard wheats over soft have been subsiding in recent years. As price differentials increase, the importance of being capable of differentiating increases.

Quality differentials and prices both are important competitive factors in international markets (Wilson and Gallagher, 1990). Every market is price and quality-conscious to some extent. Econometric analysis demonstrated that through time there has been a growing diversity of demands for end-use characteristics. A range likely exists reflecting the extent markets are price and quality-conscious. At one extreme, imports by price-conscious markets would be highly responsive to relative prices, at the other extreme the market could be alluded to as quality-conscious (i.e., one in which substitutability in response to changes in relative price levels is limited). A market may be quality-conscious even if it does not import the most expensive wheat as substitutability may be limited in some markets due to products produced or technology employed.

Asia is by far the most price-conscious market (Ryan, 1993). The markets in SE Asia and Japan are very quality-conscious with increasing noodle demand. Japan has been a major advocate of higher wheat quality in international wheat markets (Frey, 1994). Japan is a major buyer of wheat from Canada and Australia (Stiegert and Blanc, 1995). Increasing development of Asian country economies with a comparable growth in demand for grain for food as well as for livestock feed has also been observed (Ryan, 1993). Latin America and Japan are comparably less price-conscious, thus suggesting fairly rigid class preferences (Wilson and Gallagher, 1990). Wilson and Gallagher (1990) maintain that this should not be interpreted as these countries necessarily having a strong preference for “high quality” wheat, but rather unique preferences for particular wheat qualities. Egypt, the FSU, PRC, and Iran are bulk buyers and are less discriminating and more concerned

with price, yet quality standards are still critical. In some cases they have been concerned with credit availability.

**Durum wheat market** The durum wheat market is extremely quality-conscious (USITC, 1989). Pasta manufacturing dictates a high-quality product that demonstrates a number of end-use values not included in grade specifications. The U.S. is able to provide contracts of greater specificity while the Canadian marketing system can market only to grade. Wheat millers need to produce flour that meets particular high-volume baking specifications in order to fulfill downstream customer needs (Stiegert and Blanc, 1995). Protein serves as a reliable proxy measure of how wheat will perform in baking of yeast breads and hard rolls, thus causing the use of minimum protein contracts for hard wheats. Nevertheless, the correlation between higher protein and preferred end-use quality is also dependent upon the quality of the protein that is specified by two classes of gluten proteins. The two classes of gluten proteins may vary across wheat classes and varieties as well as growing conditions and producer practices. Therefore, the marginal value of wheat protein should indicate its heterogenous nature.

Given the many types of wheat produced and end-use products, the degree of substitution should vary across countries (Wilson et al, 1987). Wilson et al (1987) analyzed importer purchasing patterns and exporter competition and found that half of Canada's market share is due to loyalty and that Canadian wheat is a better substitute for U.S. wheat than vice versa. Additionally, they argued that in some cases, substitutability is limited due to highly specialized product requirements. However, substitution between

classes of wheat has become increasingly possible through innovations in milling and baking technologies (Gilmour and Fawcett, 1987).

### **Various end-uses of wheat**

Demand for wheat relies on many factors, the most important of which is the suitability for its actual end use that in turn is discovered by the possessed quality characteristics (Ahmadi-Esfahani and Stanmore, 1994). Quality characteristics prevalently considered to be important in determining the suitability of wheat to various end-uses include protein content, test and thousand-kernel weight, hardness, amylase activity, foreign and unmillable material, ash content, and flour extraction. Knowledge of such information is of paramount importance to the wheat industry for both production and marketing decisions.

While wheat is consumed in nearly all countries, not all regions consume wheat in the same form (Henning and Martin, 1989). In Europe and the Americas, leavened bread generally requires a relatively hard, high-protein wheat of similar high-gluten strength. Among types of leavened bread, the required protein levels vary widely. Rye is gluten deficient, thus requiring a high protein (14 - 17 percent) admixture to “carry” it. Standard white pan bread requires only protein levels of 12.5 - 14 percent which may be derived from medium hard/protein by itself or blended with a high protein wheat.

**Unleavened breads** Unleavened breads represents a major form of consumption for much of the developing world. Chapitas, a predominant form of wheat consumption in India require protein levels of nine to ten percent. Arabic and flat breads produced in the Middle East and North Africa have similar requirements (9 - 12 percent). Steamed breads

in South East Asia require 10 - 11 percent protein. Confectionary products such as crackers, cookies, pastries, and cakes generally dictate flour of 7.5 - 9 percent protein content derived from low protein soft wheat. The principal region where this group is significant is the western hemisphere.

**Oriental and pasta noodles** Oriental and pasta noodles have quite different requirements from those previously discussed. Oriental noodles generally require flour of medium protein content (10 - 11.5 percent) derived from medium hard wheat. This product is almost solely confined to the East and South East Asia, where it illustrates the largest form of wheat consumption. Pasta noodles are principally a western-style food and are primarily produced from durum flour. The only other significant durum preparation is the North Africa region, where it is derived and consumed as couscous and unleavened bread (USITC, 1989). Additionally, medium-hard and soft wheats are traditionally used for livestock feed.

**Durum demand** Durum use is concentrated in a small number of countries, specifically developing countries which consume approximately half of world consumption (USITC, 1989). Durum use in North Africa has decreased due to developing economies and accompanying increases in per capita income have changed traditional diets. Italy is a major import market for “pasta quality” durum wheat with much of the produced pasta being exported to the U.S. Both the U.S. and Canada export lower quality durum wheat for manufacture of products such as couscous in North Africa and lower quality pasta in developing countries. In the Near East, durum consumption has continued, with very little durum being consumed in the Far East.

## **CWB Market Power**

By definition, any monopoly has market power because it is the only firm selling in a market (Maurice and Phillips, 1992). This applies particularly to the CWB, not only because it is a single-seller agency that also acts as a sole procurement agent in the Canadian wheat market for human consumption, but also due to its monopoly status with respect to its production of uniform higher-quality hard wheat and loyalties experienced by some export markets. Additionally, the CWB has the ability to govern how much and where wheat is sold (Loyns and Kraut, 1995). Furthermore, the CWB has market power provided that it has done well in market intelligence and is selling in a market where the Canadian product quality and uniformity is an advantage.

With this market power, the CWB should be able to capture economic rent on behalf of producers (Loyns and Kraut, 1995; Kraft et al., 1996). Several reasons include: some countries desire to diversify their source of supply and thus may be prepared to pay a premium for CWB wheat, existence of CWB technical support, ocean freight spreads, credit availability, and reliability and consistency of supply (Kraft et al., 1996).

Goodwin and Smith (1995) found substantial support for the argument that the CWB does enjoy and exert market power in international wheat markets and that to a “considerable degree” the CWB is able to control the prices at which it exports wheat. Market power achieved either through monopoly status or brand loyalty facilitates the ability to price discriminate (Maurice and Phillips, 1992). The magnitude of producer returns is dependent upon demand and supply conditions with increases in returns falling as price elasticities of demand and supply increase (Martin and Zwart, 1987). The degree

of market power possessed by a seller is determined by the extent to which sales fall as prices are raised. At one extreme, price-taking sellers who are unable to influence price face a perfectly elastic, horizontal demand curve (i.e., the price does not decrease as the firm offers more of the product for sale). Large traders who maintain the ability to influence their prices by changing quantities of product they sell face a downward-sloping demand function that is less than perfectly elastic (Goodwin and Smith, 1995).

One source of market power is product differentiation. A seller with a more highly differentiated product faces consumers who are less likely to reduce purchases when prices are increased because other sellers' products become inferior substitutes (Tirole, 1988). The CWB has broadly acknowledged that through limiting varieties and specializing grading practices, it has deliberately endeavored to differentiate Canadian wheat from U.S., EC, Australian, and Argentinean wheat.

The CWB maintains a single-seller agency advantage as it has the ability to increase producer returns through the use of marketing programs which would allow differential pricing in individual market segments and therefore provide a higher pooled price to the producer (Martin and Zwart, 1987). The combined effects of the price pooling system and the use of a single-seller agency facilitates the ability to sell in distant deferred delivery periods (Wilson, 1993). Additionally, Wilson contends that the CWB can and does target customers on a longer-term basis and conducts several market development programs that are closely arranged with their sales strategies. Furthermore, he argues that the lack of transparency in the Canadian wheat market results in an significant source of competitive advantage for the CWB relative to U.S. counterparts.

**Target marketing** Target marketing facilitates the targeting of countries according to ability to pay and desired quality characteristics (respective elasticity level). The most effective world competitors assimilate exceptional quality and reliability into their cost structures (Levitt, 1983). Furthermore, Levitt argues that they compete on the basis of appropriate value (i.e., the best combination of price, quality, reliability, and delivery). Successful organizations create and keep customers by offering better or more preferred products in such combinations and prices that prospects prefer doing business with that organization rather than with others. Successful firms understand that in the world of homogenized products, success requires a search for sales opportunities in similar segments across the globe in order to achieve the economies of scale necessary to compete.

Target markets that the CWB sells their higher quality wheat to have a wide range of requirements and differ in their willingness to pay for quality. Some countries have very specific requirements and are prepared to pay for only the highest quality product on the market while other countries are in the market for a wider range of grades and would be willing to accept a lower quality grade at a specified discount. Additionally, other countries either do not require top quality grades or are less willing or able to pay a premium for higher quality grain. When making a marketing decision, the CWB will review relative price spreads in other markets and discriminate the combination of grades and markets that result in the highest total revenue in the pool account (CWB Planning Directorate, 1990).

