



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

COMPETITIVE BEHAVIOUR IN THE INTERNATIONAL WHEAT MARKET

J. W. Freebairn*

A model of the organization of the international wheat market is presented (a) to explain historical competitive behaviour in the market and (b) as a framework for analysing the likely effects of changes in market conditions on competitive behaviour. In the model the market is segmented into three interdependent sub-markets. The hard wheat sub-market is characterized by a co-operative duopoly model with Canada as the price leader, with the United States as the usually silent partner, and with a fringe of competitors. The soft wheat and durum wheat sub-markets are characterized by oligopoly models based on imperfect collusion between the three main respective sellers, and with a fringe of competitors. It is found that prices (particularly of hard wheats) are more stable and higher than would be prices formed under free market conditions and there is a greater emphasis on the use of non-price competition. The model indicates the importance of domestic agricultural policies in assuring continued stability in the market.

1 INTRODUCTION

This article reports an attempt to formulate a model useful for explaining the dominant features of competitive behaviour in the international wheat market. Its applicability is assessed in relation to the available empirical evidence. More importantly it is hoped that it will be useful for studying the likely effects of changes in market conditions, particularly changes in those structural and behavioural variables which underlie the model. It could be used to determine those market conditions which would be conducive to the successful operation of various types of international grain agreements.

* Economics Research Officer, New South Wales Department of Agriculture, Sydney.

This article reports on an aspect of a research project financed by a grant from the Wheat Industry Research Council. Responsibility for the views expressed is the author's.

The international wheat market is taken to be concerned with the transfer of wheat from the farmers of exporting countries, the sellers, to the millers of importing countries, the buyers. In the literature, two approaches are found in discussions on the organization of this market. First, the market is considered from an institutional and statistical viewpoint.¹ The market is described in terms of trade flows and announced prices. The future is projected using a balance sheet of estimated available supplies and requirements. A second approach attempts to analyse the underlying price mechanism. Mendelsohn argues that to use classical competitive trade theory is inappropriate, rather, "the world price of wheat is directly affected by monopolistic and monopsonistic forces exercised through the International Wheat Agreement."² Helen Farnsworth³ identifies the oligopolistic nature of wheat pricing, but does not explicitly outline a model. McCalla⁴ presents a co-operative duopoly model of wheat pricing for that volume of trade conducted between "free" world countries on commercial terms. It will be contended below that McCalla's model, while directly applicable to much of the wheat trade, is not of general applicability because of the doubtful validity of two of the assumptions on which his model is constructed. These are, firstly, that wheat is a homogeneous commodity and secondly, that only the United States and Canada possess market power. Although all authors indicate the imperfect nature of the market, only passing reference, if any, is made to the use of, and importance of, non-price competitive behaviour.

The model constructed below identifies two sets of variables, structural (section 2) and behavioural (section 3), as the most important determinants of competitive behaviour. The market is segmented into three sub-markets. There is a high degree of seller concentration and in turn seller market power. By comparison buyer concentration is not as high but the price elasticity of demand is low. Market knowledge is high. The other structural variable considered is the extent and form of government direction over the production, consumption and trade of wheat. Prices for commercial sales are explained by a co-operative duopoly model in the case of hard wheats and by oligopoly models based on imperfect collusion in the case of both soft wheats and durum wheats.

¹ Typical of these types of studies are: International Wheat Council, *Review of the World Wheat Situation* (London: I.W.C. annual), and International Wheat Council, *Secretariat Papers 1 to 6* (London: I.W.C.).

² C. Mendelsohn, "Approaches to International Trade Under Non-price Competition," *Journal of Farm Economics*, vol. 39, no. 5 (December, 1957), p. 1724.

³ Helen C. Farnsworth, "International Wheat Agreements and Problems, 1949-56," *Quarterly Journal of Economics*, vol. 66 (May, 1956), pp. 217-248, and Helen C. Farnsworth, *Determinants of French Grain Production, Past and Prospective* (Stanford: Food Research Institute Studies, vol. 4, 1964).

⁴ Alex F. McCalla, "A Duopoly Model of World Wheat Pricing," *Journal of Farm Economics*, vol. 48, no. 3 (August, 1966), pp. 711-27.

