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CANADIAN WHEAT EXPORT BEHAVIOR AND ITS IMPLICATIONS FOR THE UNITED STATES

By
J.A. Sinner
D. Blandford
and
K.L. Robinson

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York 14853

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**James Sinner is a former graduate student, David Blandford is an associate professor, and Kenneth Robinson is the Liberty Hyde Bailey professor of agricultural economics, emeritus, respectively, in the department of agricultural economics at Cornell University.

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INTRODUCTION

Farm programs in the United States have become much more costly in recent years owing in part to the decline in exports. Since the early 1980s, large public inventories of basic agricultural commodities have been accumulated under price support programs. In an attempt to reduce the accumulation of stocks and make the United States more competitive in world markets, lower support prices (loan rates) were implemented under the 1985 Food Security Act. Various forms of export subsidies were introduced in the early 1980s in an attempt to reduce the level of public stocks.

An important determinant of the success of these measures is how U.S. exports are affected by lower prices; in other words, how consumption changes in importing countries, and how production responds in the principal competing exporters. Since the impact of price changes on production and consumption in most countries is influenced by the trade and domestic agricultural policies pursued by governments or their agencies, a key issue is how competing exporters respond to lower U.S. and world prices.

The objective of this study is to identify the factors which influence exports of one commodity, wheat, from one major competing exporter, Canada, and to use this information to draw inferences about how U.S. wheat exports might respond to lower U.S. wheat prices. Because the Canadian Wheat Board (CWB) plays a major role in determining Canadian response to U.S. policy initiatives, the study focuses primarily on the behavior of the CWB.

1.0. THE CANADIAN GRAIN SECTOR

Since World War II, Canada has typically been the second leading world exporter of wheat, after the United States. More recently its position has been challenged by growing exports from the European Community (EC). Canada's market share gradually deteriorated during the 1970s; however, the volume of Canadian exports increased substantially -- from around 10 million metric tons (mmt) per year in the 1960s to between 17 and 21 mmt in the early 1980s. Exports from other countries grew even more rapidly, causing Canada's share to fall. In the mid-1980s, Canada's share of world wheat exports has averaged between 18 and 20 percent.

1.1. Production and Marketing

Wheat production in Canada, roughly 95 percent of which is derived from the Prairie Provinces (Manitoba, Saskatchewan, and Alberta), rose from 19.7 mmt in 1963 to 26.6 mmt in 1983; a gain of 35 percent. But there was considerable variation from year to year. Production reached 22.5 mmt as early as 1966, but plummeted to 9 mmt in 1970 under an acreage reduction program (Lower Inventories for Tomorrow, or LIFT). Much of the variation in production, with the notable exception of 1970, can be attributed to variable yields, which ranged from 1.36 mt/ha in 1964 to 2.1 mt/ha in 1976 and 1982 (CGC, 1986). The coefficient of variation for wheat yields in western Canada is almost twice that of the United States (Spriggs). Wheat area, on the other hand, hovered around 11 million hectares during the

1960s, then dropped to 5 million in 1970 with the LIFT program. Since 1970, wheat area has been increasing; it reached a peak of 13.7 million hectares in 1983 (Figure 1.1).

The Canadian Wheat Board (CWB) has exclusive authority to purchase wheat, barley, and oats of export quality produced in the Prairie Provinces. Since the early 1970s, the CWB has announced prior to spring planting the initial payment it will make to farmers upon delivery of grain to local elevators. Operators of these elevators serve as agents of the CWB. When all the grain received in a given marketing year has been sold by the CWB (up to 18 months after harvest), revenues are pooled and all farmers receive equal final payments, adjusted for grade differences and transport costs. In some years there are interim payments if demand is stronger than anticipated (Schmitz and McCalla).

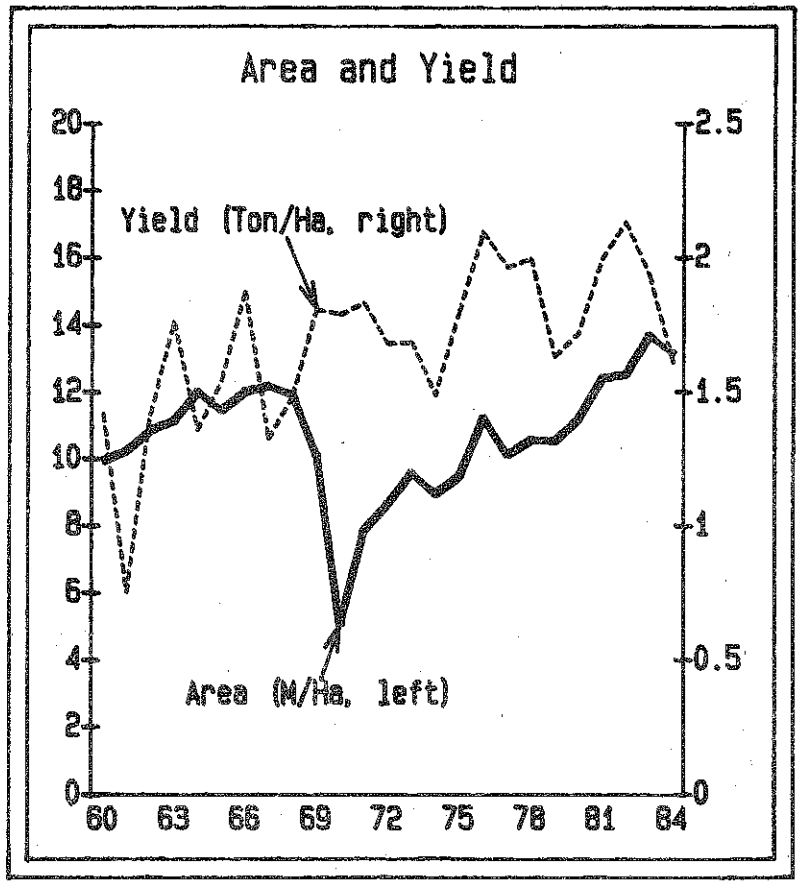
The CWB operates a delivery quota system to obtain the supplies needed to meet export commitments and to encourage uniform delivery of grain by farmers throughout the year. As quotas are announced, farmers have the opportunity to deliver a certain amount of grain based on their declared acreage. Previous delivery opportunities expire when a new quota is announced, and producers who do not use their quotas increase the risk that they will later be unable to deliver all of their grain. Nevertheless, deliveries to the CWB peak in July and August, just before and at the beginning of the new harvest. In years of large production, the CWB may actually restrict total deliveries if the nation's rail and port facilities are inadequate to move the grain or if there is insufficient demand in the world market.

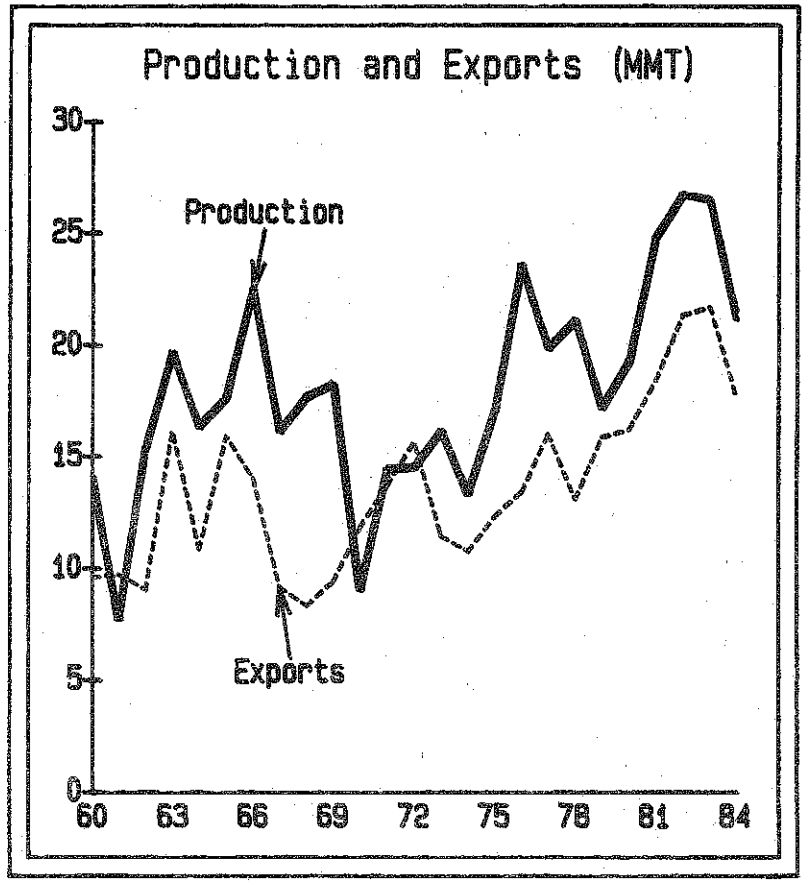
In addition to delivery to CWB terminals, farmers have the option to sell their feed-quality grains on the open (or "offboard") market. Before 1973, these sales were restricted to the province of production, but beginning in 1974 the federal government allowed interprovincial trade in feed grains (Spriggs). However, all milling wheat, milling oats, and malting barley (i.e., all export grades) must be delivered to the CWB (C. Wilson). Producers tend to deliver most of their feed grade wheat to the CWB as well. Thus, the vast majority (97 percent in 1976/77) of Canadian wheat is handled by the Board (C. Wilson).

When quotas are not restrictive, i.e., when farmers are allowed to deliver as much grain to the CWB as they would like, the offboard price should equal the best estimate of final returns from the wheat pool for feed grade wheat. When quotas are restrictive, offboard prices should be depressed below expected returns from the CWB (Spriggs). Through the quota system the CWB manages flows to the export market and can force farmers to hold substantial inventories, which may lead to reduced acreage in future years.

A further aspect of policy affecting wheat production is the Western Grain Stabilization Program (WGSP), which provides cash flow protection to producers of wheat, barley, and other prairie crops. If prices or production decline enough to cause net cash returns to fall below the previous five-year average, a payment is made from the stabilization fund equal to the net cash shortfall. Such payments continue as long as net cash returns are below the average of the previous five years (Normile, 1986.).

Figure 1.1 Canadian Wheat Area, Yield, Production and Exports





Source: Canada Grains Council

Payments are made on the basis of sector-wide performance and, hence, the program offers no protection against localized drought or poor management. There is also no explicit attempt to account for inflation. Payments per participant are determined by an individual's contributions to the stabilization fund in previous years.

Participation in the WGSP is voluntary for producers, who annually pay into the fund between 1 and 2.5 percent of their receipts (up to receipts of $60,000). The federal government matches the contributions 2 for 1 and pays administrative costs. About 75 percent of eligible producers participate (CGC, 1986). The WGSP made payouts in 1977 and 1978 which averaged C$896 and C$1,843 per recipient, respectively. In 1982 and 1983, falling farm income failed to trigger a payout, and the program came under criticism. As a result, the trigger mechanism was amended to protect cash flow per ton (net cash flow divided by volume of grain marketed) as well as total net cash flow. The program period was also changed from a calendar to a crop year basis. These changes resulted in estimated payments in 1983/84 and 1984/85 of C$1,600 and C$3,700 per recipient, respectively (Normile, 1986).

1.2. Domestic Consumption

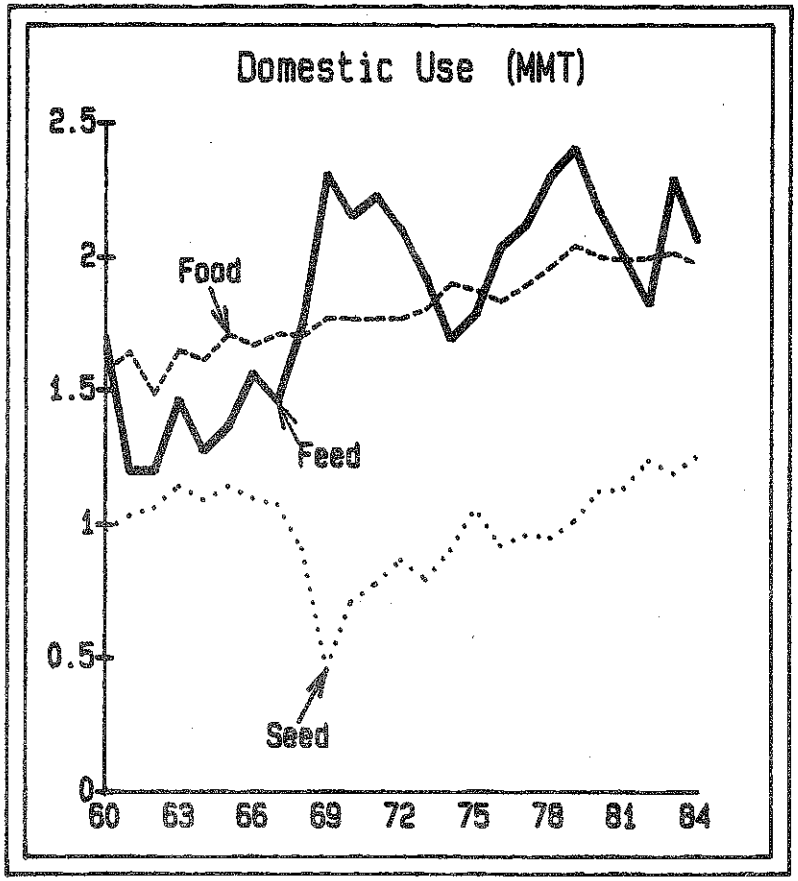
Except for the small amount of feed wheat traded on the offboard market, all wheat purchases for use in Canada are made through the CWB. Until 1979, the CWB set the price to domestic users independently of market forces, and the price changed only once between 1969 and 1979. Since 1979, the milling price has been the CWB export price, if the latter is between C$5.00 and C$7.00 per bushel. If the export price moves outside of this range, the CWB sells to processors at the boundary price (Spriggs).

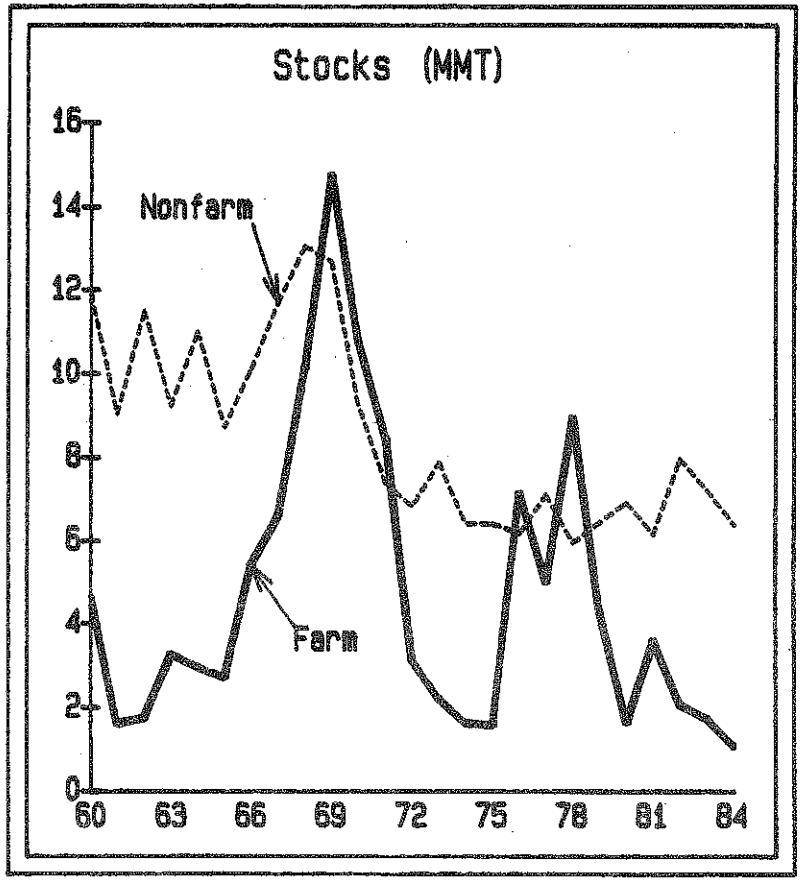
In July 1976, the CWB agreed to sell feed grains at prices competitive with U.S. corn. Thus, the CWB provided a price ceiling for western feed grains supplied by the offboard market. So long as the offboard price stayed below the CWB corn-competitive prices, the market would be supplied by the offboard market. If the offboard price moved above the CWB price, the CWB became a seller in the domestic feed-grains market (Spriggs).