**Price discrimination** Economic theory suggests that a marketing board which has the power to separate markets, charging a different price in each, will maximize its

profits by practicing price discrimination (Goodwin and Smith, 1995). Price discrimination theory anticipates that those markets which are more responsive to price changes will be offered discounts. An example would be Algeria. In the 1985/86 crop year, Algeria began receiving EEP subsidies. The effect on Canada's market share was statistically insignificant (Furtan, 1995). Therefore indicating that the CWB uses differential pricing in the Algerian market. Furthermore, in EEP markets there is a lack of evidence that the CWB has reduced its market share.

In the October 27, 1994 issue of *Backgrounder*, the CWB supported the use of price discrimination:

*The world market is made up of higher-priced and lower-price markets, but the majority are lower-priced. The CWB sells wheat and barley at different prices in different markets depending on the competition it faces from other exporting countries. ...The CWB wants to ensure farmers get the most revenue... To move all the grain produced, the CWB must sell large quantities into lower-price markets. Due to the volume of grain produced each year, the CWB has to sell wheat and barley to subsidized as well as commercial markets. To maximize revenue for the farmers, the CWB makes sure that it has covered the demand for commercial markets first. Since commercial markets represent only a limited share of the total world market, the CWB must sell a substantial portion to subsidized markets if it is to export the volume of grain that Prairie farmers make available. A single-desk seller has the ability to price differently to different markets. This enables the CWB to take advantage of the price differences prevalent in world grain trade due to market segmentation. The single-desk approach has provided Canadian farmers market power in a highly concentrated trade environment" (CWB Backgrounder, October 27, 1994, pgs.1-3).*

Price discrimination is facilitated by three important factors (Wilson et al, 1995). First, inherent differences in price elasticities exist across markets. Second, the U.S. export policies which are also discriminatory exacerbate the differences in prospective revenues

from different markets. Third, the CWB's monopoly in Canadian wheat sales enable it to exercise discriminatory pricing.

Prices for wheat from different countries of origin vary in part due to differences in protein, variety, and foreign material content (Goodwin and Smith, 1995). These variations are sometimes effectively viewed as differences in quality characteristics that result in product differentiation. Furtan (1995) asserts that differential pricing alludes to charging different prices in separate markets for the same product and is also referred to as price discrimination. This concept is similar to "pricing to market" and exerting market power in a particular market.

The CWB will act to raise prices (and lower sales) in markets with less elastic demands and lower prices (and increase sales) in markets with more elastic demands. Thus, these concepts may be fully extended to the case of multiple markets (Goodwin and Smith, 1995). Therefore, it may quite often make "sound economic sense" for the CWB to offer "discounted" prices in more competitive markets and charge "price premiums" in less competitive markets. Furtan (1995) maintains that with respect to differential pricing, it is done so only for commercial reasons in order to meet conditions of supply and demand in export markets. Premiums for CWB wheat have predominantly been realized from Asian and European sales (Kraft et al., 1996). As expected, premiums were found to decline/increase as the levels of quality/supply decrease.

**Canada's reputation for quality** The following statement condenses and verifies in few words the sentiments of the world with respect to Canadian wheat:

*"Canadian wheat has a reputation for being high quality and very uniform"*  
(Congress of the U.S., O.T.A., 1989).

The mandatory federal grading system in Canada has enabled it to enjoy an excellent international reputation with respect to grading. Canada's Certificate of Final Grade has been known to have the "integrity of a gold bond." (McCalla and Schmitz, 1979, p. 205). As a result of this reputation, Canada was the only country for a significant period to market grain successfully on the basis of a certificate of grade and weight (Canadian International Grains Institute, 19XX).

Canada maintains a reputation of consistently uniform, high-quality wheats and is the largest durum exporter in the world, accounting for 40 to 50 percent of the world durum trade with the United States being a close second (USITC, 1989). The Canadian marketing system depends principally on rigidly enforced varietal licensing which has ensured certain genetic end-use characteristics in their wheat. While this ensures more uniformity, it also foregoes yield. Canadian export grade specifications surpass domestic requirements principally in the areas of grain cleanliness and uniformity.

The OTA implemented a survey of overseas millers regarding their perceptions towards U.S. wheat. With the assumption of identical price and transport costs, the rankings in particular for bread wheats are:

- 1.) Canadian Western Red Spring (CWRS);
- 2.) Australian Prime Hard (APH);
- 3.) U.S. Dark Northern Spring (DNS);
- 4.) U.S. Hard Red Winter (HRW);
- 5.) Australian Hard;
- 6.) Argentinean Hard;

- 7.) EC Soft; and
- 8.) U.S. Soft Red Winter (SRW).

For soft wheats, the rankings are:

- 1.) Australian Standard White (ASW);
- 2.) U.S. White (WHI);
- 3.) U.S. Soft Red Winter (SRW);
- 4.) Australian Soft White (ASW); and
- 5.) European Community (EC).

For durum wheat, the rankings are:

- 1.) Canadian Western Amber Durum (CWAD);
- 2.) U.S. Hard Amber Durum (HAD);
- 3.) Argentinian; and
- 4.) EC (OTA, 1989).

Additionally, the survey yielded other important factors related to wheat quality.

Wheat class is not a good indicator of end- use quality. Important criteria in relative ranking include protein quality, pesticide residue, insects (hidden and dead), and mycotoxin. Overseas millers desire more information on dough handling properties. A primary concern of survey respondents was a distinct increase in lack of uniformity in end-use quality (OTA, 1989).

**“Reputation effect” and importer loyalty** The concept of reputation only makes sense in an imperfect information world (Shapiro, 1983). Shapiro argues that a firm has a good reputation if consumers believe its products to be of high quality. Through its

sales operations, the CWB has the ability to sell at higher quality than contract allows and likely do so intentionally to create “reputation” - something not easily discharged in a system such as in the U.S. (Wilson, 1989).

The price paid to exporting firm  $j$  for wheat of grade  $k$  is assumed to reflect the importing country’s certainty about the quality of its imports (Larue and Lapan, 1992). An exporting country with a large number of firms is more likely to receive quality complaints because its firms will have fewer incentives to exceed their minimum contractual requirements. In the case of a country with a sole exporter, the reputation of the country is that of the firm (agency) and there is no free riding. Larue and Lapan (1992) further argue that an importer has to rely on the reputation of the exporting country. Individual exporting firms in that country have incentives to operate as “free riders” by satisfying the minimum contractual quality requirements by a smaller margin.

Product heterogeneity forces the introduction of a reputation mechanism in three ways (Larue and Lapan, 1992). First, efforts to meet the needs of all consumers may lead to a burgeoning of ambiguous contract specifications and confusion between buyers and sellers. This dilemma is directly related to the reliability of an exporting country’s inspection and grading services, and therefore, to the country’s reputation in their ability to fulfill importers’ desires. Second, as disputes occur, the buyer must rely on the exporter’s consideration for its reputation and the integrity of the government agency in charge of dispute resolution. Third, prices for grain imports must exhibit expectations regarding quality. They further argue that the effect of EEP on quality of U.S. exports has been adverse, thus resulting in increased quality complaints.

Wilson et al. (1987) found that the U.S. is an exporter that is vulnerable to market share erosion. They argue that unless significant changes are instituted, the U.S. market share will gradually decline; Canada's will remain constant, and that for the EC, Argentina, and Australia will increase. This is sustained through increased supply diversification of the PRC and Japan. Japan, while being diversified, exhibits very limited switching between exporters. Additionally, the FSU has demonstrated strong loyalty to each of the major suppliers and has displayed purchasing behavior where switching between exporters is apparent.

**Lack of transparency** In the case of the CWB there are two elements of transparency; price and operational (GAO, 1992). As discussed previously, price transparency is indicative of the extent of the details of transactions made by a purchasing or selling agent are made available to the public. Operational transparency alludes to the extent of which information about an institution's operating procedures is available to the public. In recent years, the U.S. and other grain-exporting countries have criticized the CWB's pricing practices due to the lack of price transparency (GAO, 1992; Furtan, 1995).

Wilson (1993) contends that transparency is a matter of degree. A market system is "more transparent" to the extent that it reveals more information relevant to the formulation of competitive bids. Single-seller agencies such as the CWB or Australian Wheat Board reveal few details of their transactions. The result is an information asymmetry which competitors use to formulate their bidding strategies, particularly for export tenders. Lack of transparency facilitates the ability of the CWB to under-bid U.S. export offers (Wilson et al., 1995).

The CWB treats proprietary price information no differently than large grain-exporting firms in the U.S. (GAO, 1992; Furtan, 1995). By establishing a confidential environment, it can more effectively compete in the international market. Furtan (1995) asserts that the basic nature of the international grain trading industry lends itself to confidentiality. Furtan further argues that the CWB is a commercial enterprise much like the privately-held *Cargill*, *Continental Grain Company*, and other large grain companies. Moreover, the CWB does not reveal selling prices but indicates that it sells its commodities at competitive rates. Additionally, non-transparency diminishes the possibility that farmers will criticize the CWB for underpricing specific sales (GAO, 1992). Moreover, the CWB argues that non-transparency is justified because, unlike its competitors, the CWB does not receive public funds nor direct government subsidies for its activities. Thus sustaining the argument that the CWB has rights to secrecy because if an increase in transparency occurred, the harming of the enterprise's legitimate commercial interests would result (Furtan, 1995).

End-users often covet confidentiality as the grain industry is very competitive and information regarding prices is closely defended by all participants (Furtan, 1995). Importers make purchases without knowledge of what neighboring countries are paying. Trading prices for the U.S. and Canadian are not available although the former can be approximated through market information at the time of sale.

### **Conclusion**

A background of and review of literature regarding CWB pooling, pricing, grading, reputation, and market power were discussed in detail in this chapter.

Additionally, the regulatory role of the CGC as well as Canadian government support programs provide a flavor of the environment in which the CWB operates. In the next chapter, empirical procedures and data description are introduced.