Wheat sales at "concessional" rates are an important sector of world trade. Considerable seller emphasis is given to product development and to promotion.

In section 4 the model is used to assess the implications for competitive behaviour of some likely changes in market conditions.

2 STRUCTURE OF THE MARKET

2.1 SEGMENTATION OF THE MARKET

There is not a single market for a homogeneous commodity "wheat", but a number of sub-markets and infra-structures for the different types of wheat, where wheat is typed according to its end-use suitability. These sub-markets are not separate but are interrelated because processors can make limited substitution of one type of wheat for another. The rates of substitution vary with the types and qualities of cereal commodities to be processed, with the types of wheat, with the level of milling and baking technology, and with the time period being considered.⁵ While distinctions between the different types of wheat are important to most buyers they are largely meaningless to some buyers, such as manufacturers of chapattis.

Ideally, we desire to form sub-markets containing units of wheat whose intra-sub-market cross elasticities of demand are high and whose inter-sub-market cross elasticities are low. The International Wheat Council identifies four classes of wheat according to the end use suitability of the wheat, viz., strong wheats, medium hard wheats, soft wheats and durum wheats.⁶ For our purposes we adopt a classification requiring three sub-markets:

- (a) a hard wheat sub-market;
- (b) a soft wheat sub-market; and
- (c) a durum wheat sub-market.

Hard wheats, which are here taken to include the International Wheat Council's strong and medium hard wheats, are used predominantly for making high quality bread. At the higher protein levels soft wheats are used for breadmaking, usually in grists with hard wheats, and at the lower protein levels they are used for cakes, noodles, pastries, biscuits, etc. Durum wheats are used almost exclusively for making pasta products.

It must be remembered that this split-up of sub-markets is broad and that the collection of data pertaining to each must of necessity involve some arbitrary adjustments and approximations.

⁵ For a discussion of these rates of substitution see: J. W. Freebairn, *Marketing New South Wales Wheat: Segregated or F.A.Q.* (Unpublished M.Ag.Ec. thesis. Faculty of Agricultural Economics, University of New England, 1968), chapter 6.

⁶ International Wheat Council, *International Wheat Prices* (Secretariat Paper 1. London, 1961), p. 18.

22. INSTITUTIONAL INFLUENCES

The production, consumption and trade of wheat is subject to institutional controls and directives to such an extent that Wheeler was able to conclude that "virtually 100 per cent of the world's trade in wheat is handled through government monopolies or made possible by governmental subventions of one kind or another."⁷ In other words government intervention in the wheat economy is an essential feature of national agricultural policies. Objectives of these policies include price and income stabilization, maintenance of trade balances, and welfare legislation to ensure employment and a "fair" return to producers.

In exporting countries authorities with monopolistic powers have been instituted to administer producer prices, to hold stocks, and to market the country's wheat on behalf of its farmers. The Canadian Wheat Board is a government sales monopoly, the Australian Wheat Board has statutory powers as the sole seller of Australia's wheat, the Argentinian Grain Board and the French Grain Board (O.I.N.C.) are government controlled, and the United States Department of Agriculture by determination of the loan rate and the export subsidy largely determines trade flows from that country. In short, the monopoly control of each country's wheat sales means that the selling structure is not one of individual farmers competing against each other, but rather of individual national economies operating as economic units.

In many wheat importing countries imports of wheat are entirely in the hands of governments or of government appointed agencies. In other countries the grain trade is in private hands, although most governments maintain close supervision with regard to the amount and sources of wheat imports, exercising control through import permits, import levies, currency control and so on.

To allow attainment of the objectives of their domestic agricultural policies both exporting and importing countries have found it necessary to protect domestic wheat producers against overseas competition by import guides and restrictions. The outcome of these restrictions is the separation of the world wheat economy into autonomous domestic markets sheltered against outside influences and an international wheat market in which export countries compete to supply import countries with their residual requirements.

2.3 SELLER CHARACTERISTICS

Except for Canada, producers' returns in most countries are only partially related to the price at which wheat is sold on the international market.⁸ In fact, in some countries, of which France and the U.S.S.R. are the most

⁷ L. A. Wheeler, "The New Agricultural Protectionism and Its Effects on Trade Policy," *Journal of Farm Economics*, vol. 42, no. 4 (November, 1960), p. 804.