These arrangements had the potential to influence world markets for wheat and feed grains by diverting grain from the export to domestic markets when prices reached their upper boundaries. Corn-competitive sales of feed grains were suspended from August 1, 1985, but the upper and lower boundaries for the domestic milling price of wheat remain in effect. During most of the period of operation of the scheme, CWB official export prices remained between the milling price boundaries, and exports were unaffected.

Consumption of wheat for food and industrial uses rose from 1.6 mmt in 1963/64 to 2.0 in 1983/84, with year-to-year variations not exceeding 8 percent (Figure 1.2). The use of wheat for feed has shown both more growth and greater variability during the same period; total use rose from 1.5 mmt in 1963/64 to 2.3 mmt in 1983/84, with annual changes of up to 30 percent. The use of seed wheat has varied roughly with wheat area, but has shown

Figure 1.2 Canadian Wheat Use and Stocks





Source: Canada Grains Council

little overall growth. Usage was 1.1 mmt in 1963/64, 0.5 mmt in 1969/70, and 1.2 mmt in 1983/84 (CGC, 1986).

1.3. Exports

As noted above, the CWB is the sole agent for exports of Canadian grain. The CWB announces its export prices frequently, but actual prices and other delivery terms are negotiable. In addition to the regular promotion of single sales to any buyer, the CWB negotiates bilateral agreements for minimum annual deliveries over longer periods. Agreements generally cover three to five years. Both the volume and the share of Canadian grain exported under bilateral agreements have varied over the past twenty years, reaching 11 mmt (78 percent) in 1966, falling to less than 1 mmt during the pre-1973 glut, increasing to 14.5 mmt (68 percent) in 1982 and 13.5 mmt (75 percent) in 1985 (IWC). Total exports have also varied considerably. Canada exported 16.2 mmt of wheat in 1963/64, 8.3 mmt in 1968/69, and 21.8 mmt of wheat in 1983/84 (Figure 1.1).

1.4 Storage

Stocks are held by farmers, processors, and by the CWB. Farmers often hold grain until June or July when they have a better idea of the current year's crop and the following year's prices before delivering to the CWB (Normile, 1983). They also need to deliver before August 1 to be included in the preceding year's CWB payment pool. On-farm stocks of wheat have usually been in the 2-4 mmt range over the past twenty years; however, they have ranged from a low of 1.6 mmt in 1974/75 to a high of 14.8 mmt in 1969/70. Nonfarm stocks (primarily held by the CWB) were usually 9 to 11 mmt during the 1960s, but rose to a peak of 13.1 mmt in 1968/69. Since 1972, ending stocks have averaged between 6 and 8 mmt (Normile, 1983). Officials at the CWB indicated in 1986 that the desired minimum year-end carryover (July 31) was around 7 mmt to ensure a steady flow of exports.

2.0. OBJECTIVES AND MARKETING STRATEGIES OF THE CANADIAN WHEAT BOARD

Given the importance of the Canadian Wheat Board in exporting Canada's wheat, it is necessary to understand the export behavior of the Board. The first step in understanding export behavior is to identify the Board's objectives.

2.1. Stated Objectives of the Canadian Wheat Board

The Canadian Wheat Board Act of 1935 created the CWB and continues, as amended, to define the Board's objectives and powers. In the Act, the object of the CWB is stated broadly as follows: "The Board is incorporated with the object of marketing in an orderly manner, in interprovincial and export trade, grain grown in Canada..." (C. Wilson, p. 64). The stated selling policy is equally open-ended. "The Board shall sell and dispose of grain acquired by it ... for such prices as it considers reasonable with the object of promoting the sale of grain produced in Canada in world markets" (C. Wilson, p. 65).

The CWB has interpreted its mandate somewhat more specifically as follows: "(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; (3) To ensure that each grain producer gets his fair share of the available markets each year." (quoted in McCalla and Schmitz, p. 204). These objectives are not necessarily mutually consistent, and may not be given equal weight. It is necessary to examine the behavior of the Board to determine its principal objectives and strategies.

The history of the Wheat Board since the late 1960s does not suggest that is has attempted to control supply. Although the CWB apparently did withhold supplies from the market during the 1950s and early 1960s in an attempt to raise prices (McCalla; Menzies et al.; Oleson), this strategy resulted in reduced sales and increased stocks, necessitating the unpopular LIFT (acreage reduction) program of 1970. The Board came under substantial criticism for having accumulated large stocks, and a CWB study concluded that the Board should concentrate on selling grain and keep stocks to a minimum (Menzies et al.). In the early 1980s, producers opposed supply restrictions because of cash flow problems and lingering resentment over restrictions on deliveries in the 1970s.

In response to these events, the CWB now views itself primarily as a marketing agency for producers. This is reflected in a personal statement made by the Chief Commissioner of the CWB that the Board's objective is to sell grain and pass price signals along to farmers, keeping stocks as low as possible. Another CWB official said that the Board would always allow farmers to deliver grain if the Board could sell it, and added that the Board makes no attempt to influence farmers' production decisions (CWB, 1986a).

Finally, the constraints which the Board may face because of price stabilization and equity considerations have been reduced by changes in institutional arrangements. The Western Grain Stabilization Program, described earlier, was established specifically to allow the Wheat Board to

price competitively in the world market with less concern about stabilizing producers' incomes (Oleson).

The Board's delivery quota system is designed to guarantee equitable access to markets for all producers. Changes in this system indicate how the operating philosophy of the CWB has evolved (C. Wilson,). A study for the Board in 1971 concluded that "the primary function of the quota system should be to secure the delivery of the grains and oilseeds required to fill sales contracts and provide reasonable stocks against anticipated sales.... Equalization of quotas among farmers is a desirable objective but should not be achieved at the expense of marketing efficiency" (Menzies et al., p. 26).

The resulting changes in the quota system apparently improved the efficiency of the marketing system. As one observer noted, "Because a lower priority was placed on equitable delivery opportunities, the Board achieved a significantly larger export volume in 1970/71 than had been accomplished in the previous crop year" (C. Wilson, p. 242). The equity objective was not discarded, however, as producers still cite the fairness of the delivery quota system as one of the main virtues of the CWB (Harder; Penner; and Wild).

Since the report of Menzies et al. in 1971, the Wheat Board's declared objectives have been to maximize returns from each crop that farmers produce without trying to manage supply, and to keep stocks to a minimum.

2.2. Theoretical Implications for CWB Behavior

Economic theory implies that the Wheat Board should follow certain strategies to achieve its stated objectives. Simple linear supply and demand curves can be used to describe how the CWB can be expected to respond to different marketing situations, specifically the problems of variable domestic production and variable foreign demand. Nonlinear demand curves will be introduced subsequently to reflect more accurately the actual conditions in the world wheat market.

Figure 2.1 depicts a simplified model of the situations that the CWB might face in selling its wheat crop. D_o represents normal (or average) excess demand for Canadian wheat, and q_o is the average level of Canadian exportable surplus.[1] The output at which marginal revenue is zero is represented by q_m. At that point, which is the midpoint of the linear demand schedule, the excess demand elasticity equals -1.0. If exportable surplus is less than q_m, total revenues will be maximized by selling the entire supply. It will be argued below that Canada's average exportable surplus, q_o, has been less than q_m since 1973.

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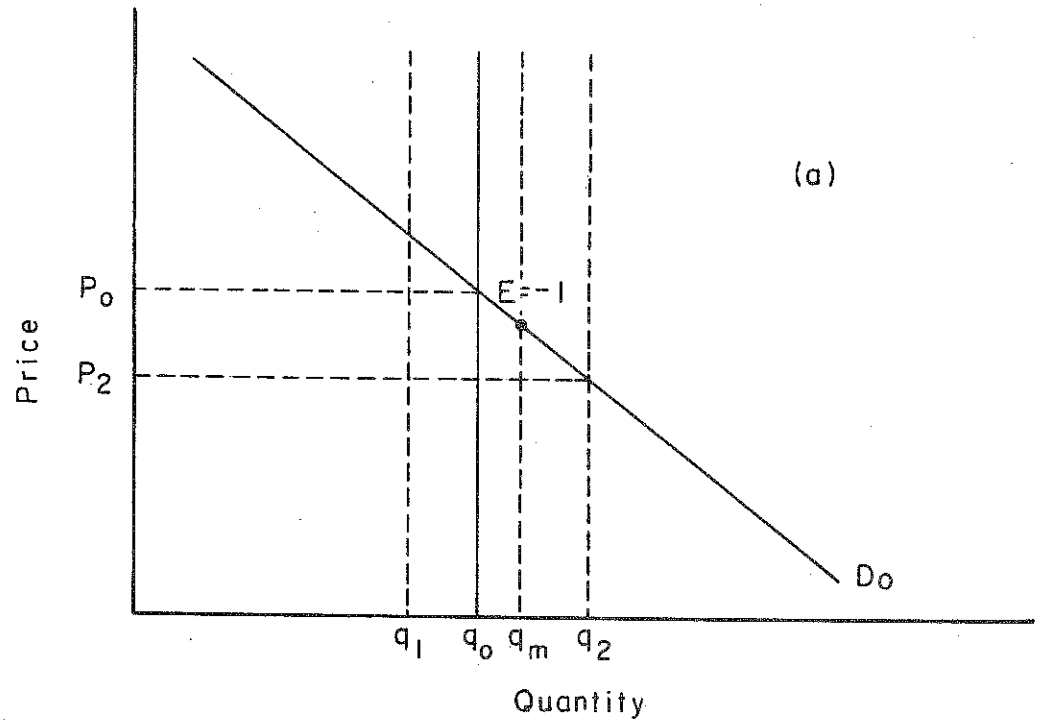
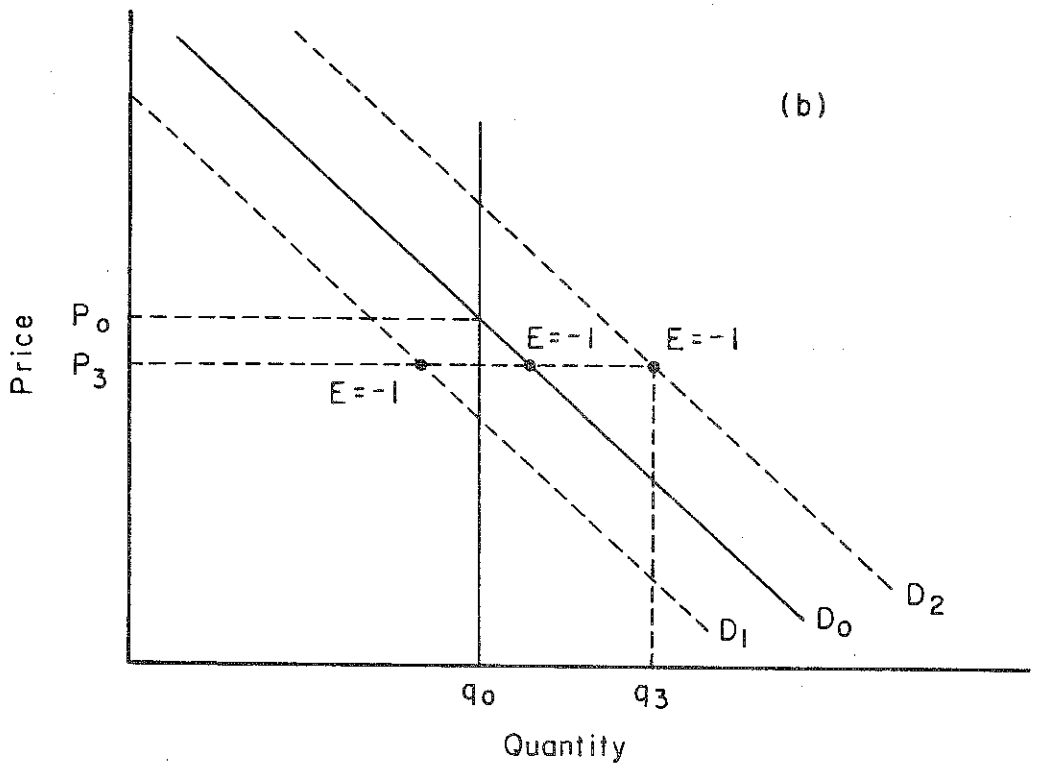
[1] The excess demand facing Canada is the difference between world demand and world supply, excluding Canada's demand and supply. Canadian exportable surplus is defined as the difference between Canada's production and consumption in a given year.

Figure 2.1. Variable Canadian production and variable demand for Canadian wheat exports





If in a given year exportable surplus is greater than q_m, for example, q_2 in Figure 2.1(a), and the Board exports this entire supply at price P_2, it will receive less revenue than if it sells only q_m because it is operating on the inelastic segment of the demand curve. A superior strategy for the disposal of supplies greater than q_m may be to store the excess (e.g., q_2-q_m) and sell it in another year when exportable surplus is less than q_m. To implement this strategy, the Wheat Board needs to know what constitutes average production (at least approximately) so that grain is stored only when exportable surplus is greater than average. If the Board underestimates average production, it will accumulate stocks because there will be insufficient "short" years to dispose of the excess. Conversely, if average production is overestimated stocks will be depleted and the CWB may find itself unable to supply its regular customers.

The Wheat Board faces similar problems as a result of variable excess demand for Canadian exports, and the Board can respond in similar ways. The world demand for wheat and the demand facing Canada vary from year to year mostly due to variable production in importing countries and in competing exporters. This situation is shown in Figure 2.1(b), where D_o and q_o are again average foreign demand and average exportable surplus. Parallel shifts in the demand curve are shown as D_1 and D_2.

Even if Canadian supplies were stable, variable demand might make it profitable for the CWB to store wheat from one year to the next. For instance, if foreign demand shifts from D_o to D_1, the CWB will find itself facing inelastic demand if it tries to sell the entire exportable surplus. On the other hand, if demand is strong and shifts out to D_2, the CWB can sell as much as q_3 at price P_3 before it faces inelastic demand. Assuming that the CWB has reasonable knowledge of what constitutes "average" demand conditions, its optimal strategy for maximizing returns under weak demand is to store some grain for sale during a year of strong demand or low production.

The situation is further complicated by the fact that production and foreign demand may vary at the same time. The effects may negate each other (strong demand may coincide with high production) or reinforce each other (weak demand may coincide with high production), but the principles remain the same. As long as the Board correctly estimates average production and average demand, and the approximate price at which demand becomes inelastic, it can increase returns to producers by storing wheat in years of weak demand and/or above-average supplies and selling stocks in years of strong demand and/or below-average exportable surplus.

A major question that arises is what strategy the CWB would follow if either production or foreign demand were to shift such that average production, q_o, exceeded q_m in a normal year. In this situation, the Board could maximize the returns for any particular crop by selling no more than q_m. In the interest of producers, the Board would have to restrict deliveries of wheat to this level. The CWB's stated objectives, however, suggest that the Board would not follow such a strategy. When questioned on this point, Board officials indicated that they would sell all the grain and let farmers decide if returns justified continued production of wheat. Even if this is the case, however, the optimal long-run strategy of the Board will

be to use variations in stocks to absorb short-term variations in domestic production and export demand.

If the CWB is trying to maximize returns from a given crop of wheat, it might adopt a strategy which includes price discrimination across markets. If demand for Canadian wheat is inelastic in certain markets, the CWB could sell less and charge higher prices in these markets, while selling larger volumes of grain at a lower price to buyers whose demand is more elastic,. This would be possible only if the CWB could effectively separate the markets so that wheat could not be trans-shipped between importing countries. The success of price discrimination also depends upon the absence of close substitutes for Canadian wheat. Since Canada controls a relatively large percentage of high-protein wheat, it might be feasible for the CWB to identify and extract economic rent from inelastic markets for this type of wheat.

However, even if the CWB set its higher price just below the U.S. loan rate to avoid competition from U.S. supplies of high-protein wheat, it is unlikely that the CWB could maintain a system of price discrimination, given the potential competition from other suppliers such as Australia. If, for instance, the CWB offered to sell wheat to Japan (with price inelastic demand) at a high price and South Korea (with price elastic demand) at a lower price for high-protein wheat, Australia could divert supplies from South Korea to Japan and effectively negate Canada's attempt at price discrimination.

Price discrimination might be possible because of the inflexibility in trading patterns introduced through long-term agreements (LTAs) between the CWB and importing countries. If the terms of an LTA effectively require the importer to buy a minimum amount from Canada, then the effective elasticity of substitution between Australian and Canadian wheat is low (at least at or near the agreed minimum) and Canada would be in a position to extract rent from a LTA customer. Japan has for the past ten years had LTAs with Canada that call for trade of 1.3 mmt of wheat per year, and each year Japan has purchased only slightly more than this amount. The USSR and China have each had LTAs with Canada during the past decade. These countries occasionally purchased no more than the minimum quantities for a few years in succession.

