



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.*

NEW METHODOLOGIES FOR COMMODITY PROMOTION ECONOMICS

PROCEEDINGS FROM THE NEC-63 CONFERENCE

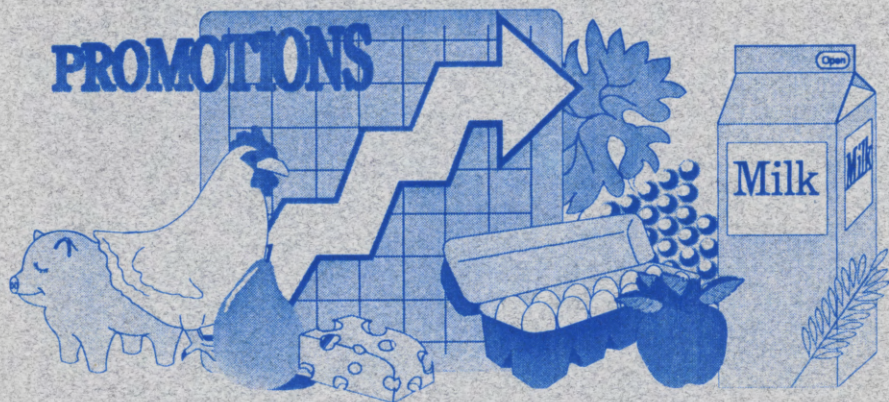
Red Lion Inn ❖ Sacramento, California ❖ October 5-6, 1995

Edited by:

Harry M. Kaiser
Henry W. Kinnucan
Jennifer L. Ferrero

SPONSORED BY AND PUBLISHED WITH THE SUPPORT OF:

The Research Committee on Commodity Promotion (NEC-63)
and
The National Institute for Commodity Promotion
Research and Evaluation



Strategic Export Promotion (review)

Richard J. Sexton

Professor Liu has presented a cogent and interesting introduction to the industrial organization methods that might be relevant to analysis of strategic export promotion. Along the way he has also presented us with his views on the Simpson trial, the Chinese government, and most curiously, sweating in "good shirts." I agree with almost everything that Liu discussed except, perhaps, his implicit conclusion that I.O. game theory methods applied to issues of strategic export enhancement represent a fruitful avenue for research. Thus, my approach in this discussion will be to amplify on some of the points Liu has already raised and render my own conclusion on the merits of using methods of strategic interaction to study export enhancement programs.

Liu began his analysis of strategic methods by considering some basic static models including Dorfman and Steinner's model of optimal advertising by a monopolist, the prisoner's dilemma, and Bertrand competition. Whereas these models all have something interesting to say, they are collectively either far too simple or too restrictive to be useful for the purpose at hand. In particular, the essential features of most strategic interactions among players need to be captured in a dynamic model. Here, the modeler has several choices. The simplest approach, and the one Liu focused upon, uses a two-stage game where in stage one, agents undertake some kind of action that is irreversible and influences subsequent play¹, and in the second stage, production takes place and sales are realized. The universal key to these models is that agents use stage one to commit

to a course of action occurring in stage two, giving them a competitive advantage over a rival or rivals.

There is nothing sacrosanct about two stages. Three or more stages of play may be developed, if needed, to explicate the essential features of the model. The point is that *at least* two stages are more than likely necessary if the essentials of a strategic setting are to be captured. Worth noting is that other dynamic modeling approaches exist and have achieved extensive use in literature on the subject. The two prominent alternatives are finite repeated games and infinite horizon games. Neither are very useful in a setting of *perfect information*, where all players know the exact location of play on the game tree, each knowing that the others know, etc. Finite repeated games collapse to the outcome of the single-play solution in every period--creating a so-called *chain store paradox*, meaning that there is no gain to the modeler generalizing a two-stage game by repeating the production stage multiple periods. Expanding play to an infinite horizon is usually not fruitful because the *folk theorem* indicates that any individually rational solution can be supported as an equilibrium in a game of infinite horizons as long as discount rates aren't too high.

Games of Incomplete and Asymmetric Information

Therefore, although dynamics are crucial to modeling strategic behavior, there is usually little to be gained in expanding the dynamic specification beyond the two-stage game that Liu appropriately focused upon. Rather, the energies of economists interested in games and strategic behavior have been focused mainly in the area of information for the past 15 years or so. Liu did not touch upon this crucial subject in his introduction, and the games he analyzed

were all implicitly games of perfect information as defined in the preceding paragraph. Rasmusen's game theory book is one of the best at elucidating the role of information in specifying games. In games of *incomplete information*, at least one player is uncertain about another player's payoff function.