## **Chapter IV: EMPIRICAL PROCEDURES AND DATA DESCRIPTION**

### **Introduction**

This chapter describes the empirical theory of economic choice behavior via a model suitable for empirical analysis of the target marketing decision. Economic choice behavior theory provides a framework in which to base the actual modeling as well as an intuitive characterization of the CWB target marketing decision.

This chapter is organized as follows. Foundations of decision process modeling are discussed in the next section. Model specification alternatives are addressed in the third section. In the fourth section, specifications of the empirical model are presented. Sources of data are described in the fifth section.

### **Foundations of Decision Process Modeling**

#### **Aggregate and disaggregate models**

Aggregate models describe markets while disaggregate models describe individual decision-making units that underlie market demand and supply (Train, 1986). Economically relevant behavior is essentially at the individual level as market supply and demand are merely the aggregate of many individuals' decisions. Therefore, capturing the structure or causal relationships intrinsic in behavior is more inherently pursued at the individual decision-making level. Economists contemplate individual choice behavior in many settings. Often the choices may be considered to be selections from a continuum of alternatives. In this application, the decision-maker is the CWB. The CWB choice in this application is to target or not target a particular country for export. Factors that cause the CWB to target a particular country for export may therefore be considered.

Economic theory provides models of individual behavior in these cases, and standard procedures allow statistical inferences about “average” population behavior given a random sample of data from that population (Train, 1986). As a result of the increasing availability of “microdata<sup>12</sup>”, economists are faced with discrete decision choices. In this case, specific export information is available and may be used to model the marketing behavior of the CWB.

Disaggregate information necessarily contains greater variation in each factor and usually less covariation among factors than aggregate data (Train, 1986). This is due to aggregate data being sums or averages of the disaggregate data. Econometrically, this is important in model estimation due to the precision with which each parameter may be estimated generally increases with the variance of the variable entering the model and decreases with the covariance among variables. The result is disaggregate models oftentimes are able to capture effects that cannot be included accurately in aggregate models.

Standard econometric techniques such as regression were designed for evaluating variables that can assume any value on the real line for continuous variables (Train, 1986). This technique is appropriate when observing aggregate data. When the individual decision-making unit’s behavior is scrutinized, nevertheless, it is often found that the outcome of the behavior is not continuous and standard regression techniques are unsuitable.

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<sup>12</sup> However, the contention may be made that this “microdata” has been proprietary and limited.

The literature typically illustrated a goal of utility-maximization as the motivation of decision-making (Train, 1986). In this case, revenue-maximization is arguably analogous to utility-maximization. Here the decision-maker, the CWB, is theorized to be selecting the alternative with the highest expected revenue among those available at the time the choice is made. Application of the model incorporates parameterized utility functions in terms of observable independent variables and unknown parameters. Parameter values are estimated from a sample of observed choices made by decision-makers confronting a choice situation. Random utility is used to defend against the impossibility of specification and estimation of discrete choice models that will always accomplish the goal of predicting the chosen alternatives by all individuals. Actual utilities of the alternatives are considered random variables. Therefore, the probability that an alternative is chosen is explained as the probability that it has the greatest utility among available alternatives.

### **Target markets**

Assuming the classical model of the rational, revenue-maximizing firm, each has a portfolio of potential markets they could target. This theory of the firm is applicable to the CWB. The choice of which countries to target is then merely a combination choice of revenue maximization:

$$\pi = \max (\pi_1^*, \dots, \pi_j^*), \quad \text{[Equation 1]}$$

where  $\pi$  represents revenue and 1 to  $j$  represents the revenue-maximizing choices of countries to target a particular portfolio of wheat grades and classes.

As discussed previously, the monopoly sales position of the CWB facilitates the ability to differentiate with respect to quality and price-conscious markets. Undoubtedly, the CWB has the ability to differentiate among buyers in terms of their willingness and ability to pay as well as quality preferences. Targeting occurs only if it fits the CWB goal of revenue maximization. However, a sale that occurs only once constitutes targeting during that time period. For this analysis, the targeting hypothesis is that if a country receives wheat during a given year, the country in question is being targeted by the CWB for that particular time period. The conviction with which it can be said that a country is targeted would arguably increase as the number of years, quantity, and quality with which the country imports Canadian wheat increase. The primary thrust of this thesis is to determine which factors affected the targeting decisions of the CWB and how they have changed through the 1973-91 period.

### **Alternative models of decision structures**

Determination of which countries should be targeted involves a decision process to determine export allocations among importing countries constrained by the desire to maximize producer returns. The structure of this decision process is an empirical question, and has important implications for model specification and estimation. This section describes previous export agency decision modeling as well as alternative decision structures considered in this thesis.

### **Trade flow modeling factors**

Koo and Karemera (1991) applied a conventional gravity model employing time series and cross sectional data to wheat markets to determine factors affecting trade flows

of wheat. The study revealed that prices play an important role in determining world wheat flows. Additionally, income, long-term agreements, and credit as well as trade policies used in wheat trade play an meaningful function in determining trade flows of wheat.

Distance was found to not be an important factor.

With regard to use of a decision theory application, no previous research has been found to exist related to export agency decision-making.

### **Ordinary Least Squares**

Due to the dependent variable being truncated below zero in many markets (i.e., decision to not target for export), least squares methods applied to this limited dependent variable would lead to biased and inconsistent parameter estimates (Greene, 1993). The error term is heteroscedastic in a way the depends on  $\beta$  since  $\beta'x + \varepsilon$  must equal 0 or 1. Therefore, due to the availability of “convenient” estimation software, the linear or ordinary least squares model is used less frequently except as a basis for comparison to other appropriate models.

### **Probit**

Modeling of a limited dependent variable hinges on the decision structure. A probit-type model may be used to model the simple decision model (target-or-not-target) in which the decision is to select target export markets (Train, 1986). However, importing countries also control purchases of Canadian wheat, thus implying a Tobit model. Furthermore, different factors may affect the quantity decision differently from the discrete decision.

### **Cragg Double-Hurdle Model**

For the CWB, the decision organization may entail a multi-step process, but whether discrete and quantity decisions are based on the same criteria and have the same affects is not known *a priori*. A derivation of the Tobit, the Cragg Double-Hurdle model may be used to explain whether discrete and quantity decisions are based on the same criteria. The Cragg Double-Hurdle model is composed of two decisions in which the quantity decision is conditional on the discrete target/not target decision.

In some situations, the decision to target and the amount of the export may not be closely related. While exports may take place only after a country is “targeted”, there may be factors such as search, information, and transactions costs as well as changing market conditions which may constrain the carrying out of desired plans to export. In such a case, failure for the variable to take a non-zero value (being targeted for export) may ensue either due to the desired change not being positive or due to other factors that restrain carrying out changes which would be desired in their absence. In this application, two hurdles must be overcome before positive values for the dependent variable are observed. First, the country must be targeted for exports. Second, favorable circumstances must ensue in order for the sale to occur.

Unfortunately, econometric software is not available that is able to handle the truncation issues associated with the data, thus making the Cragg Double-Hurdle model impossible to specify for this application. Additionally, truncated regression models are sometimes less “well-behaved” than the tobit model as the “zero” observations are entirely lost for a researcher (Greene, 1995, p. 627). Furthermore, if the data are clustered far from

the assumed truncation point, the model will attempt to mimic ordinary least squares. In doing so, the iterations may fail to converge. Attempts to remove larger exports from the observations would result in spurious conclusions.

### **Tobit Model**

The Tobit model was originally developed by Tobin (1959) and assumes that the dependent variable has a number of its values clustered at zero (McDonald and Moffit, 1981; Amemiya, 1990). The Tobit model is sometimes referred to as a *censored regression model*. In this context, censored refers to the situation where a research knows both the number of observations for which the dependent variable takes zero value and the value of the independent variable for those observations. This is in contrast to the *truncated* regression model where the zero observations are entirely lost for a researcher. In this case, the decision to target and how much are based on the one set of estimated Tobit coefficients. Additionally, the Tobit model implies the discrete and quantity decisions are made simultaneously.

The Tobit technique uses all observations, both those at the limit and those above, to estimate a regression line. Tobin's model for explaining the CWB targeting decision may be derived from a simple theory of utility maximization (recall equation 1) subject to the boundary constraint  $Y \geq Y_0$  or  $Y=0$ . Specification of the Tobit model is as follows (Train, 1986):

$$Y_0^* = \beta_1 + x_i \beta_2 + u_u \quad \text{[Equation 2]}$$

where:  $Y_0^*$  are unobserved latent variables (in this case the decision to target);

$x_i$  is a vector of explanatory variables;

$\beta_2$  is a vector of a known coefficient; and

$\epsilon_i$ 's are independently, identically, normally distributed random variables with mean zero and variance  $\sigma^2$  and may be interpreted as the sum of all unobservable variables which affect the utility function.

Then the solution to the original problem, denoted by  $Y$  observed dependent variable  $Y_0 = 0$  if  $Y^* \leq 0$ , or  $Y^*$  if  $Y^* > 0$ .

Now, if we assume further that  $u$  is i.i.d. over the targeting decisions of the CWB with a normal distribution and that  $Y_0$  is the same for all decisions made by the CWB, the following statistical model is obtained:

$$Y_i^* = x_i' \beta + u_i, \quad Y_i = Y_i^* \text{ if } Y_i^* > 0 = 0 \text{ if } Y_i^* \leq 0, \quad i=1,2,\dots,n, \quad [\text{Equation 3}]$$

where  $u_i$  are independent and identically distributed as  $N(0, \sigma^2)$ . This is the standard Tobit model.