⁸ Data on export prices and the return to producers, with a brief resume of the institutional arrangements for the different countries is given in: International Wheat Council, *World Wheat Statistics* (London: I.W.C., 1967).

important examples, returns to producers bear no relationship to world prices. In the United States additional constraints are placed on wheat production by means of acreage allotments. In general it may be said that domestic agricultural policy considerations are the most important variables determining the levels of wheat production.

TABLE I

Wheat Exports by Sub-markets and Sellers

Type of wheat and seller	Average 1960-61 to 1962-63		Average 1963-64 to 1965-66	
	Quantity	per cent	Quantity	per cent
	million tons		million tons	
<i>Hard:</i>				
U.S.A.*	10.6	41.7	14.5	44.2
Canada	7.8	30.7	12.2	37.2
Argentina	1.8	7.1	4.5	13.7
U.S.S.R.	5.2	20.5	1.6	4.9
Total	25.4	100.0	32.8	100.0
<i>Soft:</i>				
Australia†	5.4	30.0	6.7	30.9
U.S.A.‡	4.7	26.1	4.8	22.1
France	2.1	11.7	4.0	18.4
Other§	5.8	32.2	6.2	28.6
Total	18.0	100.0	21.7	100.0
<i>Durum:</i>				
U.S.A.	0.2	16.7	0.6	28.6
Canada	0.6	50.0	0.8	38.1
Argentina	0.3	25.0	0.5	23.8
Others	0.1	8.3	0.2	9.5
Total	1.2	100.0	2.1	100.0
Total Exports	44.6	..	56.6	..

* Hard Red Spring and Hard Winter.

† Includes small quantities of hard.

‡ Red Winter, White and Mixed.

§ A residual quantity.

Source: Compiled from International Wheat Council, *World Wheat Statistics* (London: I.W.C., 1960 to date).

The objectives of world wheat marketing authorities with respect to export sales are not specified other than simply to facilitate the orderly

marketing of their country's residual wheat supplies. There is no conclusive evidence with which to determine whether orderly marketing should aim to maximize profits, sales or revenue, or whether it should aim to maintain stable prices, or to achieve some other objective. Many of these objectives may not be in conflict. Because the selling authorities do not control the levels of production, because they do not have knowledge of the price elasticity of demand for their wheat, because they operate at cost with no profit incentive, and because of the high costs of storage we will contend below that they aim to sell their annual surpluses subject to some constraints, including those of a minimum price.

In the aggregate the wheat selling market is highly concentrated with Canada and the United States supplying 60 per cent of all export sales. These two countries together with Australia, Argentina and France collectively supply over 85 per cent of the wheat trade's requirements.

Looking at table 1 we find even greater levels of concentration in the sub-markets. Canada and the United States provide about 80 per cent of hard wheat exports with Argentina and the U.S.S.R. providing the rest. Three countries account for 70 per cent of soft wheat sales. Three countries supply over 90 per cent of durum wheat exports. Note also that the relative importance of any seller varies between sub-markets.

Because of the institutional factors noted above the various selling authorities are unable to control directly the quantity of wheat which they have available for sale, but they are able to exercise control over the quantity of wheat they actually put on the market by adding to and withdrawing from stocks. Thus, to exercise market power⁹ in these circumstances, sellers, in addition to being important suppliers, also require sufficient storage capacity and stocks to be able effectively to control the quantity of wheat they place on the market. For example, in some years Canada and the United States have carried over sufficient stocks to cover their exports three times, and on occasion Argentina, Australia and France have held stocks sufficient to cover from half to a full year's exports. No data are available on the storage capacity of the U.S.S.R.

In summary, while the United States and Canada are best placed to exercise market power, it is certain that Australia, France, Argentina and possibly the U.S.S.R. can exercise considerable market power in their various sub-markets by reason both of their relative importance and of their storage facilities.

2.4 BUYER CHARACTERISTICS

Ten countries take about 60 per cent of the market's purchases (five of these accounting for about 40 per cent) and the remainder is bought by more than 50 importing countries. The imports of several of the

⁹ Market power is considered as the ability and the willingness of an economic unit to influence price.

larger buyers are to a great extent dependent upon the generosity of exporting countries, for example, P.L. 480 imports into India, Brazil and United Arab Republic. These buyers are unable to exercise market power. On the other hand some importing countries, including the United Kingdom, Japan, West Germany and Mainland China, who buy a significant portion of the market's commercial imports, may possess significant market power. Smaller buyers are price takers.

