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# **Competition in the International Wheat Market**

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## Highlights

In recent years, the United States' share of world grain exports has declined and as a result the competitiveness of the U.S. in international markets has come into question. Recent discussions on United States farm policy have also induced tremendous debate on this topic. The purpose of this study is to briefly describe the structural characteristics of the international wheat market in the 1980s.

Following a period of oligopolistic interdependence between some of the major exporters, the U.S. is posed currently as the price leader. All other exporting countries are price takers and produce and export along their export supply function. Recent competitive behavior of the major exporters is described which tends to support this market structure.

## Structural Characteristics of the International Wheat Market\*

William W. Wilson\*

World trade in wheat increased rapidly during the 1970s (especially during the latter 1970s) and began to stabilize in the 1980s after crossing the 100 million metric tonnes (MMT) level in 1981 (Figure 1).<sup>1</sup> Trade peaked in 1984/85 at 105.6 MMT, largely due to record purchases by the USSR, but world trade is estimated to decrease in 1985/86 by 5.7 percent to 99.6 MMT. U.S. exports reached their peak in 1981/82 at 47 MMT and have since decreased by 33 percent to 32.7 MMT in 1985/86 (estimate). The U.S. market share has also decreased from a recent peak in 1981 at 48 percent to an estimated 36 percent in 1985/86. The increase in the world wheat trade since 1981 was shared by each of the major competitors: Canada, Australia, Argentina, and France (Figure 2). During most of the 1970s the U.S. loan rate was significantly below world prices and did not play an important role in the price structure for world wheat. However, in the 1980s the U.S. loan rate began to escalate, world prices decreased, and the U.S. loan rate set a floor for U.S. prices and an effective ceiling for competition prices (Figure 3).<sup>2</sup> Recent proposals in the 1985 farm legislation call for fairly large reductions in the U.S. loan rate, an attempt to regain export markets.

The important trends are that world trade has increased since 1981/82, but U.S. exports have not; that growth in exports was generally shared by each of the competitors; and that the U.S. loan rate has increasingly become an important factor in the structure of international wheat prices. The purpose of this study is to briefly describe the structural characteristics of the international wheat market in the 1980s. The U.S. is posed as the price leader; U.S. loan rate and futures prices are the reference price for world trade. All other exporting countries are price takers and produce and export along their export supply function.

### Structural Characteristics

#### Traditional Concepts

The structure of international competition<sup>3</sup> among exporters has evolved since the 1950s. Initially, the market structure was described as a

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<sup>1</sup>Tables corresponding with each figure are shown in the Appendix.

<sup>2</sup>Figure 3 is a fairly gross comparison because transport and handling costs are not included and the qualities are marginally different.

<sup>3</sup>This paper is concerned primarily with the structural characteristics of exporter competition. Thus, market power by importers is not incorporated in the discussion or analysis.



Million  
Metric  
Tonnes

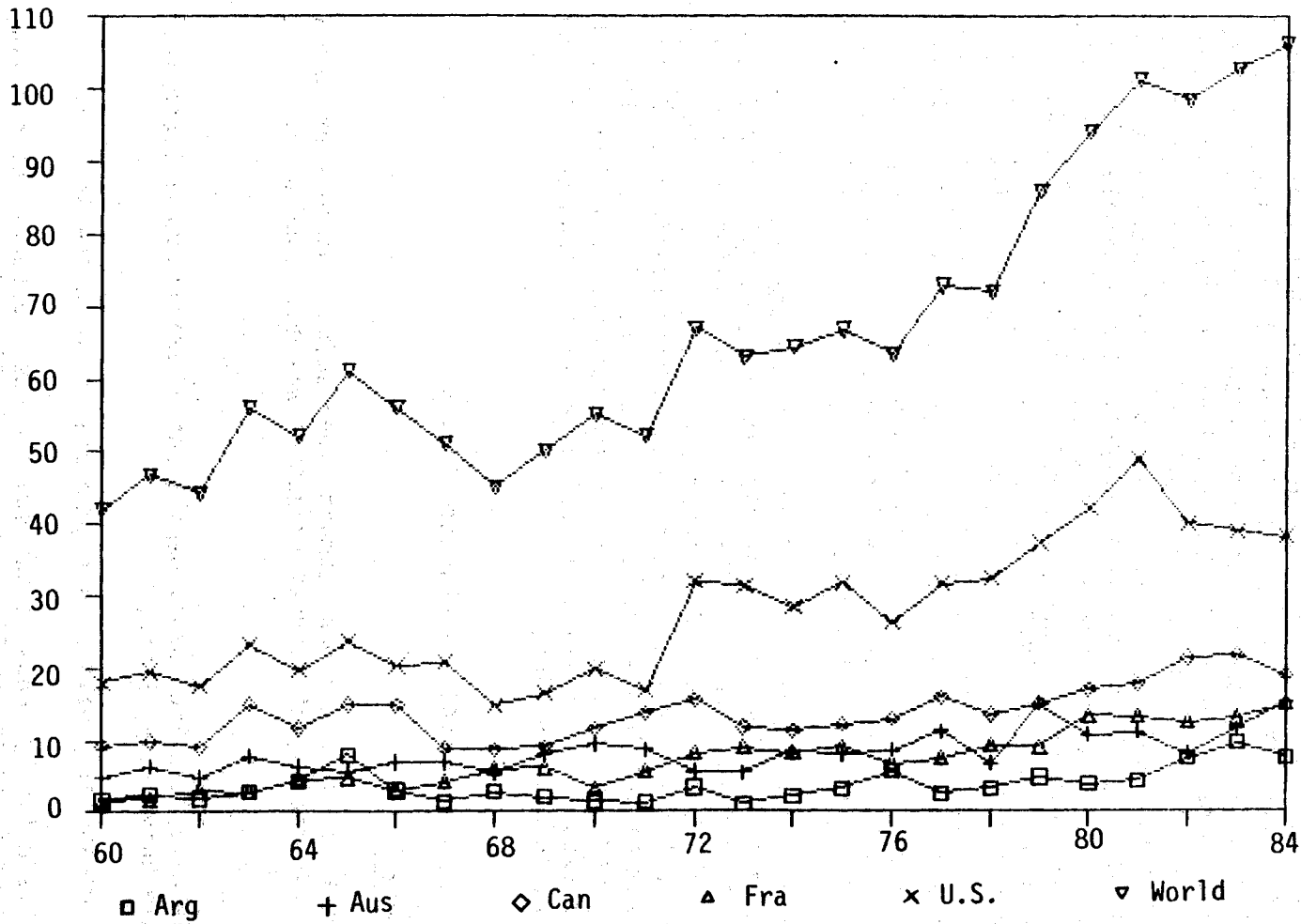


Figure 1. Wheat Exports by Major Exporters, 1960-1984.

Million  
Metric  
Tonnes

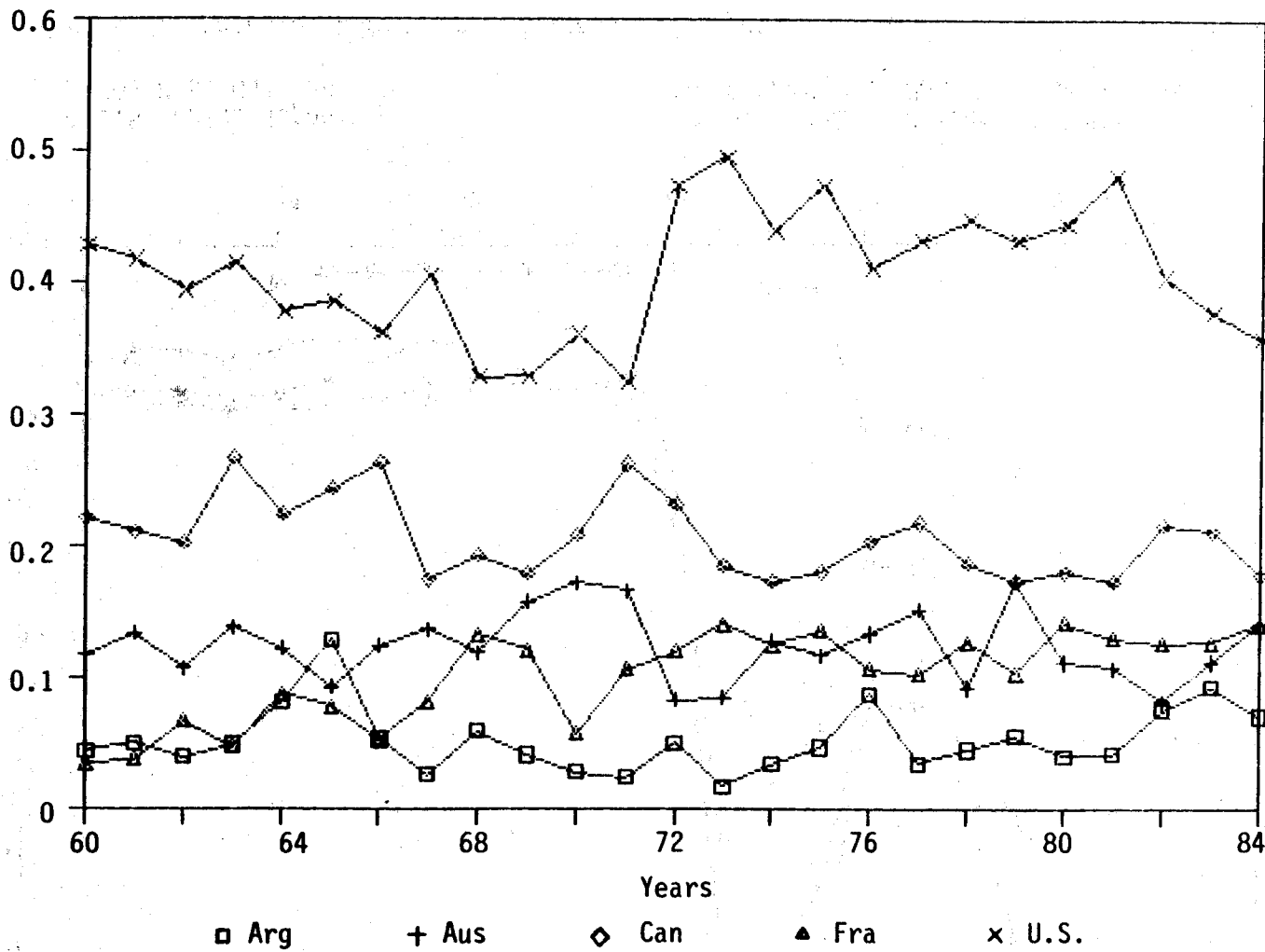


Figure 2. Market Share of Wheat Exports (of Major Exporters), 1960-1984.

Dollars Per  
Metric Tonnes

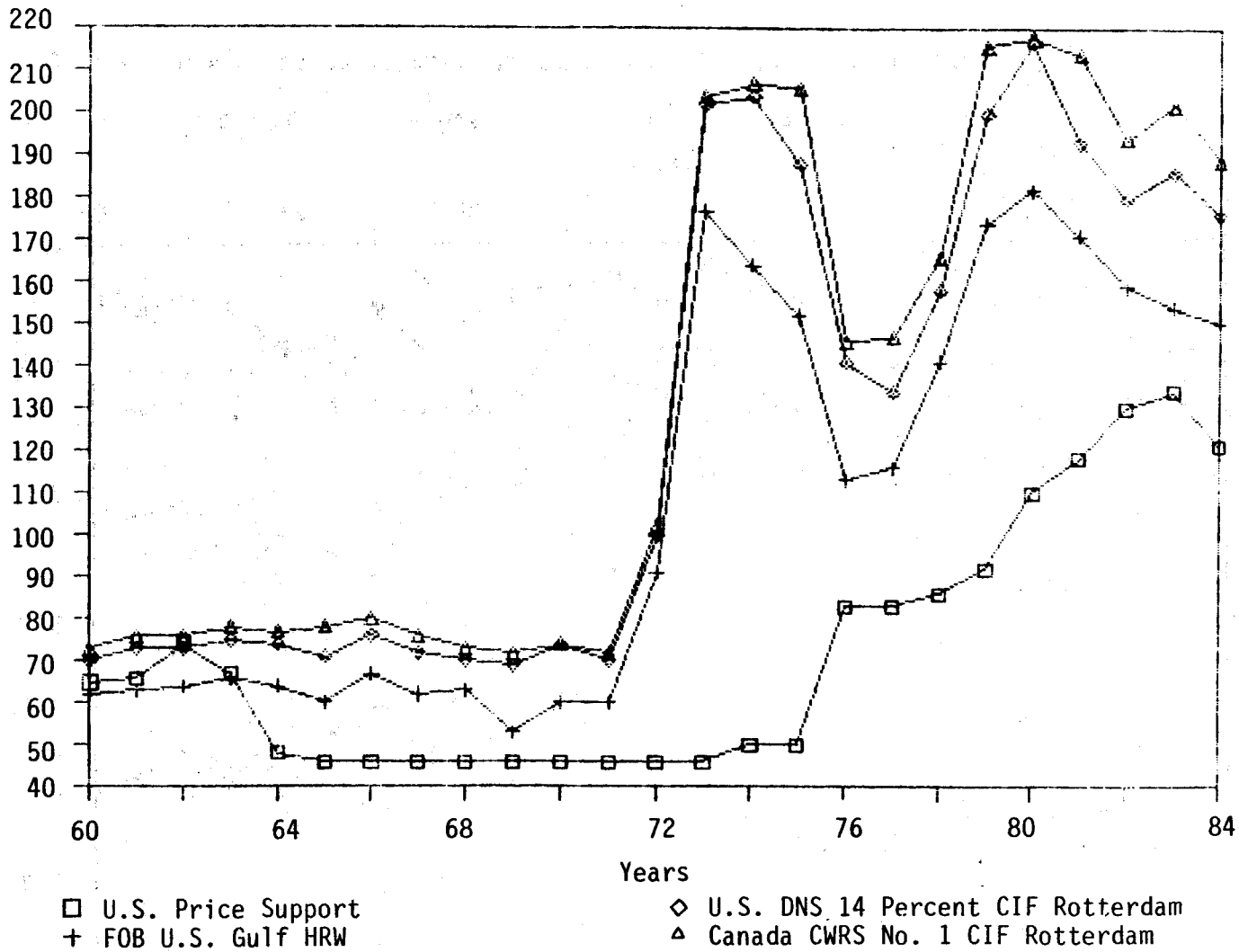


Figure 3. Selected World Wheat Prices, 1960-1984.