The modeling approach to incorporate incomplete information is to allow *nature* to move first and choose a state of the world which then determines player types. Generally, nature's choice is revealed to some but not to all of the players making the case a game of *asymmetric information*. In these games, some players hold valuable private information. The trick is for the informed player(s) to communicate or *signal* to other players concerning their private information and for the uninformed players to rationally update their information based upon the signals they have received. Updating of information is done in accord with Bayes Theorem, so these games are often known as Bayesian games. The key solution concept is *perfect Bayesian equilibrium*, an extension of the concept of *subgame perfect equilibrium* discussed by Liu. In a very real sense, these games are "where the action is," and I will later discuss briefly the application of these games to the subject of strategic export enhancement.

Incomplete and asymmetric information can be incorporated readily within the two-stage game format noted by Liu, and I agree that this basic framework is the best for analyzing questions of strategic export enhancement. Thus, I turn now to addressing a couple of features of modeling two-stage games that I think are important and frequently mishandled.

Important Features in Modeling Two-Stage Games

In strategic situations, it is intuitive that the opportunity to move first is an advantage. In plain English, the first mover gets a jump on a rival and most likely converts the opportunity into an enhanced payoff.² Modelers need to think very carefully about giving players first move advantage. In a game among otherwise symmetric players, why should someone get to go first if it confers a strategic advantage? Allowing one player to move first is bad modeling unless a convincing reason is given for handing over an advantage. Valid reasons for a first move usually pertain to asymmetries among the players. For example, in games of entry and entry deterrence, it is appropriate by the very definition of incumbency that the extant firm moves first. In games involving trade policy, it is appropriate that the government moves first and sets its policy in stage one, before the firms play in stage two. This is the framework of the Brander-Spencer (B&S) model. However, if multiple countries are competing to establish trade policies in stage one, it will probably be difficult to justify why one of those countries should have a first mover advantage over any of the others. Liu's model with simultaneous stage one competition among countries is the appropriate way to base an analysis in this case.

The second point to emphasize is the importance of how play in the second stage is modeled. As noted, in most cases, the second stage is the production and selling stage. Within the framework of a subgame perfect equilibrium or a perfect Bayesian equilibrium, behavior in this stage must constitute a Nash equilibrium. Firms' strategy variables in stage two will usually be either price or quantity, although in a game of export promotions, they could be the level of advertising expenditure. Bertrand's solution was the Nash equilib-

rium of the price setting game. It is an interesting equilibrium, as Liu noted, primarily when the firms' products are differentiated or firms adopt binding capacity constraints in stage one. Cournot's solution was the Nash equilibrium when firms choose quantities. The problem arose when the subgame perfect equilibria to the two-stage game hinged critically upon whether Bertrand or Cournot competition was assumed in the second stage, and there may be little justification for one choice versus the other. Indeed, a key criticism of B&S's famous result that export subsidies can be surplus enhancing for an exporting country was that the result reversed if activity in stage two was Bertrand rather than Cournot (Eaton and Grossman).

Game Theory Modeling of Export Enhancement

Liu sketched the framework of a two-stage game that he believes may yield useful insights into strategic export promotion. The players were two exporting countries and two firms, one from each country. The first stage involved the exporting countries choosing simultaneous levels of advertising in promotion of their firm's exports to a particular importing country. Stage two involved simultaneous competition among the exporting firms. This competition was modeled as Cournot. Liu's model structure was very appropriate to the problem and, considering the various factors, may well be the best model. Nonetheless, I see analysis within this basic framework wrought with sufficient problems and limitations to make me question whether the paradigm will be very useful in practice.

Liu's model was largely the B&S model adapted to commodity promotion. A key addition was competition among countries in stage one, rather than allowing one country to be the leader in setting policy in this first stage. In principle, there is no reason that

promotion expenditures cannot take the place of B&S's export subsidy as a device to shift a home country's reaction function to the right, making it a Stackelberg leader and shifting rents from the rival firm to the home firm. However, simultaneous stage one competition among countries makes it likely they will be caught in a prisoner's dilemma setting, each dumping resources into the importing country to promote their firm's product, but neither gaining the crucial edge that a first mover advantage confers.

It is also easy to perturb Liu's framework in basic and intuitive ways. For example, promotions make the most sense when firms' products are differentiated. Indeed, Liu's specification of demand implied product differentiation. In this case, it is probably more intuitive that stage two competition be Bertrand than Cournot. As in the case of B&S, it is likely that results will not be robust with this choice. Indeed, optimal promotion policies must hinge critically upon the extent of product differentiation. In the absence of product differentiation, promotions by one country will benefit the firms in both countries. No strategic advantage is conferred, and free ridership by the rival country's exporter(s) will surely discourage such expenditures.

Another variant that moves us closer to the actual workings of the MPP program and the reality of agricultural exports is the following: countries compete in stage one to set export promotion policies (e.g., rates of subsidization), and firms follow in stage two by choosing actual levels of advertising. Output in this model would be exogenous, having been determined by farmers' prior production decisions. Prices, hence payoffs, are determined by advertising expenditures, given the volumes of production in both countries. This model has many appealing features. Apart from its realism, it avoids

the likely arbitrary choice of Cournot versus Bertrand competition. However, results are still likely to depend critically upon how and whether products are differentiated.