Unfortunately, the evidence is too sparse to establish any relationship between LTAs and price discrimination, especially because there are other plausible explanations for minimum purchases. Besides, the degree of obligation involved in these agreements is questionable, since both minimum and maximum quantities are frequently abrogated. Therefore, it seems doubtful that Canada could successfully use LTAs as a mechanism for price discrimination.[2]

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[2] Political relationships between countries can also lower the elasticity of substitution between wheat from different suppliers and provide opportunities for price discrimination. Again, however, such discrimination, if it exists, is difficult to document.

2.3. Recent Behavior of the Canadian Wheat Board

In this section the recent behavior of the Canadian Wheat Board is examined to determine its consistency with its stated objectives and the predictions of economic theory.

Relationships with Other Exporters

There has been considerable speculation about actual collaboration in the past between wheat exporters and the potential for future collaboration. However, collusive arrangements to restrict exports in order to raise prices would be inconsistent with the Canadian Wheat Board's current stated objectives listed above. Although it has been argued (e.g., by McCalla) that exporters colluded to maintain prices in the 1960s and early 1970s, there is little evidence that tacit collusion or joint action has occurred since. Since the early 1970s, Argentina and the EEC have both become significant exporters of wheat (with about 6 percent and 15 percent of world exports, respectively). Both of these countries have export policies that are driven by considerations other than the extraction of economic rent from importing countries. EEC export behavior is determined by the need to dispose of surplus production. Argentina has used wheat exports as a major source of government tax revenue. Though the other three major exporters (the United States, Canada, and Australia) still have about 75 percent of the market, the experience of OPEC in the mid-1980s demonstrates that unless supply in the rest of the world is extremely inelastic, a cartel may have difficulty enforcing its price.

If collusion existed among exporters, one would expect market shares to be reasonably stable. In fact, such shares have been highly variable in recent years. Canada's market share ranged between 17 percent and 22 percent from 1975 to 1985, while Australia's market share varied between 9 percent and 17 percent over the same period. The U.S. share was fairly stable, around 45 percent during the late 1970s, but rose to 49 percent in 1981/82 and then dropped to 40 percent for each of the next three years. In 1985/86 the U.S. share dropped even further to just under 30 percent of world exports. While the United States accumulated stocks and limited supply through acreage reduction programs in the early 1980s, Canada and Australia were producing record amounts of wheat. This does not suggest that exporters were colluding.

Price-cutting has been severe in recent years. Since 1982, the United States has allocated a large amount of funds to "export enhancement programs" for wheat. These programs provide low-interest credit and other forms of direct and indirect subsidies to importers, the objective of which is to make American wheat more competitive with that of Argentina and especially the EEC (Petit). The U.S. Food Security Act of 1985 continues and expands these programs, with over $5 billion per year available for credit guarantees and roughly $1 billion per year in cash and CCC commodities provided to exporters to offset "unfair trade practices" or to "develop, maintain, or expand" U.S. markets (Stucker and Collins). Major portions of this export assistance are being devoted to wheat.

Given these facts, it is extremely implausible that the U.S. and Canada, let alone Australia, have been colluding through their export policies. U.S. acreage reductions and stock accumulations have helped to support world prices, with the U.S. taxpayer bearing the burden of support alone. The reduction of loan rates under the 1985 Agricultural Act was partly intended to bring pressure on Canadian and Australian producers and the European Community to reduce production and exports.

Management of Carryover Stocks

Since the report of Menzies et al. in 1971, it has been the CWB's policy to sell most of what is produced each year and to minimize carryover. One would, therefore, expect carryover stocks to be limited to working stocks and have little year-to-year variation. Prior to the 1972/73 crop year, the CWB had been willing to accumulate stocks to help support world prices. This led to large inventories in 1968 and 1969, which ultimately resulted in a reduction in wheat production under the LIFT program in 1970.

Annual carryover stocks and their ratio to production are shown in Figure 2.2. Since 1971/72, aggregate (commercial plus on-farm) stocks have been substantially lower than they were in the late 1960s, both in absolute volume and in relation to production. This appears to be consistent with the Board's stated objective of minimizing stocks. Between 1976 and 1979, the Board was compelled to limit deliveries from farmers due to transportation and handling constraints. This led to the accumulation of on-farm stocks. Since then, stocks and their ratio to production have declined.

Use of Delivery Quotas

It seems clear there has been no collusion among exporters in the world wheat market since at least the late 1960s, but it remains to be seen whether the CWB accepts unlimited deliveries of wheat and simply exports it at the best price that can be obtained. The crucial question is whether the Wheat Board is in any way restricting Canadian wheat production, because any restriction would cast doubt upon whether the Wheat Board is really pursuing its stated objectives.

Despite recent record Canadian wheat production and exports, there is evidence that CWB delivery quotas have been restrictive at times. There is general agreement, for instance, that transportation and handling constraints during the late 1970s forced the CWB to use its delivery quota system to ration available facilities among producers (Normile, 1983; Hildebrand).

More recently, however, the CWB and the Canadian government have undertaken an ambitious program to upgrade rail and port facilities, including a $90 million purchase by the CWB of 2000 railway hopper cars to help alleviate bottlenecks (Normile, 1983; USDA; CWB, 1981). This suggests that the Board has not used transportation constraints as an excuse to restrict production. As a result of recent improvements in transport and port facilities, combined with the decline in energy prices and decreased

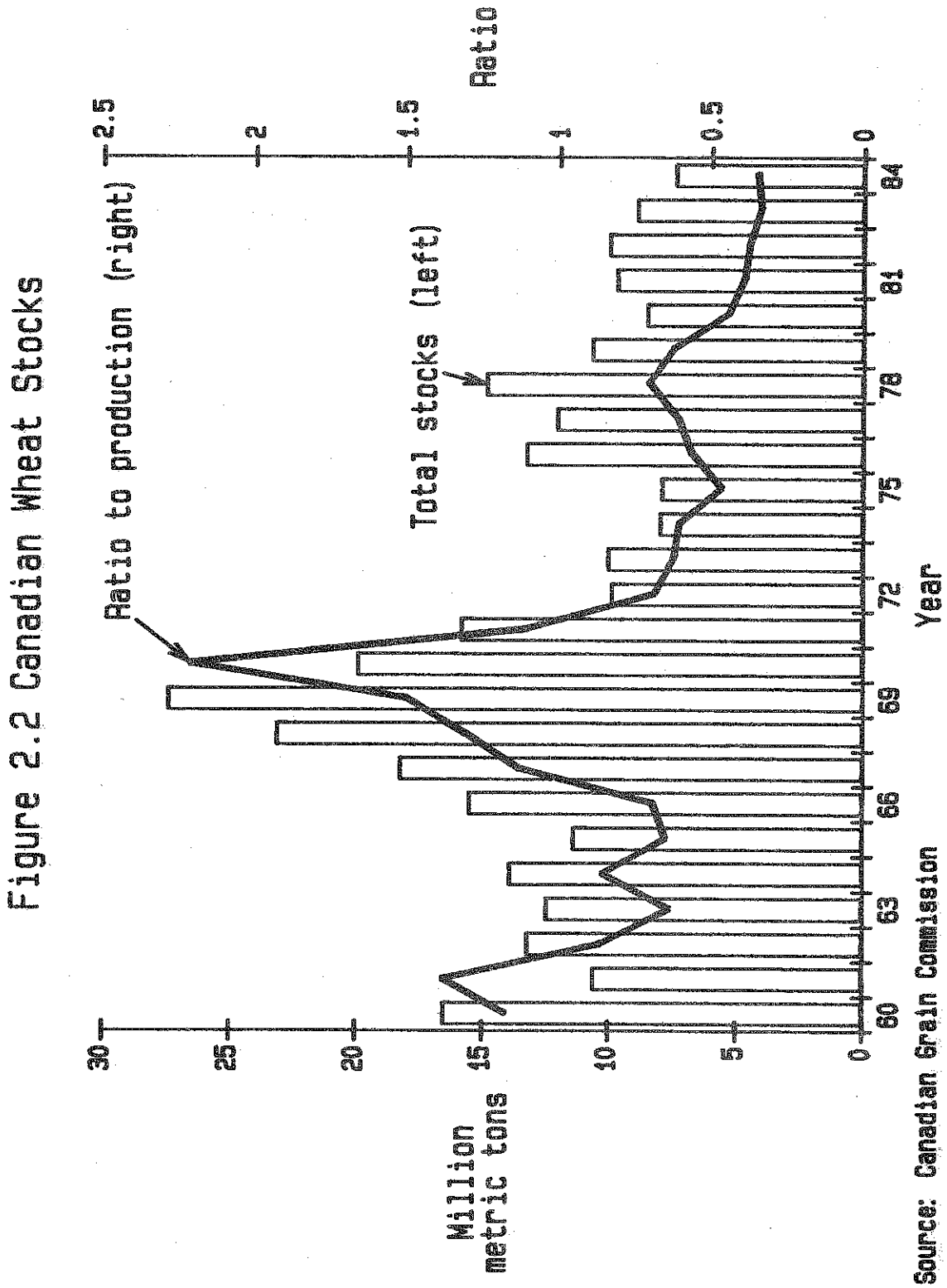


Figure 2.2 Canadian Wheat Stocks

Source: Canadian Grain Commission

demand for facilities from the energy sector, the transportation and handling system is no longer a constraint for the CWB and grain producers (CWB, 1986a).

In an interview conducted during 1986, an official of the CWB did say that restrictive quotas had been applied to Canada Utility, a minor class of wheat, to signal producers to grow less because the market could not absorb available supplies at acceptable prices. Eventually producers reduced the area planted to this grade from 0.7 to 0.25 million hectares. Instead of lowering producer prices in order to reduce production, restrictive quotas were used because the Board did not want to be accused of disrupting the world market (CWB, 1986a).

Delivery quotas have recently restricted delivery of certain types of grain from certain locations in certain years. In 1984/85 there was an abundance of high-quality wheat and the CWB restricted deliveries of this grade. During 1985/86 there were surpluses of low-quality wheat, and delivery of lower grades was restricted. This implies that the CWB has used delivery restrictions to maintain prices in some cases.

Three Canadian farmers from different areas were interviewed about the delivery quota system. Two stated that the restrictiveness of quotas is difficult to predict and generally does not influence their planting decisions. A third farmer stated that delivery of the lower grades (CWRS No. 3 and Canada Feed) is often restricted and that he analyzes Board projections of sales and quotas before deciding how much wheat to plant (Harder; Penner; and Wild). All three farmers agreed that producers can deliver all of their top grades of wheat to the Board, if not during the current year then the year after, and that the delivery quota system is fair in that it guarantees equivalent delivery opportunities to both small and large farmers.

The Board may be reluctant to declare quotas open at the end of the marketing year because that would diminish its ability to persuade producers to deliver in winter months when it is less convenient to do so (A. Wilson; Weaver). Still, a Board official involved in implementing the quota system insisted the CWB would not restrict deliveries, even for a small group of producers, provided the Board felt it could sell the grain. The Board does prefer high quotas to open quotas at the end of the year in order to have "controlled" deliveries, but this does not take preference over allowing producers to deliver grain if the Board can sell it (CWB, 1986a). Whatever the full explanation, the extent to which lower grades are consistently restricted appears minimal. Criticisms by farmers on this point are probably due more to the manner in which total quota acres are determined rather than to overall supply restrictions.

In announcing a new variety for unrestricted production in 1986, the Board said that it would "endeavor to market all wheats grown by producers, and that the relative merits of HY320 or any other variety will have to be determined by the marketplace. ...the future of the variety will now be decided by the producers themselves, based on whether they are satisfied with the price and volume the marketplace can provide" (CWB, 1986b).

Occasional delivery quota restrictions seem to arise because the Wheat Board cannot easily dispose of short-run surpluses of a particular grade of wheat. This suggests that the short-run elasticity of substitution between different wheat grades may not be high and/or the elasticity of substitution between the wheat of different exporters may be low.

In short, the use of quotas instead of prices to enforce sustained acreage reduction appears to have been limited primarily to a fairly minor grade of wheat with clearly inelastic demand.

Licensing of New Varieties

For at least ten years, the Canadian wheat industry has debated the licensing in Canada of so-called "American" varieties. These are high-yielding, mostly semi-dwarf wheats that are commonly grown in the United States. They typically yield 30 percent more grain than the standard Canadian variety, but are also lower in quality. The CWB has long maintained that export of these varieties would undermine Canada's reputation as supplier of the best wheat in the world and consequently reduce the premium that its top grades command (Mants et al.).

Supporters of the new varieties (sometimes called 3M varieties, for medium protein, medium hardness, and medium baking strength) have countered that the higher yields and higher export volumes would more than compensate for any price premium lost because of lower quality. They have argued that utilization of the varieties is growing faster than for high-quality wheat, and that Canada must supply 3M wheat if it is to maintain its share of a growing market (Mants et al.; CGC, n.d.). The Wheat Board has been accused of being overly preoccupied with high-quality wheat when the market growth potential is for "fair average quality" wheat (Lancashire). Producers and academics have called for the licensing of 3M varieties (Winnipeg Free Press, 1985a and 1985b).

In response to these criticisms, the CWB has argued that "we should maintain our markets for high-quality wheat. The countries that buy it (Europe and Japan) are consistent, cash customers" (Lancashire). It has not been suggested that Canada drop its top grades entirely, but the problem has been complicated by the visual indistinguishability of some of the best 3M varieties from premium Canadian varieties. Since the Canadian grading system relies on visual distinctions, the CWB and the Canadian Grain Commission have resisted the introduction of 3M varieties, on the grounds that these would inevitably be mixed with CWRS Nos. 1 and 2 and thereby ruin Canada's reputation for quality (Mants et al.).

Varietal tests for yields and quality were conducted over a number of years, with limited amounts being contracted for delivery to the Wheat Board. Finally, the CWB and the Grain Commission bowed to producer pressure and established a new class of wheat, Canada Prairie Northern, for a 3M variety known as HY320. This variety was made available for planting on an unrestricted basis for the first time in 1986, subject to delivery quotas. While it is not the best available variety in terms of yield and baking qualities, it is visually distinguishable from other Canadian varieties (CGC, n.d.).

Why did the CWB and the Grain Commission resist the new varieties for so long? In addition to the reasons given above, there are indications that the Board is reluctant to market large quantities of wheat which would compete directly with standard varieties of the United States (Dark Northern Spring and Hard Winter Ordinary) and Australia (Standard White). Currently, Canada's reputation for quality constitutes a degree of product differentiation that provides price separation from its competitors, even though the extent of this separation is probably limited. Large exports of "American" varieties would virtually eliminate any separation and would inevitably intensify competition among sellers in markets for wheat of fair average quality.

It is not possible to determine with certainty whether these reasons were responsible for the delay in licensing HY320, but a comment by a CWB commissioner suggests they may have been important. The commissioner told a group of producers at the end of 1985 that if more medium-quality wheat had been planted that year, the CWB could not have exported it all (including the high-quality wheat that was down-graded due to rain damage) in competition with similar wheat that the United States and the EEC are selling with $30 and $40/ton subsidies (Ewins).

A study by the Canada Grains Council declared "the delay in [HY320] being licensed seems to be the philosophy that Canada should not compete in the medium- to lower-protein market" (CGC, n.d., p. 10). The same study indicated that Canada would have to be a price-taker in the market for 3M wheat, but that it could play the role of fringe supplier and "could do some limited price-cutting without fear of retaliatory pricing by the major exporters in this market" (p. 38).

It remains to be seen how much 3M wheat Canadian farmers will produce and how much the CWB will allow them to deliver for export. It may be more than a coincidence that the grades for which evidence exists of the use of supply restrictions, CWRS No. 3 and Canada Utility, are precisely those which compete more directly with American, Australian, and EEC supplies of average-quality wheat. It would probably be overly skeptical to conclude that the Board is not really concerned about visual distinguishability and the deterioration of Canada's reputation for superior-quality wheat. But it would seem to be realistic to conclude that a reluctance to compete with the United States and other exporters has played a role in delaying approval of the new wheat varieties.

3.0. A MODEL OF EXCESS DEMAND FOR CANADIAN WHEAT

It was argued in the previous section that the recent behavior of the Canadian Wheat Board is broadly consistent with its stated objectives, but some apparent contradictions remain. This section develops a model of excess demand for Canadian wheat which resolves these contradictions.