cooperative duopoly with Canada being the price leader (McCalla 1966). In the mid-1970s a triopoly was posed among Canada, U.S., and Australia (Alaouze, Watson, and Stugess 1978). More recently it appears that a price leadership market structure is more appropriate, with the U.S. being the price leader. Essential features of each of these are first discussed below, and then the price leadership model is developed fully.

In his seminal article, McCalla (1966) described the international wheat market during the 1950s and 60s as a cooperative duopoly with Canada as the price leader, the U.S. as a price follower, and a fringe of other competitors acting as price takers. Market power was defined as the willingness and ability to hold stocks. Both the U.S. and Canada had relatively large storage capabilities and did undertake extensive storage, thereby giving these countries market power. Both countries had an objective to maximize exports subject to the implied duopoly relationship. Canada set prices, and the U.S. adjusted prices within a zone of cooperation. The market structure yielded a deterministic solution for prices and exports. However, the duopolists' demand function was the residual from the aggregate demand and supply function of the fringe, and increases in the latter had a destabilizing influence.

This market structure was facilitated by a very active International Wheat Agreement (IWA) which established price ranges and values. In addition, the U.S. actively used export subsidies to establish export values relative to Canadian values, for hard red spring and for the other classes of U.S. wheat. Because the IWA reference price for wheat was for No. 1 Northern, Canada effectively set the daily price for high protein wheat and the U.S. established prices for other classes. The fringe acted as price takers when selling all their exportable supplies. Thus, Canada was viewed as the price leader.

Ten years later Alaouze, Watson, and Sturgess (1978) postulated the international wheat market as a triopoly with Canada as the price leader. Three pieces of evidence supported this market structure. First, the storage capability of Australia was increased in the post 1966-67 period. Increased storage capacity was viewed as a prerequisite to market power. Second, it appeared that Australia had adopted a policy to not liquidate exportable stocks in each marketing year. This was especially apparent during 1968-69 when they increased carryover stocks to prevent a price war. Third, informal quarterly meetings between Canada and the U.S. regarding price and market shares now included Australia.

The model was deterministic by assuming that Canada was the price leader with an objective of maximizing revenue. In the period after 1972 the triopoly no longer functioned for a number of reasons. Of primary importance was that the large surpluses were nearly eliminated due to the large grain purchases of the USSR. Market power required stockholding, and because all stocks were drastically reduced, prices and exports were thereafter determined by competition.

More recently, Oleson (1979) examined the structural characteristics of the international wheat market and split it into three periods: 1953-62, 1963-72, and 1972-current. Unlike the others, he placed a great deal of importance on the role of heterogenous wheat quality in the establishment and maintenance of market power. All of the other studies recognized the

potential substitutability of wheat by class and origin but ultimately assumed them to be homogenous.

In the 1953-62 period, Canada's dominance in the high protein wheat market allowed them a greater ability to exercise market power. Price ranges were established via the IWA with No. 1 Northern being the reference class. Canada was the price leader, setting and publishing daily prices. During this period most of their sales were to international traders, and thus the daily "card price" was an accurate indicator of transaction prices. The U.S., having a limited supply of higher protein wheats, accepted Canada's price leadership and established export prices for other classes using an active day-to-day export subsidy scheme. Fringe competitors had limited storage and followed a policy of minimizing year-end stocks (Oleson 1979:100). During this period the demand for higher protein wheat was inelastic, and supplies from sources other than Canada were limited.

From 1963-72 the structure of the international wheat market was in transition. Canada's role as price leader eroded due to both supply and demand factors related to the higher protein wheat market. The U.S., and to a lesser extent Australia, increased its capability of producing higher protein wheat. In addition, the Chorleywood process was introduced in the baking industry in the UK in the early 1960s and was adopted elsewhere in ensuing years. This technological change resulted in reduced demand for higher protein wheats. The combination of these factors meant a gradual reduction in the market power previously maintained by Canada. In addition, a price war evolved during the late-1960s and the International Wheat Agreement eventually broke down. Meanwhile the U.S. became dissatisfied with its market share and made a very significant policy change by decreasing its loan rate to 130¢/bushel. U.S. domestic prices were now closer to world prices and required less of an export subsidy, and in some years none (see Figure 3). Canada tried to retain its role as a price leader during this period, but efforts were increasingly futile.

The most recent period, from 1972 to current, was a transition from market determination of prices and exports to the United States' becoming the recognized price leader in recent years. Several factors contributed to this transition. First, there was a tremendous expansion in export demand due to grain purchases by the USSR, which were absorbed mostly by the U.S. Second, the mechanism for administering export subsidies in the U.S. was suspended in 1972; this marked an end to the day-to-day interaction between U.S. and Canadian agencies in price establishment. The U.S. policy was for open-market pricing subject to the effects of loan rates, target prices, supply control, and storage payments. In this action the U.S. became the price leader with prices determined in cash and futures markets, subject to the operation of government programs--prices which became world reference prices for different classes. The third important factor was that during the early 1970s, Canada's exports were restricted due to logistics and transportation problems which served as constraints and had an overriding influence on their stockholding decisions. Decisions were made in the mid-1970s to solve these problems, and thereafter the apparent Canadian strategy was to export according to transportation capabilities, as opposed to stockholding. This was an indication of perceived reduction in market power, and Canada essentially became a part of the competitive fringe. It was during this period that Canada, as part of its strategy, expanded use of long-term bilateral

agreements. The "card price" no longer played a central role in pricing, since an increasing majority of the transactions were made in government-to-government negotiations. The Canadian Wheat Board (CWB) recognized this as an advantage because the main competitor, the U.S., set prices openly through the market. The CWB could now move target quantities by slightly undercutting visible open market prices, which are obviously an important part of all negotiations (Oleson 1979).

In summary, international competition in the wheat market has evolved from a duopoly between Canada and the U.S., with the former being the price leader, to a situation in which the U.S. now appears to be the price leader. A number of important factors contributed to this evolution. One was that the earlier International Wheat Agreements played important roles in pricing and exports and was a main facilitator of Canada's price leadership. More recent wheat agreements have been of minimal influence with the exception of informational exchange. Concurrently, the market condition for higher protein wheat was changing in such a way that Canada's market power was eroded. Indeed, premiums traditionally received from Canadian wheat have gradually been reduced.<sup>4</sup> Another important factor contributing to the evolution was that use of the daily export subsidy in the U.S. was suspended in 1972. In the ensuing years the U.S. loan rate became an increasingly important factor in the international price structure for wheat, even though its purpose was not primarily related to export competition.

#### Structural Characteristics of the Current Market

In the current market (during the last four years) the U.S. is viewed as the price leader, albeit in a passive role, whereby the interaction of cash and futures markets subject to the loan rate program determines transaction prices. Price leadership is viewed in the "dominance" sense, whereby it is the overriding policy affecting the U.S. market which determines price and output.<sup>5</sup> The purpose here is to describe price and quantity determination in a market structure with the U.S. as the price leader and with all other exporters as the competitive fringe. The model is described briefly first, and then several important comparative static effects are discussed. In the next section evidence is discussed which supports this type of market structure.

The structural characteristics are based on the dominant firm price leadership model [see Scherer (1980) for a more general description]. In any

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<sup>4</sup>In the period 1964-72 Canadian wheat commanded a 5.1 percent premium over the world average; this decreased to 2.4 percent during 1973-80 (Canadian Grain Council 1985:117).

<sup>5</sup>This is as opposed to price leadership being viewed from a short-term temporal perspective as analyzed by Spriggs, Kaylen, and Bessler (1982) and more recently by Lee and Cramer (1985). In the latter study, statistical evidence indicated that some U.S. cash markets were the price leader during 1972-81. However, this was a period where at least institutionally prices were determined competitively as discussed in the previous section.

oligopolistic market structure, it is necessary to have some mechanism for communication. In this case the U.S. is posed as the price leader and prices are determined through the operation of the market subject to the effects of loan rates. However, due to the somewhat rigid nature of the loan rate, the U.S. (as a country, but not necessarily the markets located in the U.S.) plays a passive role, certainly within a year and to some extent between years, in pricing in the export market. The competitive fringe includes all other exporters who export along their excess supply function and who act as price takers. Each member of the competitive fringe acts independently and is individually too small to have a perceptible influence on price through their output decisions. Price differentials do evolve in this market structure due to product heterogeneity.

Graphical solution to the model is shown in Figure PL1.  $S_{cf}$  is the aggregate supply function for the competitive fringe. In particular it is the aggregation of the excess supply function for each of the competing exporters.  $D^A$  is the aggregate export demand function for wheat and is drawn to be relatively inelastic. The effective demand function for the U.S., the price leader, is the residual of  $D^A$  and  $S_{cf}$  and is represented by  $ABD^A$ . If the U.S. aggressively pursued an objective of maximizing export revenue, prices would be at the point of unitary elasticity on the effective demand function  $ABD^A$ . In addition, optimal prices would vary with shifts in either the competitive fringe supply,  $S_{cf}$ , or aggregate export demand,  $D^A$ .

Given prices at  $P_{lr}$  which are determined via the U.S. loan rate mechanisms, equilibrium is achieved. The demand function for the competitive fringe is perfectly elastic at  $P_{lr}$ , and they export  $OQ_{cf}$ . U.S. exports are at  $OQ_{us}$  and aggregate exports at  $OQ_A = OQ_{us} + OQ_{cf}$ . Prices are determined by the interaction of U.S. supply and demand subject to the effects of the loan program. If equilibrium prices in the U.S. exceed  $P_{lr}$ , then prices and exports are determined through competition. Figure PL2 shows this case where equilibrium prices  $P_1 > P_{lr}$  and exports are  $OQ_{us1}$  and  $OQ_{cf1}$  for the U.S. and competitive fringe, respectively. On the other hand, with a larger U.S. supply,  $S_{us}^2$ ,  $P_{lr}$  becomes the world price. Exports from the competitive fringe are reduced (a movement along their supply function), and those from the U.S. increase. Equilibrium price is  $P_{lr}$ , and the U.S. accumulates stocks. Thus, the model allows for equilibrium prices greater than or equal to the U.S. loan rate, but in both cases members of the competitive fringe act as price takers.