**Estimation** Previously, it was noted that the least squares method will yield biased and inconsistent estimates. Tobin (1959) provides a consistent and asymptotically efficient estimator by the maximum likelihood (ML) estimator. The likelihood function of Tobin's model (equation 2) is given by:

$$L = \prod_0 [1 - \Phi(x_i \alpha)] \prod_1 \sigma^{-1} \phi[(Y_i - x_i' \beta) / \sigma], \quad [\text{Equation 4}]$$

where  $\prod_0$  refers to the product over those  $I$  for which  $Y_i = 0$ , and  $\prod_1$ , for  $Y_i > 0$ . The first term is equal to the probability of the observed event  $x' \beta + u_i < 0$ , and the second term is

equal to the density of the observed  $Y_i$ . Thus, the likelihood function is the product of probabilities and densities. Despite this unusual aspect of the likelihood function, it can be shown that the ML estimator is consistent and asymptotically normal with its asymptotic variance - covariance matrix given by the formula -  $(E \partial^2 \log L / \partial \theta \partial \theta')^{-1}$ .

Note that in Tobin's model (equation 3), we observe  $x' \beta + u_i$  when it is positive. If instead, we do not observe it and only learn that  $x' \beta + u_i$  is positive, we have the probit ML estimator.

### **Nested Multinomial Logit Model with a Tobit Quantity Nest**

Initially, a nested multinomial logit model (NML) with a limited dependent variable or Tobit quantity nest was to be specified and compared to the results of the Cragg Double-Hurdle or Tobit model. The decision framework for the NML model is also multi-step and was to consist of three decisions: the first decision to target or not target; second, the decision regarding which grade/class to sell; and third, the decision of how much to export to the targeted country.

Development of this type of model was not possible for several reasons. First, no studies are known to have combined the NML with that of a Tobit. Second, mutual exclusivity is violated in the second nest as it is conceivable that a particular target market may be targeted for more than one grade of a particular class of wheat. A potential methodology that would circumvent the lack of mutual exclusivity would be to apply a portfolio methodology (Train et al., 1987). However, assuming a model could be developed that combined a NML with that of a Tobit, the use of a portfolio proxy in this case would not be plausible. During the 1973-91 period, the predominant grade exported

each year was number one for both CWRS and CWAD, thus removing the econometric usefulness of including this decision and essentially collapsing the model down to that of the Cragg Double-Hurdle or Tobit model.

### **Specification of the Empirical Model**

The empirical specification is based on these relationships and anticipated to apply to the CWB's target market allocation decision. It is estimated for both CWRS and CWAD as well as over a cross-section of countries that have imported higher quality hard Canadian wheat during the 1973-91 period. As discussed previously, the international wheat market experienced many changes during this time period. Therefore, three time intervals will be analyzed. First, 1973-79 will be analyzed to capture CWB targeting behavior during a phase of expanding export markets and cooperation among the largest wheat exporters. Second, 1980-84 will be analyzed to capture effects of the EC as a major exporter, the third world debt crisis, and the dynamics of the international wheat market associated with increasing self-sufficiency of lesser developed countries. Third, 1985-91 will be analyzed to capture international wheat market effects associated with the implementation and use of the U.S. EEP program in efforts to counter EC subsidization programs as well as dynamics associated with increasing buyer specificity. The empirical model is specified as:

$$T_{j,t} = f(POP_{j,t}, GNP_{j,t}, DEBT_{j,t}, URB_{j,t}, EEP_{j,t}, CRED_{j,t}, WOM_{j,t}, RANK_{j,t}, SCORE_{j,t}, DIST_{j,t}, D_{AFR}, D_{ASP}, D_{CAM}, D_{EUR}, D_{NAM}, D_{OCE}, D_{SAM}, D_{USR}, GOVT_t, \epsilon_j)$$

Where  $T_{j,t}$  is the decision to target or not target country  $j$  during year  $t$ ;

$POP_{j,t}$  is the population of country  $j$  during year  $t$ ;

$GNP_{j,t}$  is the income of country  $j$  during year  $t$ ;

$DEBT_{j,t}$  is the debt of country  $j$  during year  $t$ ;

$URB_{j,t}$  is the level of urbanization of country  $j$  during year  $t$ ;

$EEP_{j,t}$  is the quantity of U.S. HRS or Durum received by country  $j$  during year  $t$ ;

$CRED_{j,t}$  is the level of wheat import credit received by country  $j$  during year  $t$ ;

$WOM_{j,t}$  is the level of women in the workforce of country  $j$  during year  $t$ ;

$RANK_{j,t}$  is the risk measure associated with country  $j$  during year  $t$ ;

$SCORE_{j,t}$  is the risk associated with country  $j$  during year  $t$ ;

$DIST_{j,t}$  is the distance from Canada of country  $j$  during year  $t$ ;

$D_{AFR}$ ,  $D_{ASI}$ ,  $D_{CAM \& SAM}$ , and  $D_{EUR, NAM, OCE, USR}$ , are dummy variables to capture regional effects during year  $t$ ;

$GOVT_{j,t}$  is a dummy variable representing a centralized government procurement agency in country  $j$  during year  $t$ ;

$\epsilon_t$  is the error term reflecting factors not included in the model specification for country  $j$  during year  $t$ .

### **Dependent variable**

As discussed previously, it is assumed that the CWB targets particular countries in order to maximize the net present value of expected returns. Additionally, if the CWB sells to a country it is targeting it in order to maximize producer revenue - even if for a short duration of time. Therefore, the hypothesis is that if a country receives wheat during a given year, the country in question is being targeted by the CWB during that period. The dependent variable will therefore be the quantity of the particular class and grade exported by the CWB to country  $j$  during year  $t$ .

### **Independent explanatory variables**

Levitt's concept that consumer preferences are becoming homogenized stimulates the search for countries which have similar characteristics (Huszagh et al, 1986).

Therefore, it is plausible that targeted countries may be grouped together by similar characteristics. These characteristics may be internal, external, or environmental. Internal characteristics include: population, GNP, and levels of urbanization and women in the workforce. Environmental factors may include government policies and regulations pertaining to international business as well as external economic relations, use of export subsidies and tariffs, and cultural and geographical distance. External economic relations include: the debt service burden and the cultural distance between exporting and importing countries. The cultural distance between the exporting and importing countries would be represented by the differences in cultural values, languages, structures, and ways of life that are particularly large.

Accordingly, the independent variables analyzed are cross-sectional and consist of Population, Total GNP, External Debt, Level of Urbanization, Level of EEP-Funded Imports, Level of Credit Extended, Level of Women in the Workforce, Risk, Distance, and Government wheat purchase decision structure proxies, and dummy variables representing regions and government procurement organization. All variables, expressed in monetary values, are in U.S. dollars.

Population and total GNP are hypothesized to reflect market size as well as ability to pay during the previous year. Arguably, the larger the particular market in terms of population and income *ceteris paribus*, the more effective the targeting strategy would be.

A higher income would suggest an increased ability to pay for convenient, higher-quality foods that are derived from higher quality hard wheats exported by the CWB.

During the mid-1980's, approximately 25 percent of world trade in wheat was sold under credit programs (International Wheat Council 1990). The level of credit variable is included to capture effects associated with markets that have increased costs of doing business due to the need to offer credit to facilitate wheat purchases. Plausibly, given the third world debt crisis of the early 1980's, the heavy use of credit as a necessary term of trade to move wheat poses an increased risk of default.

External debt is hypothesized to reflect inherent risk in ability to repay foreign debt. The net result of high indebtedness, high inflation, and high unemployment in several countries has resulted in highly unstable governments that further increase the risk of doing business (Philips, 1988). Additionally, the mentioned factors may force a country's currency to depreciate, or at least increase volatility. The result is that foreign investors hesitate to hold much of the foreign currency, thus limiting trade. Many countries of the world that would otherwise be attractive markets have amassed such high foreign indebtedness that they cannot even pay the interest on their obligations. Again, the CWB likely seeks to minimize its risk of loan default by targeting countries with a lower amount of debt *ceteris paribus*.

The probability of default in credit or in terms of trade is not observable. Therefore, the risk proxies such as Rank and Score from the *Euromoney* risk index, which measures country risk based on economic factors as well as political and social conditions are used as a proxy. Score ranges from 0 for high-risk countries to 100 for those with

lowest risk and is available for the period 1982-91. This variable is frequently used to assess risk (USDA 1990). Rank ranges from 1 to the number of countries included in the ranking during the particular year. For better comparative analysis, the Rank variable was divided by the number of countries included in each respective year. Rank is available for selected countries beginning in 1979. Again, the higher the level of risk in targeting a particular market, the less attractive it would be relative to lower risk markets.

As discussed previously, the use of EEP to enhance U.S. wheat exports began in 1985 and ended in August of 1995. The inclusion of EEP-subsidized exports is included to capture effects of the U.S. export subsidization program. EEP was primarily designed to target markets of which the EC was subsidizing its imports (GAO, 1992). The CWB has been trying to concentrate on markets for higher-quality grains, thus avoiding EEP-targeted markets when possible or targeting them as a later resort. Arguably, potential target markets that receive EEP-subsidized wheat imports are typically more price-oriented than quality-oriented, thus signaling less willingness/ability to pay more for quality.

The distance proxy, is included to capture effects associated with shipping costs to export markets from Canada. Transportation costs act as trade barriers and are anticipated to be negatively related to trade flows. Arguably, the further away a particular potential target market is, the less likely the CWB will target it, *ceteris paribus*. Higher relative freight costs may offset the expected premium a market may be willing to pay relative to the next best alternative. Additionally, inclusion of this variable is expected to disclose potential logistically feasible fringe export markets who may be more concerned about quality than price. Arguably, the more focused a potential target market is on price,

the less attractive the particular market will be relative to those that are more concerned about quality.