An important structural characteristic of the buying side of the market is the very low price elasticity of demand for wheat for food consumption. This *a priori* presumption has been verified by empirical studies.¹⁰

While the demand for particular classes of wheat would be relatively more price elastic than for wheat in the aggregate, (the more so the longer the time period considered), it is not known whether or not the elasticity of demand for any particular class would be greater than unity. To the author's knowledge no empirical study yet published has estimated the demand functions for particular classes of wheat.¹¹

2.5 LEVEL OF MARKET KNOWLEDGE

Apart from two qualifications mentioned below there is a high level of market knowledge. Several responsible organizations freely circulate comprehensive market reports.¹² In addition to trading statistics these reports include assessments of changes in market conditions, and supply and demand projections. Sales and price quotations are regularly referred to in daily and weekly publications.

The first qualification concerns the failure of reports to disclose the actual prices at which transactions are made; only price quotations are provided. Although the relationship between transaction prices and price quotations is not known, it is unlikely that large differences would exist. The second qualification concerns wheat's heterogeneous quality. Without conducting a series of comprehensive laboratory tests market knowledge of the quality of different sellers' wheat is less than perfect.

¹⁵ See for example: K. W. Meinken, *The Demand and Price Structure for Wheat* (U.S. Department of Agriculture Technical Bulletin No. 1136), 1965.

¹⁰ The *American Journal of Agricultural Economics*, vol. 50, no. 2 (May, 1968), p. 481 reports that a thesis has recently been completed on this topic, viz., Jo Chun Chai, "An Economic Analysis of the Demand and Price Structure of Wheat for Food by Classes in the United States" (Ph.D. dissertation University of Minnesota, 1967).

¹² For example: International Wheat Council, *Review of the World Wheat Situation*, (London: I.W.C., Annual); F.A.O., *World Grain Trade Statistics*, (Rome: F.A.O., Annual); U.S. Department of Agriculture, Economic Research Service, *Wheat Situation* (Washington: U.S.D.A., Five-times-a-year); Bureau of Agricultural Economics, *The Wheat Situation*, (Canberra: B.A.E., half-yearly).

3 BEHAVIOURAL VARIABLES

3.1 PRICE POLICIES

First we will consider price policies applying to that volume of wheat traded on commercial terms, i.e., for convertible hard currency with credit terms of less than 5 years. Initially price policies in each sub-market will be considered on the assumption that each sub-market is independent of the other two. Later on, the interdependence of the sub-markets will be taken into consideration.

McCalla's co-operative duopoly model provides an explanation of price determination in the hard wheat sub-market.¹³ Briefly, the burden of McCalla's model is that within an area of co-operation delineated by certain price and quantity constraints the United States, for reasons related to her domestic agricultural policies and her foreign policies, chooses to follow Canadian price leadership. The Canadian Wheat Board establishes its export price within a range determined at the minimum by the initial payment price to Canadian farmers—currently 150 cents (Canadian) per bushel—and at the maximum by a price which just precludes United States stocks from becoming price competitive with Canadian wheat. Prior to July, 1964, this upper price was simply the United States loan rate of 200 cents (U.S.) per bushel. Under more recent United States wheat programmes this upper price constraint is somewhat obscure because the support price is based on a lower loan rate—currently 125 cents (U.S.) per bushel—supported by a certificate programme. The value of the certificate which is determined annually by the United States Government is not known *ex ante*. Co-operation between the two sellers depends on both Canada and the United States being able to sell at least a minimum quantity of wheat. McCalla indicates this minimum quantity for Canada as being 275 million bushels per year. He could not establish an explicit minimum quantity for the United States.

Argentina and the U.S.S.R. set their prices so as to enable them to dispose of their annual surpluses subject to the restrictions of a minimum price constraint, the level of which is closely related to domestic policy considerations. McCalla's co-operative duopoly model offers a valid explanation of pricing within the hard wheat sub-market as long as Canada and the United States are able and willing to operate within the confines of the price and quantity constraints which define the area of co-operation. Should any of these constraints be significantly broken a phase of price warfare would likely follow.

