Bargaining rationale for cooperative generic advertising

John M. Crespi and Jennifer S. James

The beggar-thy-neighbour aspect of commodity advertising means that benefits to one commodity from advertising come at the expense of other commodities. The effect can be mitigated by cooperation among groups as shown by Alston, Freebairn and James (AFJ). A drawback to AFJ's analysis is that some cooperative outcomes require side payments from one producer group to another. This paper offers a bargaining solution as an alternative to cooperation in the case where cooperative side payments would be needed. We show that while bargaining without side payments is not as effective as cooperation at reducing beggar-thy-neighbour effects, it is a welfare improving alternative to non-cooperation and is likely more practical in many situations.

Key words: cooperative and non-cooperative solutions, excessive advertising, mandated commodity promotion programs, Nash bargaining, US beef and pork.

1. Introduction

Generic advertising has become one of the most contentious issues in agricultural policy. In the past decade alone, three cases challenging the Constitutional validity of generic advertising programs have been heard by the US Supreme Court (see Crespi (2003) for a history and rationale behind the litigation). Although hundreds of studies show benefits to growers from commodity promotion exceeding the costs (see the review and discussion of studies in Kaiser *et al*. (2005), for example), many farmers mistrust the marketing boards that oversee the programs and question whether the benefits reach all farmers. As a result, the courts have taken an interest in distributional aspects both within and across programs.

Partly in response to the controversy, agricultural economists have begun to look beyond the 'first-order' impacts of the marketing programs on the farmers who fund them and, increasingly, into the second-order, or distributional effects of generic advertising. One strand of the literature on second-order effects focuses on how generic advertising affects different groups of farmers within a program (Chung and Kaiser 2000; Crespi and Marette 2002, 2003). This present analysis contributes to a second strand of the literature, which focuses on how advertising by one program affects producers in a competing program (Alston *et al*. 2000, 2001). However, as we discuss later, the implications may also be useful to within-program distributional issues of the first strand. Most discussion and examples are provided in the context of US legislation and producer groups, but the policy issues translate to levy-funded advertising conducted by Australian producer groups.

Alston, Freebairn and James (AFJ) (2001) showed that if commodity promotion programs across industries could cooperate in the setting of their advertising expenditures, the programs could overcome a 'beggar-thy-neighbour' effect, in which one commodity group benefits at the expense of the other. In the case where commodities are substitutes, for instance, an advertising-induced increase in the demand for peaches may come at the expense of pear consumption and vice versa. AFJ demonstrated that by cooperating in the setting of advertising expenditures, producer groups in the cooperating industries could earn more profit.

AFJ optimised the aggregated profit functions of the cooperating producer groups without restricting the distribution of profits. As such, there exists a likelihood that one producer group would gain more from the cooperative advertising, or even that one producer group could lose revenue. In order for the cooperative advertising to be feasible, AFJ proposed using lump-sum transfers or 'side payments' from gainers to losers such that all groups enjoy a net gain from cooperating. For example, if peach and pear growers cooperated in setting advertising quantities for their two industries and pear growers earn less profit by cooperating, they would need to be compensated with side payments from the peach growers. In fact, in AFJ's simulation example comparing non-cooperative and cooperative models of beef and pork advertising, although aggregate profits were higher, cooperative advertising made pork producers worse off unless they received a lump-sum transfer from the beef producers. Hence, without such a payment, there would be no reason for the pork producers to enter into an agreement that would lead to cooperative advertising.

The need for such side payments is, in fact, well established in the literature on cartel formation. If firms in a cartel have asymmetric costs, for example, Schmalensee (1987) demonstrates that joint profit maximisation necessarily dooms a cartel to failure unless side payments exist, the firms are merged, or members are prevented from deviating from the cartel.

As AFJ showed, if side payments were allowed, all of the programs operating under a cooperative advertising venture could be made better off than if the programs continued to advertise independently. However, a problem in the US context is that side payments are not allowed under the generic advertising legislation. For example, the Almond Marketing Order (1950) that allows the Almond Board of California to assess growers in order to pay for generic almond advertising stipulates that any funds not used for almond promotion, almond research or to cover the Board's administrative activities pertaining to almond promotion or research must either be returned pro rata to almond handlers or used to reduce the assessments on almonds in the next crop year (§981.81). Other US checkoff legislation includes similar stipulations.

Even if transfers were to be made legal in the US, we surmise that politically they would still be very difficult for a board made up of industry players to achieve without grower member distrust. Indeed, even within a marketing order that covers only one commodity, squabbles over redistribution of assessment funds have led to serious breakdowns. As Crespi (2003, p. 301) discusses, one impetus for the litigation over almond promotion came from the Almond Board's decision to reimburse assessments paid by one almond handler while refusing reimbursements to other handlers. If such decisions lead to litigious antagonism within an industry, one can conjecture that the discord would be magnified when transferring funds from one industry to another.