Another limitation of the B&S model that becomes especially important in the export enhancement arena is the choice of governmental objective function. B&S (and also Liu) assumed a single exporter in each country. B&S further assumed that there were no domestic sales. Liu was silent on this point. To follow B&S on this issue is certainly the most simple and tractable route, but it strikes me as a patently unrealistic assumption and one that is likely to be crucial to the model's results. Under the B&S assumption, the objective functions of the home country and its exporting firm coincide. The U.S., however, is a major domestic consumer of almost every agricultural product it produces. Therefore, with a given supply of product, policies that encourage exports raise domestic prices to home consumers' detriment. When the commodity in question is subject to price supports, export enhancements may well also diminish those costs to the treasury. The key point is obvious: promotion policies that are desirable under B&S's objective function may no longer be desirable when the government's objective function is expanded to include home consumers' welfare and effects on price supports.

Another issue that ties well with the discussion in the prior section concerns the role of information. Within the two-stage model framework, governments are actually determining outcomes in the stage two competition because they take this subsequent competition into account in choosing their stage one actions. The likely outcome is that a fundamentally less-informed agent, the government, is making the important decisions in the industry instead of

the better-informed agents, the exporting firms. This information asymmetry is absent in the B&S and Liu models because they are games of perfect information, but it strikes me as a rather important point in real life. Implications are twofold: worse decisions are likely to be made by the relatively poorly informed decision-maker, and opportunities may exist for modeling the issue as a game of asymmetric information.³

Finally, the B&S and Liu models ignored competition within the home country for export opportunities. Strategic advantages created by government policies can be readily dissipated in the short-run by multiple exporters in the home country and in the long-run through entry. The result is that policies that look desirable under the one-shot, stage two duopoly competition of B&S and Liu may become deleterious in the long-run if they cause rent-diminishing entry, possibly pushing government onto a treadmill of expanding subsidies to try to maintain profits in the industry.

Strategic Export Promotions: Bane or Boon?

I intend this question to apply both to governments undertaking strategic export promotions and to economists considering studying the topic using game theory methods. B&S's work was pathbreaking because it contradicted in a rigorous setting the long-standing maxim that free trade is always the best policy. Rejoinders to B&S quickly established the fragility of their result and reinforced the general wisdom of a free trade policy. The work, nonetheless, remains a seminal contribution.

I see even more pitfalls for countries using promotions as strategic export policies and for economists using B&S-type models

to study the issue. From a government's perspective, the problems are implicit in the preceding section and need only be listed here: (1) unless product differentiation is significant (unlikely in agriculture), successful promotions also benefit firms in the rival countries, (2) retaliatory policies by rival countries eliminate the crucial first mover advantage and create instead a prisoner's dilemma environment, (3) given the importance of most agricultural products in domestic consumption, successful export programs will harm domestic consumers, and (4) dynamic competition among exporting firms will ultimately erode rents created by successful programs.

Now, how about economists studying the issue using game theory models? The experience of B&S is useful information as is increasing sophistication concerning use and misuse of game theory models. It is now widely recognized that results are often very fragile, with seemingly modest and intuitive changes in the game specification yielding drastically different outcomes. As Sutton has noted, "given any form of behaviour observed in the market, we are now quite likely to have on hand at least one model which [derives] that form of behaviour as the outcome of individually rational decisions." As the preceding section indicates, any model that yields a specific set of results on the efficacy of export promotion subsidies can and probably will soon be met by models that yield opposite results under equally plausible model specifications.

My overview of the problem suggests to me that government-sponsored export promotions are unlikely to enhance the welfare of the exporting country. Even if I am correct, that conclusion doesn't mean such programs won't continue, however. What it means is economists wishing to understand such policies within a behavioral framework ought to turn their attention to models of the political

economy rather than to models in the B&S tradition.

Endnotes

¹The decision to enter a market and the choice of capacity have been the two most common examples of this type of irreversible commitment.

²The only circumstance I can recall when this rule doesn't apply is price leadership. The price leader is responsible for supporting the price he or she establishes and must restrict sales, while rivals are free to sell whatever amounts they want to at the leader's price.

³Within such a framework, the modeler would want to give exporting firms an opportunity to signal their governments about the desirability of an export subsidy. They may not signal this information truthfully, so the government's job is to interpret signals from firms and choose which industries to support with subsidies. Signals, for example, could come in the form of political contributions.

References

- Brander, J.A., and B.J. Spencer. "Export Subsidies and International Market Share Rivalry." *Journal of International Economics* 18(1985):83-100.
- Eaton, J. and G.M. Grossman. "Optimal Trade and Industrial Policy Under Oligopoly." *Quarterly Journal of Economics* 101(1986):383-406.

Rasmusen, E. Games and Information, Oxford: Basil Blackwell, 1989.

Sutton, J. "Explaining Everything, Explaining Nothing? Game Theoretic Models in Industrial Economics." *European Economic Review* 34(1990):505-512.