The levels of women in the workforce and urbanization are included to capture effects associated with the levels of women in the workplace and urbanized population lifestyles. Arguably, the higher the level of women in the workforce as well as urbanization, the higher the associated demand for pre-made convenience items containing higher quality hard wheats such as breads and pastas.

Four regional dummy variables for Africa, Asia, Central and South America, as well as Europe, North America, Oceania, and the FSU, respectively, are included in the model. These geographic variables are hypothesized to capture several possibly meaningful geographic effects such as location, trade and political relationships, and foreign policy objectives (Wilson and Yang, 1996). It is important to include this dummy variable as a marketing board may wish to pursue political or other non-economic objectives as well as revenue maximization (Goodwin and Smith, 1995). These objectives are not likely to be quantified otherwise.

Due to the low number of observations, regions are grouped together when possible to lower the number of degrees of freedom necessary to find the proper specification and marginal effects. Region One and Two countries include those in Africa and Asia respectively. Region Three countries include those in Central and South America. Region Four countries (this dummy variable was captured by the constant) comprise of those in Europe, the FSU, Oceania, and the U.S..

The decision-making structure of the government is theorized to effect the targeting decision of the CWB. While a relationship is better facilitated by two centralized decision-making agencies, quality has historically increased in importance when the procurement structure was decentralized.

### **Model Specifications**

Each grade of CWRS and CWAD were characterized in separate applications of the Tobit model. Iterations were ran for each year representing the entire 1973-91 time period with comparative analysis for each of the following time periods: 1973-79, 1980-84, and 1985-91. Analysis of the three separate time periods were anticipated to reveal changes in CWB targeting strategies over time. One year from each period was analyzed extensively in order to obtain the best specifications to be used during the period. A correlation matrix was generated to facilitate specification and avoid inclusion of highly correlated independent variables.

### **Data Description**

While price and terms of trade information are not disclosed by the CWB, quantity and destination country information are available for specific grades and classes for the 1973-91 time period from *GRAINBASE*. Socioeconomic and financial characteristics are obtained from the *WORLD TABLES Stars Dataset*. Wheat trade data are derived from the International Wheat Council with supplementary information obtained from the USDA's *Grain Market News* and annual reports from the Australian and Canadian Wheat Boards. Country political, social and credit risk proxies (*RANK* and *SCORE*) are obtained from *EUROMONEY*. EEP export data for 1985-91 are obtained from

Tierney. A distance matrix is derived from *Lloyd's Maritime Atlas of World Ports and Shipping Places*.

As with any disaggregated cross-sectional data, missing/incomplete observations are a problem. When possible, missing observations are derived from various issues of *The Europa Year Book - A World Survey*. Additionally, missing observations are extrapolated when comparable observations from other years are available.

## **CHAPTER V - EMPIRICAL RESULTS**

### **Introduction**

This chapter presents details on scope of analysis, estimation results, and relevant marginal effects of behavioral models of CWB targeting in CWRS and CWAD exports from Canada. Different model specifications were attempted for each of the years of data availability. However, the ones with meaningful parameter estimates and summary statistics are reported. Also, the marginal effects are different from the estimated model parameters for the Tobit and the truncated models although they can be derived from them. The derivation, the marginal effects estimates, and their interpretation in the context of developed econometric models are explained as well.

Generally, the highest statistically significant model specification results indicated that market size and income were important factors in CWRS target-marketing by the CWB during the 1973-91 period. For CWAD, regional factors appear to have been an important factor in the CWB targeting decision in 1979, 1981, and 1984-88. During the 1979-84 period, population appears to have been a significant factor in the CWAD targeting decision. During the 1985-91 period, income appeared to be a significant factor in CWAD targeting.

Next, the scope and dimensions of analysis are discussed. In the third section statistical results are reviewed. Subsequently, marginal effects are defined and explained in the fourth section. In the last section, an economic interpretation of the results is presented.

## **Scope/Dimensions of Analysis**

Behavioral models of CWB targeting decisions for CWRS exports were developed for each year for the 1973-91 period. Only CWRS Grades One and Two were analyzed as the number of observations for Grades Three and Four were inadequate to conduct econometric analysis. Models on CWAD exports were developed for 1979-91. Paucity of data and or inadequate number of reporting countries prevented analysis of CWAD for the early 1970's.

### **Inclusion of Variables**

Although all the variables described in the model development section were included in estimation attempts of different specifications, those specifications that provided better summary statistics and meaningful interpretations were utilized here for discussion. In particular, the estimated parameters on variables, such as; external debt, level of urbanization, U.S. use of EEP, women in the workforce, level of credit, risk proxies such as *Rank* and *SCORE*, and distance from exporting country were either statistically non-significant or failed to provide meaningful economic interpretation.

### **Summary statistics**

Summary statistics (illustrated in several tables to follow) were calculated using the correlation between actual quantities exported to country  $j$  and those predicted by the Tobit model. Due to the use of cross-sectional data as well as the non-inclusion of other variables<sup>13</sup> that affect the CWB targeting decision, low summary statistics were anticipated.

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<sup>13</sup> Variables that are unmeasurable or unavailable.

## T-test

Different models were specified and coefficients estimated. Model specifications for every year included zero-one variables corresponding to Grades and Regions among alternatives. The model results presented here performed better in terms of expected signs and statistical significance. The choice between models with and without dummy variables was based on an overall chi-squared test of likelihood ratios. This test reflects how the reported specification performs relative to an alternative. In particular, log-likelihoods of unrestricted and restricted models were obtained and the statistic  $\lambda$  was calculated as:

$$\lambda = -2 * \{ \text{LOGL}_{\text{restricted}} - \text{LOGL}_{\text{unrestricted}} \}$$

Here  $\text{unrestricted}$  refers to the model with zero-one variables and  $\text{restricted}$  refers to the model that treats the zero-one variables as having zero coefficients. The statistic  $\lambda$  follows a chi-square distribution with degrees of freedom equaling number of restrictions (which equals number of dummy variables in the unrestricted model).

**CWRS** For CWRS, the coefficients were generally good with remarkable consistency after 1976 (refer to Table 1). For most years in the analysis, the constant was significant at the five percent level with the exception of 1973 and 1975-76.

<b>Table 1. Truncated Regression Model Estimates of Canadian CWRS Exptrs for 1973-91.</b>					
Year	Constant	Grade 1	GNP	Population	Summary Statistic
1973	-104.76 (-1.858)	198.46 (2.847)	0.11711E-09 (0.852)	0.54592E-06 (1.624)	0.194
1974	-186.53 (-2.856)	187.46 (2.567)	0.96181E-09 (2.667)	0.62448E-06 (0.530)	0.4668
1975	-44.592 (-0.607)	17.615 (0.191)	0.10604E-09 (0.755)	-0.18154E-06 (-0.463)	0.1364

1976	-84.104 (-1.676)	163.69 (2.691)	0.14089E-09 (1.547)	0.87488E-09 (0.003)	0.1106
1977	-336.09 (-4.098)	352.29 (4.130)	0.46592E-09 (1.373)	0.26044E-05 (1.580)	0.4291
1978	-267.37 (-3.776)	263.58 (3.433)	0.84902E-09 (3.023)	0.43371E-05 (0.320)	0.5482
1979	-204.98 (-3.040)	217.56 (2.852)	-0.76900E-10 (-0.504)	0.18356E-05 (1.189)	0.1803
1980	-246.42 (2.579)	238.14 (2.140)	0.67199E-09 (3.486)	0.27060E-06 (1.244)	0.5397
1981	-281.83 (-4.349)	277.00 (3.705)	0.46462E-09 (3.292)	0.77887E-06 (4.517)	0.6382
1982	-361.55 (-4.246)	233.22 (2.511)	0.46881E-09 (2.777)	0.80195E-06 (3.903)	0.6133
1983	-95.544 (-1.940)	43.148 (0.656)	0.21123E-10 (0.311)	0.55425E-06 (3.354)	0.3958
1984	-189.82 (-3.888)	257.20 (4.393)	0.55602E-10 (1.224)	0.47657E-06 (3.457)	0.4280
1985	-122.33 (-2.702)	149.12 (2.656)	0.43448E-10 (1.013)	0.25881E-06 (1.687)	0.2185
1986	-173.40 (-2.598)	50.294 (0.700)	0.93410E-10 (2.096)	0.22053E-06 (1.189)	0.1815
1987	-138.37 (-2.134)	22.211 (0.266)	0.11973E-10 (0.231)	0.15038E-05 (7.420)	0.6931
1988	-98.798 (-2.770)	122.31 (2.760)	0.14489E-10 (0.639)	0.89462E-06 (7.443)	0.6983
1989	-75.596 (-2.263)	65.894 (1.535)	0.44235E-10 (1.839)	0.45630E-06 (4.152)	0.4972
1990	-411.16 (-3.049)	488.33 (2.922)	0.43634E-10 (0.502)	0.10780E-05 (1.707)	0.1627
1991	-700.20 (-5.655)	823.38 (5.709)	0.34337E-10 (0.479)	0.22378E-05 (6.969)	0.5565

For CWRS, during the period of analysis, the GNP variable was less significant than the five percent level during 1973, 1975-77, 1979, 1983-85, 1987-91 with particularly

low levels of significance during 1973, 1975, 1979, 1983, 1987-88, and 1990-91.

Interestingly, a high level of statistical significance of the GNP variable as a CWB targeting factor was evident in 1978 and during the 1980-82 period. This period is also characteristically known as a period of “the third world debt crisis” - a time phase of high default by third world countries. While not a perfect example, countries with high income levels have better ability to repay loans than those with lower incomes. It is plausible that in the interest of decreasing the risk of loan default that the CWB targeted higher income markets during this time period. Additionally, in 1986 and 1989, the GNP variable was again at a higher level of statistical significance as a target factor by the CWB (but less than the five percent level). Interestingly, this coincides with the introduction of U.S. EEP.