An important factor influencing changes in exports in the assumed price leadership model is that of exogenous changes in aggregate exports.  $D^{A1}$  in Figure PL3 represents an increase in aggregate demand relative to  $D^A$ . As a result, the effective demand for the U.S. becomes  $A^1 B^1 D^{A1}$ . With price at  $P_{lr}$ , U.S. exports increase to  $Q_{us}^2$ , but exports for the competitive fringe would be unchanged. All of the increase in aggregate demand is realized by the U.S. Of course if demand increases far enough, prices would exceed  $P_{lr}$  and equilibrium would be the same as that in Figure PL2. Similarly, if aggregate demand shifts toward the price axis, all of the decrease would be absorbed by the U.S. Changes in aggregate demand are absorbed by the U.S. when prices are determined by the U.S. loan rate mechanisms; i.e. the proportion of the change in aggregate demand absorbed by the U.S. exceeds that

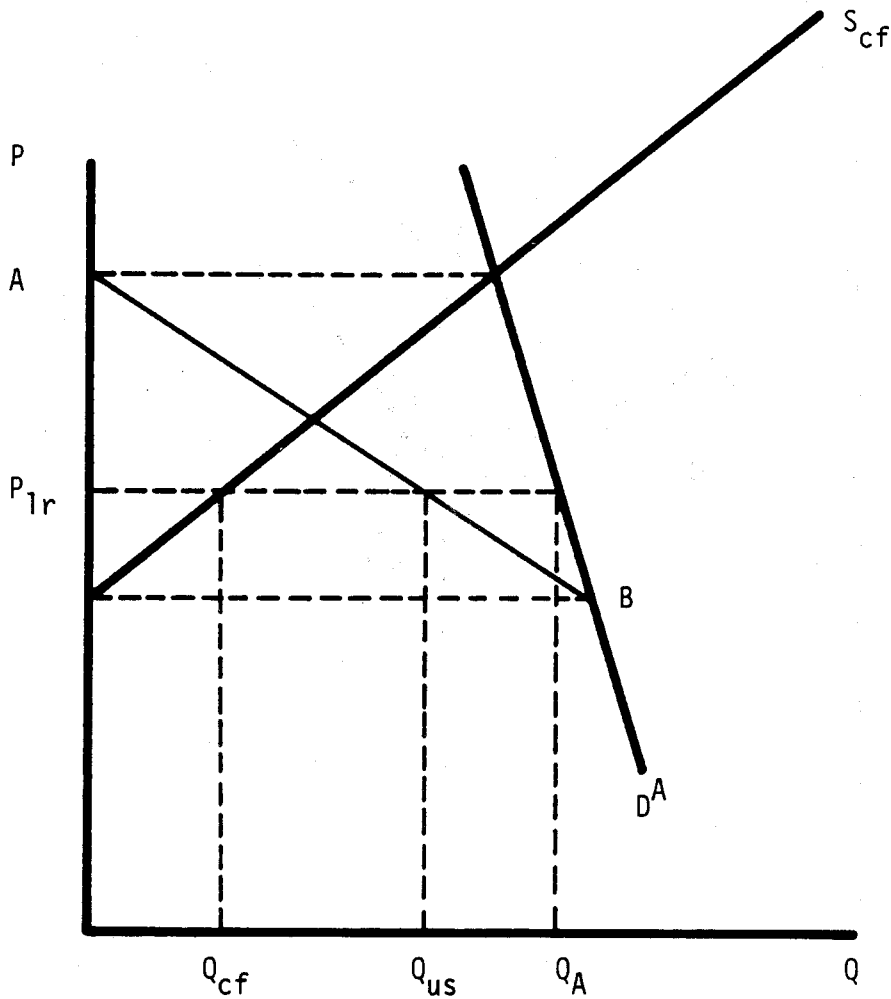


Figure PL1. Price and Determination of Exports Under U.S. Price Leadership.

Where  $S_{cf}$  = supply for competitive fringe

$D^A$  = aggregate export demand

$D_{us} = ABD^A = D^A - S_{cf}$

$Q_{cf}$  = quantity exported from competitive fringe

$Q_{us}$  = quantity exported from U.S.



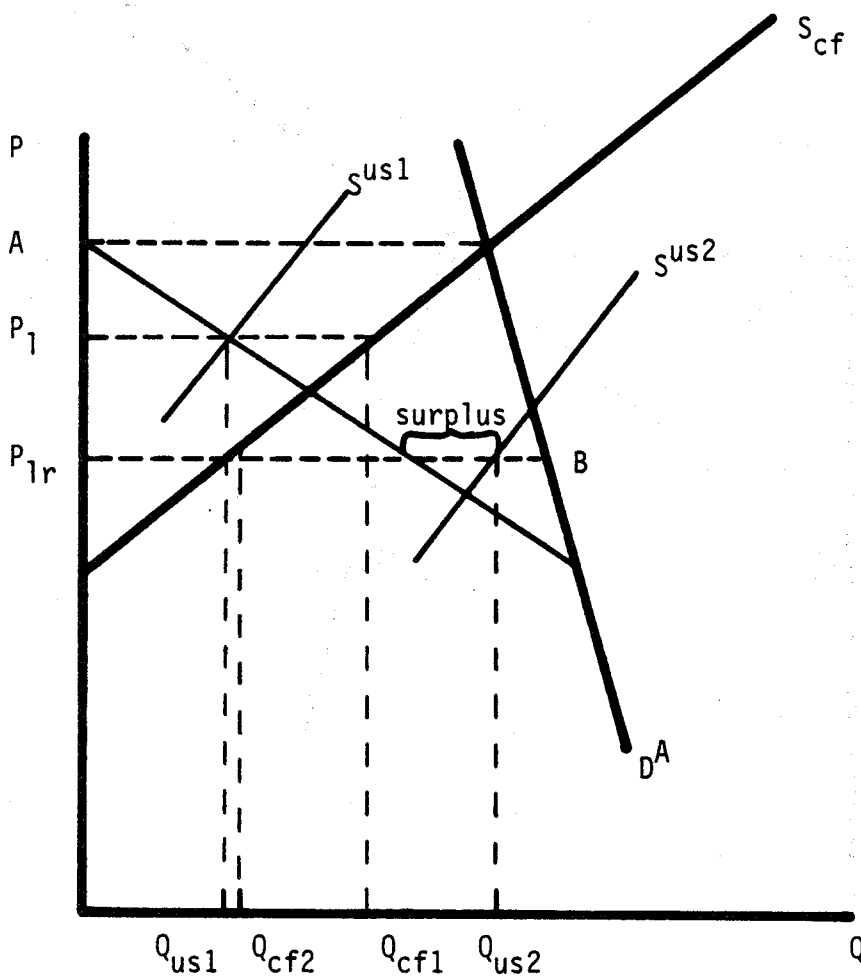


Figure PL2. Price and Determination of Exports Under U.S. Price Leadership: With Different Supply Functions for U.S.

Where  $S_{cf}$  = supply for competitive fringe

$D^A$  = aggregate export demand

$D_{us} = ABD^A = D^A - S_{cf}$

$Q_{cf}$  = quantity exported from competitive fringe

$Q_{us}$  = quantity exported from U.S.

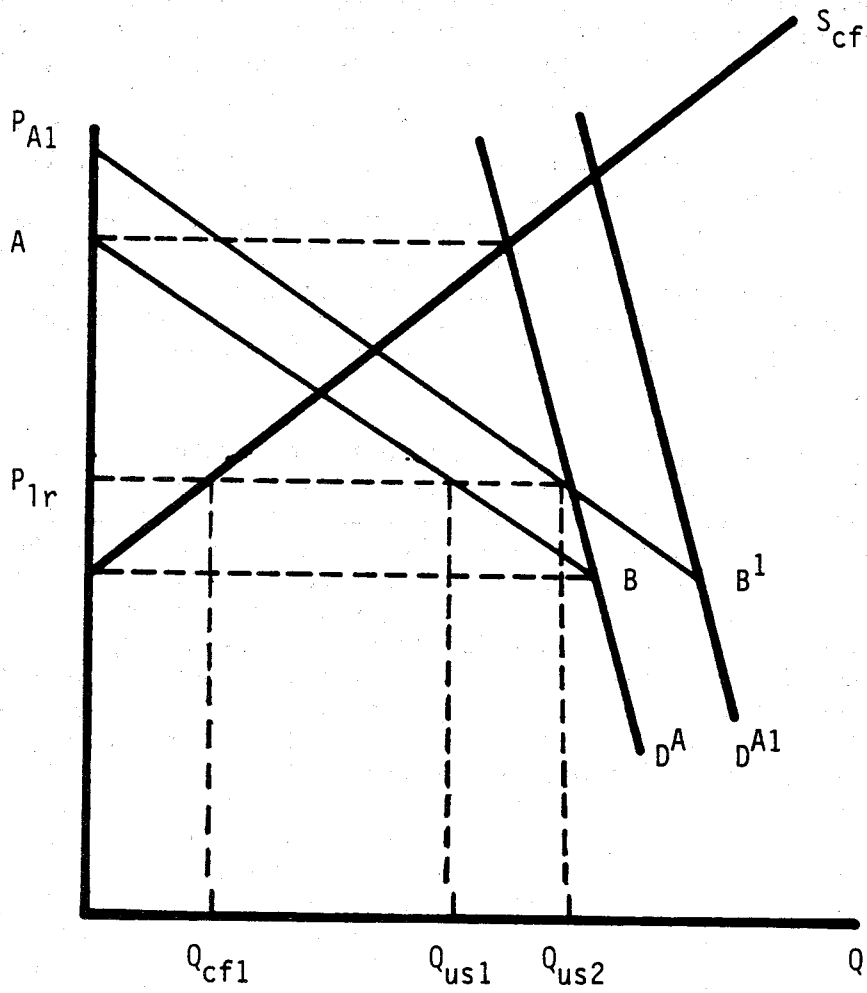


Figure PL3. Price and Determination of Exports Under U.S. Price Leadership: Changes in Aggregate Demand.

Where  $S_{cf}$  = supply for competitive fringe

$D^A$  = aggregate export demand

$D_{us} = ABD^A = D^A - S_{cf}$

$Q_{cf}$  = quantity exported from competitive fringe

$Q_{us}$  = quantity exported from U.S.

of the competitive fringe in the dominant country price leadership model with "sticky prices." This is primarily due to the rigidity of the loan rate as a pricing mechanism in export competition.

Another important aspect of the dominant country price leadership model is the behavior of the supply function of the competitive fringe. A crucial determinant of the market power of the U.S. is the slope of  $S_{cf}$ , assuming the price transmission elasticity exceeds zero. A more price elastic (inelastic)  $S_{cf}$  implies a more elastic (inelastic) effective demand function for the U.S. Likewise, a more price inelastic (elastic)  $D^A$  implies a more inelastic (elastic) effective demand for the U.S. Similarly, shifts in  $S_{cf}$  result in shifts in the U.S. effective demand function. Technological improvements, government programs, and changes in input prices all result in rightward shifts in  $S_{cf}$  and in decreases in the U.S. effective demand function. Thus, U.S. market power depends on supply conditions of the competitive fringe, which is the appropriate interpretation of recent allegations that the U.S. is the "residual supplier."

Constraints in the logistics and transportation system of some exporters in the competitive fringe have played an important role in the international wheat market. Both Argentina and Canada have had constraints in grain handling and transportation systems. Decisions were made in the mid-1970s to expand the capacity of the Canadian grain handling system, and by the early 1980s these objectives were met. Argentina continues to have seasonal problems, but its capacity has increased and efficiency improved significantly since 1979. Constraints in the logistical system for exports implies that at some point the excess supply function of the competitive fringe becomes very inelastic, or perfectly inelastic as shown in Figure PL4. The effect of logistical restrictions in the competitive fringe is for a relatively more inelastic effective demand function for the U.S. at higher prices ( $A^1BDA$  in Figure PL4). Expansion of export capacity and increased efficiency means the perfectly inelastic portion of the export supply function shifts rightward (or is eliminated), which has the effect of mitigating the relatively inelastic portion of the effective demand function at higher prices.<sup>6</sup> Thus, market power for the U.S., which may have been apparent when some members of the competitive fringe had logistical constraints, has been reduced or eliminated in recent years as those problems have been solved.

The value of the U.S. dollar has an important influence on export competition. The U.S. dollar was undervalued throughout much of the 1970s, and has become allegedly overvalued in the 1980s. Longmire and Morey (1983) incorporated the changing value of the dollar in a spatial equilibrium model assuming competitive conditions. Appreciation of the dollar was viewed as an effective ad valorem tax on U.S. exports and was introduced as a rotation of the export demand function toward the price axis (Figure PL5). The distinguishing feature of dollar valuation in the context of the price leadership model is that the U.S. export demand function itself is a residual. Thus, in deriving the effective U.S. demand function, the effect of the dollar

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<sup>6</sup>These results differ if the dominant country has logistical constraints. In that case prices for the competitive fringe increase relative to that of the price leader.