3.1. Elasticity of Substitution Between Types of Wheat

As Oleson has stressed, differing demand by type of wheat is an aspect of the world wheat market which is often neglected by analysts. Demand for high-protein wheat, which usually makes up over 70 percent of Canadian supplies, probably exhibits significant changes in price elasticity over a range of quantities and prices. Demand may be quite price inelastic for small quantities because buyers have needs for which other wheats are poor substitutes. Additional quantities of high-protein wheat compete with lower-quality wheat in uses where the elasticity of substitution is higher (Tomek and Robinson; Oleson).

Recently, the price differential between high- and medium-quality wheat has been sufficiently stable and small to suggest that supplies of high-quality wheat are competing with wheat of lower quality (albeit at a slight premium) in the general market for bread wheats. For example, Mants et al. provide data on prices in Japan. They argue that price premiums for quality in this market can be considered world maxima because the Japanese are known to pay a premium for top-quality wheat. Average prices from 1977/78 to 1981/82, in U.S. dollars per metric ton, were $212 for No. 1 CWRS (13.5 percent protein), and $182 for both Australian Standard White and U.S. No.2 Hard Winter Ordinary (13 percent protein). Between 1964/65 and 1980/81, the average difference in price between No. 1 CWRS and the latter two grades was 15.7 percent, with a maximum of 26.9 percent in 1973/74, a minimum of 10.3 percent in 1978/79, and a standard deviation of 4.8 percent. Mants et al. also note that two American grades which differ primarily by protein content (No. 2 Dark Northern Spring, 14 percent, and No. 2 Hard Red Winter, 13 percent) differed in price by an average of $6/mt over the same period.

The data suggest that, while customers (especially the Japanese) are willing to pay a premium for high protein and other quality differences, this premium remains fairly constant despite changes in the relative amounts of the various qualities produced. In some years, a shortage of top grades (e.g., in Canada in 1980/81) or strong demand for top grades tends to increase the price differential, but in most years the premium appears to be limited by the fact that over a substantial proportion of their total demand customers can adjust their usage across competing qualities without much difficulty.

Nevertheless, as indicated by the variation in the premium for Canadian wheat, the potential substitution between wheat of different grades and between wheat from different suppliers is less than perfect. This is due to both political and technical factors. As a result, the CWB has some discretion in pricing its wheat, and there is no single "world price" even if the various wheat prices move more or less together.

If Canada alone raises its price for high-protein wheat, millers will substitute more medium-protein wheat. Canada sells less than it would if all exporters raised prices together, but it still sells some high-protein wheat. This is shown in Figure 3.1, where q_a and q_b are high- and medium-protein wheat, respectively, and O_1, O_2, and O_3 are isoquants for production of increasing amounts of flour of constant quality. If the prices of high- and medium-protein wheat increase in the same proportion, the budget line will shift in a parallel fashion and the input mix changes from A to C to D. But if only the price of high-protein wheat rises, the mix changes from A to B to E, which leads to a more elastic demand for q_a. The higher the elasticity of substitution between Canadian and other export wheats, the more market share Canada loses when it raises its price. If U.S. or Australian grades compete well with Canadian high-protein wheat, and if there are excess supplies of these substitutes, the CWB would sell very little if it raised its price above those of its competitors. This explains why oligopolists typically try to differentiate their products. Differentiation enhances their ability to set prices.

The elasticity of substitution for wheat is also directly related to the U.S. elasticity of stocks adjustment. During periods of surplus and before the Export Enhancement Program was expanded in 1986, the U.S. loan rate and government stock accumulation held the price of U.S. wheat exports relatively steady. At least in the short term, Canada could change its export price knowing that the U.S. price would remain unchanged. Thus, in the short run, the effective elasticity of U.S. supply with respect to Canadian price was zero because price transmission was zero. The elasticity of substitution between the products of competing suppliers effectively determines the extent to which Canada and other exporters can displace American supplies and, ultimately, the amount of grain the United States exports. For instance, the higher the elasticity of substitution, the more U.S. exports will be displaced and the more U.S. stocks will accumulate as a result of a given price reduction by a competing exporter.

It follows that the U.S. loan program may support not only domestic U.S. prices but also the level of world prices. If the United States is willing to accumulate stocks rather than reduce its prices, other exporters will have no need to set prices much below the loan rate unless there is poor substitution between their wheat and U.S. wheat. As a result, during periods of surplus the U.S. loan program acts to support world wheat prices at levels near the loan rate.

3.2. A Model of Kinked Excess Demand for Canadian Wheat

Given the small number of major wheat exporters, the lack of a homogeneous product, and the dependence of demand for Canadian wheat exports on the relationship between Canadian prices and the U.S. loan rate, the classical theory of competitive oligopoly and kinked demand can be used to analyze the characteristics of excess demand for Canadian wheat. A graphical representation of this theory is shown in Figure 3.2, where DD is Canada's demand curve if all oligopolists change price together and maintain market shares, and dd is Canada's demand curve if Canada alone changes price. In other words, dd is the demand for Canadian wheat as a separate good assuming the prices of close substitutes (i.e., supplies from other exporters)

Figure 3.1. Quantity effects of price changes for high protein and medium protein wheat

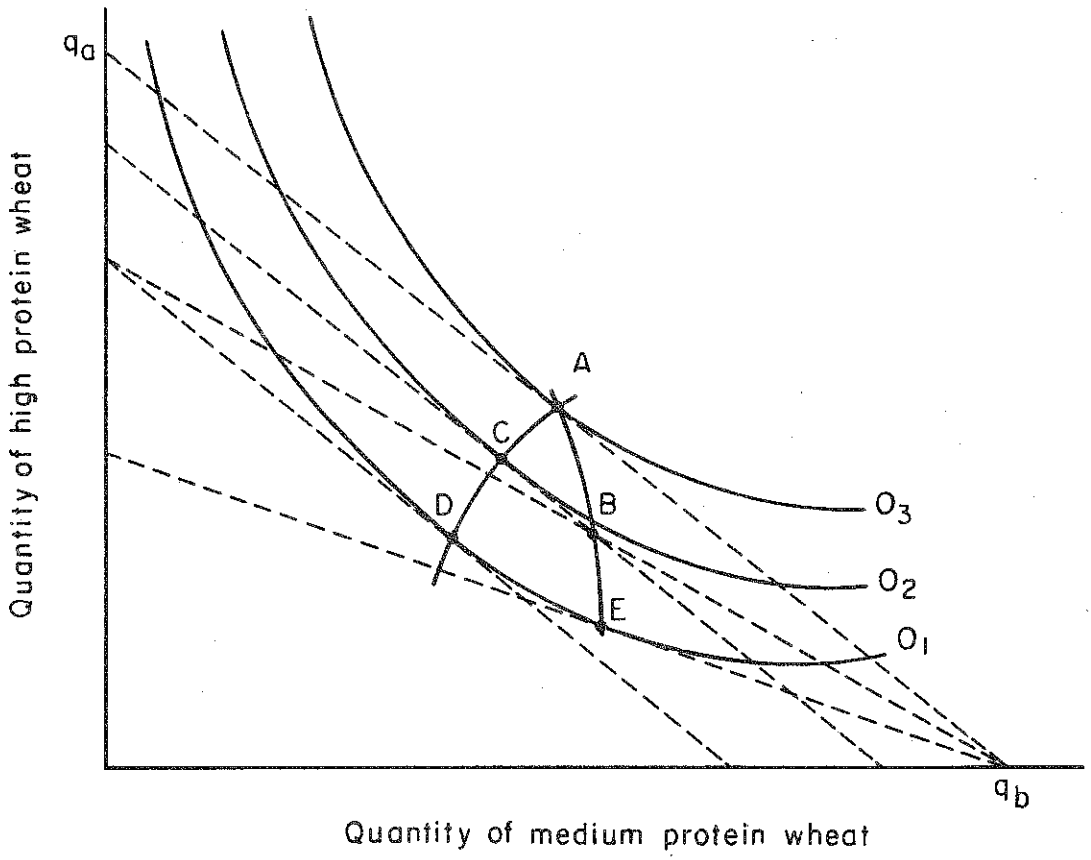
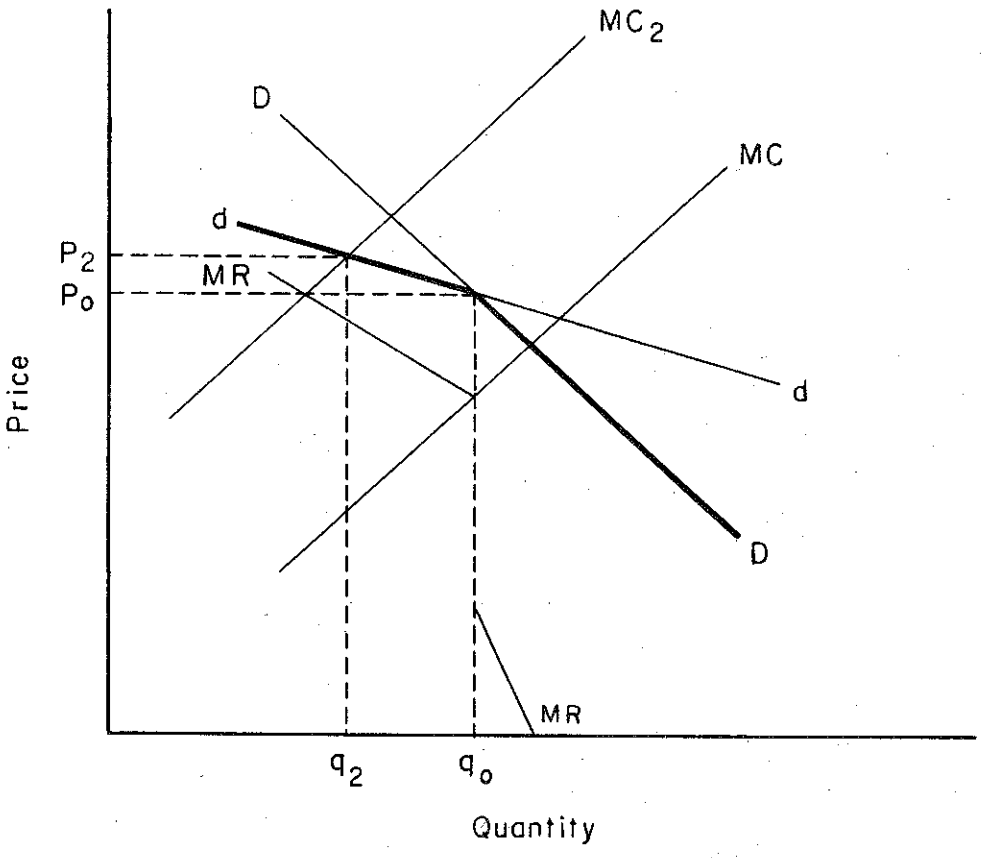


Figure 3.2. Competitive oligopoly: the kinked demand curve



remain constant at P_o. MC is the marginal cost of wheat for Canadian producers (Henderson and Quandt).

According to the theory of competitive oligopoly, competitors will match a price decrease by the CWB, and Canada will face the demand curve DD. If the CWB raises its price, however, competitors will not follow the lead but instead will try to increase their market shares. In this case, Canada faces the curve dd. Canada's excess demand curve would, therefore, be kinked at price P_o, which is the established price of its competitors, and its marginal revenue curve (MR) would be discontinuous. Thus, Canada's sales remain stable at q_o (and world price remains at P_o) under a variety of conditions. It should be noted, however, that if the Canadian marginal cost curve is MC_2, i.e., above the kink in the demand curve, then the kink is irrelevant.

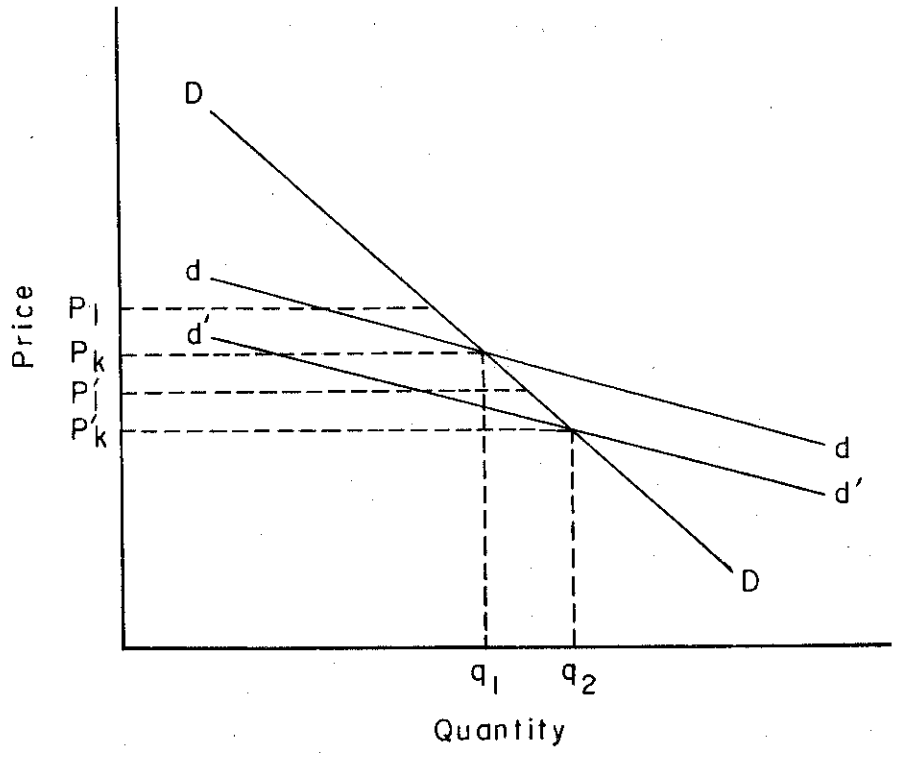
Since the early 1980s, the U.S. loan program has determined the level of world wheat prices and effectively established a kink in the demand curves faced by other exporters. The U.S. program was not flexible enough prior to 1986 to respond immediately to price-cutting by competitors, so other exporters were able to sell at prices below the U.S. loan rate and still experience elastic demand on their respective dd schedules.

In a stagnant market, increased sales by other exporters are likely to come at the expense of U.S. market share if the U.S. loan rate is above market-clearing levels. It is difficult for Canada to capture any of Argentina's market share because Argentina will probably match Canada's price-cuts, as will Australia and the EEC. However, there is a point at which the United States retaliates, as evidenced by the expansion of the Export Enhancement Program in 1986. In Figure 3.3 price P_k is the point of retaliation and marks the actual kink in the demand curve. P_1 is the U.S. loan rate. This situation implies that Canada can reduce its price as far as P_k and sell q_1 before the United States retaliates.

In practice, the kink at P_k is ill-defined, since the United States has implemented price retaliation by degrees. The initial U.S. reaction to the price-cutting of its competitors during the early 1980s was to institute relatively modest indirect export subsidies. Later these were greatly expanded. Eventually, in 1986 the United States retaliated directly by lowering the loan rate and, hence, world prices. Even before the United States lowered the loan price, its indirect retaliation made it more difficult for Canada and other competitors to capture U.S. customers. Demand for Canada's wheat became more inelastic, i.e., the demand schedule approached DD. The kink is, therefore, "soft" and actually consists more of a zone of transition from dd to DD than an abrupt kink at P_k.

Lack of full information on prices also contributes to the "softness" of the kink. Because most of the CWB's sales are made at negotiated and unannounced prices, it is difficult for competing exporters to follow Canada's lead when the latter reduces its price. Even if the U.S. government concludes (perhaps because Canada's market share is growing) that the CWB has been cutting its price, the United States cannot retaliate quickly except perhaps through targeted "export assistance." This problem contributes to the selective nature of U.S. retaliation which results in an ill-defined kink.

Figure 3.3. Kinked demand for Canadian wheat exports



Argentina and the EEC, and perhaps Canada and Australia, have in fact been selling according to their respective dd curves beyond the kink, and it is this which has provoked U.S. retaliation. The U.S. decision to lower the loan rate in 1986 was not triggered solely by other exporters exceeding a certain export volume or pricing below a certain price. Rather, the decision was the result of a complex set of events, including the cumulative impact of the loss of foreign markets, continued high production in the U.S., and expiration of the 1981 farm act which provided an opportunity to reevaluate U.S. farm programs. Once U.S. retaliation became certain, competing exporters took maximum advantage to export wheat before the new U.S. loan rates came into effect. This partially explains why U.S. wheat exports declined to 25 mmt in 1985/86 from 38 mmt the previous year.