Given the power of AFJ's results but the practical difficulty of side payments, it is worth considering other ways boards could cooperate to make producers better off than they are under the current beggar-thy-neighbour advertising battles. One alternative is the horizontal integration of related industries. Some multi-industry cooperative marketing occurs on a limited basis. The Australian Meat and Livestock Corporation, and the Australian Horticultural Corporation provide multi-industry export promotion, for example. Perhaps the closest case of a truly integrated marketing board is the California tree-fruit agreement (CTFA). The CTFA is an umbrella marketing and research program that facilitates the activities of the peach, plum and nectarine programs. However, legally each program is stand-alone and has its own board determining assessments and contributes a fixed share to the CTFA for generic advertising of stone fruits. By statute, transfers of funds from one group to another are not allowed under US marketing order legislation, so peach growers can neither fund promotion of plums nor transfer funds to nectarine growers, for example. For any of these programs, the allowance of side payments from one industry to another or the creation of a fully integrated marketing cartel would entail changes in US legislation. In the United States, commodity promotion laws have existed virtually unchanged since the 1930s and commodity promotion is arguably one of the most contentious of all farm programs. However, Congress has shown little interest in changing the laws and seems to have passed the issue on to the courts who review dozens of lawsuits every year.

We present a 'second-best' alternative in the spirit of AFJ's model that increases returns to producers while both mitigating the beggar-thy-neighbour effects and leaving unaltered the current checkoff legislation. The key is to choose advertising in a manner that embeds, to some extent, the side payments necessary for AFJ's model. Allowing boards to meet jointly to bargain over the amount of advertising that each board will perform would eliminate the need for overt monetary transfers while complying with current legislation. Current US marketing order statutes do not prevent groups from discussing advertising levels with each other. In addition, neither the antitrust laws in the Sherman Act nor the restrictions of the Federal Trade Commission Act prevent groups from bargaining over advertising levels.

In this type of bargaining scenario, for instance, peach growers and pear growers might come to an agreement to lessen their advertising intensities so as to dampen the beggar-thy-neighbour effects. In fact, the CTFA is a good example as the three separate entities may attend and make comments at each other's meetings and share budgets for joint research and promotion. While we do not doubt the likelihood that a lawsuit could be brought against boards that undertake bargaining over assessments, we do not see any legislation that would be undermined by a bargaining solution, especially if negotiations are voluntary. The question is how to characterise a bargaining solution, and under what conditions would such a bargaining arrangement for advertising be stable?

There are many bargaining models in the economics literature; in the next section we discuss why we use the Nash bargaining model and derive the necessary conditions for a bargaining outcome in advertising expenditures. We then demonstrate the effectiveness of bargaining using a simulation based on AFJ's analysis of the US beef, pork and poultry industries.

2. Nash bargaining

AFJ's article is based upon the observation that the advertising set by one commodity board results in decreased demand for substitute goods and can impose a cost on other industries. The result is an inefficient use of advertising resources in all industries. Coase (1960) argues that agents can overcome this type of problem by arriving at a mutually advantageous agreement and that this agreement would also be socially efficient (see Samuelson 1985 for a theoretical discussion of the relationship between the Coase theorem, bargaining theory and cooperative game theory). Thus, private bargaining between commodity boards seems a viable means of mitigating beggar-thy-neighbour effects. However, there are a variety of models that might be used to model the bargaining outcome.

Many models are based on zero-sum games where the agents are trying to determine how some fixed resource should be shared. Roth (1985) and Osborne and Rubinstein (1990) provide overviews of the literature. However, in the case of commodity promotion, zero-sum games are too limiting as the purpose of the advertising may be as much to increase the size of the market, as to alter its shares. Another class of bargaining models examines deals struck through repeated trials where agents must worry about the threat of deviation and develop trigger strategies to deter cheating, as discussed in Rubinstein (1982, 1985) and Gibbons (1992, p. 68). However, commodity promotion assessments cannot be altered once they are approved by the Secretary of Agriculture and are part of public record, so cheating and trigger strategies are not necessary components to a model of bargaining in commodity promotion.

In short, we seek a model that allows for boards to either enter into a bargain over the amount of advertising they will spend or walk away from the bargaining table and continue spending at their current levels. We also seek a model that allows for Pareto improvements under the agreed upon advertising assessments without need for side payments. Finally, we seek a static model that does not necessitate trigger strategies or repeated games given that an outside agent holds the boards accountable to the agreed upon assessments. Without priors about exactly how the bargaining procedure might take place (e.g. will it be a sequential offer procedure, will there be a time constraint, what happens when impasses arise?), or foresight concerning the bargaining environment (e.g. risk attitudes, bargaining strengths or discount factors of the parties), several models could be used to represent the bargaining process. The model we have chosen is the Nash bargaining model (1953). A benefit of the particular static model of the Nash program is that Binmore *et al.* (1986) demonstrate that this framework can approximate two common types of strategic models that use alternating offers.