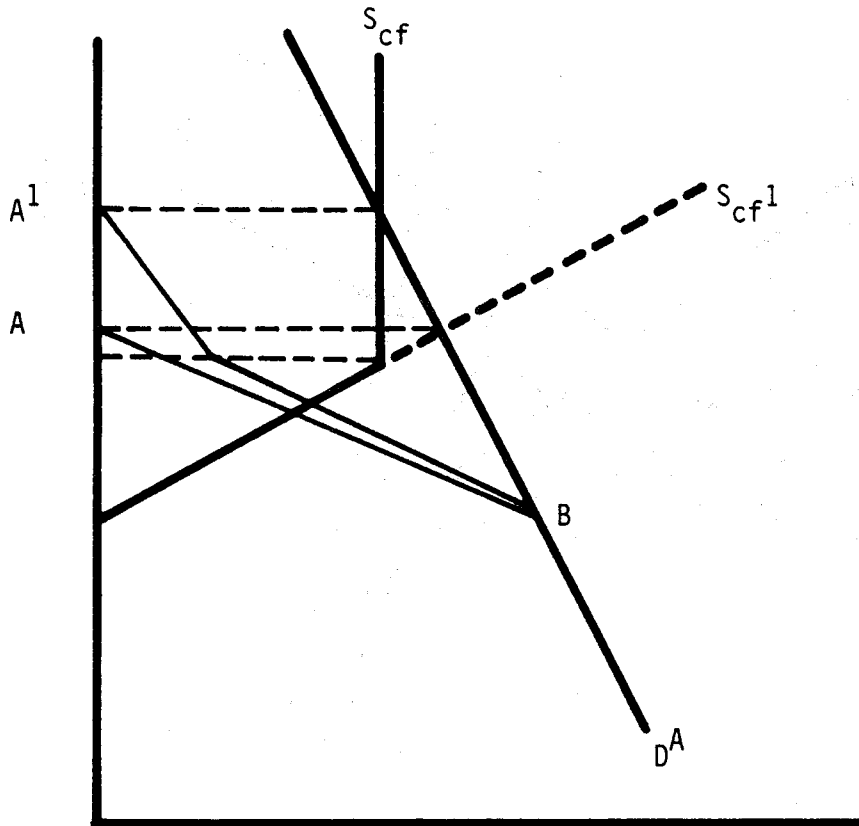


Figure PL4. Price and Determination of Exports Under U.S. Price Leadership: With Logistical Constraints in Competitive Fringe.

Where  $S_{cf}$  = supply for competitive fringe

$D^A$  = aggregate export demand

$D_{us} = ABD^A = D^A - S_{cf}$

$Q_{cf}$  = quantity exported from competitive fringe

$Q_{us}$  = quantity exported from U.S.

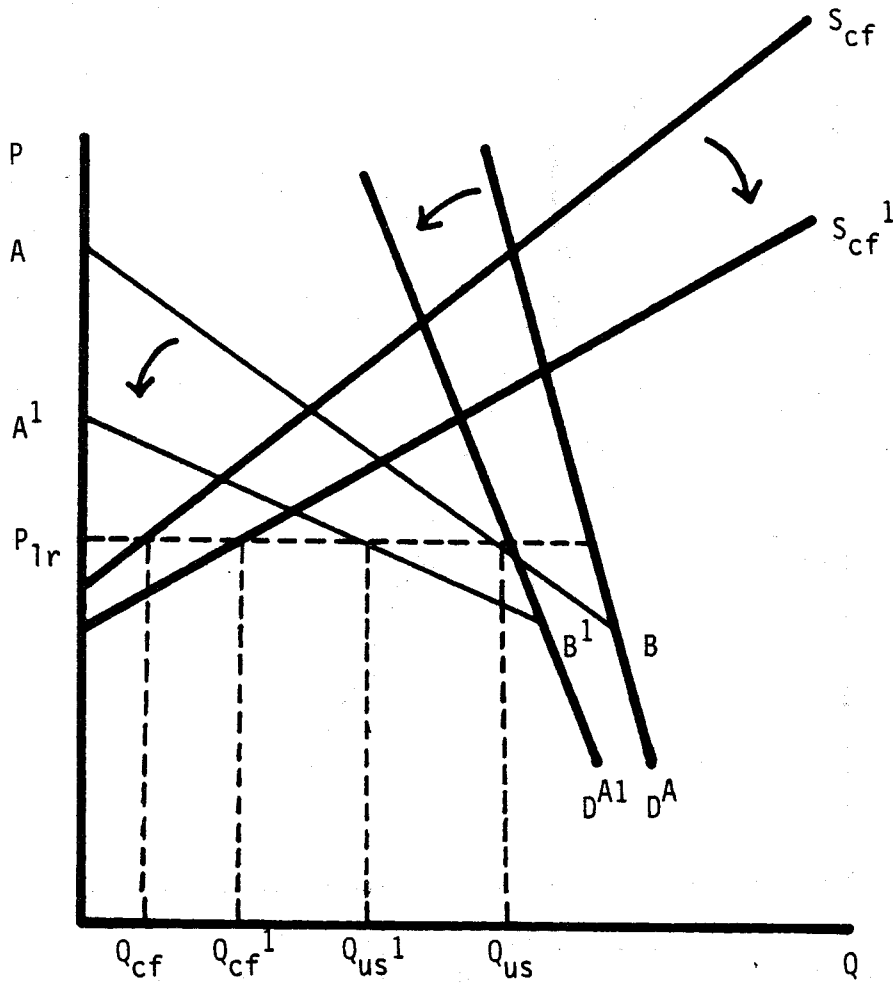


Figure PL5. Price and Determination of Exports Under U.S. Price Leadership: With An Appreciating U.S. Dollar.

Where  $S_{cf}$  = supply for competitive fringe

$D^A$  = aggregate export demand

$D_{us} = ABD^A = D^A - S_{cf}$

$Q_{cf}$  = quantity exported from competitive fringe

$Q_{us}$  = quantity exported from U.S.

on both aggregate demand and the competitive fringe supply must be captured. Real appreciation of the dollar not only serves as a tax on the aggregate demand function (i.e., leftward shift) but also gives incentives to expand production in the competitive fringe.<sup>7</sup> The results are that the effective demand function for U.S. exports becomes flatter. For a given price level (i.e., loan rate) in U.S. dollars, the quantity produced and exported by the competitive fringe increases and that exported from the U.S. decreases. Real appreciation of the dollar is equivalent to an ad valorem subsidy to foreign competition, rotating their supply function rightward. Of course, real depreciation of the dollar would have opposite effects, and the dynamics of adjustments including the likely irreversibilities would be of critical importance.

So long as members of the competition fringe act as price takers and have positively sloped supply functions, the U.S. export price is critical. The above analysis is short-run static equilibrium. Long-run equilibrium depends on the cost characteristics of both the U.S. and members of the competitive fringe and on price policies of the price leader. If prices transmitted to the competitive fringes are high enough to allow positive economic profits, their capacity and exports will increase. Several members of the competitive fringe in international wheat have taken measures to increase export capacity and logistical efficiency, to increase productivity, and to bring new land under cultivation; some of these measures are undoubtedly irreversible. The ultimate result is that the dominant country will have a tendency to lose market share through time (Worcester 1957). In the long run the dominant country price leadership model has a tendency to break down in the absence of aggressive pricing on the part of the leader to deter expanded production by the competitive fringe and other potential rivals. Therefore, the price leader cannot act passively in pricing policies. The dominant country price leadership model is inherently unstable and will normally break down and become either a competitive, oligopolistic, or monopolistic market in the longer term.

#### Exporting Country Behavior and Competitive Strategies

The current wheat market is operating without an International Wheat Agreement and with a U.S. loan rate program in the absence of an active export subsidy mechanism, both of which facilitated previous oligopolistic arrangements. It appears that the structure of competition in the international market for wheat is evolving to one characteristic of price leadership, with the U.S. assuming that role, and to a price-taking competitive fringe composed of all other exporters. This section provides evidence which would support this market structure.

Related to the price leadership role of the U.S. is the cost of production in the U.S. compared to that of members of the competitive fringe.

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<sup>7</sup>The price transmission elasticity to producers in the competitive fringe is assumed  $\geq 0$  in this analysis.

Prior to describing the market strategies in each country, several recent studies on cost of production are presented.

The U.S. has always been a relatively low-cost producer of commodities such as wheat. However, in light of recent actions by competitors, the cost-of-production advantage of the U.S. has been questioned. One recent study compared growth rates in yields in the U.S. with those of major competitors (Zulauf and Steimer 1985). Yield comparisons are admittedly an imperfect proxy for cost-of-production comparisons because they simply measure physical productivity of one input, land. Results for wheat indicated that compound annual growth rates in production were 2.8 percent during 1950-65, 1.6 percent during 1965-75, and 2.4 percent during 1975-80. For comparison to gains in productivity in other producing and exporting countries, a ratio of yields in the U.S. relative to the rest of the world was derived for particular years. For wheat the results were as follows:

<u>Year</u>	<u>Ratio</u>
1950	1.2
1965	1.4
1975	1.3
1980	1.2

The U.S. has always had a yield advantage relative to the rest of the world. That advantage increased from 1950 to 1965, at which time there was a 40 percent advantage. Since then that advantage decreased and in 1980 was only 20 percent. These results indicate that the domestic cost-of-production advantage has declined since 1965. The rapid appreciation of the dollar since 1980 has exacerbated this problem and caused the U.S. cost-of-production advantage to decrease further.

Another recent study analyzed the variable cost of production in selected exporting countries (Paarlberg et al. 1985). Such comparisons are fraught with problems (see p. 100 of that report for discussion of conceptual and empirical problems) but do give an indication of relative advantage. Following are the average variable costs (AVC) for wheat production in selected regions of the U.S. and Canada and in Australia:

	<u>1980</u>	<u>1981</u>	<u>1982</u>
	<u>U.S. \$/Bushel</u>		
United States			
National Average	1.52	1.61	1.55
Hard Red Winter (HRW)	1.32	1.69	1.49
Hard Red Spring (HRS)	1.94	1.47	1.35
Canada (Saskatchewan)	1.29	1.31	1.24
Australia	1.47	2.45	2.25

SOURCE: Paarlberg et al. 1985:101-2.

The higher cost per bushel for U.S. HRS in 1980 is likely due to the drought condition of that year.<sup>8</sup>

Average variable costs in the U.S. exceeded those in Canada in each of the three years. The average variable costs in Canada were also less than those for U.S. HRS, the appropriate comparable wheat, in each year. Average variable costs in Australia increased in 1981 and 1982 due largely to the drought conditions in those years which reduced yields and increased unit costs. Additional results indicated that prices paid for inputs by producers in U.S. and Canada had comparable increases from 1976 to 1982, but Australian input prices increased slightly more. In general these conclusions indicate that U.S. average variable costs have exceeded those in Canada for comparable regions but have been substantially less than those in Australia.

### Competitive Developments

A description of recent competitive developments of each exporter is discussed briefly in this section with the exception of Canada and Argentina, which are discussed in greater detail, because it appears their role and/or policies have changed the greatest since the early 1970s.

#### United States

The United States has not pursued policies that directly affect market prices or exports since the late 1960s. In recent years, however, loan rates have increased to equal or exceed world prices and have had the effect of decreasing U.S. exports despite increases in world trade. Thus, the U.S. policy toward exports has been fairly passive even though several attempts have been made to use short-term solutions (e.g., export PIK, BICEP).

The implied competitive strategy of the U.S. has had several important components. First, the U.S. policy has had limited use of long-term bilateral agreements (LTAs). These have not been pursued as part of an export strategy though LTAs have been maintained with both the USSR and China. The use of credit for export sales, however, has been an important component of the competitive strategy. Traditionally PL-480 sales were concessional sales because of their repayment terms. In 1979, with the introduction of the GSM-102 program, the U.S. policy toward credit changed from a system of government credit to credit guarantees. In 1982 the "blended credit" program was introduced as a combination of GSM-102 and GSM-5, the latter being interest-free direct government credits (International Wheat Council 1985). In this program the commercial rates under GSM-102 were blended with the direct government credits under GSM-5. The proportion of sales under these credit programs increased from 14 percent of U.S. wheat exports in 1981/82 to 40 percent in 1982/83 and 37 percent in 1983/84. In recent years the U.S. has become the largest user of export credit measured in total and relative sales. Export credit has likely been used to partly offset the relative value of U.S. prices in selected markets. Finally, the U.S. has periodically used or

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<sup>8</sup>Average yield per harvested acre in 1980 was 18.7 in North Dakota compared to 26.3 and 28.4 in 1979 and 1981, respectively.



attempted to use other enhancement programs such as export PIK. The \$2 billion BICEP program with selected offers to Algeria and Egypt are efforts at offsetting either unfair trade practices of other countries or the relative uncompetitive position of the U.S.

### Canada

As opposed to the U.S., Canada has explicitly pursued policies with the objective of expanding export sales. An interpretation of one of the objectives of the Canadian Wheat Board Act is to market as much grain as possible at prices it considers reasonable. McCalla (1979) interpreted Canada's objective as to maximize producer revenue. In the 1950s-60s this was implemented subject to perceived market power for high protein wheat and entailed holding stocks to support prices. More recently, however, it appears that Canada's market power has diminished and the current strategy is to produce and market grains to fully utilize the grain handling and transportation system (Canadian Grain Council 1985; Oleson 1979; Canadian Wheat Board 1985).