At the lower U.S. loan rate, P_1' in Figure 3.3, the kink is re-established at a lower price (P_k') assuming U.S. flexibility to retaliate remains limited. Canada can now undersell the new loan rate and increase sales according to demand schedule d'd' up to q_2. If the kink is established low enough, however, so that Canada's cost of producing q_2 tons of wheat exceeds P_k', the kink will be irrelevant for Canada because the CWB will try to avoid exporting at a loss. In fact, the United States government is hoping that the new loan rate for wheat is sufficiently low that Canadian farmers will find it unprofitable to produce q_1 for export. In this case, Canadian exports would decline from q_1, enabling the U.S. to regain some of its market share. However, if farmers in Canada, Argentina, Australia, and the EEC are willing to continue to produce at the lower prices, or their governments are willing to bear the cost of insulating domestic prices from world prices, the United States will have difficulty regaining lost markets.

A final caveat concerning the above model is necessary. The model implies that in each year the CWB makes a single decision about how much wheat to sell and at what price to sell. This obviously is unrealistic. The Wheat Board adjusts its pricing strategy throughout the marketing year. The harvests of the Australian and Argentine crops from November to February give the Board a better sense of residual demand. As the end of the marketing year approaches, the CWB receives estimates of the next Canadian crop. All of these considerations are likely to affect the Board's decision of how much wheat to sell in the current year and how much of a price discount is acceptable or necessary to move any unsold grain. Any grain that cannot be sold at acceptable prices or without disrupting the market must be stored. Though the model cannot capture these complex dynamic processes exactly, it provides an approximation of actual behavior.

3.3. The Impact of Other Exporters on the Demand Facing Canada

The discussion above has focused on the relationship between Canadian and U.S. export behavior and largely ignores the behavior of Argentina, Australia, and the EEC. While the U.S. loan program has had a major impact on the demand for Canadian wheat exports, the CWB must also consider the behavior of other wheat exporters.

The nature of excess demand facing Argentina, Australia, and the EEC has also been dominated by the U.S. loan program. During periods of sur-

plus in the United States, each of these countries faces a demand that is kinked slightly below the loan rate, just as Canada does. These exporters can expand their sales by pricing below the U.S. loan rate to displace U.S. sales. Because the United States has less flexibility to match price-cuts than other exporters, one would expect these exporters to try to displace U.S. wheat sales before those of a third country.

Under such conditions, the Canadian Wheat Board must consider its pricing strategy in the context of the actions of other exporters. During a year in which Argentina or the EEC has less than normal supplies and is, therefore, discounting prices to a reduced extent, the CWB should be able to offer price discounts to win additional customers from them without provoking U.S. retaliation. Conversely, when other exporters have large supplies of wheat for export, Canada will have difficulty selling wheat to infrequent customers because competition will be strong. Even if the CWB targets U.S. markets, it may face competition from other exporters trying to capture these markets. This is particularly likely since Argentina, Australia, and the EEC appear to be less willing than Canada to hold stocks. Since the CWB knows that other exporters are likely to match Canadian price reductions, the CWB will be willing to store some wheat to avoid selling at severe discounts and provoking U.S. retaliation. So when other (non-U.S.) exporters have large crops, the CWB is more likely to accumulate stocks than when competing exporters have small crops. The CWB must also be prepared to counter attempts by other exporters to displace Canadian sales to the CWB's regular customers.

The historical record suggests that the level of production in other exporting countries has had significant effects on Canadian exports. In 1984/85, for example, production in the EEC increased by 30 percent compared to the previous three years. Half of the 17 mmt increase was carried over to the next year in storage, but EEC exports increased by 5 mmt. Higher EEC exports should have resulted in substantial price-cutting, but this was ameliorated by an Australian drought during the same year. A projected small crop in Argentina in 1985/86 made it possible for Canada as well as Australia and the EEC to expand exports with only limited price-cutting.

Policy decisions in other countries also affect Canada's ability to expand its wheat exports. In 1980, for example, with the partial embargo of wheat sales to the USSR, the United States relinquished a major portion of the Soviet market. Other exporters were able to increase their market share without provoking U.S. retaliation. In May, 1981 the CWB signed a long-term agreement with the USSR which called for an average of 5 mmt of wheat exports per year for five years, compared to average trade of 1.6 mmt/year during the five years before the embargo. EEC wheat exports to the USSR increased from less than 1 mmt in 1980/81 to 6 mmt in 1984/85 (USDA, 1985).

In addition, the demand for Canadian wheat is influenced by the grades of wheat produced by other exporters. Argentina competes most directly with U.S. hard red winter wheat, and Australia competes with U.S. and Canadian white wheats. Canada competes directly with the United States for sales of both hard red spring and durum wheat, Canada's two most important classes (CGC, 1985). Thus, the most important factors influencing the

export demand facing Canada are the size of the U.S. crop and where U.S. prices are in relation to the loan rate. Events in other exporting countries will affect the nature of demand as described above, especially if the CWB wishes to dispose of large quantities of medium- or feed-quality wheat.

3.4. Canada's Elasticity of Excess Demand

The analysis in section 2 of this report suggested that the feasibility of alternative CWB export strategies depends upon the elasticity of excess demand facing Canada. This elasticity, and how it varies with sales volume and price, determines the feasibility of storing wheat in years when availability is high relative to demand. In the medium term, the ability of Canada to increase its exports without losing revenue depends upon the elasticity of the excess demand curve.

According to the model of kinked demand presented above, the excess demand for Canadian wheat is more elastic above the kink than below the kink. This still leaves open the possibility that demand is elastic (or inelastic) both above and below the kink. In the case of elastic demand below the kink, the CWB could theoretically increase revenue by selling along the DD curve. But the substantial price-cut caused by U.S. retaliation would make it difficult for Canada to maintain its production and export levels, much less expand them to increase revenue. So the CWB is likely to be reluctant to provoke U.S. retaliation.

If demand facing the CWB is inelastic above the kink, then the Board may be reluctant to export enough wheat to approach the point of U.S. retaliation, since increased volume causes decreased revenue. In this case, the kink would not be a decisive factor in CWB strategies. For this reason, it is important to determine whether the demand for Canadian wheat exports is elastic above the point of U.S. retaliation.

Employing an "indirect approach", the price elasticity of excess demand facing Canada can be calculated from elasticities of supply, demand and price transmission in importers and competing exporters (Horner; Tweeten). Despite its simplicity, the indirect estimation of the excess elasticity can be useful in deriving qualitative conclusions, particularly if sensitivity analysis is used to evaluate the impact of changing basic assumptions. Following Bredahl et al., the elasticity of excess demand facing a country j can be calculated as follows

$$(3.1) \qquad E_{ed,j} = [E_{pi}E_{di}(Q_{di}/Q_{xj}) - E_{pi}E_{si}(Q_{si}/Q_{xj})], \; i \neq j$$

where E_{pi} is the elasticity of price transmission from the world to the domestic market in the ith country, E_{di} and E_{si} are the domestic elasticities of demand and supply for the ith country, Q_{di} and Q_{si} are domestic levels of demand and supply for country i for a chosen base period, and Q_{xj} is exports of the jth country. Of interest here is the case where the jth country is Canada, and the i's are members of the set of all other countries or regions. Equation (3.1) describes the elasticity of excess demand for the period of time over which the various elasticities are defined.

When U.S. price is at or below the loan rate, U.S. stock adjustment replaces production response. This occurs because producer prices will be stable due to the loan program (and deficiency payments) and production is unaffected by lower prices. Variation in U.S. wheat exports will be reflected in inventory changes. Under these circumstances, Canada's elasticity of excess demand should be calculated using equation (3.1) for all countries except the United States. For the United States, the following equation should be used

$$(3.2) \qquad E_{ed,j} = E_{pi}E_{di}(Q_{di}/Q_{xj}) - E_{pi}E_{ki}(Q_{ki}/Q_{xj}); \; i=U.S.$$

where E_{ki} is the elasticity of stocks adjustment with respect to domestic price, and Q_{ki} is the level of domestic stocks in country i (the United States). To obtain a total E_{ed} for Canada, the elasticity derived from (3.2) is added to the sum for all other countries from (3.1).

A price decrease below the loan rate could theoretically cause all U.S. production to go into government storage, and $E_{k,us}$ would be practically infinite. Calculations involving this elasticity are performed assuming values of $E_{k,us}$=-2.0 and $E_{k,us}$=-5.0. The remaining country and regional elasticities (supply, demand, and price transmission) are based upon those in USDA, 1986. The supply, demand and transmission elasticity estimates are combined with average production, consumption, and U.S. stocks for the period 1982-1984, and used to calculate the elasticity of excess demand.[3]

When prices are below the U.S. loan rate but above the kink in the demand curve, Canada's elasticity of excess demand is estimated to be -8.0 if $E_{k,us}$=-2.0 and -13.5 if $E_{k,us}$=-5.0. This assumes some production and consumption response (equation 3.1) in all countries except the United States, where only stocks and consumption are assumed to respond (equation 3.2). Below the kink, the United States is assumed to match Canadian changes. If U.S. producer prices are also allowed to reflect world market conditions, then equation (3.1) can be used for the U.S. response as well. Under these assumptions, the excess demand elasticity facing Canada is estimated to be -4.9.

The calculation of excess demand elasticities depends upon many assumptions and rough estimates of country and regional elasticities, but it is reasonable to conclude that Canada faces elastic demand for its wheat exports when prices are at or just below the U.S. loan rate. When the United States retaliates by matching Canadian and other exporters' prices with subsidies or by lowering the loan rate, it appears that Canada still faces elastic demand, although demand is less elastic than above the kink. As noted above, the substantial price-cuts involved in U.S. retaliation make it unlikely that Canadian producers would expand production (and thereby exports) to try to increase revenue. Since Canada will be worse off after retaliation, the CWB might try to avoid provoking such action.

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[3] The elasticities and data are given in Sinner, along with a more complete description of the calculations themselves.

As noted above, one problem with this methodology is the assumption of perfect elasticity of substitution between suppliers and grades of wheat. These are unrealistic assumptions, at least for the short run. If an importer has developed a reliable relationship with a given exporter using a certain type of wheat, the importer is unlikely to switch to a different supplier for the sake of small and perhaps temporary price savings, especially if the second supplier is offering wheat of a different type or quality. Hence, Canada's short-run elasticity of excess demand may be substantially less than suggested by the above calculations.

It has been argued that the indirect estimation of the excess demand elasticity can reflect the elasticity of substitution by adjusting the price transmission elasticity downwards (Cronin). This is difficult given the lack of quantitative information on substitution elasticities. Bredahl et al., for example, define price transmission elasticities in such a way as to incorporate barriers to transmission such as tariffs or quotas but not those due to quality differences or customer loyalty.

If excess demand is inelastic in the short term, Canada would lose revenue if it lowered its price in an attempt to attract additional customers. In the medium term, however, price differences can be expected to cause importers to shift their sources of supply. If importers can be reasonably certain that favorable terms will persist, they will probably make the effort to adapt their end-use processes to a different grade of wheat and to learn the logistics of dealing with a new supplier. It can, therefore, be concluded that Canada faces elastic excess demand in the medium term as the above estimates suggest.

3.5. Implications of the Model for Canadian Export Strategy

It has been argued that excess demand for Canadian wheat has been characterized by a kinked function with the kink somewhere below the U.S. loan rate. Above the kink, demand is elastic in the medium term but inelastic in the short term. If the Canadian Wheat Board sells wheat at prices below the kink, it is likely to provoke one of two types of retaliation by the United States. Minor price-cutting by the CWB will probably attract increased U.S. competition in the form of export subsidies, making excess demand for Canadian wheat more inelastic. When there is surplus production, substantial short-run price discounting by the CWB (relative to U.S. prices), or less substantial discounting over a series of years, increase the likelihood that the United States will retaliate by lowering the loan rate. While the elasticity of demand facing Canada above and below the new kink established after the loan rate reduction might be similar to that around the previous kink, the price level would clearly be lower.

If this is an accurate interpretation of the demand conditions facing Canada, it has important implications for the export marketing strategy of the CWB. In particular, the model explains the apparent inconsistencies between the CWB's stated objectives and its observed behavior. These include a reluctance to license high-yielding varieties and the use of storage as a buffer. In addition, the model suggests how the CWB might use price discounts to develop additional markets.

Licensing of New Varieties

The risk of U.S. retaliation might account for the reluctance of the CWB in approving new wheat cultivars which can yield up to 30 percent more than current Canadian varieties. Increased exports of this magnitude could only be achieved by displacing the supplies of another exporter, and with its loan program the U.S. has been a frequent loser due to price discounting by the EEC and Argentina. If Canada followed this strategy and displaced U.S. sales by offering 3M wheat that is similar to U.S. hard red winter wheat, it would increase the risk of U.S. retaliation.

The timing of the CWB's decision (in January 1985) to license a high-yielding variety makes it impossible to draw firm conclusions about the causes and effects of the decision. In announcing the change in policy, the Minister for the CWB said, "It has become clear that market conditions have changed over the years. We believe that HY320 will help us maintain and expand our market share" (Mayer). A press release by the CWB a year later said the new variety is intended for "more price conscious customers" (CWB, 1986b).

Since HY320 was opened for unrestricted production for the first time in 1986, it is unlikely that the change in CWB policy had much to do with the U.S. decision to lower its loan rate. Rather, the Canadian statements suggest that price-cutting by other exporters was affecting Canada as it was the United States. The circumstances which contributed to the Canadian decision were the same as those contributing to the U.S. decision. Nonetheless, the fact that Canadian authorities were reluctant to approve the new varieties until forced to do so by widespread price-cutting is consistent with the model of kinked demand and efforts to avoid U.S. retaliation.

Use of Buffer Stocks

The threat of U.S. retaliation would also be sufficient to explain the CWB's use of buffer stocks when Canada's average level of wheat exports is close to the kink in the demand curve. If sales of weather-induced surpluses of wheat would risk U.S. retaliation, the CWB would probably prefer to store the excess until a year of low production or strong demand. Occasional quota restrictions are simply the mechanism used to keep excess grain stored on farms to avoid congestion of the handling system.

Even if a random increase in exports would not increase the danger of U.S. retaliation, the CWB is likely to find the use of buffer stocks more acceptable than price reduction as a mechanism to deal with excess supplies because demand is inelastic in the short run. Variations in demand from Canada's customers would be expected to have a similar effect. Decreased demand would cause the CWB to increase stocks to avoid selling at unacceptable discounts. Conversely, increased demand could enable the CWB to export above-average supplies and avoid storage.

The tendency to use storage to buffer variable production and variable demand is reinforced by the CWB's desire to maintain its reputation as a reliable supplier (Oleson). Priority customers are primarily those with

whom Canada has long-term agreements, but also include Great Britain, the Netherlands, and Cuba. If available supplies are below expectations in a given year, the CWB risks undermining the loyalty of these customers if it cannot offer sufficient supplies, or if it raises its prices significantly above world levels. Canada's attractiveness as a supplier (i.e., its elastic demand in the medium term) depends in part on its reliability. It is presumed that demand is inelastic in the short-term precisely because many importers do not like to change suppliers and types of wheat. While maintaining precautionary stocks may not be the primary motive for CWB storage, it does increase the benefits of storage and weighs against the CWB's stated intention of maintaining pipeline stocks only.

Price Discounts for Market Development

Finally, if the CWB expects increasing production and exportable surplus over the medium term, it is desirable to develop regular markets for these supplies. While disposal of short-term surpluses to infrequent customers at a discount is unattractive, discounts can be justified if they attract new customers who might then become regular buyers at nondiscount prices. In 1986, a CWB sales representative said, "Our long-term market development objectives have an effect on our pricing decisions. We are sometimes prepared to discount small lots of certain types of grain if we feel we can get a foothold in a new market" (Man). If excess demand for Canadian wheat is elastic in the medium term, the CWB should be able to find new regular customers without too much difficulty. The kinked demand model suggests that in the past the easiest way to do so has been to offer discounts to U.S. customers since the U.S. could not match price reductions, as long as the CWB was careful not to provoke retaliation.

This analysis suggests that the recent behavior of the Canadian Wheat Board is fully consistent with its stated objectives. One qualification is that the Board seems to be protecting producer interests by trying to avoid disrupting the market (which would increase the likelihood of U.S. retaliation), even though CWB officials say decisions about how much and which type of wheat to produce are left entirely to farmers.

3.6. Further Evidence for the Model of Kinked Demand

It has been argued above that CWB behavior is consistent with its objectives and the model of kinked demand described earlier. This subsection attempts to show the model is consistent with other aspects of CWB behavior.