For CWRS, during the period of analysis, the Population variable was less significant than the five percent level for 1973-80 with 1974-76 yielding particularly low levels of significance. Conversely, 1981-91 with the exception of 1985-86 and 1990 generated Population significance levels of higher than the one percent level. This suggests that the size of the target market population became of increasing importance beginning in 1980. Interestingly, the highest levels of significance were observed in the 1987-89 period. This time period is also associate with the use of EEP by the U.S. to counter EC-subsidies. Particularly, it appears that during the late 1980's 1987-89 and 1991 the CWB may have targeted markets to a increasing level according to population. The consistency and apparent increase in statistical significance suggests that market size may have been increasingly important as a target marketing strategy by the CWB.

With respect to regional dummy variables, not a single year was statistically significant at any level. Therefore, suggesting that region-specific factors were not important in the target-marketing decision of the CWB in CWRS exports during the 1973-91 period.

**CWAD** For CWAD, the coefficients were reasonably good with less remarkable trends relative to that of CWRS. However, as discussed previously, not enough observations were available to do meaningful statistical analysis of target market factors for CWAD during the 1973-79 period.

For CWAD, during the 1979-84 period (refer to Table 2) a Population-based model specifications were found to be the most statistically significant. The constant was negative and typically less significant than the five percent level for CWAD during the 1979-84 period. Population variable level of significance was typically higher than the one percent level with the exception of 1982 (five percent level) and 1983 where it was much lower than the five percent level. The characteristically steady level of significance suggests that market size as reflected by the Population variable was a target market factor in the CWB decision process during this period. GNP did not appear to be a target market factor during the 1979-84 period.

As observed in the CWRS analysis, the CWB appears to have increased its CWAD targeting of markets according to size particularly in the early 1980's. As discussed previously, this period is characterized as a period of the third world debt crisis.

<b>Table 2. Truncated Regression Model Estimates of Canadian CWAD Exports for 1979-84</b>						
Year	Constant	Population	REG1	REG2	REG3	Summary Statistics
1979	-42.341 (-2.126)	0.45954E-06 (2.217)	79.848 (2.370)	-41.715 (-0.734)	-23.513 (-0.533)	0.1633
1980	-34.795 (-1.706)	0.59938E-06 (2.509)				0.2900
1981	-60.924 (-2.607)	0.74229E-06 (3.400)	112.74 (2.782)	-53.917 (-0.939)	22.328 (0.532)	0.3559
1982	-9.3403 (-1.106)	0.77324E-06 (7.969)				0.6796
1983	13.642 (1.516)	0.86243E-07 (0.923)				0.1241
1984	-26.066 (-3.064)	0.25552E-06 (3.450)	46.362 (3.449)	15.556 (1.165)	34.201 (2.210)	0.3063

During the 1979-84 period, regional dummy variables appeared to be of statistical significance in explaining the CWB target market decision during some years. The dummy variable associated with REG 1, African countries, appeared to be a targeting factor for the CWB with the exception of 1980 and 1982-83 when none of the regional dummy variables contributed to the specification. The regional dummy variables REG 2 and REG 3 representing Asia and the Latin Americas respectively were sometimes negative and not economically rational. However, in 1984, all three regions appeared to be a targeting factor of the CWB in CWAD exports as they are all of varying levels of statistical significance.

For CWAD during the 1985-91 period (refer to Table 3), the constant was negative with a generally decreasing level of statistical significance to 1991. The 1985-91 model specifications suggests the GNP-based model specifications to be the most appropriate with the Population variable being of significantly less importance relative to the 1979-84 period.

The GNP variable was generally statistically significant at the five percent level with the exception of 1986, and 1990-91.

Year	Constant	GNP	REG1	REG2	REG3	Summary Statistics
1985	-36.102 (-1.681)	0.12405E-09 (2.111)	55.760 (2.236)	-141.36 (-2.096)	39.426 (1.242)	0.03876
1986	-14.576 (-0.928)	0.11255E-10 (1.413)	44.787 (1.718)	-18.530 (-0.639)	8.5482 (0.239)	0.04806
1987	-12.817 (-0.912)	0.18194E-10 (2.832)	-15.336 (-0.750)	-6.5939 (-0.306)	86.418 (2.768)	0.3485
1988	-29.798 (-2.184)	0.20480E-10 (3.533)	5.0872 (0.227)	-12.949 (-0.492)	72.424 (2.368)	0.4351
1989	-17.361 (-1.018)	0.18427E-10 (1.870)				0.1849
1990	-28.432 (-1.313)	0.19549E-10 (1.657)				0.6248E-1
1991	-17.917 (-0.726)	0.14269E-10 (0.948)				0.4538E-3

As in the case of the CWRs analysis, the regional dummy variables were tested for significance. Regional dummy variables generally decreased in statistical significance until 1989 where they do not contribute to the model specification. Interestingly, the REG 3 dummy variable associated with the Latin Americas increased in level of statistical significance until 1989. This suggests that the Latin Americas were being targeted increasingly during the 1985-88 period.

## Marginal Effects

The primary objective of this thesis is to analyze how factors have affected the targeting decision of the CWB. Marginal effects of right hand side variables on the decision to target may be obtained and shed light on the targeting decision of the CWB as well as how these factors have changed through time.

Marginal effects in the Tobit model are different from the estimation results of Ordinary Least Squares due to censored nature of the sample and the subsequent truncation of the distribution function. The Tobit parameter estimates provide marginal effects ( $\partial y_i^* / \partial x_i$ ) of right hand variable,  $x_i$  on the unobserved variable,  $y_i^*$ . However, the immediate objective is to obtain the marginal effects ( $\partial y_i / \partial x_i$ ) of right hand side variable,  $x_i$ , on the observed dependent variable,  $y_i$ , that takes only non-negative values. This is obtained by multiplying the coefficient on a variable of interest on right hand side to a scale factor. The scale factor is the  $CDF_{\text{normal}}$  evaluated at  $\bar{x}\beta/\sigma$  ( $\bar{x}$  is a row vector of variable means appearing on the right hand side of tobit specification,  $\beta$  is a column vector of parameter estimates, and  $\sigma$  is the estimated standard deviation of the tobit regression).

Whenever a final specification included zero-one variables, the marginal effects for continuous variables, such as GNP and Population are computed for each group variable identified by the zero-one variable separately. For example, if there are two zero-one variables corresponding to Grades targeted, and four zero-one variables corresponding to Geographical regions, there would be eight groups of marginal effects with respect to GNP. That is, the marginal effect of GNP on the observed decision to target Grade One sales to Region One would be different from the marginal effects of GNP on the observed decision

to target Grade One sales to Region Two. Likewise, there would be eight such possibilities for this example. This is due to the fact that each group has a different  $\times\beta$  that is required in computing the scale factor  $CDF_{\text{normal}}(\times\beta/\sigma)$ . Marginal effects may be interpreted as a one unit change in variable x (population or GNP) causes the CWB to increase (or decrease - whatever the case may be) targeted exports to country  $j$ , ceteris paribus.

**Interpretation of marginal effects** The marginal effects correspond to the effect of a unit change in variable X (say GNP) on CWB targeted exports to country  $j$  belonging to a given region and year.

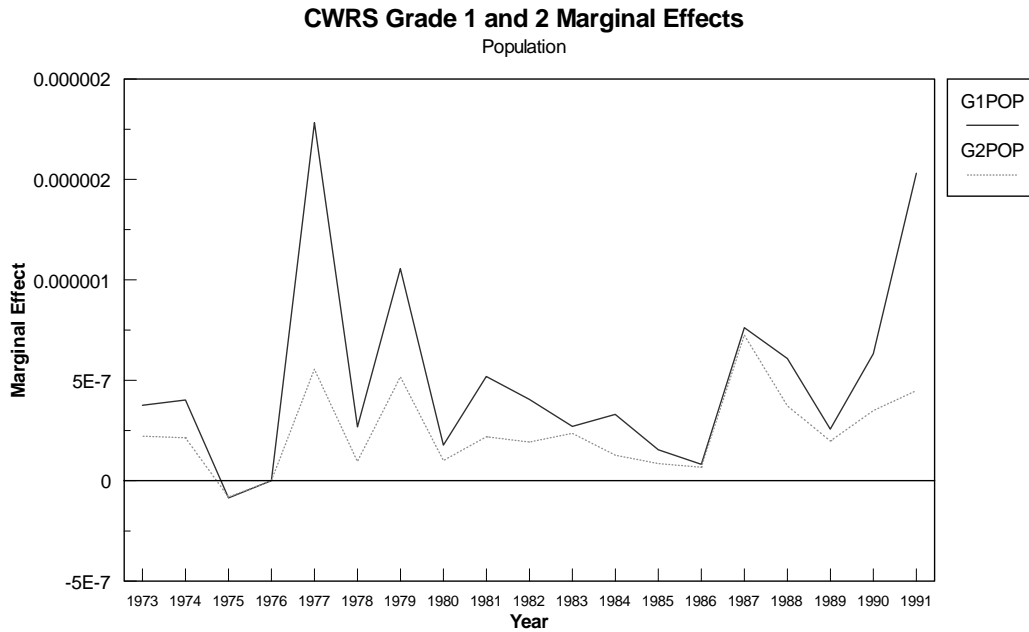
**CWRS** In the model specification of CWRS, a further breakdown of marginal effects is possible by grade due to availability of observations. For CWRS marginal effects refer to Table 4.