An important part of their competitive strategy in the 1970s was to increase the capacity of and efficiency of the grain handling and transportation system. In the 1960s Canada held stocks as an exercise of market power. In the 1970s there was a tremendous expansion in aggregate demand, most of which was garnered by the U.S., allegedly because of the lack of and inefficient use of Canadian grain export capacity. Thus, the strategy in the 1970s was to expand capacity and increase the efficiency of the grain handling and transportation system. Interestingly, these decisions were made in the 1970s based upon studies or commissions initiated as early as 1969. In 1970 the Grain Transportation Technical committee recommended improvements in the grain handling system and increases in throughput capacity. The Block Shipping System was introduced in 1970 (it was tested in 1969) and played a major role in subsequent increases in logistical efficiency (it was originally tested in 1969). In 1979 the Canadian Wheat Board purchased 2,000 covered hopper rail cars in a controversial decision, and export capacity has expanded at Prince Rupert and other West Coast terminals. Federal and provincial governments also purchased covered hopper cars--there are now about 19,000 nonrailway hoppers in the system. In 1976 an export target was set for 30 MMT of all grains and oilseeds by 1985, but this was met two years early. Another goal has been set to expand exports to 36 MMT by 1990 (International Wheat Council 1985). The important points are that the capacity of the grain handling and transportation system was expanded to increase exports, recognizing that this had been a constraint; these decisions are irreversible and were based on decisions when the dollar was valued substantially less than in recent years.

Credit sales of Canadian wheat have been limited relative to those of the U.S. and comprised only 13 percent of wheat and wheat flour exports in 1983/84 (IWC). Credit is offered at commercial interest rates available to the Board from financial institutions in Canada. The most common repayment terms is for 10 percent down and payback in three annual installations. The Board can revise some of the terms in order to meet competition.

More important to the Canadian sales strategies is the increase in the use of LTAs since the 1970s. Canada has had LTAs with China and the USSR since 1961 and 1963, respectively. However, since the early 1970s the quantity sold under LTAs has increased tremendously. The following table illustrates the use of LTAs for all grains (wheat, flour, durum, barley, and oats):

Period	Total LTA Committment	Total LTA Committment Excluding USSR and China
	-----Million MT-----	
Pre-1970	15.0	0
1970-74	1.7	1.7
1975-79	7.0	3.6
1980-84	14.2	5.4

In addition, the diversity of countries with LTAs has increased and now includes a number of smaller markets (e.g., Norway, Jamaica, East Germany). Related to administration of an LTA sale is the increased use of direct state-to-state negotiation over price, quality, and other delivery terms. Recently it has been estimated that as much as 80 percent of Canadian sales come under this type of arrangement. The purpose of increasing LTA sales has been to create "brand loyalty" in the Telser context (1962), which is particularly important in declining markets. The effects are that prices increasingly are negotiated privately, obviously using U.S. prices for reference, and that the daily "card price" of export offers has become increasingly of lesser importance (Oleson 1979).

An important characteristic of the international competition was the dominance of Canada in markets for higher quality wheat. Indeed this is what allowed Canada to exercise market power and be the price leader in the 1960s. Quality has two important dimensions in international market competition. One is the supply of high protein wheat which is used for blending, and the other is the preservation of quality throughout the marketing system. Due to strict licensing, cleaning, grading, blending, and other restrictions, Canada's wheat has gained the reputation of being superior in quality to that of the U.S. (Canadian Wheat Board). In recent years, there has been much discussion, although controversial and nonconclusive, related to the development of lower protein wheat specifically to compete with lower protein U.S. wheat (Canada Grains Council 1985; Loyns et al. 1985). The purpose of introducing additional varieties would be to take advantage of growth markets which are perceived to be for lower protein wheats, and due to Canada's strict grading and handling system, development of these varieties (e.g., Hy 320) would allow the CWB to penetrate these markets. Further, in many areas the increase in yield would more than offset the lower price received for these varieties and producer returns would increase.

## France

The export objective of France is difficult to discern because it is part of the European Economic Community (EC) and subject to provisions of the Common Agricultural Policy. It appears France's objective is to dispose of exportable supplies at minimum cost through the use of export subsidies (McCalla 1979). French strategy involves using subsidies to bring down the level of the domestic price to be competitive with world prices.

Though the EC does not grant credit for exports of grain, France does use credit as part of its competitive strategy. Recently about 30 percent of sales were under credit arrangements. Credit has been granted to traditional markets (e.g., Egypt, Tunisia, and Morocco) to match credit offered by competing suppliers (International Wheat Council 1985). Repayment is at market rates of interest and is for two to three years with a COFACE (France Export Guarantee Agency) guarantee of 95 percent. France makes limited use of supply agreements.

## Australia

Exports of wheat are marketed through the Australian Wheat Board (AWB) which operates very similarly to that of Canada. Australia's objective is traditionally stated as to maximize producer revenue (McCalla 1979). Variable levels of supply and export logistical constraints have played an important role in the Australian export strategy. It appears that the Australian's price their exports to the extent necessary to minimize ending stocks. Thus, a minimal level of pipeline stocks are stored at year-end being dictated somewhat by export capacity, which has recently been expanded, and also by problems associated with long-term storage. As opposed to other countries, Australia makes limited use of export credit, and LTAs account for only about 30 percent of export sales.

## Argentina

Given the financial dilemma of Argentina, it is fairly clear the Argentinian export objective is to maximize export revenue. To do so exports are priced to minimize year-end stocks and to make storage space available for soybeans, corn, and other fall-harvested grains and oilseeds.

The agricultural policy in Argentina was relatively constraining until 1976 when the military junta took over and gradually returned control to the private sector. Since then the agricultural policy has become much more export oriented. Two major components of policy affecting agriculture include taxes on imports and exports as revenue raising measures. This is in addition to use of a loan rate policy on wheat, though it is generally ineffective because it changes daily and in response to export market conditions. Prior to 1976 import taxes on most agricultural inputs exceeded 80 percent. The result was restricted use of more productive technology, chemicals, seed, and fertilizer, which limited growth rates in yields. Since then these taxes have been gradually reduced and more recently were about 20 percent (Mielke 1984). As a result, yields have been increasing and are expected to accelerate in the future as technology is adopted. All of the major exporters have had slightly

positively trending yields since the 1970s, indicating constant productivity growth (Table 5 and Figure 4). However, yields in Argentina and France appear to have accelerated in the most recent five years. Following is the average percentage increase in yields for the five-year period before and after 1980:

Period	Argentina	Australia	Canada	France	U.S.
	-----percent-----				
1975/1979	4.40	7.58	2.56	2.00	4.80
1980/1984	8.20	6.67	1.79	8.20	2.67

The growth in Argentina would be due at least in part to the policy changes in the mid-1970s that reduced import taxes and encouraged increases in productivity.<sup>9</sup> Export taxes are also used to raise revenue and are currently about 25 percent. These vary through time and in response to market conditions and in what appears to be an objective to maximize tax revenue. These export taxes have been reduced recently. In addition to reducing import taxes, another proexport decision was made in 1979 which would allow private sector ownership and/or leasing of export facilities. Prior to that time the capacity was limited and was inefficiently utilized and managed, thereby constraining exports. Though there are still logistical problems, primarily due to the lack of incentives to storage, there have been significant improvements in the efficiency of the exporting system.<sup>10</sup>

The export strategy in Argentina is primarily to price cheap enough to liquidate stocks. Most of the sales are priced to be shipped within the first half of the marketing year to allow room for subsequently harvested crops. There are no credit sales; however, LTAs have been used and comprise about 50 percent of sales. Recently there has been a thrust toward increased supply agreements and exchange arrangements among Latin countries.

#### Recent Competitive Fringe Behavior

Argentina, France, and to a lesser extent, Australia, have always been considered part of the price-taking competitive fringe. The discussion above and evidence presented below support this alleged behavior. The actions of Canada, on the other hand, suggest that they no longer are in a position of exercising market power and do in fact act as a price taker and are now part of the competitive fringe. The implication of this would suggest that the U.S., likely by default, has assumed the role of price leader. All other countries effectively match the comparable CIF price, which is determined through the interaction of cash and futures markets subject to provision of

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<sup>9</sup>The phenomenal growth in productivity in France is likely related to more intensive fertilization in response to favorable price ratios (i.e., wheat to fertilizer) and higher yielding varieties.

<sup>10</sup>Despite the explosion at Bahia Blanca in March 1985, there were record shipments in April and May from the Argentina ports.

Million  
Hectares

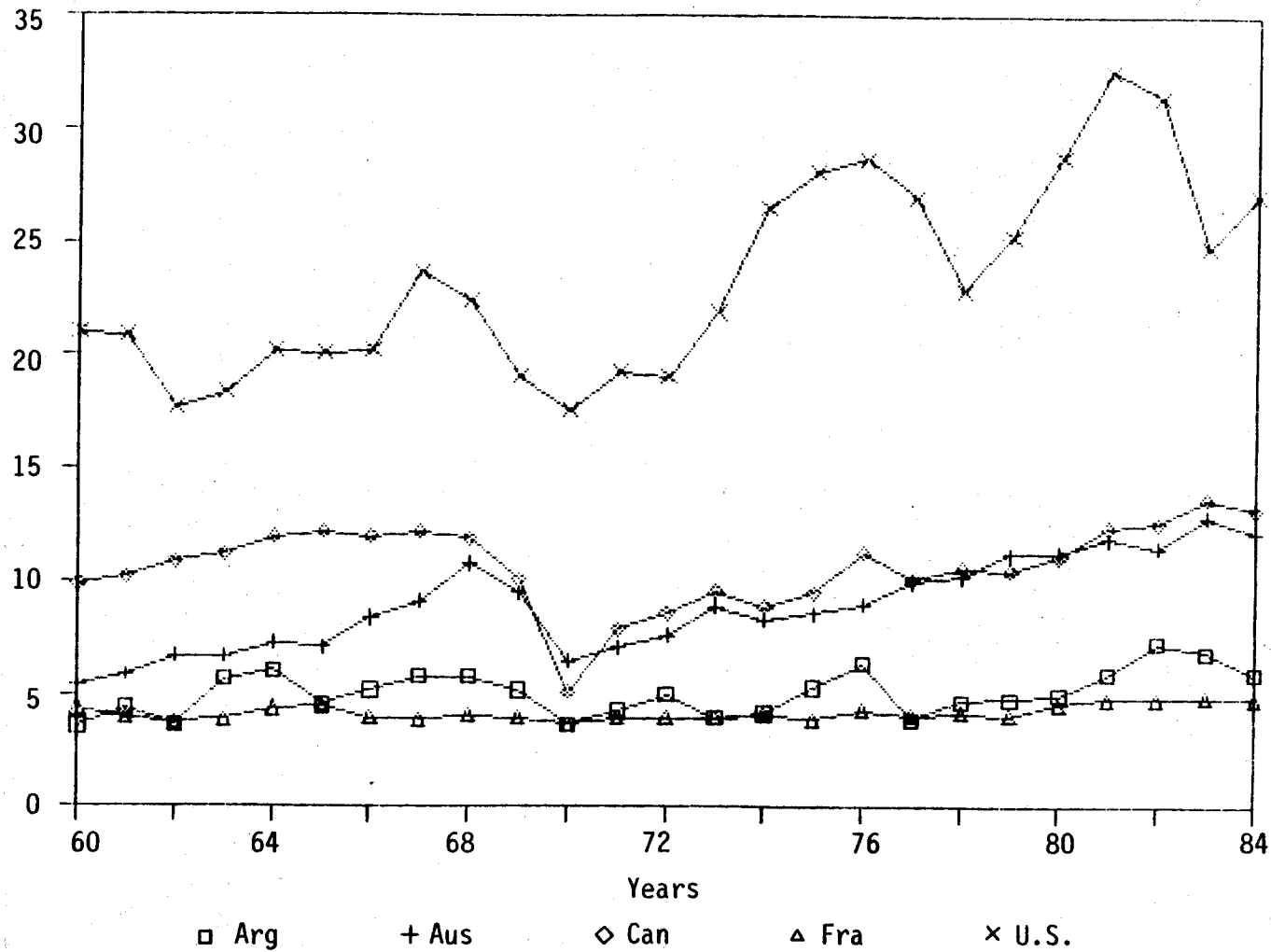


Figure 4. Area Harvested by Major Wheat Exporters, 1960-1984.

government program variables, primarily the loan rate, plus logistical costs and margins. The following statements support the existence of the current market structure:

- The U.S. loan rate acts as a price floor, which raises the world price. Importing nations buy less because of the higher prices. Farmers in other exporting countries respond to the higher price by increasing production. It does not pay these nations to absorb the additional production by holding stocks, but instead they export it at a price just below the U.S. price umbrella (Paarlberg et al. 1985).
- The unique role of the United States, which derives from its share of world wheat trade means it is both the "price setter" and also the "price-taker" in the sense that American exporters have to price their wheat more or less in line with the market. Most other grain exporting countries set their wheat export prices with reference to U.S. grain markets (International Wheat Council 1985).

In the discussion which follows, selected data are presented which tentatively support the existence of a dominant-country price leadership model with the U.S. as the price leader and all others (the competitive fringe) as price takers.

