



**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.**

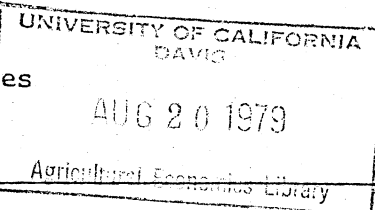
**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto: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.*

Division of Agricultural Sciences  
UNIVERSITY OF CALIFORNIA



WHEAT CARTELIZATION IN THE PRESENCE  
OF A MARKET INTERMEDIARY

Colin Carter  
Nancy Gallini

*Paper presented at CAECI meetings,  
Pullman, July 79 - Aug. 1, 1979.*

California Agricultural Experiment Station  
Giannini Foundation of Agricultural Economics  
March 1979

1979

WHEAT-- MARKETING

Carter, Colin, and Gallini, Nancy—Wheat Cartelization in the Presence of a Market Intermediary

This paper examines a von Stackelberg behavior of an intermediary firm in the wheat market. It demonstrates that the intermediary acting as a leader in the market will oppose the formation of a wheat cartel. Although the marketing charge does not change with the introduction of the cartel, volume traded decreases thus decreasing total revenue to the intermediary firm.

---

Colin Carter is a postgraduate research agricultural economist at the University of California, Berkeley.

Nancy Gallini is a postgraduate research agricultural economist at the University of California, Berkeley.

WHEAT CARTELIZATION IN THE PRESENCE  
OF A MARKET INTERMEDIARY

by

Colin Carter and Nancy Gallini

Colin Carter and Nancy Gallini are postgraduate  
research agricultural economists at the  
University of California, Berkeley

## WHEAT CARTELIZATION IN THE PRESENCE OF A MARKET INTERMEDIARY\*

### Introduction

The structure and performance of the world wheat market has received a reasonable amount of attention in the literature recently. Discussion has focused on the three major market participants—namely, the exporters, importers, and "middlemen." Unfortunately, there is no general agreement on the magnitude of power which each participant has in the market.

On one extreme, McCalla (1966); Taplin; and Alaouze, Watson, and Sturgess argue that international wheat prices are determined by the major exporters with Canada acting as a price leader. Conversely, Carter and Schmitz maintain that the market is usually dominated by the major importers and that they are perhaps imposing an optimal import tax on wheat. Recently, McCalla (1979) has suggested that the multinational grain firms play an important role in information exchange and price discovery in the international market. This proposition seems reasonable as the large multinational grain exporting firms certainly have the potential to exert a significant degree of manipulative power in the wheat market since the industry is dominated by five companies that control approximately 90% of the U. S. grain exports and 70% of the world grain exports. Their advance knowledge of export sales and their control of the handling of the majority of the world's grain presumably give these few firms an advantageous position over other market participants. The welfare implications of the presence of such large international trading companies

---

\*Giannini Foundation Paper No.

have been discussed by Just, Schmitz, and Zilberman, and they suggest appropriate governmental actions for achieving maximum social welfare, given the multinational trading firms exist.

The debate on the structure of the international wheat market is very important in light of recent discussions that have been and are being carried on in Canada and the United States on the feasibility of the formation of a wheat cartel. The success of any cartel is undeniably a function of the original structure of the market with the wheat market being no exception. It is, therefore, important for policymakers to recognize the complexity of the structure of the wheat market before the formation of a cartel is advocated.

The welfare effects of a government wheat cartel on the producers and consumers of the member countries have been determined by Carter, Gallini, and Schmitz. Relative to a free-trade structure, it has been shown both theoretically and empirically that producers may actually lose from a government cartel. This may seem counterintuitive, but it can be demonstrated that, unless domestic consumers are taxed, this result holds under certain market conditions. However, consumers in the exporting countries would stand to gain from the cartel formation.

In this paper the discussions on the wheat market are extended to consider the implications of a wheat cartel on market intermediaries. A Stackelberg leader-follower model is used as the framework of analysis where the intermediary firms are represented by a single middleman.

#### The Model

Consider a good produced in perfectly competitive markets in countries A and B. Trade takes place between the countries where A is the net exporter and B is the net importer. A single intermediary firm (middleman) has control of

the international market channel and buys the good from A and sells it to B. Furthermore, trade cannot take place without the services of this firm. The middleman's marketing costs are zero and thus can profit from its position by adding a marketing margin onto the price of the product before selling it in country B.

The middleman's objective is to choose  $\tau$ , the marketing margin, to maximize total revenue.

The behavioral assumption in this market is that the middleman behaves as a von Stackelberg leader, taking into account the response of the two countries to his choice of  $\tau$ , the marketing margin. That is, the middleman chooses  $\tau$  to maximize total revenue, incorporating the information of the reaction of country A and B to any level of  $\tau$  he chooses. It is assumed that the reaction function of the countries is constant such that the equilibrium marketing margin ( $\tau$ ), export price ( $P_X$ ), import price ( $P_M$ ), and amount traded ( $q^*$ ) are determined in a Stackelberg leader-follower model.