<b>Table 4. 1973-91 CWRS Marginal Effects</b>				
Year	Grade 1 GNP	Grade 1 Population	Grade 2 GNP	Grade 2 Population
1973	0.8057E-10	0.3756E-06	0.4754E-10	0.2216E-06
1974	0.6192E-09	0.4020E-06	0.3295E-09	0.2139E-06
1975	0.4990E-10	-0.8542E-07	0.4730E-10	-0.8098E-07
1976	0.9373E-10	0.5820E-09	0.5479E-10	0.3402E-09
1977	0.3190E-09	0.1783E-05	0.9940E-10	0.5556E-06
1978	0.5254E-09	0.2684E-06	0.1880E-09	0.9602E-07
1979	-0.4424E-10	0.1056E-05	-0.2166E-10	0.5171E-06
1980	0.4406E-09	0.1774E-06	0.2491E-09	0.1003E-06
1981	0.3096E-09	0.5191E-06	0.1304E-09	0.2185E-06
1982	0.2367E-09	0.4048E-06	0.1128E-09	0.1929E-06
1983	0.1031E-10	0.2705E-06	0.8995E-11	0.2360E-06
1984	0.3855E-10	0.3304E-06	0.1483E-10	0.1271E-06

1985	0.2596E-10	0.1546E-06	0.1435E-10	0.8549E-07
1986	0.3481E-10	0.8219E-07	0.2834E-10	0.6691E-07
1987	0.6068E-11	0.7621E-06	0.5774E-11	0.7253E-06
1988	0.9850E-11	0.6082E-06	0.6042E-11	0.3731E-06
1989	0.2498E-10	0.2574E-06	0.1922E-10	0.1982E-06
1990	0.2558E-10	0.6321E-06	0.1412E-10	0.3489E-06
1991	0.2349E-10	0.1531E-05	0.6887E-11	0.4489E-06

Generally, a trend is not evident for marginal effects associated with Grade One and Two with respect to Population for CWRS (refer to Figure 2). During the 1970's the Population marginal effect associated with Grade One and Two appears to be particularly volatile. This is likely due to effects of other factors not considered in the model. Moreover, this volatility may reflect the possibility of lower importance of target marketing strategy of particular markets by the CWB during this period. During the 1973-80 period, the world wheat market was less competitive. Thereby, providing less incentive to have an advanced target marketing program.

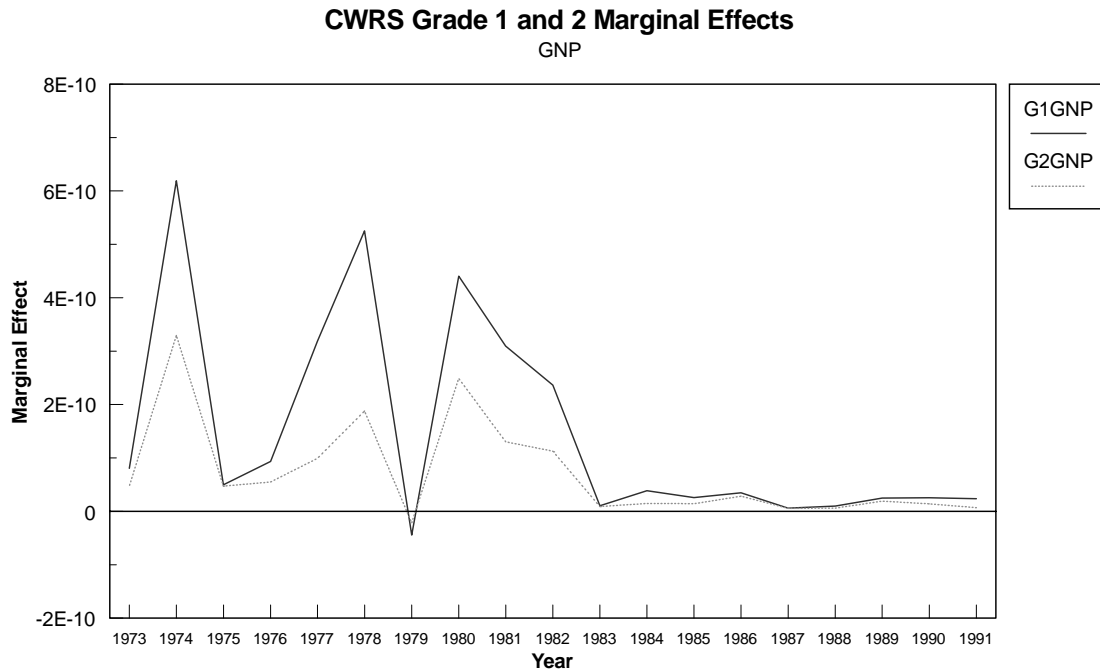
During the 1980's the respective Grade-Population marginal effects are much less volatile relative to pre-1980 with an apparent upward trend during 1989-91. This upward trend during 1989-91 may be as a result of an increased focus in targeting markets according to size.



**Figure 2.** 1973-91 CWRS Population Marginal Effects

It is evident that the Population marginal effect with respect to Grade One is generally higher than that of Grade Two. Thus supporting the idea that a preference existed during this time period by the CWB for larger populations when targeting Grade One relative to Grade Two.

With respect to GNP marginal effects associated with Grade One and Two, similar results were generated to that of Population. Comparably, GNP marginal effects are volatile during the 1970's until 1983. After 1983, the GNP marginal effect is relatively low compared to the 1970's and particularly stable. Similarly to Population, GNP marginal effects associated with Grade One are higher than that of Grade Two. Again, this suggests that the targeting of markets by the CWB in accordance with specific attributes such as market size and ability to pay may not have been a strategy until the early 1980's where it appears to have increased in strategic importance.

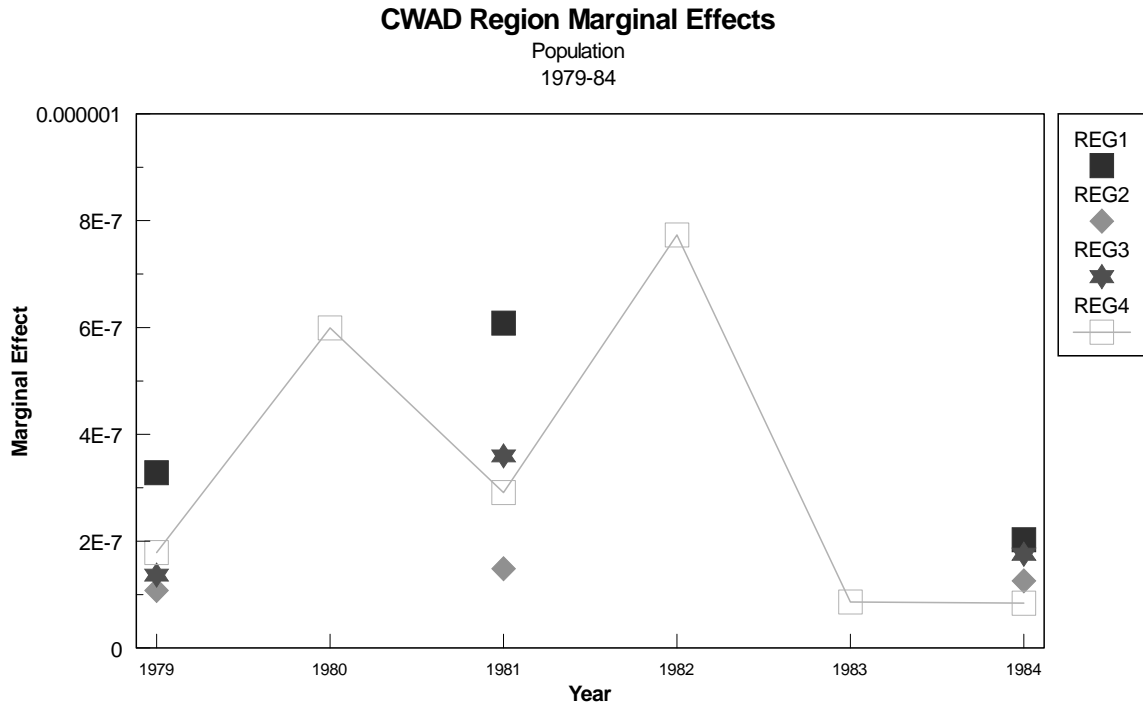


**Figure 3.** 1973-91 CWRS GNP Marginal Effects

**CWAD** There were not enough observations to observe marginal effects by grades during the 1973-79 period. For the 1979-84 period population-based model yielded the best results and was used in the final specification for that period (refer to Table 5). With respect to trends, none are evident and are difficult to follow due to the region dummy variables being statistically insignificant in 1980 and 1982-83 (refer to Figure 4). The population marginal effect associated with the REG1 dummy variable (Africa) is the highest with the marginal effect affiliated with REG3 (Central and South America) and REG2 (Asia) following respectively during the 1979-84 period. Thereby indicating that the CWB may have been primarily targeting African countries with Central American and Asian countries following in importance during this time period.

The marginal effect associated with the REG4 dummy variable is interpreted as only the Population marginal effect when all the regional dummy variables do not contribute to the model specification. When the region dummy variables are significantly different from zero, the REG4 Population marginal effect may be interpreted as the marginal effect associated with countries not included in the regions of Africa, Asia, nor in Central and South America.