When U.S. and world stocks have become burdensome, the U.S. has traditionally introduced supply control programs to reduce stocks and raise or maintain prices. In the past much of this burden of adjustment was by the U.S., and both Canada and Australia cooperated in attempts to reduce supply. Most notable were the supply control measures in 1970 (see Figure 5). Each country with the exception of France had notable reductions in area harvested. This joint effort to reduce supply can be explained either by an implicit or explicit oligopolistic arrangement, or because each country felt it could have a perceptible influence on price via its output decision. In more recent attempts at supply control and stock-reduction, the U.S. has not had cooperation from other major exporters. In particular, extensive acreage reduction programs affected the 1982, 1983, and 1984 crops in the U.S.; however, no explicit steps were taken during those years to attempt to control supply. Canada, in fact, increased area planted to wheat and to all other crops through a reduction in summerfallow in each of these years. Thus, it appears that the main competitors who have shared the burden of stock adjustment are no longer willing to do so or at recent price levels have tremendous incentive not to reduce production.

The willingness and ability to carry stocks from one season to another has traditionally been accepted as a prerequisite to market power (McCalla 1966; Alaouze, Watson, and Sturgess 1978). Canada, for example, maintained very large stocks in the 1960s, allegedly due to the price leadership activities. Other exporters, being part of the competitive fringe, minimized their levels of ending stocks. Figure 6 (and Appendix Table 6) shows ending stocks for major wheat exporters since 1960. Ending stocks have generally been increasing in the U.S. since 1973 and have become fairly high in recent years. The projected level of ending stocks is expected to increase further in 1985/86 to 42.2 MMT. There is no apparent trend in stocks with either Argentina or France, which illustrates their implicit policies of minimizing year-end stocks. Australia has also maintained a policy in recent years of

Metric  
Tonnes Per  
Hectare

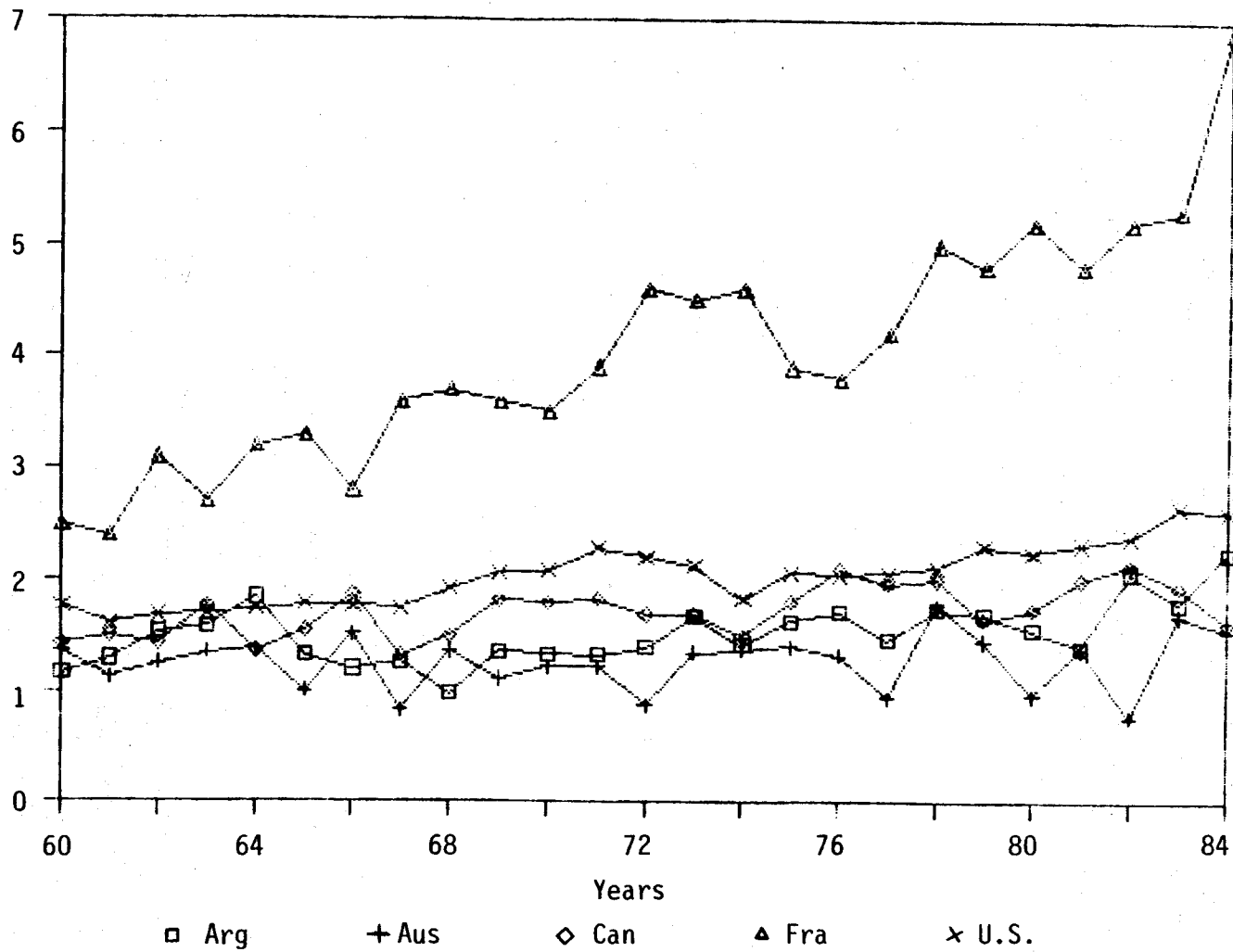


Figure 5. Yield by Major Wheat Exporters, 1960-1984.

Million  
Metric  
Tonnes

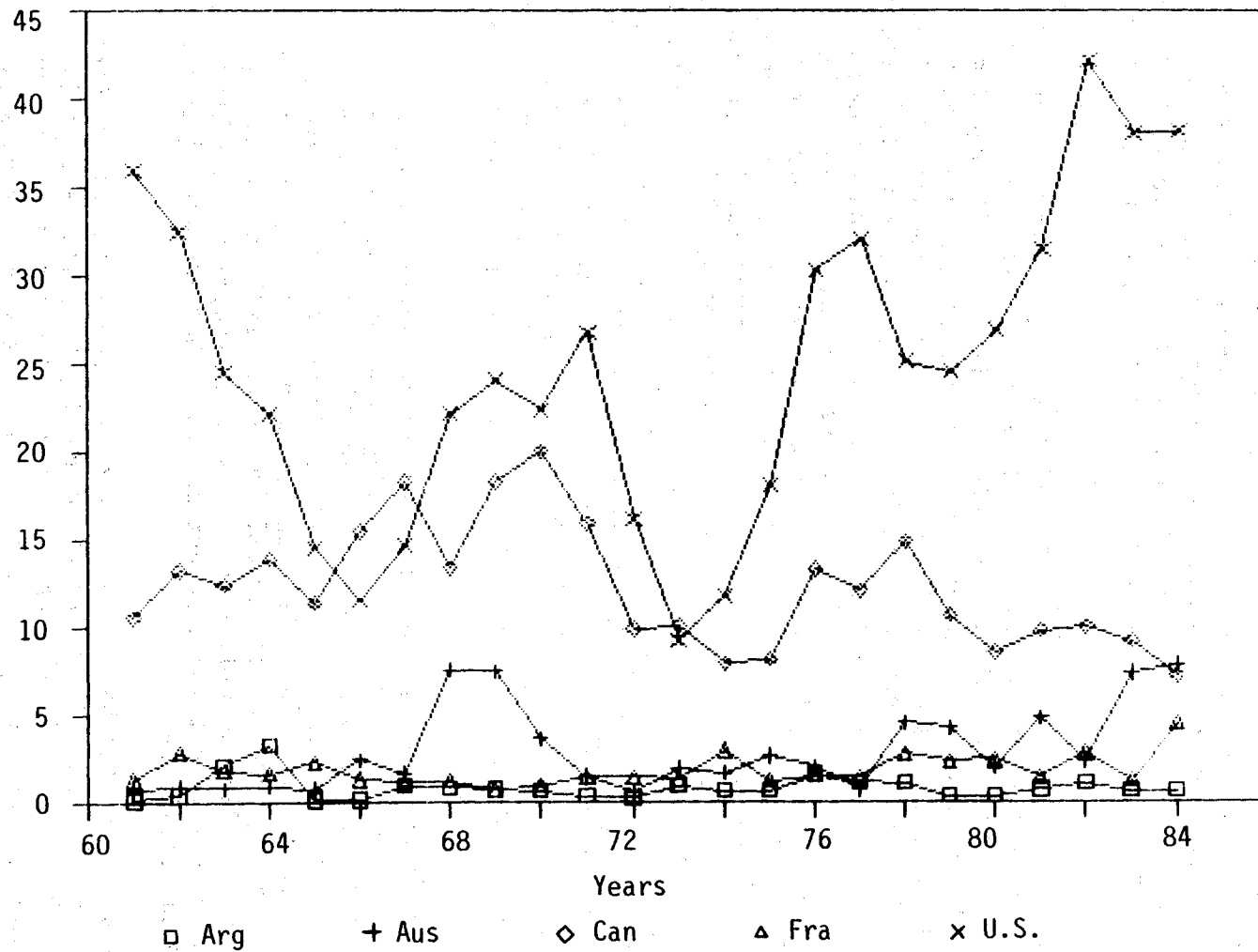


Figure 6. Ending Stocks of Wheat (by Major Exporters), 1960-1984.



minimizing year-end stocks, despite relatively volatile production. In the past two years stocks have increased to abnormally large levels. However, this increase was by default and was due to the record large production in 1983/84, which was abnormally low in quality and which took more than one marketing year to dispose of as feed wheat. Consequently, there has not been a change in policy regarding stockholding. On the other hand, there apparently has been a change in Canada's stockholding policy. The change in policy has become very apparent in the last several years during which transportation was not a constraint and ending stocks were reduced to a record low of 7.2 MMT in 1984/85. Canada does have a tendency to maintain higher stocks than other members of the competitive fringe, but there has been a definite change in policy from the 1960s when ending stocks averaged 14.4 MMT, to the 1980s when ending stocks in each year were less than or equal to 10.0 MMT.

Another way to examine and compare stockholding patterns of exporters is the stocks/production ratio, which indicates the amount of ending stocks relative to production and captures increases in the latter through time. Figure 7 (and Appendix Table 7) shows these data for each of the major exporters. The U.S. stocks/production ratio has been increasing since 1980 and is currently at 0.54. There appears to be no apparent trend for either Australia or France. However, the stocks/production ratio has decreased significantly since 1980 for both Canada (Figure 7a) and Argentina. The reduction for Canada is fairly sharp with an average value of 0.91 in the 1960s and 0.38 in the 1980s. These observations would suggest and support a definite change in Canada's export policy which has become fairly apparent in the 1980s, though it may have been building since the early 1970s. Discussions with individuals in the trade indicated that in 1971 the Canadian government encouraged the CWB to increase its marketing efforts. The first evidence of the change in behavior was the extensive liquidation of barley stocks beginning in 1971/72, followed by increased liquidation of wheat stocks in 1973/74. It appears that the Canadians have recognized their limited ability to influence prices through stockholding, have improved their grain handling and transportation system, and now behave as a price-taking member of the competitive fringe.

In the past year much anxiety has been raised about the proposed shipment of Argentine wheat to the U.S. Allegations were raised that the shipment was economical only because of unfair subsidies, but none were applicable. In fact, the export tax policy in Argentina should have detracted from the economics of the sale. The proposed transaction was very consistent with the price-taking behavior of competitive fringe sellers--in the case of Argentina it is actually individual producers which comprise the fringe. Of particular importance is not the transaction itself but the mere fact that it was an economical arbitrage.