Regularity of Canadian Customers

It was noted earlier that importers of wheat are reluctant to switch suppliers unless substantial and/or consistent price advantages can be gained. Thus, one would expect the CWB to attempt to serve primarily regular customers in order to minimize the amount it must discount to sell to infrequent customers. Table 3.1 shows that over the five-year period 1980/81 - 1984/85, 91 percent of exports of Canada's top two grades of

wheat went to 15 countries who made purchases of these grades in each of the five years. The addition of 11 more countries which made purchases in three or four of the five years raises the percentage to about 97 percent for the top two grades. Similar patterns are evident for other grades. For example, 73 percent of exports of CWRS No.3 were taken by two countries which bought at least some No.3 each year. Between 1975/76 and 1979/80, 79.3 percent of exports of Canadian feed wheat went to three countries which made purchases of that grade in at least four of the five years. Table 3.2 shows that, while the percentage of exports shipped to regular customers varies, it is always high. For example, for Nos. 1 and 2 CWRS, this percentage ranged from 99.3 percent with the short crop of 1975/76 to 82.6 percent the next year.

Statements made by the CWB indicate that the Board gives high priority to regular customers. A sales representative reported that customers with whom Canada has signed long-term agreements have top priority in years when available supplies are low. Only when those commitments are filled does the Sales Office know how much it can offer to infrequent customers (CWB, 1986a). In urging farmers to deliver their grain early after the poor harvest of 1984, the CWB stated, "The odds are that this year's crop is a temporary break in a trend of increasing production, and that next year's crop will be a better one. Customers will be needed for those bigger crops, and one of the keys to making sure they will still be there is to show Canada is making every effort to keep exports going through 1984/85, and maximizing exports under the circumstances" (CWB, 1984b).

In late 1985, after harvest rains resulted in large quantities of lower-quality grain, the Board told farmers, "We have not had large amounts of 3 CW for a couple of years, and therefore do not have a steady group of customers for that grade.... We are actively pursuing additional markets, and quota levels for the balance of the year will reflect how successful we've been" (CWB, 1985b).

Over the past several years the CWB has increased its supply commitments under long-term agreements from about 3 mmt per year during the latter half of the 1970s to 12.7 mmt in 1984/85. This supports the view that the Wheat Board's marketing strategy focuses on a set of regular customers. In order to ensure the availability of supplies to these customers, the CWB must keep some stocks on hand to guard against a poor crop. The Board, therefore, forces farmers to store excess supplies when there is a bumper crop and allows deliveries from stocks when the crop is below expectations.

Buffer Stocks for Individual Grades of Wheat

On the basis of the model, it is to be expected that the patterns that characterize overall CWB export behavior will be reflected in the exports of individual grades of wheat. The previous subsection showed that the CWB's tendency to serve primarily regular customers holds for CWRS Nos. 1 and 2 as well as for all wheat. In this subsection, it will be argued that the use of buffer stocks also applies to individual grades.

To verify this proposition is difficult because neither stocks nor domestic use is reported by individual grades. Nevertheless, the use of

Table 3.1 Percentage of Canadian wheat exports accounted for by consistent customers, selected grades, 1980/81-1984/85.

Grade	Number of countries	Number of years making purchases	Average annual purchases (mmt)	Percent of exports of grade
CWRS 1 & 2	15	5 of 5	10.34	91.1
	6	4 of 5	0.20	1.7
	5	3 of 5	0.46	4.0
All grades except durum	18	5 of 5	14.04	86.3
	6	4 of 5	1.16	7.1
	5	3 of 5	0.46	2.8

Source: Canadian Grain Commission (1981-1985).

Table 3.2 Volume and percentage of Canadian exports of selected grades accounted for by consistent customers.*

	CWRS Nos. 1 and 2		All grades**	
	mmt	%	mmt	%
1975/76	4.67	99.3	8.81	88.5
1976/77	6.97	82.6	8.84	80.3
1977/78	7.70	87.0	11.80	88.9
1978/79	5.98	93.9	10.41	95.1
1979/80	7.36	93.6	12.50	94.7
1980/81	7.78	94.9	12.16	90.1
1981/82	10.30	86.0	12.83	81.9
1982/83	11.51	93.0	15.92	87.1
1983/84	11.56	93.1	16.67	89.0
1984/85	10.41	89.3	12.64	82.9

*Consistent customers are defined as countries that made purchases of the given grades in each year of the five year period. Percentages are based on the total volume of exports of the indicated grade in a given year.
**Except durum.
Source: Mants et al.; Can. Grain Comm. (1976-1985).

buffer stocks by grade can be inferred by examining data on production, deliveries to the CWB, and exports of wheat by grade. These data for CWRS Nos. 1 and 2 and CWRS No. 3 are presented in Tables 3.3 and 3.4, respectively. Average exports are less than average production because of domestic use. It is evident from the coefficient of variation that exports are less variable than production, and for Nos. 1 and 2, also less variable than deliveries to the CWB. This can only be explained by use of buffer stocks, since domestic use of these grades varies little. This evidence supports the hypothesis that the CWB is forced to store wheat in excess of demand from regular customers in order to avoid selling at discount prices.

This explanation is also consistent with the way in which the Wheat Board has recently administered its delivery quota system. As noted earlier, quotas are generally not restrictive in that they have little effect on how much wheat acreage farmers plant, but quotas have restricted delivery of certain grades of wheat in certain years. This is apparently due to short-term inelasticities related to the reluctance of importers to change suppliers or types of wheat. Restrictive quotas are sometimes used to force farmers to store wheat not needed to supply regular customers. For instance, in 1976 farmers produced almost 18 mmt of CWRS Nos. 1 and 2, but the CWB accepted delivery of only 11.5 mmt. In the medium term, demand is more elastic and Canada can increase its sales by moderate price reductions or by offering attractive long-term contracts. Thus, the CWB took delivery of the excess from 1976 gradually over the next several years.

Emphasis by CWB Officials on Market Share

According to one Commissioner, one of the objectives of the CWB is to maintain its percentage share of the world market (CWB, 1986a). This objective seems aimed at assuring markets for Canadian supplies at acceptable prices rather than at maximizing market share for its own sake. While the model presented here assumes elastic demand for Canadian exports in the medium term, it does not mean the CWB can neglect its regular customers. As noted above, the difference between the short-term and the medium-term elasticity is precisely the assurance of a steady supply of a known grade of wheat. If the CWB neglects its reputation as a reliable supplier, it may find itself losing regular customers that are difficult to regain or replace.

An official of the CWB said the Board would probably react favorably to any proposal for a new International Wheat Agreement that would stabilize prices, but he doubted that agreement could be reached on price and market share provisions. The situation is complicated, he said, by the fact that Canada's transportation constraints in the latter 1970s resulted in decreased market shares that were not indicative of Canada's "traditional" share of the market. Canada is now trying to reestablish its claim to the share of the market it enjoyed before those constraints became binding (CWB, 1986a).

If the above analysis correctly describes Canadian export behavior, then one might ask why market shares have fluctuated so much in the past decade. In part, these fluctuations can be explained by variable production in both exporting and importing countries. Since exporters have

Table 3.3. Production, deliveries, and exports of CWRS Nos 1 and 2 wheat.*

Crop Year	Production	Deliveries	Exports
	---------- mmt ----------		
1973/74	11.90	NA	8.67
1974/75	5.00	4.22	5.69
1975/76	9.06	NA	4.70
1976/77	17.98	11.52	8.44
1977/78	7.52	6.11	8.86
1978/79	10.83	8.60	6.40
1979/80	9.45	10.74	7.97
1980/81	8.18	11.01	8.29
1981/82	17.23	14.23	11.99
1982/83	11.72	15.12	12.38
1983/84	17.68	15.03	12.42
1984/85	NA	13.29	11.66
Mean (mmt)	11.51	10.99	8.96
Std. dev. (mmt)	4.19	3.53	2.54
Coefficient of variation**	.36	.32	.28

NA = not available.
*Nos. 1 and 2 are combined because some of the data are available from the CWB in this form only.
**The coefficient of variation equals the standard deviation divided by the mean and is used to compare variances of samples with different means.
Source: CWB, 1973-1984a; Canadian Grain Comm., 1974-1985.

Table 3.4. Production, deliveries, and exports of CWRS No. 3 wheat.

Crop Year	Production	Deliveries	Exports
	---------- mmt ----------		
1973/74	2.03	NA	0.77
1974/75	3.45	2.93	1.89
1975/76	3.90	NA	2.71
1976/77	0.99	0.58	1.30
1977/78	6.47	1.58	2.83
1978/79	4.72	2.06	3.17
1979/80	3.34	2.91	3.33
1980/81	6.87	5.15	3.88
1981/82	3.11	1.52	2.28
1982/83	6.43	3.33	3.32
1983/84	4.59	3.70	3.81
1984/85	NA	1.51	1.94
Mean (mmt)	4.17	2.53	2.60
Std. dev. (mmt)	1.79	1.27	0.94
Coefficient of variation	.43	.50	.36

NA = not available.
Source: CWB, 1973-1984a; Canadian Grain Comm., 1974-1985.

different trading partners, a large or small crop in China or Egypt will affect exporters differently and market shares will change.

3.7. Changes in CWB Strategy Since 1980/81

During the late 1970s, Canada was forced to accumulate stocks because of binding transportation and handling constraints. During this period, the CWB continued to increase exports along a medium-term trend rather than according to availability in a given year. Since then the Board has had more flexibility and has taken advantage of it. In the period 1980/81 - 1984/85, annual production (less Canadian domestic use) became a significant factor in determining exports, though stocks continued to be used as a partial buffer. In other words, the Board partially adjusted annual exports in response to short-term changes in annual availabilities. Because infrequent customers account for 5-10 percent of exports, the CWB can afford a slight shortfall in availability without jeopardizing its relationships with loyal clients. Savings in storage costs make it worthwhile to sell some extra grain even if demand is slightly inelastic in the short run. Accordingly, the ratio of Canadian stocks to production has declined significantly since 1978/79.

The recent change in the extent to which the CWB has used stocks to buffer fluctuations in production may help to explain the fact that officials at the Board disclaim any strategy that involves the storage of grain. A sales representative noted that in years of surplus, especially of Nos. 1 & 2 CWRS, the CWB may have to look at lower-priced markets. The Board might carry over surplus if it could sell it the following year, but with the world wheat economy in surplus, an official stated, "It's better to sell most production in the current year" (CWB, 1986a).

Thus, even during 1975/76 - 1979/80 when 24 consistent customers accounted for 87.3 percent of all Canadian sales, another 31 countries purchased Canadian wheat in only one or two of those five years. The percentage accounted for by regular customers declines somewhat in years of high production. However, the tendency to export all available supplies is limited by short-term inelasticities and a need to maintain sufficient stocks to guarantee supply to regular customers.

4.0. AN EMPIRICAL ANALYSIS OF CANADIAN WHEAT EXPORT STRATEGY

The central concern of this study is the potential responsiveness of Canadian wheat exports to changes in world prices. This is a function of the export strategy of the Canadian Wheat Board, the relationship between world prices and Canadian producer prices, and the extent to which Canadian producers respond to changes in prices. These three aspects are analyzed empirically in this section of the study.

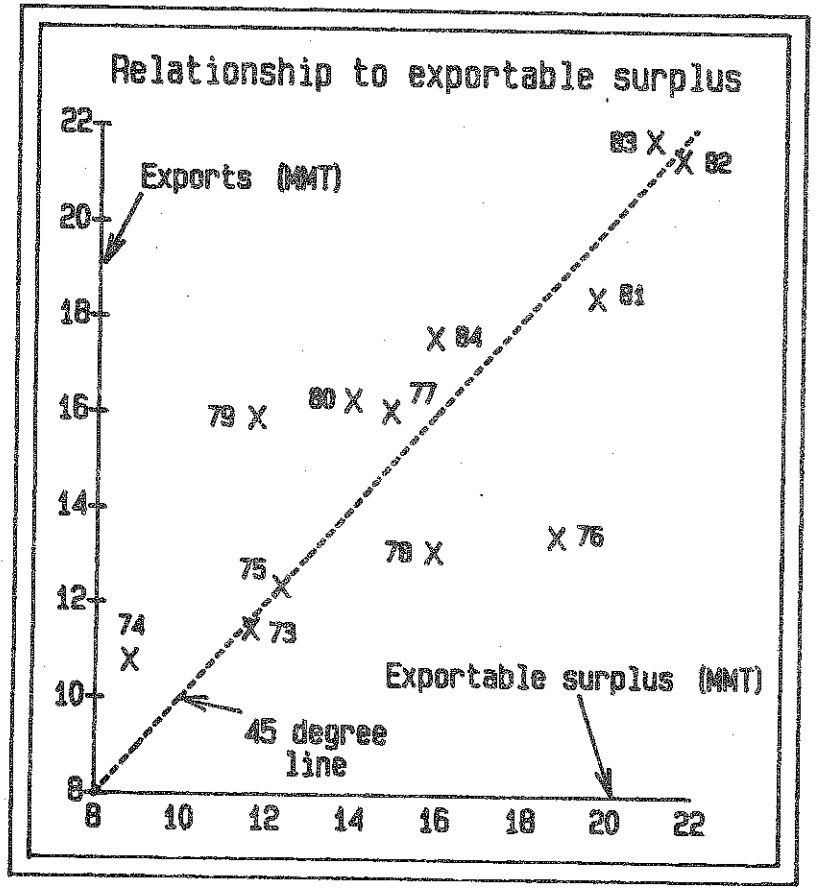
4.1. Estimation Results for Exports

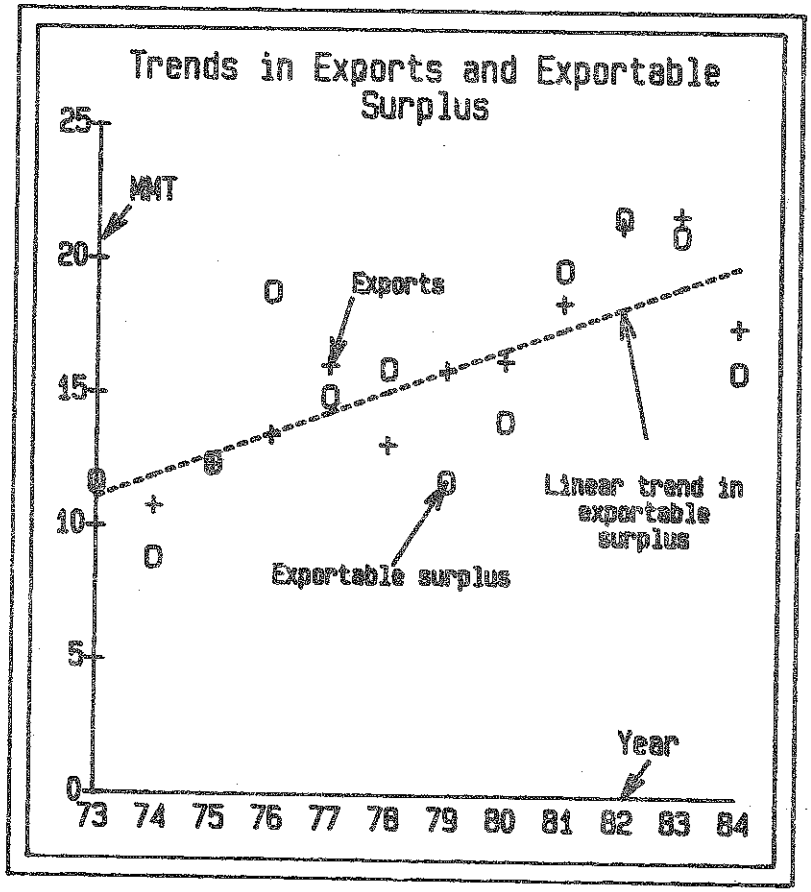
If the Canadian Wheat Board were essentially playing a passive role in determining Canadian wheat exports, i.e., the Board acted simply as a market intermediary, then exports would be determined by the difference between production and domestic consumption, and stocks would not be used actively as a buffer. To examine this hypothesis, exports were plotted against exportable surplus, both in thousands of metric tons, for the period 1973/74 - 1984/85 (figure 4.1). If exports were simply determined by availability, all observations would lie along the 45-degree line. Observations below the 45-degree line represent stock accumulation (XSUR > EXPW) while those above indicate stock depletion. Figure 4.1 also plots exports and exportable surplus through time. In this diagram, stock accumulation occurs in years when availability (XSUR) is greater than exports (EXPW), whereas the reverse indicates stock depletion. It is this pattern of accumulation and depletion which the naive model does not capture. These diagrams illustrate that a simple relationship between actual exports and exportable surplus does not exist.