The reaction function represents the quantity which will be traded in a competitive market for a given excess demand  $f(q)$  and excess supply  $c(q)$  plus  $\tau$ , the marketing margin. Therefore, the reaction function determined by equating price with total marginal costs is

$$(1) \quad f(q) = c(q) + \tau.$$

Let  $q(\tau)$  be the solution to (1). The middleman incorporates this information in choosing  $\tau$  to maximize his profits:

$$(2) \quad \pi = \tau q(\tau).$$

First-order conditions are:

$$(3) \quad \tau q' + q = 0.$$

It can be shown that the solution implied by (3) is identical to the middleman solution arrived at by Just, Schmitz, and Zilberman. They demonstrate the middleman extracts surplus from both the buying and selling agents in the market by equating the marginal outlay of the supply curve to the marginal revenue. To see the equivalence of their solution to (3), equilibrium condition (1) is differentiated to yield

$$(4) \quad q' = \frac{1}{f' - c'}.$$

Thus, substitution of (4) and (1) into (3) gives

$$(5) \quad f + f'q = c + c'q.$$

For the case of linear excess demand and supply curves given, respectively, by

$$(6) \quad P = \alpha - \beta q$$

$$(7) \quad P = \gamma + \delta q + \tau,$$

the reaction function of countries A and B to the marketing margin is

$$(8) \quad q = \frac{\alpha - \gamma - \tau}{\delta + \beta}$$

and the revenue-maximizing  $\tau^*$  follows:

$$(9) \quad \tau^* = \frac{\alpha - \gamma}{2}.$$

The Stackelberg equilibrium solution is illustrated in figure 1. The excess demand of country B is given by  $\alpha D$ , the excess supply of country A by  $\gamma S$ . The reaction function (or demand curve for the marketing firm's services)