Little attention has been given to recent expanded imports of Canadian wheat to the U.S. In the 1970s there was generally very little exportation of wheat from Canada to the U.S. with only periodic "border sales." In the past three years, however, exports have increased substantially (Appendix Table 8). The first large transaction was made in 1982/83 for frost-damaged wheat. Even though it was sold as "special bin," much of it went into commercial milling channels. In 1984/85, the imports through June were 145,000 MT, were comprised of traditional milling wheat, and were shipped mainly during April,

Percent

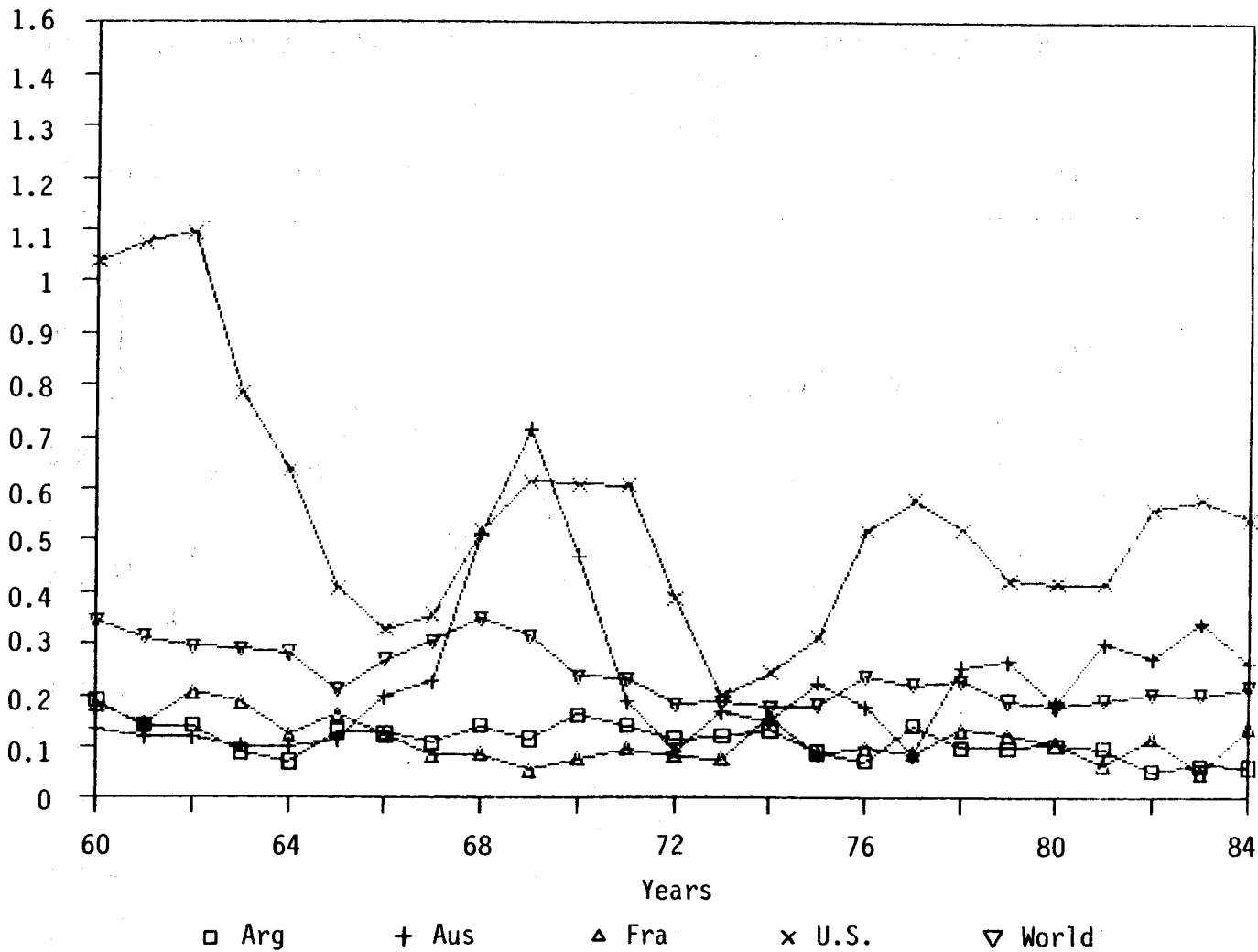


Figure 7. Stocks Divided by Production (Ratio for Major Exporters), 1960-1984.

Percent

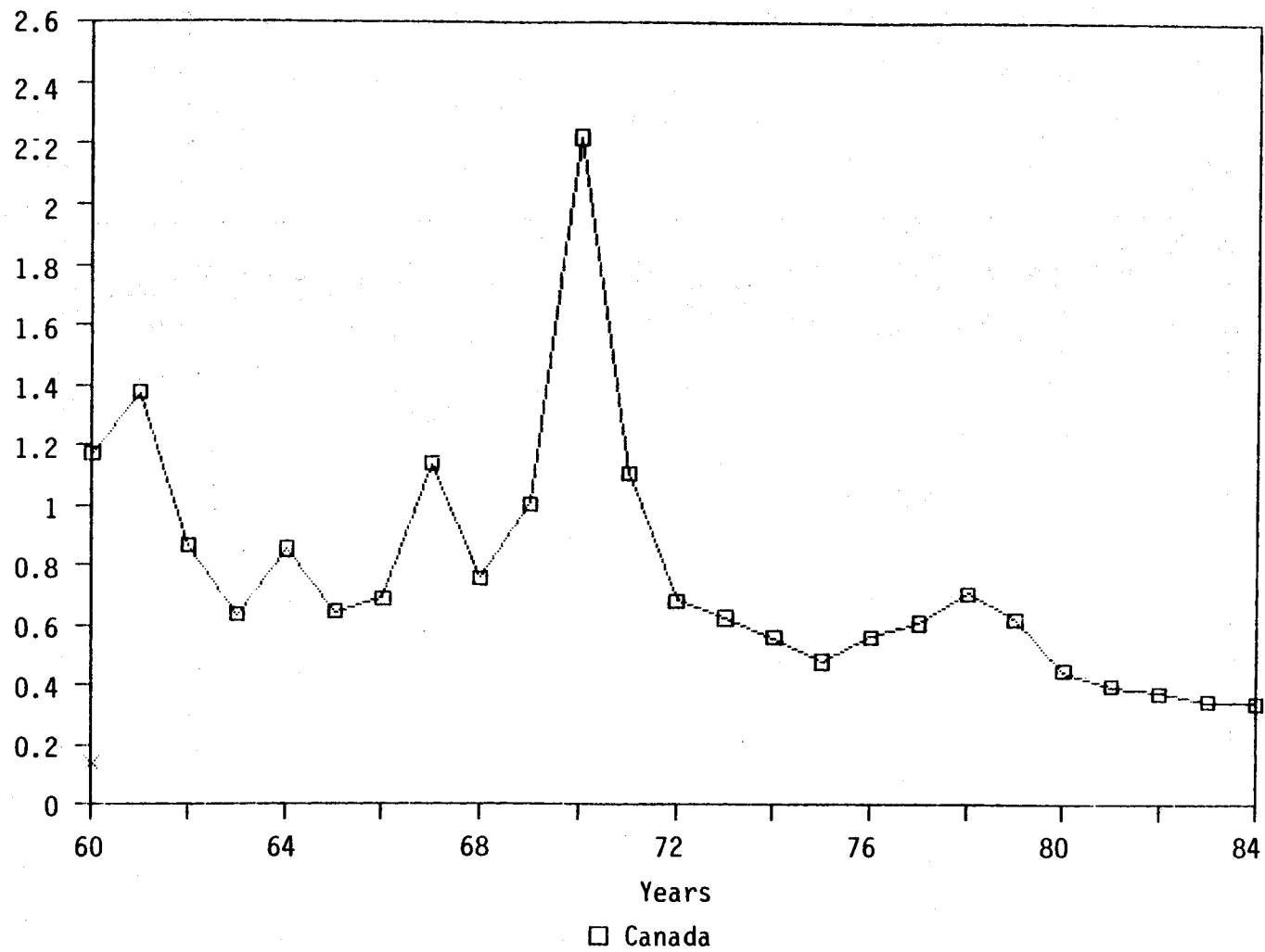


Figure 7a. Stocks Divided by Production (Ratio for Canada), 1960-1984.

May, and June (27,000, 19,000, and 61,000 MT, respectively). Though these amounts appear small, they would have potentially been in competition with HRS wheat shipments from Duluth/Superior, whose shipments during May and June were 75,836 and 85,170 MT, respectively.

The size or detail of the transactions is not as important as the institutional arrangements which allow them to be economical. In the case of HRS wheat, producers are highly participative in farm programs (in excess of 90 percent in the past three years). At and immediately following harvest, sales of free stocks and wheat ineligible for the program are made and shipped prior to December. In the postharvest period, free stocks become very tight, and the normal market response is for increases in the basis and/or futures to attract wheat away from storage to meet mill and export demand. However, in the past few years the Canadian sales were made in the period commencing with the opening of the Great Lakes shipping season. Though these sales were relatively small, the important point is the willingness of Canada to price wheat to sell and deplete stocks to abnormally low levels, which is very consistent with a competitive fringe price taker.

Data presented in this section illustrate that (1) in previous years export competitors participated in supply reduction programs, but in recent years they have not; and (2) each exporter, including Canada, has followed a policy of minimizing carryover stocks in recent years. The lack of cooperation in supply control is likely an indication that each member of the competitive fringe is too small to have an influence on price through output decisions. A major change in the structure of international competition in wheat is that Canada, who previously influenced prices by storing stocks, now apparently has pursued a strategy of liquidating year-end stocks similar to other members of the competitive fringe. The effects of these two phenomena are supportive of the notion that the U.S. is now the price leader and all other exporters in the international wheat market are price takers.

### Conclusions and Implications

International trade in wheat has evolved from an oligopoly in which Canada was the price leader during the 1950s and 1960s, to a competitive equilibrium in the 1970s, to what appears to be a price leadership model with the U.S. being the price leader in the 1980s. The earlier oligopolistic structure was facilitated by an active International Wheat Agreement and an active U.S. subsidy mechanism for price determination. Neither of these is present in today's environment. Currently, U.S. farm programs, particularly the loan rate program, play a dominant role in the international price structure for wheat. It is the interaction between cash and futures markets with the loan program which determine FOB and CIF prices, which are effectively ceiling prices for the price-taking competitive fringe. It is in this indirect way that the U.S. has assumed the role of price leader, although it was probably not intentional.

There are several important aspects of the dominant-country price leadership model. The U.S. is assumed to be the leader, although passive, and all others make up the competitive fringe, are price-takers, act independently, and are each individually too small to have a perceptible influence on price. The supply function for the competitive fringe is critically important in this

market structure and largely determines the effective demand function for the U.S. A more elastic competitive fringe supply implies a more elastic effective U.S. demand. Technological improvements and expansion in exporting capacity, each of which are largely irreversible, result in reductions in the effective demand function for the U.S. With "sticky prices" determined by the U.S. farm programs, changes in aggregate demand are all absorbed by the U.S. in terms of stock and supply adjustment. Recent appreciation of the U.S. dollar was also demonstrated to adversely affect the effective export demand function for the U.S. by simultaneously reducing aggregate demand and increasing competitive fringe supply (introduced as shifts when measured in U.S. dollars).

The export strategies by each of the major wheat exporters tend to support a price leadership model. France, Argentina, and Australia have always had implicit policies to minimize the level of ending stocks and have priced exports to reach that level. Canada, on the other hand, did maintain abnormally large stocks in the 1960s as an exercise of market power to support prices. More recently, however, there has obviously been a major decision to increase exports and reduce the levels of ending stocks, which is a recognition of reduction of market power. Decisions related to this change in policy were likely made in the early 1970s but have not become blatantly apparent until the 1980s due to the concurrent logistical inability to expand exports in the earlier period. The level of ending stocks decreased significantly since 1980 and in 1984/85 will be a record low. Also in these last three years there have been relatively sizable exports to the U.S. from Canada in what appears to be more than border sales, but are economical simply due to the price structure for U.S. wheat in the postharvest period. These observations support the theory that all exporters now aggressively price their exports with the objective of carrying over minimal ending stocks.

International competition in wheat trade has also seen a proliferation of nonprice, and possibly price, variables. The major export expansion tool for the U.S. has been the use of credit. Other exporters also increased their use of credit offerings, but not as extensively as the U.S. Each of the other exporters have also aggressively sought long-term bilateral trade agreements (LTAs). Most notable is the distinct increase in LTAs by Canada since the pre-1970 era. Canada has increased both the diversity of countries using LTAs as well as the proportion of sales under LTAs. As a result, prices and delivery terms have been increasingly determined on a state-to-state negotiation and not easily discerned by other market participants. Other countries are using LTAs to a lesser extent, and those used by the U.S. are minimal.

There have been several critical decisions made by major competitors which will likely continue to affect the U.S. in the longer term. Of particular importance are the decision by Argentina in 1976 to reduce import taxes and increase utilization of more productive inputs; a decision in 1979 to allow private firms to own and/or lease export facilities in Argentina, resulting in improved logistical efficiency; a series of related Canadian decisions to expand export capacity and improve logistical efficiency commencing from the early 1970s; and the apparent development in Canada of wheats of different quality characteristics, but higher yielding. All of these decisions result in rightward shifts in supply and/or in removing constraints to increased exports (i.e., making export supply more elastic at higher price levels) and in a simultaneous reduction in the effective U.S.

export demand function. Of particular importance is that first, those decisions were made in the early to mid-1970s when the dollar was undervalued. Second, their impacts on the effective export supply function are dynamic and take an extended period for adoption. Finally, by nature of the decisions there are likely very important irreversibilities which will make the supply function very inelastic for price reductions.