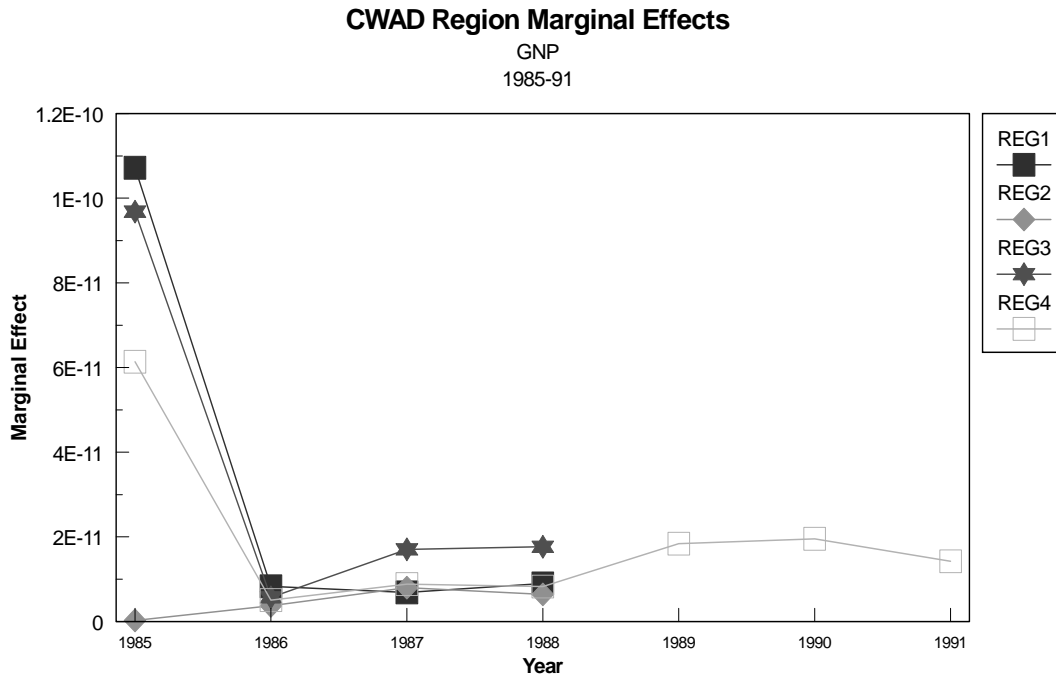
<b>Table 5. 1979-84 CWAD Region Marginal Effects</b>				
Year	REG1 Population	REG2 Population	REG3 Population	Other REG Population
1979	0.3281E-06	0.1076E-06	0.1366E-06	0.1786E-06
1980				0.59938E-06
1981	0.6083E-06	0.1485E-06	0.3597E-06	0.2911E-06
1982				0.77324E-06
1983				0.86243E-07
1984	0.2027E-06	0.1257E-06	0.1755E-06	0.8402E-07



**Figure 4.** CWAD 1979-84 Population Marginal Effects

For the 1985-91 period (refer to Figure 5 and Table 6), GNP generated the best statistically significant results and was used in the final specification for that period.

<b>Table 6. 1985-91 CWAD Region Marginal Effects</b>				
Year	REG1 GNP	REG2 GNP	REG3 GNP	Other REG GNP
1985	0.1072E-09	0.2837E-12	0.9684E-10	0.6139E-10
1986	0.8323E-11	0.3736E-11	0.5743E-11	0.5092E-11
1987	0.6888E-11	0.8008E-11	0.1706E-10	0.8872E-11
1988	0.9019E-11	0.6434E-11	0.1769E-10	0.8264E-11
1989				0.18427E-10
1990				0.19549E-10
1991				0.14269E-10



**Figure 5.** CWAD 1985-91 GNP Marginal Effects

An obvious trend appears with respect to the marginal effect associated with REG4. Regional dummy variable effects contribute to the model specification during 1985-88. In 1985 REG1 (Africa) is the highest GNP marginal effect with REG3 (Central and South America) and REG2 (Asia) following behind respectively. A substantial decrease in all region-specific marginal values is evident in 1986 where all regional marginal effects were similar with a small recovery in 1987 and 1988. In 1989, the regional dummy variables were not significantly different from zero. During 1989-91, the GNP marginal effect associated with countries not included in Africa, Asia, and the Latin Americas increased marginally. This suggests that the CWB modified its target market strategy to countries outside of Asia, the Latin and South Americas, and Africa. Interestingly, many of these countries in Asian, African and the Latin and South Americas are also targets of U.S. EEP.

## **Economic Interpretation**

**CWRS** Evidence from fluctuating Population and GNP marginal effects as well as low relative statistical significance during this period suggests that during 1970's that the CWB may not have been targeting particular countries. This is likely due to the 1970's being a period of substantially increased world wheat trade with plenty of demand for the suppliers during this time period. Thereby making it comparably easier to sell yearly production relative to the 1980's and particular post 1985. With the substantial increase in world wheat production during the late 1970's, the CWB was then forced to improve or create a target marketing strategy. This improvement appears to be largely captured by target market strategies according to size and ability to pay.

**CWAD** During the 1979-84 period, population was a particularly important observed factor in effecting CWB targeting decisions with respect to CWAD. Additionally, the Population marginal effects associated with regional dummy variables (when they were significantly different from zero) indicated that Africa had the highest population marginal effect with Central and South America and Asia following. Thereby indicating that the CWB may have been targeting African countries in particular during this time period.

For 1985-91, GNP is the most significant observed factor affecting the CWB CWAD targeting decision. The GNP marginal effects associated with regional dummy variables indicated that in 1985 Africa had the highest effect with Central and South America and Asia following respectively. A remarkable decrease in GNP marginal effects associated with region dummy variables occurred in 1986. From 1989-91 the GNP marginal effect increased. This phenomenon coincides with the introduction of U.S. EEP.

This apparent increase in CWB interest in countries with higher relative GNP's suggests that they may have been trying to target countries that may have been non-EEP markets or had specific quality issues that higher incomes could overcome.

## CHAPTER VI - SUMMARY AND CONCLUSIONS

This thesis research consisted of three main objectives. The primary objective centered on the identification of socioeconomic factors and other elements that impact sales of CWB wheats to targeted customers by grade/class. The importance of this objective stems from the increasingly competitive trade environment faced by North Dakota wheat farmers. Additionally, from a policy perspective, knowledge of CWB targeting practices may be considered when implementing policy strategy.

The second thesis objective was to analyze how these factors have changed through time. Given the growing competitiveness of this market, understanding how CWB factors have changed over the past will likely shed light on the more optimal marketing strategies for the North Dakota wheat producer. This objective is particularly important in analyzing evidence of CWB targeting and the resulting importance in understanding it.

The third thesis objective was to provide a detailed description of how the various agencies, particularly that of the CGC and the Canadian government, influence the reputation and market dynamics of the Canadian wheat marketing system.

### Summary and Implications

A Tobit model was specified for 3 periods for CWRS and for 2 for CWAD with actual export quantities by grade for CWRS and CWAD. A number of variables were included in a comprehensive model specification during each period respectively. Variables that did not make the final model specifications include: External Debt, Levels of Urbanization, Women in the Workforce, and Credit, as well as the risk proxies *RANK* and *SCORE*, and Distance from country *j* to the nearest Canadian terminal export facility.

Variables that were statistically significant during some or all of the years include GNP, and Population in the case of CWRS. Results indicate that during the period of analysis respectively, the CWB targeted potential CWRS wheat importers according to market size and income. Additionally, it appeared that the CWB increasingly used target marketing strategies from the late 1970's forward. This may have been in response to the third world debt crisis as the CWB sought to reduce credit risk. The regional dummy variables were not statistically significant during the 1973-91 time period for CWRS.

For CWAD during the 1979-84 period Population was the primary factor affecting the CWB targeting decision. When the regional dummy variables were significantly different from zero Africa had the highest Population effect on the CWB CWAD targeting decision with Central and South America and Asia following respectively.

For CWAD during the 1985-91 period GNP was the primary factor affecting the CWB targeting decision. The GNP marginal effect associated with the regional dummy variables decreased substantially in 1986. This may be as a CWB reaction to the implementation of EEP by the U.S. as they sought markets with increased ability to pay who may not have been EEP targets. When the regional dummy variables were significantly different from zero (1985-88) Africa yielded the highest GNP influence on the CWB CWAD targeting decision with Central and South America and Asia following respectively.

### **Limitations of Analysis**

Model specifications were limited during each year due to the limited number of observations associated with the socioeconomic variables. Therefore, the model

specification is only as good as the worst variables included. During the period of analysis, external debt was particularly confining and in many instances had to be removed from the specification. When respective models were specified, caution was exercised with respect to ensuring that enough observations were available to yield statistically sound results. Therefore, as better proxies for risk, ability to pay, and other difficult to measure phenomenon continue to be developed, better analysis may result.

Additionally, it is clear from the volatility evident during the 1970's that not all relevant factors that influence CWB targeting were incorporated into the model specification. While it is likely that the CWB used targeting strategies increasingly since the 1970's, these other factors may be explained as an element of "randomness". In this analysis the element of "randomness" is quite high, particularly during the 1970's for CWRS and in general for that of CWAD.

### **Implications for the ND Farmer**

The international single-seller Canadian wheat marketing agency, the CWB, publicly acknowledges that they target according to population and ability to pay. Additionally, the CWB argues that they have been able to collect historical premiums through target marketing. Comparatively, the ND wheat producer sells through the cash market and does not share the collective bargaining power of their Canadian neighbors. Additionally, the ND wheat grower does not enjoy the ability to hide the price they sell their product for on the market. Similarly, the ND wheat grower suffers an extreme competitive disadvantage by not being able to see what their primary competitor, the CWB, sells their

product for. With the exception of cooperatives in a limited sense (market prices are still public), this represents a serious competitive disadvantage to the ND wheat producer.

The competitive answer to capturing more economic rent may be twofold. The use of farmer-owned vertical integration as a means of capturing more economic return is a strategy that historically has worked well and facilitates the ability to capture value-added “rent”. Additionally, the use of cooperatives as a method of recapturing any “profits” that result from the trading of wheat in cash markets may also be used.

### **Need for Further Study**

As better proxies are developed for socio-economic phenomenon including “random” factors such as oil embargos, poor crop years, international political factors, and other elements the accuracy of the Tobit methodology will be improved. This area necessitates further study as improved variables are developed.

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