In the model of excess demand for Canadian wheat in section 3, it was hypothesized that in the short run the Canadian Wheat Board determines exports primarily on the basis of the availability of markets. The CWB develops these markets based on its medium-term expectations of exportable surplus. High availability or weak demand causes stock accumulation, while low availability and/or strong demand causes stock depletion. Thus, the stock depletion in 1974 is explained by low production and the strength of the market. The stock accumulations of 1976 and 1978, and the associated depletions of 1977, 1979, and 1980, were the result of transportation and handling difficulties that limited exports and forced the CWB to restrict deliveries. Examination of the data indicates that the accumulations of 1976 and 1978 were also associated with weak demand from Canada's regular customers. The modest quantities added to stocks in 1981 made it possible for exports to exceed the quantity available from current production in 1984. The lack of significant accumulation in 1982 and 1983, despite high availability, is more difficult to explain since this was a period of weakening prices and declining world imports of wheat.

Figure 4.1 also suggests the existence of heteroskedasticity in that the deviations of exports from the trend line increase for the last three observations. It is possible that in this period of large U.S. wheat surpluses, the price support provided by the U.S. loan program and the related ability of other exporters to undersell the United States served to increase the short-term elasticity of demand for Canadian wheat. This would make it easier for the CWB to dispose of above-average supplies and

Figure 4.1 Behavior of Canadian Wheat Exports





Source: Based on data from CGC.

to avoid storage. Alternatively, even if short-term demand remained inelastic, the CWB might have decided against storing wheat in a period of generally weak demand and excess supply. This last explanation seems the most likely.

To estimate the export model, a variable is needed to represent CWB expectations. These expectations are assumed to be captured by the following trend in exportable surplus

(4.1) $$\underset{(t)}{XSUR} = \underset{(3.52)}{-1,556,751} + \underset{(3.55)}{794.6}\ YEAR$$

$R^2 = .53$ d.w.= 1.66 n = 13

CWB expectations, PXSUR, are taken as the trend values from (4.1). Thus, the equation is interpreted to imply that the Wheat Board expects exportable surplus to increase by about 800 thousand metric tons each year. The large negative intercept results from the use of actual years (e.g., 1973, 1974, etc.) in the regression, and the intercept is the meaningless extrapolation of the linear trend back to year zero.

The low proportion of total variation explained by this equation implies that expectations formed on the basis of linear trend predict actual availability quite poorly. It is likely that, due to random variation in production, the CWB experiences difficulty in anticipating the size of exportable surplus. Thus, the model may reflect CWB expectations closely while lacking the ability to explain the actual variation in the quantity available for export.

This is not to suggest that a linear trend fully represents how the CWB forms its expectations. Equation (4.1) is the simplest of several formulations which could have been used. The Wheat Board is hypothesized to set medium-term export targets based on medium-term expectations of exportable surplus. In forming such expectations, the CWB presumably uses previous years as a guide but also has access to current information on factors likely to affect future production. The use of a trend line estimated from realized ex post production assumes that the CWB uses all the information available and correctly anticipates the trend. While this may seem a fairly restrictive assumption, the fact that a simple linear trend is used rather than a more complex functional form makes it more plausible. In fact, in 1976 the Wheat Board announced an export target for 1985 of 30 million tons of grain, a figure which is consistent with the linear trend estimated. The Board actually reached this target in 1983/84. Even if the Board may not actually form its expectations on the basis of a linear trend, such a trend serves to capture Board estimates reasonably well ex post.

Based on the theoretical model developed in section 3, export behavior is analyzed empirically as a function of CWB expectations of exportable surplus (PXSUR) and deviations of actual surplus from expectations (XSDV7679). The second variable is included because it is acknowledged that exports do vary with availability even if stocks are used as a buffer. A coefficient of one on XSDV7679 would indicate that each thousand metric ton change in availability results in a thousand metric ton change in exports, other things equal, and that stocks are not used as a buffer.

Conversely, a coefficient of zero would indicate that there is no response of exports to changes in availability, i.e., that exports are determined by trend and that the residual is absorbed completely by stocks.

The coefficient on PXSUR is expected to be one since this variable is simply the trend in exportable surplus and the expected net change in stocks is assumed to be zero. In other words, exports must keep pace with the trend in availability or else stocks will either accumulate or diminish persistently. The results obtained are as follows

$$
\begin{array}{lll}
(4.2) & EXPW = -464 + 1.05\ PXSUR + 0.64\ XSDV7679 & \\
 & \quad (t) \quad (0.25) \quad (9.18) \qquad (4.12) & \\
 & R^2 = .93 \quad d.w. = 2.70 \qquad n = 12 &
\end{array}
$$

PXSUR represents CWB expectations of exportable surplus derived from the predicted values from equation (4.1). The variable XSDV7679 is XSURDEV, deviations of actual exportable surplus from CWB expectations, multiplied by D7679, a 0-1 variable that reflects binding transportation and handling constraints. D7679 equals 0 for 1976/77 - 1979/80, 0.5 for 1980/81, and 1.0 otherwise. Even though the physical constraint was most limiting in 1978/79, the effect was also felt the next two years due to stocks that had previously been accumulated. Including XSDV7679 prevents the regression from using deviations to explain variation in exports during the years of the binding constraints and only partially in 1980/81. The explicit assumption is that the CWB was forced to use stocks as a buffer in this period and export only the amount it projected to be available. The structure of the model is assumed to be otherwise constant in that the coefficient for PXSUR applies to the entire period.

The estimation results provide empirical evidence to support the theoretical analysis of CWB export strategy given in section 3. The coefficient on PXSUR is close to 1.0 as expected and is highly significant, which confirms the hypothesis that export growth has been keeping pace with the average increase in availability of 800 thousand mt per year. The coefficient for XSDV7679 is significantly different from zero, and indicates that a change in availability of 1000 mt is associated with a 640 mt change in exports, all other things equal, when handling constraints are nonbinding. The remaining 360 mt would be absorbed by stocks.

Based on the model described in section 3, one would also have expected that changes in demand from regular customers would affect exports, at least when handling constraints were nonbinding, but this is not substantiated by the regression results. The hypothesis was tested using the variable QWDM, which is total imports (from all suppliers) of eleven countries which purchased Canadian wheat consistently throughout the period, accounting for 80 percent of all Canadian exports. Because this variable has a significant upward trend, the trend was removed and the variables QMDV (deviations from trend) and QMDV7679 (QMDV multiplied by D7679) were tested in the export equation. The results are shown in table 4.1 as models (b) and (c). The results from equation (4.2) are provided as model (a) for comparison. In neither of the alternative equations is the demand from regular customers statistically significant. It is possible that when these customers reduce their total imports, they maintain imports from Canada. This is particularly likely for the six of these countries

Table 4.1. Regression results with Canadian wheat exports as dependent variable, various models, 1973/74 - 1984/85.*

Model	Intercept	PXSUR	XSDV7679	B3 X3	d.w.
(a)	-464 (0.25)	1.05 (9.18)	0.64 (4.12)		2.70
(b)	125 (0.07)	1.01 (8.23)	0.78 (3.55)	-0.1 QMDV7679 (0.88)	2.85
(c)	-532 (0.28)	1.05 (8.71)	0.61 (3.27)	0.03 QMDV (0.36)	2.53
(d)	-955 (0.45)	1.07 (8.50)	0.64 (3.93)	95.66 PWXI7679 (0.50)	2.84
(e)	-946 (0.45)	1.07 (8.53)	0.64 (3.93)	93.38 PWROTI7679 (0.50)	2.85
(f)	-1068 (0.28)	1.09 (4.30)	0.58 (1.73)	15.87 PDIFF7679 (0.01)	2.48
(g)	-912 (0.44)	1.07 (8.63)	0.64 (3.92)	136.2 PWIPI7679 (0.52)	2.85
(h)	-188 (0.10)	1.02 (7.46)	0.64 (3.88)	36.2 INT7679 (0.51)	2.88
(i)	-561 (0.31)	1.03 (8.73)	0.65 (4.04)	0.06 LSTKS7679 (0.81)	2.91

*t-ratios are given in parentheses.

which have long-term agreements with Canada and which account for about 60 percent of all Canadian wheat exports.

A related question is whether Canadian exports are price responsive in the short term, that is, whether the CWB draws down stocks to increase exports when prices are strong. This question is different from that relating to meeting the demand from regular customers because their demand will not necessarily be correlated with world prices. Events in other countries may dominate world prices which should affect the CWB's ability to sell grain to infrequent customers without disrupting the market. Based on the theoretical model, one would expect such exports to be positively related to prices.

This hypothesis was tested using three different price variables. These variables are the average annual CWB export quotations for No. 1 CWRS (PWXI7679); the Rotterdam price of U.S. No. 2 Dark Northern Spring (PWROTI7679) ; and the average March price of December wheat futures on the Chicago Board of Trade, less March cash price in the same market (PDIFF7679). All three variables are in Canadian dollars, deflated by producer prices, and multiplied by the dummy variable D7679. As Table 4.1 indicates (models d, e, and f), none of the estimated coefficients for these variables is significantly different from zero.

The lack of evidence in the present study for price response of Canadian wheat exports is somewhat surprising. It suggests that, while the CWB accumulated some stocks in years of high production, it did not do so consistently when prices were weak. This could suggest that the CWB pays more attention to market share considerations than anticipated by the theoretical analysis in section 3, since a lack of price response implies less variable exports, other things constant.

The model developed in section 3 focused on the issues discussed in the foregoing paragraphs, but the model does not preclude the possibility that other factors affect CWB export behavior. For example, exports might be negatively related to the CWB's initial payments since higher payments (which serve as guaranteed minimum prices) could reduce the CWB's flexibility to reduce prices in order to increase exports. Alternatively, exports may be negatively related to the Wheat Board's cost of capital, since the CWB may be less willing to hold stocks when interest rates are high. Yet another hypothesis is that exports are affected positively by the level of carry-in stocks, based on the assumption that large carry-in would make the CWB reluctant to store additional grain.

Testing these hypotheses should reduce the likelihood of bias due to omitted variables. The results are shown in Table 4.1 (models g, h, and i). CWB initial payments, deflated by producer prices, were found to be statistically insignificant as an explanatory variable, as were interest rates and carry-in stocks. These results support the conclusions reached above that exports are mainly a function of the expected exportable surplus and respond only partially to short-term variations around expected levels.

4.2. Acreage Response

The second major aspect of Canadian wheat response to be analyzed in this study is the supply (acreage) equation. One of the most important issues in the specification of this equation is the choice of the price to which producers respond.

Spriggs concluded that, even though returns to wheat consist largely of payments from the Canadian Wheat Board, offboard prices more closely reflect the "supply-inducing price" and are a more appropriate explanatory variable in the supply equation than CWB payments. He argues that the offboard price reflects the expected value of returns from the CWB except when the CWB restricts deliveries to elevators. In this case, the diversion of additional supplies to the offboard market will depress prices in that market below expected returns from sales to the CWB. As a result, the offboard price is even more appropriate as the supply-inducing price because the CWB price becomes irrelevant in marginal production decisions.

Glenn and Lattimore use the farm price of wheat (apparently equivalent to the offboard price), but go one step further by adjusting this price by average storage costs of on-farm stocks (per ton of marketed wheat). This adjustment incorporates the possibility that farmers may not be able to deliver to the CWB all that is produced in a given year.

Several other studies have used combinations of CWB payments (initial, final, and total) as explanatory variables in acreage response models (Meilke; MacLaren; Lowe and Petrie; and Koo). These specifications are interesting because it would be useful to know how wheat area responds to announced government prices, but there are complications. Final payments are announced sometimes 2 years after the initial payment, i.e., well after planting decisions are made for the next crop. To use only the initial payment assumes that producers have no information as to whether future final payments will be above or below the historical average, while to include those future final payments is to assume perfect expectations. If the most recent previous final payment is included, this assumes naive expectations.

None of these assumptions is very realistic. Furthermore, since not all wheat is deliverable to the CWB, Board payments can become irrelevant for marginal supplies. Consequently, the offboard price is chosen as the supply-inducing price in this study. While offboard price is probably the best indication of marginal returns in the previous year, carry-in stocks represent information on the likelihood that prices in the current year will be depressed by restrictive quotas. For this reason, lagged ending stocks are also included as a separate variable in the model.

In estimating the acreage response equation, Spriggs' model was taken as a starting point. Spriggs explained acreage in terms of average returns to wheat, barley and rapeseed, calculated as price weighted by a three-year moving average of yields; a zero-one variable to reflect the impact of the LIFT program in 1970/71; and a further qualitative variable to reflect structural change from monocropping in the 1960s to diversified farming in the 1970s. In the present model, the weighting of prices by average yields is dropped, crop prices are deflated by an input price index, and lagged

stocks are added. Each of these changes is discussed below. Two alternative equations are estimated: the first assumes that producers base their decisions primarily on prices lagged one period (model 1); the second assumes a lag in adjustment in the form of a partial adjustment model (model 2). The partial adjustment framework has been used by Meilke, Glenn and Lattimore, and Koo. The estimated equations are

(4.3) $$AW = \underset{(t)}{-443{,}882} + \underset{(8.12)}{25.6\ PWFI\text{-}1} - \underset{(3.63)}{30.6\ PBFI\text{-}1} - \underset{(3.74)}{3.61\ PRAPEI\text{-}1} - \underset{(3.56)}{0.18\ OFSW\text{-}1} - \underset{(6.62)}{2236\ LIFT} + \underset{(6.46)}{3670\ STRUCT} + \underset{(10.31)}{231\ YEAR} + \underset{(8.49)}{}$$

$R^2(adj) = .98$ d.w. = 3.14 n=20 (1964/65-1983/84)

(4.4) $$AW = \underset{(t)}{10{,}702} + \underset{(9.08)}{32.5\ PWF\text{-}1} - \underset{(2.63)}{41.5\ PBF\text{-}1} - \underset{(2.96)}{4.35\ PRAPEI\text{-}1} - \underset{(2.43)}{3559\ LIFT} + \underset{(5.78)}{409\ STRUCT} - \underset{(1.44)}{0.23\ OFSW\text{-}1} + \underset{(5.13)}{0.32\ AW\text{-}1} + \underset{(3.83)}{}$$

$R^2adj = .95$ n=20 (1964/65 - 1983/84)

where:
- AW = Canadian area planted to wheat in thousands if hectares;
- PWFI-1 = offboard price of wheat, previous year, deflated by producer price index, $C/mt;
- PBFI-1 = offboard price of barley, previous year, deflated, $C/mt;
- PRAPEI-1 = price of rapeseed, Winnipeg exchange, previous year, $C/mt;
- OFSW-1 = ending on-farm stocks of wheat, previous year, mmt;
- LIFT = 0/1 variable for the acreage reduction program equal to 1 in 1970/71 and 0 otherwise;
- STRUCT = 0-1 variable for structural change from monocropping of 1960s to diversified farming of the 1970s, equal to 1 for 1963/64 to 1968/69, 0.5 in 1969/70, and 0 thereafter; and
- YEAR = trend variable in years (e.g., 1978).

The variables AW, LIFT, and STRUCT are as used by Spriggs. The estimated coefficients for the prices of wheat, barley, and rapeseed (deflated and lagged) all have the expected signs, as does OFSW. All other variables have large t-ratios as well as expected signs. The LIFT variable reflects the impact of this program upon planted acreage. While this effect was short-lived, there was also longer-term change resulting from the change from monocropping to diversified farming. This is captured by the STRUCT variable. One of the objectives of the LIFT program was to encourage diversification away from wheat and, as C. Wilson notes, barley production has increased substantially since. In fact, the diversification appears to have begun the year before, in 1969/70, and included other crops as well, especially rapeseed. Both the acreage data and the precision of the estimated coefficient are suggestive of its impact.

The LIFT program is estimated to have caused a reduction of over 2 million hectares in wheat area, again similar to Spriggs' estimate. To the extent that the LIFT program hastened the process of crop diversification as captured in the variable STRUCT, it may be inferred that the program was associated with an additional reduction of 3.7 million hectares, since this

is the first year that diversification is assumed to have taken full effect.

Already discussed above is the question of the form the price variables should take. While Spriggs' use of returns (price times a moving average of yield) is appealing because it accounts for differential changes in productivity over time, estimation revealed that deflated prices perform better than deflated returns. Furthermore, inspection of the data indicates that no major shifts in relative crop yields have taken place in the last twenty years. Using returns instead of prices seems an unnecessary and unproductive complication.