There are several important implications of a dominant-country price leadership market structure. First, if the U.S. continues to pursue a passive role in pricing (i.e., by not accounting for shifts in aggregate demand and competitive fringe supply), expansion in the competitive fringe will continue and U.S. market share will decrease. Second, if effective export prices remain relatively inflexible, the U.S. will continue to absorb the shocks in aggregate demand and competitive fringe supply. And third, because the decisions which have resulted in expanded exports by the competitive fringe are largely irreversible, a relatively long adjustment period to reductions in U.S. prices will be necessary. Typically, a dominant-country price leadership structure would be a short-run phenomenon. In the longer run, a more aggressive role in export pricing by the U.S. would require taking the market fundamentals into consideration, namely supply response of the competitive fringe and aggregate demand. In doing so, the market structure would have a tendency to evolve either toward some type of cooperative oligopoly or competition.



## Appendix





APPENDIX TABLE 1. EXPORTS OF WHEAT FROM MAJOR EXPORTERS (ARGENTINA, AUSTRALIA, CANADA, FRANCE, UNITED STATES) AND WORLD TOTAL, 1960-84

Year	Argentina	Australia	Canada	France	U.S.	World
1960	1.9	5.0	9.3	1.5	18.0	41.9
1961	2.4	6.3	9.9	1.8	19.6	46.8
1962	1.8	4.8	9.0	3.0	17.5	44.3
1963	2.8	7.8	15.0	2.7	23.3	56.0
1964	4.3	6.4	11.7	4.6	19.7	52.0
1965	7.9	5.7	14.9	4.8	23.6	61.0
1966	3.1	7.0	14.8	3.0	20.3	56.0
1967	1.4	7.0	8.9	4.2	20.7	51.0
1968	2.7	5.4	8.7	6.0	14.8	45.0
1969	2.1	7.9	9.0	6.1	16.5	50.0
1970	1.6	9.5	11.5	3.2	19.9	55.0
1971	1.3	8.7	13.7	5.6	16.9	52.0
1972	3.4	5.6	15.6	8.1	31.8	67.0
1973	1.1	5.4	11.7	8.9	31.3	63.0
1974	2.2	8.3	11.2	8.1	28.3	64.3
1975	3.2	7.9	12.1	9.1	31.7	66.7
1976	5.6	8.5	12.9	6.8	26.1	63.3
1977	2.6	11.1	15.9	7.5	31.5	72.8
1978	3.3	6.7	13.5	9.2	32.3	72.0
1979	4.8	15.0	15.0	9.0	37.2	86.0
1980	3.9	10.6	17.0	13.4	41.9	94.1
1981	4.3	11.0	17.6	13.2	48.8	101.3
1982	7.5	8.1	21.4	12.5	39.9	98.6
1983	9.6	11.6	21.8	13.1	38.9	102.9
1984	7.6	15.1	19.0	15.0	38.0	105.6

SOURCE: Foreign Agricultural Circular, Grains: World Grain Situation and Outlook, Various Issues.

APPENDIX TABLE 2. MARKET SHARE OF MAJOR EXPORTERS OF WHEAT, 1960-84

Year	Argentina	Australia	Canada	France	U.S.
-----percent-----					
1960	5	12	22	4	43
1961	5	13	21	4	42
1962	4	11	20	7	40
1963	5	14	27	5	42
1964	8	12	23	9	38
1965	13	9	24	8	39
1966	6	13	26	5	36
1967	3	14	17	8	41
1968	6	12	19	13	33
1969	4	16	18	12	33
1970	3	17	21	6	36
1971	3	17	26	11	33
1972	5	8	23	12	47
1973	2	9	19	14	50
1974	3	13	17	13	44
1975	5	12	18	14	48
1976	9	13	20	11	41
1977	4	15	22	10	43
1978	5	9	19	13	45
1979	6	17	17	10	43
1980	4	11	18	14	45
1981	4	11	17	13	48
1982	8	8	22	13	40
1983	9	11	21	13	38
1984	7	14	18	14	36

SOURCE: Foreign Agricultural Circular, Grains: World Grain Situation and Outlook, Various Issues.

APPENDIX TABLE 3. SELECTED WORLD WHEAT PRICES

Marketing Years <sup>1</sup>	Price Support	FOB U.S. Gulf HR Wheat	CIF Rotterdam	
			U.S. DNS 14%	Canada CWRS No. 1
-----\$/MT-----				
1960	65	62	--	73
1961	66	63	--	76
1962	74	64	--	76
1963	67	66	75	78
1964	48	64	74	77
1965	46	60	71	78
1966	46	67	76	80
1967	46	62	--	76
1968	46	63	70	73
1969	46	53	69	72
1970	46	60	74	74
1971	46	60	70	72
1972	46	91	100	102
1973	46	177	202	--
1974	50	164	204	207
1975	50	152	188	206
1976	83	113	141	146
1977	83	116	134	147
1978	86	141	158	166
1979	92	174	200	216
1980	110	182	217	218
1981	118	171	193	214
1982	130	159	180	194
1983	134	154	186	202
1984	121	150*	176*	189*

\*Preliminary.

<sup>1</sup>July/June until 1976, July/May thereafter.

SOURCE: International Wheat Council, Various Reports.

APPENDIX TABLE 4. AREA HARVESTED FROM MAJOR EXPORTERS OF WHEAT, 1960-84

Year	Argentina	Australia	Canada	France	U.S.	World
-----Million Hectares-----						
1960	3.6	5.4	9.9	4.4	21.0	202.2
1961	4.4	5.9	10.2	4.0	20.9	203.4
1962	3.7	6.7	10.9	3.8	17.7	206.9
1963	5.7	6.7	11.2	3.9	18.4	206.3
1964	6.1	7.3	12.0	4.4	20.2	215.9
1965	4.6	7.1	12.2	4.5	20.1	215.5
1966	5.2	8.4	12.0	4.0	20.2	213.7
1967	5.8	9.1	12.2	3.9	23.7	219.3
1968	5.8	10.8	11.9	4.1	22.4	223.9
1969	5.2	9.5	10.1	4.0	19.1	217.8
1970	3.7	6.5	5.1	3.7	17.6	207.0
1971	4.3	7.1	7.9	4.0	19.3	212.9
1972	5.0	7.6	8.6	4.0	19.1	211.0
1973	4.0	8.9	9.6	4.0	21.9	217.2
1974	4.2	8.3	8.9	4.1	26.5	220.1
1975	5.3	8.6	9.5	3.9	28.1	225.4
1976	6.4	9.0	11.3	4.3	28.7	233.2
1977	3.9	10.0	10.1	4.1	27.0	227.1
1978	4.7	10.2	10.6	4.2	22.9	228.9
1979	4.8	11.2	10.5	4.1	25.3	228.3
1980	5.0	11.3	11.1	4.6	28.8	236.8
1981	5.9	11.9	12.4	4.8	32.6	239.3
1982	7.3	11.5	12.6	4.8	31.5	238.5
1983	6.9	12.9	13.7	4.9	24.8	230.1
1984	5.9	12.2	13.2	4.8	27.1	231.5

SOURCE: Foreign Agricultural Circular, Grains: World Grain Situation and Outlook, Various Issues.

APPENDIX TABLE 5. WHEAT YIELD FOR MAJOR WHEAT EXPORTERS AND WORLD AVERAGE

Year	Argentina	Australia	Canada	France	U.S.	World
-----Metric Tonnes Per Hectare-----						
1960	1.16	1.37	1.42	2.5	1.76	1.18
1961	1.29	1.13	1.50	2.4	1.60	1.10
1962	1.52	1.25	1.42	3.1	1.68	1.22
1963	1.58	1.34	1.76	2.7	1.70	1.13
1964	1.84	1.38	1.36	3.2	1.73	1.25
1965	1.32	1.00	1.54	3.3	1.78	1.22
1966	1.20	1.51	1.87	2.8	1.76	1.44
1967	1.26	0.83	1.32	3.6	1.74	1.36
1968	0.98	1.36	1.49	3.7	1.92	1.48
1969	1.35	1.11	1.81	3.6	2.06	1.42
1970	1.33	1.22	1.79	3.5	2.08	1.52
1971	1.32	1.21	1.83	3.9	2.28	1.65
1972	1.39	0.87	1.68	4.6	2.20	1.63
1973	1.66	1.34	1.69	4.5	2.12	1.72
1974	1.41	1.37	1.49	4.6	1.83	1.64
1975	1.63	1.40	1.80	3.9	2.06	1.58
1976	1.71	1.32	2.10	3.8	2.04	1.81
1977	1.46	0.94	1.96	4.2	2.06	1.69
1978	1.73	1.77	2.00	5.0	2.11	1.95
1979	1.69	1.45	1.64	4.8	2.30	1.86
1980	1.55	0.96	1.73	5.2	2.25	1.87
1981	1.40	1.38	2.00	4.8	2.32	1.87
1982	2.05	0.77	2.13	5.2	2.39	2.01
1983	1.79	1.68	1.94	5.3	2.65	2.13
1984	2.24	1.54	1.61	6.9	2.61	2.22

SOURCE: Foreign Agricultural Circular, Grains: World Grain Situation and Outlook, Various Issues.

APPENDIX TABLE 6. ENDING STOCK FOR MAJOR WHEAT EXPORTERS AND WORLD TOTAL

Year	Argentina	Australia	Canada	France	U.S.	World
-----Million Metric Tonnes-----						
1961	0.2	0.8	10.6	1.4	36.0	70.2
1962	0.5	1.0	13.3	2.9	32.5	74.0
1963	2.2	0.9	12.5	1.9	24.5	67.8
1964	3.3	1.0	13.9	1.7	22.2	76.2
1965	0.2	0.8	11.4	2.4	14.6	55.3
1966	0.2	2.5	15.5	1.4	11.6	82.1
1967	1.0	1.7	18.3	1.2	14.7	90.6
1968	0.9	7.6	13.4	1.3	22.2	115.0
1969	0.8	7.5	18.3	0.8	24.1	97.8
1970	0.7	3.7	20.0	1.0	22.4	74.2
1971	0.4	1.6	15.9	1.5	26.8	81.0
1972	0.3	0.6	9.9	1.5	16.2	62.6
1973	1.0	2.0	10.1	1.4	9.3	70.2
1974	0.7	1.7	8.0	3.0	11.8	63.7
1975	0.7	2.7	8.2	1.3	18.1	64.2
1976	1.6	2.1	13.3	1.6	30.3	99.8
1977	1.2	0.8	12.1	1.5	32.1	84.2
1978	1.1	4.6	14.9	2.8	25.1	100.9
1979	0.4	4.3	10.7	2.4	24.5	81.0
1980	0.4	2.0	8.6	2.5	26.9	78.2
1981	0.8	4.9	9.8	1.5	31.5	85.1
1982	1.1	2.4	10.0	2.9	42.2	96.4
1983	0.7	7.4	9.2	1.3	38.1	98.5
1984	0.7	7.9	7.2	4.5	38.2	110.4

SOURCE: Foreign Agricultural Circular, Grains: World Grain Situation and Outlook, Various Issues.

APPENDIX TABLE 7. STOCK/PRODUCTION RATIO OF MAJOR WHEAT EXPORTERS AND WORLD AVERAGE<sup>1</sup>

Year	Argentina	Australia	Canada	France	U.S.	World
-----percent-----						
1960	19	13	117	18	104	34
1961	14	12	138	15	107	31
1962	14	12	86	21	109	29
1963	9	10	63	19	79	29
1964	7	10	85	12	64	28
1965	13	11	64	16	41	21
1966	13	20	69	12	33	27
1967	11	23	114	8	36	30
1968	14	51	76	9	52	35
1969	11	71	101	6	61	32
1970	16	47	222	8	61	24
1971	14	19	110	10	61	23
1972	12	9	68	8	38	18
1973	12	17	62	8	20	19
1974	13	15	56	16	24	18
1975	9	23	48	9	31	18
1976	7	18	56	10	52	24
1977	14	9	61	9	58	22
1978	10	25	71	13	52	23
1979	10	27	62	12	42	19
1980	10	18	45	11	42	18
1981	10	30	40	7	42	19
1982	5	27	37	12	56	20
1983	7	34	35	5	58	20
1984	6	26	34	14	54	21

SOURCE: Foreign Agriculture Circular, Grains: World Grain Situation and Outlook, Various Issues.

<sup>1</sup>Ending stocks divided by production.



APPENDIX TABLE 8. CANADIAN WHEAT EXPORTS TO THE U.S.

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Year	000MT
1970 <sup>1</sup>	0
1971	0
1972	0
1973	77
1974	0
1975	22
1976	35
1977	0
1978	0
1979	0
1980	0
1981	0
1982	115
1983	60
1984 <sup>2</sup>	145 <sup>3</sup>

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<sup>1</sup>Marketing Year, August/July.

<sup>2</sup>Through June 1985.

<sup>3</sup>Including: 7,245 No. 1 CW 13.5 percent protein;  
99,060 No. 1 CW 14.5 percent protein; 12,145 No. 2 CW;  
and 26,255 No. 3 CW.

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