Looking at the monthly price quotations for hard wheats for the period 1954 to 1966 the stability of Canadian and United States hard wheat

¹³ McCalla, *op. cit.*

prices is apparent.¹⁴ In respect of Canadian Manitoba No. 2 and United States Hard Winter No. 2 coefficients of variation for both of the price series were estimated as 4.1 per cent. Large price adjustments are infrequent; when they occur they are abrupt. Both prices move in sympathy with each other. Most variations in market conditions are absorbed by changes in the volume of stocks held, rather than by price fluctuations. Within a narrow range prices exhibit continual minor variations indicating that marginal price competition for individual sales may be important. By contrast, as McCalla's model would predict, prices of Argentinian and Russian wheats are relatively more variable.

Oligopoly models incorporating imperfect collusion are useful in analysing pricing behaviour of the three principal sellers in both the soft wheat and the durum wheat sub-markets. The relative importance of the principal sellers necessitates that they take into account each other's behaviour. The other relatively smaller sellers set their prices so as to dispose of their supplies.

Partly as a reflection of institutional influence in the market, concepts of morality in trade such as a "fair" price and a "fair" share of the market underlie the informal collusion between the oligopolists. In addition to these concepts a broad interpretation of the "kinked" demand curve hypothesis explains the high level of observed price stability. In general the validity of the "kinked" demand curve in our model requires sellers to be holding a significant volume of stocks. This requirement may be explained with two examples. First, only when stocks fall to a "normal"¹⁵ level does a general rise in prices that can be maintained become feasible. Second, the expectation that other sellers would follow a substantial price cut by one seller is likely to be greater if the sellers are holding burdensome stocks than if they are not. The more inelastic the demand the greater resistance we would expect to find to a general price cut because of the smaller gains, if any, to be had from such action. In an earlier section we suggested that the demand for both soft wheat and durum wheat is inelastic.

There is evidence that sellers tolerate considerable price competition within a narrow band of prices. This is perhaps a natural and expected outcome of the informal nature of collusion in these sub-markets. The range of the price constraints in which price manipulation may be used without disrupting the market are difficult to estimate. In addition to the institutional considerations the relative position of available supplies and effective demand is important, particularly as the latter affects those market conditions which are compatible with a "kinked" demand curve model. In general the smaller the level of stocks the closer the market approaches a free moving price model.

¹⁴ The price observations are graphed and discussed in: International Wheat Council, *World Wheat Prices, op. cit.*, pp. 16-18. Prices are shown c.i.f. London. London prices were found to be representative of prices at other European ports.

¹⁵ The International Wheat Council considers "normal" stocks as those quantities necessary for maintaining continuity of supplies and for protection against short crops and national emergencies.

In summary, prices of the principal sellers' wheats in both the soft wheat and durum wheat oligopoly sub-markets are established at levels which, to a large extent, reflect institutional considerations of a "fair" price. Stability of prices within a narrow range about these levels is maintained by (a) the forces associated with a "kinked" demand curve for each seller's wheat, particularly for those market conditions in which sellers are holding above normal stocks, in conjunction with (b) the price inelasticity of demand for these wheats. The position and extent of the "kink" are somewhat variable according to the level and distribution of stocks. Smaller sellers price so as to dispose of their supplies.

To the extent to which the different sub-markets are interdependent, price policies for the different types of wheat are formed with some consideration of prices ruling in other sub-markets. The effect of this interdependence for price policies may be considered in terms of an oligopoly model similar to that discussed above, but with sub-markets rather than sellers being the economic units. The importance of such interdependence, particularly over the longer run, may be gained from observations of the different price series. They show that while prices of the different types of wheat may move in divergent directions in any particular month they exhibit a fairly consistent pattern over time.

An increasingly important feature of world trade is the sale of wheat for "concessional" (non-commercial) terms, i.e., at price levels substantially below commercial transaction prices.¹⁶ Of these the most important are sales of United States wheat under P.L. 480 to a small number of underdeveloped countries in exchange for local currencies. They represent some 60 to 70 per cent of United States exports and about 20 per cent of all wheat sales. As such they depend on institutional intervention in the market. To the extent that these sales are largely trade creation rather than trade diversion (the relative importance of each is still in doubt) they may be considered as sales to a separate independent market¹⁷. Thus their effect on competitive behaviour in the commercial sector of the market rests largely with the quantity of stocks they divert from the commercial market.