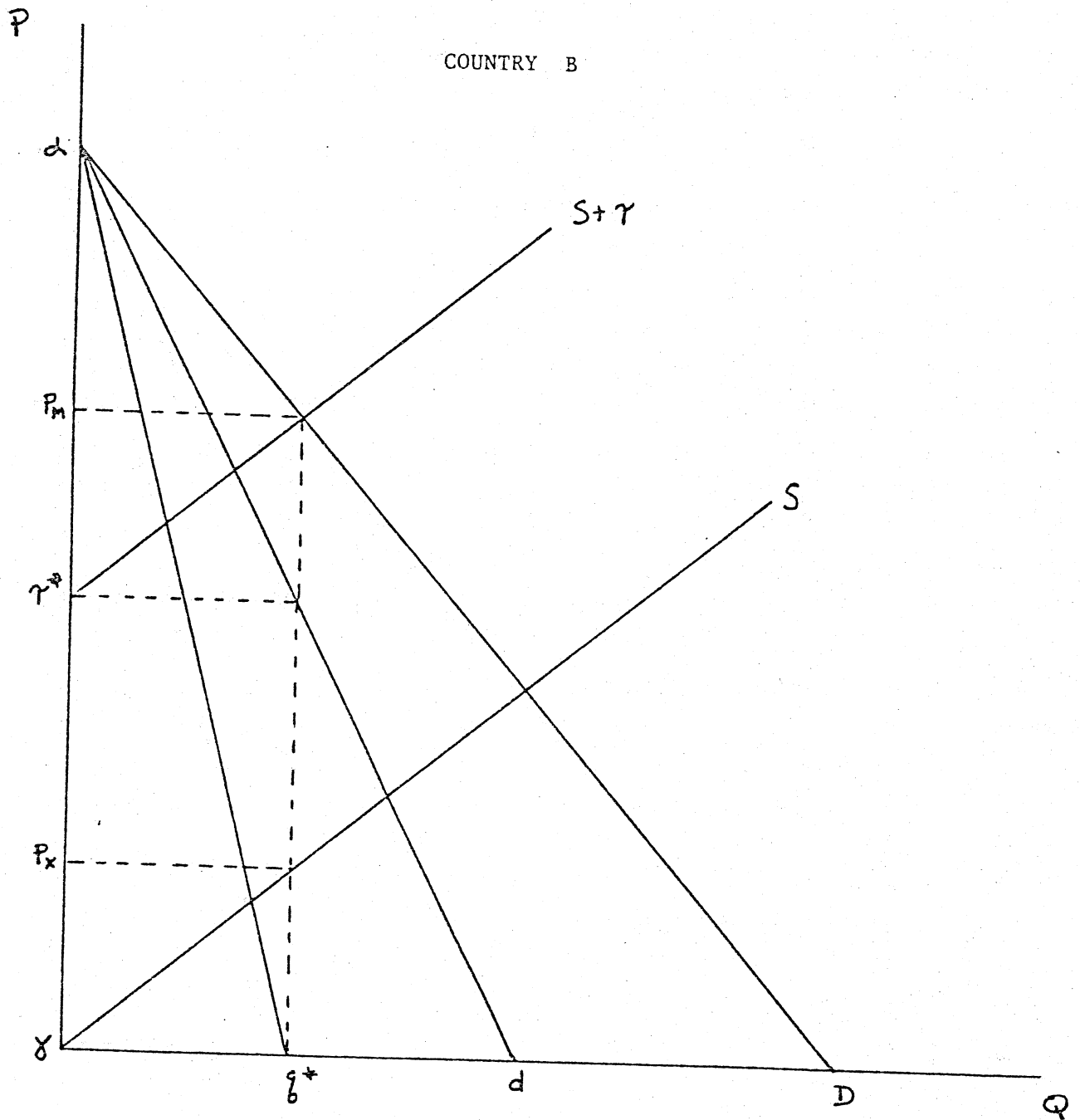


Figure 1. Stackelberg Equilibrium Solution

is  $\alpha d$ . The revenue maximizing solution is  $\tau^*$ , or the value for which the marginal revenue ( $mr$ ) of the middleman's reaction function is zero.  $P_m$  and  $P_x$  represent the output and export prices, respectively.

#### Cartel Formation in the Presence of a Middleman

Suppose that the exporting government decides to form a cartel. In determining the socially optimal export tax, the government desires to maximize consumer surplus plus producer surplus in the domestic market, plus the export tax in the international market, and less production and marketing costs. This restriction of trade is desirable to country A alone since it faces a downward sloping excess demand curve in country B. However, trade restriction is not optimal when the welfare of both country A and B is considered.

Let

$$U(q_D) = \int_0^{q_D} p dq$$

be consumer surplus evaluated at the domestic demand quantity,  $P(q_{ED})$  be the excess demand curve of the importers, and  $C(q_S)$  be the marginal cost of producing  $q_S$ . Then the government cartel's objective is to choose  $q_D$  and  $q_S$  to maximize

$$(10) \quad V = U(q_D) + P(q_{ED}) q_{ED} - C(q_S) - \tau \cdot q_{ED}$$

subject to  $q_S = q_{ED} + q_D$ .

The first-order conditions are

$$(11) \quad MR_{ED} = C' + \tau$$

$$(12) \quad P_D = MR_{ED} - \tau.$$

That is, the marginal revenue of the excess demand,  $MR_{ED}$ , is equated to the excess supply price plus the marketing margin, and the domestic price is the marginal revenue less the marketing margin. If the linear demand specifications are employed, the reaction function is found to be

$$(13) \quad q = \frac{\alpha - \gamma - \tau}{\delta + 2\beta}.$$

Thus, for every level of the marketing margin, the export quantity  $q_{ED}$  is lower than in the absence of a cartel. For (8) and (13), it can be seen that the formation of the cartel has produced an isoelastic shift in the reaction function facing the marketing firm. Since the price elasticity of demand remains the same at every price, the elasticity at  $\tau^*$  equal one (thus,  $mr = 0$ ), and the solution for the revenue-maximizing marketing margin is insensitive to the formation of the new market structure. Since the export quantity of excess demand  $q_{ED}$  has fallen, the middleman losses from the cartel formation.

#### Conclusion

Employing a Stackelberg equilibrium model, this paper demonstrates that market intermediaries will likely oppose the formation of a wheat cartel. Under the assumptions of linearity and using a partial equilibrium analysis, it is found that the intermediary is better off under free trade relative to a cartel structure. Because of the decrease in the volume of wheat traded in the latter regime, the middleman's total revenue declines since the marketing margin ( $\tau$ ) is constant. Even though this discussion has been applied to the specific case of the wheat market, it also has application to other international markets that are blessed with the presence of a middleman.

This analysis should be extended in further research. One possibility is the investigation of marketing strategies an intermediary may follow to try to

prevent the cartel from forming. However, this behavior will result in a Stackelberg disequilibrium since both actors are to be market leaders. Another might consider joint profit maximization possibilities for the intermediaries and other major market participants.

## References

- Alaouze, C. M., A. S. Watson, and N. H. Sturgess. "Oligopoly Pricing in the World Wheat Market." Amer. J. Agr. Econ. 60 (1978):173-185.
- Carter, C., and A. Schmitz. "Import Tariffs and Price Formation in the World Wheat Market." Amer. J. Agr. Econ., in press (August, 1979).
- Carter, C., N. Gallini, and A. Schmitz. "Producer-Consumer Trade-Offs in Export Cartels." Mimeographed. Berkeley: University of California, October, 1978.
- Just, R. E., A. Schmitz, and D. Zilberman. "Price Controls and Optimal Export Policies Under Alternative Market Structures." Amer. Econ. Rev., in press.
- McCalla, A. F. "A Duopoly Model of World Wheat Pricing." J. Farm Econ. 48 (1966):711-727.
- \_\_\_\_\_. "Strategies in International Agricultural Marketing: Public versus Private Sector," eds. Jimmie Hillman and Andrew Schmitz. International Trade in Agriculture: Theory and Practice. Boulder, Colorado: Westview Press, forthcoming.
- Taplin, J. H. "Demand in the World Wheat Market and the Export Policies of the United States, Canada and Australia." Ph.D. thesis, Cornell University, 1969.