A related issue is how to account for the income insurance effects of the Western Grain Stabilization Program (WGSP) on supply. It is inappropriate to add an estimate of a deficiency payment to crop prices, because the WGSP makes payments based on shortfalls in farmers' total revenue. While farmers may be able to attribute approximate portions of their payments to low prices for certain crops, this is difficult to model. A variable (WGSPAY) was defined as the total payout by the WGSP on an annual basis. (Started in 1976, the program made only two payouts, in 1977 and 1978, during the period of this study.) This variable, deflated and lagged to be consistent with the other "price" variables, was tested as an explanatory variable in the equations.

If the effect of the payments were straightforward, one would expect a positive coefficient, i.e., higher payouts should temper the acreage reduction effects of lower prices. The estimated coefficient, however, was negative and of low precision. Apparently, the fact that payouts are correlated with low prices (and low acreage) overwhelms any possible positive contribution. Or perhaps two nonzero data points are insufficient to establish the expected relationship. As the program continues, it is possible that a longer data series could be shown to have an effect, but for the time being the variable must be excluded.

A related issue is the possible effect of the changing structure of Canadian rail rates on wheat acreage. In a recent pamphlet, Transport Canada (no date) projected that rail rates for wheat shipment will increase from $4.89/mt in 1982/83 to $24.69/mt by 1991/92 as a result of the Western Grain Transportation Act, which went into effect on January 1, 1984. Under the act, rapeseed meal and oil and various other commodities became eligible for the current subsidized rates for the first time and, henceforth, cost increases will affect equally the prices of these commodities and grain prices. If the benefits of these transport subsidies for rapeseed were passed along to producers, one would expect this to change relative returns from wheat and rapeseed and to have reduced wheat acreage in 1984.

In fact, the area planted to wheat did decline substantially that year, for only the second time in a decade, while the area planted to rapeseed increased. But because rapeseed products and other "specialty crops" which provide cropping alternatives to wheat producers have now been included in the statutory rate structure, increasing rail rates over the next decade can be expected to have little effect on relative returns. As a result of higher transport costs for wheat, there may be more cattle feeding in western Canada (Normile, 1984). Grain prices will be lower and

farmers may grow more barley and less wheat for feed purposes. Lower grain prices can also be expected to force some marginal areas out of production if these can no longer cover variable costs. However, it is unlikely that the modest reduction in price due to changes in transport costs will be a major factor influencing wheat acreage.

Estimated price elasticities from the two equations and from other studies are presented in table 4.2. Because yield is exogenous, supply elasticities can be assumed to be identical to acreage elasticities in the medium term. When used to project changes in supply, however, these estimates will be less reliable than for acreage because of random variation in yields. The estimated elasticities for the price variables derived from model 1 are close to those of Spriggs, despite the fact that Spriggs used undeflated returns. This model implies that wheat area is increasing by 230 thousand hectares every year, other factors held constant. The trend effect is large relative to the price effect.

The elasticity estimates derived from model 2 are all substantially higher than those in model 1, at least in the long run. As may be observed, there are no compelling statistical criteria which might be used to choose between equations (4.3) and (4.4); however, the decision to include or exclude a trend or a lagged response clearly produces different results. If the model assumes a lagged response as in equation (4.4), the implied long-run elasticities are nearly twice as large as the elasticities in equation (4.3). However, the difference in the <u>combined</u> own and cross-effects of equal price changes for wheat and barley is negligible between the models. The prices of wheat and barley have historically been highly correlated (r=.98 for the current sample period). With respect to a major concern of this study, the effect of lower U.S. and world prices on Canadian exports, this is a significant conclusion. The 1985 U.S. Food Security Act lowered loan rates for both wheat and feed grains, and movements in the two prices can be expected to be highly correlated at least in the medium term. Consequently, the choice between the two models is not as critical as it may at first appear.

4.3. <u>Wheat Price Transmission</u>

The final aspect of the Canadian response to be analyzed is the relationship between world and domestic prices. If Canadian wheat farmers use the offboard price for planning purposes, then it is necessary to know to what extent changes in U.S. prices affect the offboard price in order to assess the likely impact of lower U.S. prices.

Spriggs estimated a price transmission equation for Canada between the offboard price of wheat and the Canadian Wheat Board's export ("asking") prices. The present study diverges from that of Spriggs in two important respects. The first is in the choice of the variable to represent world price. CWB export price quotations are unsatisfactory because these quotes are only asking prices. Since the mid-1970s, the CWB has sold large quantities of wheat at prices below its official quotations in order to meet the prices of other suppliers (Oleson). Furthermore, using the CWB quotations does not shed much light on the transmission of price from the world to the Canadian domestic market. Since the focus of this study is

Table 4.2. Estimated acreage elasticities from this and other studies

	Prices			On-farm wheat stocks
	Wheat	Barley	Rapeseed	
This study				
Model 1 (means)	.42	-.41	-.15	-.09
(1983 prices)	.24	-.19	-.08	-.03
Model 2 (means)				
Short run	.53	-.54	-.18	-.12
Long run	.78	-.80	-.27	-.18
(1983 prices)				
Short run	.31	-.26	-.10	-.04
Long run	.46	-.39	-.15	-.06
Spriggs (means)	.43[a]	-.22[a]	-.13[a]	
Glenn & Lattimore				
Short run	.53[b]	-.26		
Long run	1.07[b]	-.53		

[a] Price variables not deflated by input prices.

[b] Average inventory costs subtracted from wheat price.

the effect of changes in U.S. export prices on Canadian exports, U.S. export prices are used.

A second difference in the current study is that the price transmission equation is estimated in log-log form instead of the linear form used by Spriggs. It would be appropriate to use the linear form (or some other form with nonconstant elasticities) if there were an indication of differential price transmission at different price levels. Such asymmetries would typically be caused by policy intervention. In the case of Canada, the Wheat Board's delivery quota system is a policy instrument that can affect price transmission. It is hypothesized that when delivery quotas are restrictive, Canadian offboard prices will be depressed. Otherwise, it is expected that the elasticity of price transmission would be constant, since CWB payments are determined by prices received in world markets and offboard prices should reflect the marginal value of deliveries to the CWB.

The restrictiveness of delivery quotas can be represented by the proxy variable used by both Meilke and Spriggs, defined as deliveries to the CWB divided by farm supply. This variable is only weakly correlated with U.S. export prices ($r=0.33$), so it is inappropriate to subsume its effect in a linear functional form in which elasticity varies with price but does not explicitly include the delivery quota effect. It is preferable to include the proxy as an explanatory variable in a log-log model which assumes that the elasticity of price transmission is otherwise constant. The results from estimating the log-log price transmission model are shown as equation (4.5) in table 4.3.

Because 21 years is a long period for which to assume that the structure of price transmission remained unchanged, the model was also estimated for two subperiods. The marketing year 1973/74 was taken as a likely point of change, because of the entry of the Soviet Union into the world wheat market. The results (table 4.3 equations (4.6) and (4.7)) do not support the hypothesis of structural change. The differences in the coefficients for the two subperiods are not statistically significant. Consequently, the results for the entire period (equation (4.5)) are used.

Equation (4.5) implies that a 1 percent change in the U.S. price (USPXGF) will be associated with a 0.95 percent change in the Canadian offboard price in the concurrent year. Hence, there is virtually complete price transmission with no lag. The one qualification is that when quotas are restrictive, transmission of world prices to the offboard market is incomplete. The proxy variable for restrictiveness of delivery quotas, DQR, is at a minimum for the sample period in 1981/82 at 1.14, i.e., farm supply was only slightly greater than deliveries to the Wheat Board. This can be taken as a standard for open quotas, since some wheat is sold on the offboard market and farmers prefer to carry over some wheat to the next year.

The implications of the coefficient for DQR are clearer if predicted values for PWF are recalculated using equation (4.5), based on the assumption of open quotas. For instance, from this equation the predicted offboard price for 1978/79, at the height of Canada's transportation difficulties, is $86/mt. However, if one assumes "open" quotas and substitutes DQR=1.14 for the actual value of DQR(1978)=2.39, the predicted value of PWF is $120/mt. For 1982/83 it is estimated that quotas depressed prices from

Table 4.3. Regression coefficients for price transmission equations (dependent variable is PWF)

Period	Explanatory variables			R^2 (adj)	Equation number
	CONSTANT	lnUSPXGF	lnDQR		
1963/64 - 1983/84	-0.042	0.954	-0.459	.98	(4.5)
	(t)	(0.25)	(29.17)	(6.63)	
	[s.e.]	[0.17]	[0.03]	[0.07]	
1963/64 - 1972/73	-0.366	1.043	-0.565	.88	(4.6)
	(t)	(0.32)	(3.97)	(5.58)	
	[s.e.]	[1.14]	[0.26]	[0.10]	
1973/74 - 1983/84	0.406	0.862	-0.364	.91	(4.7)
	(t)	(0.71)	(7.96)	(3.93)	
	[s.e.]	[0.58]	[0.11]	[0.09]	

$150/mt to $139/mt, and for 1983/84 from $155 to $151/mt. Again, these are maximum differences, since farmers may have voluntarily stored or sold more wheat on the offboard market in any given year, i.e., 1981/82 cannot be taken as an absolute standard. During the period 1981/82 to 1983/84, quotas were more open than in any other period in the previous two decades, which implies that world prices at that time were being transmitted to Canadian producers with little or no interference.

5.0. CONCLUSIONS AND IMPLICATIONS

A major focus of this study is the identification of those factors, including policy decisions of the Canadian government and Wheat Board, which influenced Canadian wheat exports in the 1970s and early 1980s. Analysis of these factors is vital in assessing how Canadian wheat exports are likely to respond to U.S. policy initiatives. Of particular interest is the question of how Canadian wheat production and exports are likely to respond to lower export prices for wheat from the United States.

The Canadian Wheat Board's primary objective apparently is to maximize returns for each year's crop while keeping stocks to a minimum. The CWB does not try to influence production but simply markets the grain produced. Domestic use is relatively stable and also largely free of policy intervention. Thus, over the medium term, a change in production is the most important single factor affecting exports.

Because neither the CWB nor the Canadian government has attempted to influence production levels, it follows that CWB decisions have had only a marginal impact on Canadian wheat exports. An exception to this generalization is the delay by the Canadian authorities in licensing varieties of medium-quality wheat. Furthermore, the CWB's delivery quota system has been used in the past to restrict deliveries and, therefore, production. It could also be used in this way in the future, particularly for the newly-licensed, medium-quality varieties.

Although production is the major force behind the rising trend of Canadian exports, year-to-year changes are not due solely to fluctuations in output. Annual exports are determined in part by the demand from Canada's regular customers and the Wheat Board's desire to avoid selling at depressed prices or provoking retaliatory price-cutting by the United States.

A central component of the model of export demand for Canadian wheat discussed in this study is the hypothesis that short-term demand is inelastic due to the reluctance of importers to switch suppliers or types of wheat. This implies that if the CWB tries to export more than its regular customers wish to buy, substantial price discounts would be necessary. In years when production is high and/or demand is weak, the CWB is compelled to store some of the excess wheat to avoid disrupting the market and provoking U.S. retaliation or to avoid selling at unacceptably low prices. Stored grain is subsequently sold in years of low production and/or strong demand.

These market conditions have led the CWB to rely on long-term agreements to provide regular buyers for Canadian wheat. Faced with increasing Canadian production, the CWB attempts to expand its sales to regular customers in line with the production trend. But regardless of the CWB's success in developing regular markets, it must on average sell the available quantity of exportable surplus in order to avoid accumulating stocks.

During the latter half of the 1970s, transportation and handling difficulties constrained the CWB to export no more than about 16 mmt of wheat each year. When exportable surplus exceeded this level, the CWB was forced

to store the excess. In addition, in 1976/77 and 1978/79, weak demand from Canada's regular customers prevented Canada from exporting up to the handling constraint, necessitating additional stock accumulation. By 1981/82, transportion constraints were no longer binding and all stocks accumulated in the latter half of the 1970s had been sold. Physical constraints no longer restrict sales and, consequently, exports in recent years have been linked more closely with availability. However, short-term inelasticities of demand may discourage the CWB from selling all its exportable surplus each year. As a result, the CWB may continue to use stocks as a partial buffer.

Canadian exports do not appear to be responsive to world prices in the short term. Exports appear to respond to prices only as a result of changes in production and export availability. One possible explanation is that, with persistent U.S. surpluses depressing world wheat prices, the CWB has become more reluctant to accumulate stocks when demand is weak. It is risky to hold stocks in the expectation of an improvement in world prices. As a result, the CWB seems to have been more willing in recent years to discount wheat in order to dispose of the current year's crop. Another possible explanation for the reluctance to hold stocks is the desire to maintain or increase market share.

In summary, the annual level of Canadian wheat exports is determined mainly by the amount the Wheat Board expects to have available and for which it has developed regular customers. In years when production is above average or demand is below average, the Board stores grain to avoid selling at depressed prices and disrupting the market. This grain is disposed of when market conditions are more favorable. In the latter half of the 1970s, the CWB followed this strategy quite closely, storing grain when production was high and/or demand was weak. In the early 1980s, exports were more closely related to annual availability.

Although Canadian exports demonstrate no significant responsiveness to price in the short run, estimation of the price transmission equation indicates that U.S. wheat export prices are quickly reflected in the Canadian offboard price of wheat. A 1 percent change in the U.S. export price is associated with an estimated 0.95 percent change in the offboard price in the current year, with no evidence of a lagged impact in subsequent years. The only obstacle to this essentially complete price transmission occurs when Wheat Board delivery quotas are restrictive. Quotas have been generally nonrestrictive since 1980. Because of this nearly complete price transmission, the major factor influencing exports in the medium term and beyond is the response of Canadian production to changes in U.S. and world prices.

Canadian wheat yield varies randomly with weather, but it is possible to identify several factors which influence planted acreage of wheat. These factors include Canadian offboard prices of wheat and alternative crops, ending on-farm stocks from the previous marketing year, trends in summer fallow and the presence or absence of an acreage reduction program. Econometric estimation of a model of Canadian wheat acreage suggests the impact of lower prices on wheat production will be limited. Depending on the model employed, the elasticity of planted wheat area with respect to offboard wheat price is estimated to be between 0.24 and 0.46, based on

changes around prices prevailing in 1983/84. The elasticity of wheat acreage with respect to an equal percentage change in both wheat and barley prices is negligible. Since historically these prices have been highly correlated, this result has important implications for the potential response of Canadian wheat acreage to simultaneous reductions in world wheat and feed-grain prices.

By lowering the loan rate for wheat under the 1985 Food Security Act, the U.S. government hoped that its supplies would become more competitive in the world market and that the United States could regain some of the customers it lost in the preceding years. The Canadian Wheat Board, however, can be expected to match U.S. export prices to retain its regular customers. To the extent that former U.S. customers have now developed commercial relationships with Canada, there is no immediate reason why they would switch back to the United States as long as Canada offers competitive prices. While the U.S. legislation was still under consideration, the CWB noted that the U.S. plan to lower export prices is "based on the premise that sales of U.S. farm products, and U.S. market share, will then be increased substantially. However, Canada and other competing countries will have no choice but to follow suit, leaving prices lower and market shares unchanged" (CWB, 1985a). Market share is probably not important to the CWB for its own sake. Rather, market share is important because it reflects purchase commitments from regular customers which enhance the CWB's ability to sell the Canadian crop without substantial price discounts.

The Wheat Board's capacity to retain its regular customers depends upon Canadian producers maintaining current levels of production. This seems quite likely since, as indicated previously, the response of Canadian wheat acreage to changes in price is limited, particularly as has been the case recently as the price of both food and feed grains are depressed. The empirical results presented above suggest that the effects of lower prices on Canadian exports are likely to be small, not because of policies of the Canadian government or the Wheat Board, but because farmers in Manitoba, Saskatchewan, and Alberta have few alternatives to growing wheat.

This study has described how the nature of the world wheat market, dominated by the U.S. loan program, affects Canadian export strategies and how the Canadian wheat sector has responded to the world market. While it has been possible to identify the policies and strategies which the Canadian Wheat Board has used in recent years, it is, of course, impossible to know whether these will continue or whether new elements will be added. Although the analysis has focused on only one of the other players in the international wheat market, it points to the critical importance of U.S. pricing policies. When world wheat supplies are abundant, as they have been in recent years, the level of the loan rate has a major effect upon the level of world wheat prices. Furthermore, it provides an important point of reference for the pricing and exporting strategies of U.S. competitors. In this type of environment, the United States is likely to face a continuing problem of how to provide a measure of price and income support to domestic wheat producers without compromising its competitive position in international markets.

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