¹⁶ See Helen C. Farnsworth and Karen J. Friedman, *French and EEC Grain Policies and Their Price Effects, 1920-1970* (Stanford: Food Research Institute Studies, vol. 7, no. 1), 1967, p. 77. These writers consider that the price of such sales may be about half the going commercial price.

¹⁷ A collection of journal articles discussing the effects of P.L. 480 sales may be found in: Robert L. Tontz ed., *Foreign Agricultural Trade: Selected Readings* (Ames: Iowa State University Press, 1966), Part II. Following the virtual elimination of barter transactions in P.L. 480 sales since the late 1950's and because of the responsible attitude taken by the U.S. Government in respect of these sales it is generally contended that P.L. 480 sales do not greatly depress the level of commercial wheat exports.

3.2 NON-PRICE COMPETITION

The most apparent expression of product policy is seen in the various grading schemes used by sellers. The aim of these schemes is, firstly, to adapt the wheat more sensitively to buyers' requirements and, secondly, to differentiate one's wheat from that of other sellers and in so doing to obtain higher returns. Less obvious forms of product improvement include the breeding of new varieties with better quality characteristics, better storage, handling and harvest facilities and research into a better understanding of the industry, its capacities and requirements.

The basis of sales promotion activities is personal contact between sellers and the processors of wheat and their buying agencies. More specifically it takes the form of missions abroad to existing and potential buyers, receiving overseas missions and enquiries, distribution of brochures containing information about the seller's wheat, and technical and market research activities¹⁸.

In those countries in which the consumption of wheat is a relatively new development and where milling and baking technology is at a low level, as in much of Asia and Africa, sellers promote their wheat by providing processing equipment and technical know-how, usually in a form which encourages utilization of the promoter's wheat.

No specific data could be found to indicate the levels of expenditure which are channelled into product improvement and promotion. A rough approximation for Australia suggests that it may be no greater than a half of one per cent of gross receipts¹⁹. Even so a perusal of some annual reports of the different marketing authorities indicates the growing importance of product improvement and promotion in sellers' marketing strategies. Such emphasis on non-price competitive strategies is to be expected when the scope for price manipulation is limited by the constraints of the price models.

The important role which non-price competitive activities can take is highlighted by Australia's experience in recent years. She has managed to sell the greater part of her increased export surplus by improving its presentation and by promoting it, rather than by resorting to price cuts which could have disrupted the market.

¹⁸ See for example: W. Riddell, *The Canadian Wheat Board, Why and How It Works* (Canadian Wheat Board Pamphlet); Australian Wheat Board, *Annual Report, 1964-65*; and C. F. Wehrwein, "Government Grain Programmes of Canada, Australia and the United Kingdom," *Journal of Farm Economics*, vol. 47, no. 4 (November, 1965), pp. 993-1008.

¹⁹ In 1964-65 Australia spent approximately £0.7 million on research into wheat as such, and the Australian Wheat Board's administrative costs totalled £0.7 million. A considerable portion of the latter sum would have been incurred as promotion. In that year gross receipts from wheat sales were £219 million.

3.3 CO-ORDINATION OF SELLERS' MARKETING STRATEGIES

Although there is no binding mechanism or authority by which the policies of sellers are co-ordinated, numerous channels of communication are used to facilitate the functioning of imperfect collusion as depicted in the above models. There is ample evidence that Canada and the United States exchange goals and ideas and forewarn each other of forthcoming policy changes through consultations at both the ministerial and administrative levels²⁰. No evidence of similar direct and formal bilateral consultation could be found in reference to the other sellers. However, it is certain that less formal channels, including trade commissioners and attaches enable the sellers to exchange information about changing attitudes and policies. In all cases the sellers retain full autonomy.

The International Wheat Agreement (IWA) is the most important voluntary co-ordinating authority in the market. It is a long-term multilateral commodity contract re-negotiated by governments of member countries every three years specifying the basic maximum and minimum prices at which "guaranteed quantities" of wheat will be offered by designated exporting countries and purchased by designated importing countries²¹. Under the 1962 IWA less than 50 per cent of the world trade could have been subjected to the "guaranteed quantities", and even then the IWA provides escape clauses. Moreover, the price range is wide. In recent years the IWA has not regulated prices, but it has undoubtedly influenced them, particularly the concept of a "fair" price, by providing a reference base for pricing operations of sellers. It has fostered co-operation in the market, it has provided much needed market information, and by providing a framework for consultations it has helped discourage the implementation of policies liable to disturb the market sufficiently to induce price warfare.

4 SOME IMPLICATIONS OF THE MODEL

In many respects our model of the organization of the international wheat market explains the dominant features of competitive behaviour in the international wheat market over the past decade. The model identifies two sets of variables, structural and behavioural, as the principal determinants of competitive behaviour. The structural variables of market segmentation, seller and buyer characteristics and market knowledge are mainly related to sellers' and to buyers' market power. To a significant extent the market power of sellers is dictated by domestic agricultural policies. In the duopoly hard wheat sub-market the behavioural variables are the price and quantity constraints and the United States policy of price followship. In the oligopoly structured

²⁰ See for example: Riddel, *op. cit.*, p. 10; and McCalla, *op. cit.*, p. 722.

²¹ International Wheat Council, *International Wheat Agreement* (London: I.W.C., 1949, 1953, 1956, 1959 and 1962). Since July, 1968, the IWA has been renamed the World Grains Agreement.

soft wheat and durum wheat sub-markets the important behavioural variables are the concepts of a "fair" price and the "kinked" demand curve. These behavioural variables have delineated areas of collusion within which it is informally agreed to avoid price warfare.

As a result prices have been relatively more stable, and there has been more emphasis on non-price competition, than would have been evident under a market organization allowing free price movement. Also, it seems likely that prices have been maintained at higher levels, particularly those of hard wheats for which there have been, and still are, surplus stocks²². Because of the low price elasticity of demand a price war would have limited success, even over an extended period of time, in dissipating stocks, unless prices dropped so far that wheat became price competitive with the feed grains²³.

In short, the model indicates that any change in either the structural or behavioural variables underlying the model sufficient to disrupt the present pattern of competitive behaviour would initially usher in a phase of more variable and declining world wheat prices.

However, because of the high level of concentration of market power on the selling side of the market such a phase of price warfare is unlikely to continue for an extended period. Rather, a form of market organization involving relatively stable prices would be expected to evolve. To a very large degree domestic agricultural policies would be vital determinants of the final price levels.

An important behavioural question concerns the role of the IWA and other proposed international agreements. Since inward-looking domestic agricultural policies dominate the production, consumption and trade of wheat it may be argued that any international agreement will continue to exist only so long as it is consistent with the internal policy goals of the participant governments.

In summary, our model indicates that competitive behaviour in the international wheat market is to a large extent subject to the constraints imposed by domestic agricultural policies. Because of the inward-looking nature of these policies the market is inherently unstable. The continuance of relative price stability and the present approximate balance of supplies and import requirements depends on governments'

²² At the end of 1961 carryover stocks of hard wheat were more than twice the annual level of exports, while those of soft wheat were equal to about a half a year's annual exports (global quantities). By the end of 1965 hard wheat stocks had fallen to about a year's annual exports and those of soft wheat to about three months' exports.

²³ An implicit assumption underlying this line of reasoning is that domestic agricultural policies influencing the level of production would not be altered by a change in competitive behaviour. Such an assumption is probably unrealistic. An analysis of U.S. agricultural policies in recent years, for example, indicates that the size of wheat acreage allotments are partly dependent upon international wheat market conditions.

taking a responsible attitude in their domestic agricultural policies if extended periods of price warfare are to be avoided. International agreements, if only because they provide a medium for consultation and discussion among member countries, perform a useful function in this regard. In this respect the World Grains Agreement, negotiated at the Kennedy Round and put into effect in July, 1968, represents a major advance over past IWAs²⁴.

²⁴ Irwin R. Hedges, "Kennedy Round Agricultural Negotiations and the World Grains Agreement," *Journal of Farm Economics*, vol. 49, no. 5 (December, 1967), pp. 1332-41.