In his 1950 work and his 1953 extension, Nash addressed the case where two agents bargained over some division that would result in agent 1 agreeing to take q_1 and agent 2 agreeing to take q_2 without need for renegotiation. The sum of q_1 and q_2 does not need to be fixed beforehand, and 'may also be regarded as a non-zero-sum two-person game' (Nash 1950, p. 155). Nash showed that under very general conditions, the two agents will agree to a pair (q_1^B, q_2^B) that maximises the product of the difference between (q_1^B, q_2^B) and each agent's next best alternative, provided each difference is positive. The model assumes symmetric bargaining power in that all Pareto-improving outcomes are feasible.

Nash's solution requires adherence to four axioms in order for an equilibrium to be reached: (i) an invariance property that linear transformations of the payoff functions do not affect the outcome; for example, arbitrary changes in units cannot affect the utility each player receives from the payoffs; (ii) Pareto efficiency; (iii) individual rationality, such that the solution must not be dominated and a player's payoff must be greater than or equal to her payoff from choosing not to bargain; and, finally (iv) independence from irrelevant alternatives, such that the outcome of a bargain cannot depend on the availability of alternative bargains that were rejected when a player had the opportunity to choose them.

Formally, for an *n*-player problem (see, for example, Gintis 2000, p. 346), the Nash Bargaining Theorem states that there is a unique solution $(q_1^B, q_2^B, \ldots, q_n^B) = (f_1(S, d_1, d_2, \ldots, d_n), f_2(S, d_1, d_2, \ldots, d_n), \ldots, f_n(S, d_1, d_2, \ldots, d_n))$ that satisfies (i)–(iv) and that this solution defines $(q_1^B, q_2^B, \ldots, q_n^B)$ as the vector that solves $\max_{q_1, \ldots, q_n} \prod_{i=1}^{n} (\pi_i(q_i) - \pi_i(d_i))$ subject to $(q_1, q_2, \ldots, q_n) \in S$ where S is the set of real-number potential payoffs, and $(d_1, d_2, \ldots d_n) \in S$ denote the agents' next-best options if no agreement is reached. There is no incentive for any agent to deviate from the unique solution.

3. Optimal advertising in a bargaining model

Following AFJ, we consider a model of n goods that are related in demand but not supply. Quantities and prices (Q_i, P_i for $i = 1$ to n) are endogenous and determined in a competitive market. A_i represents the generic advertising expenditure by each of m producer groups where $m \leq n$. Demand and supply equations for the n goods are thus:

$$Q_i = d_i(P_1, P_2, \ldots, P_n, A_1, A_2, \ldots A_m),$$

and

$$Q_i = s_i(P_i^P),$$

where P_i^P is the producer price, which differs from the buyer price depending on the type of financing for the checkoff program: $P_i^P = P_i$, $P_i^P = (1 - t_i)P_i$, or $P_i^P = P_i - T_i$, under lump-sum, *ad valorem*, and per-unit funding, respectively.

As the framework for developing the bargaining solution is similar regardless of the financing mechanism (lump-sum, *ad valorem*, per-unit), we motivate the model using the bargaining solution under lump-sum advertising as an example. Following AFJ, to determine a group's status-quo position, we define the non-cooperative optimisation problem of producer group i under a lump-sum funding mechanism as:

$$\max_{A_i} \pi_i = P_i d_i(P_1, P_2, \ldots, P_n, A_1, A_2, \ldots, A_m) - TVC_i(Q_i(\cdot)) - A_i,$$

where $TVC_i(Q_i(\cdot))$ is the total variable cost of production and the group optimises subject to market-clearing conditions (i.e. $d_i(P_1, P_2, \ldots, P_n, A_1, A_2, \ldots, A_m) = s_i(P_i^P)$).[1]

Using AFJ's notation, the superscript N (non-cooperative) denotes optimised values when each group acts on its own. Specifically, $\pi_i^N \equiv \pi_i^N(A_1^N, A_2^N, \ldots, A_m^N)$ is the optimal profit in the case where the commodity groups choose their advertising expenditures independently. The non-cooperative equilibrium for the special case of $n = m = 2$ is shown in Figure 1. The first group's reaction function, $R_1(A_2)$, shows that group's optimal advertising as a function of advertising spending by the other group; $R_2(A_1)$ is defined similarly. The non-cooperative equilibrium occurs where the reaction functions intersect at point N. The slopes of the reaction functions are expressed as functions of elasticities in AFJ (equation (26)), and are negative for most reasonable ranges of elasticity values, provided the products are substitutes. Group 1 makes more profit when group 2 spends less on advertising, so iso-profit contours closer

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[1] Our modelling of the market equilibrium follows that of AFJ because of the comparison we are drawing to that study. However, an equivalent motivation would be to model the decision-making process in terms of a multistage game as in Zhang and Sexton (2002) whereby the board makes its advertising decision in stage 1 and firms react to this decision in stage 2.

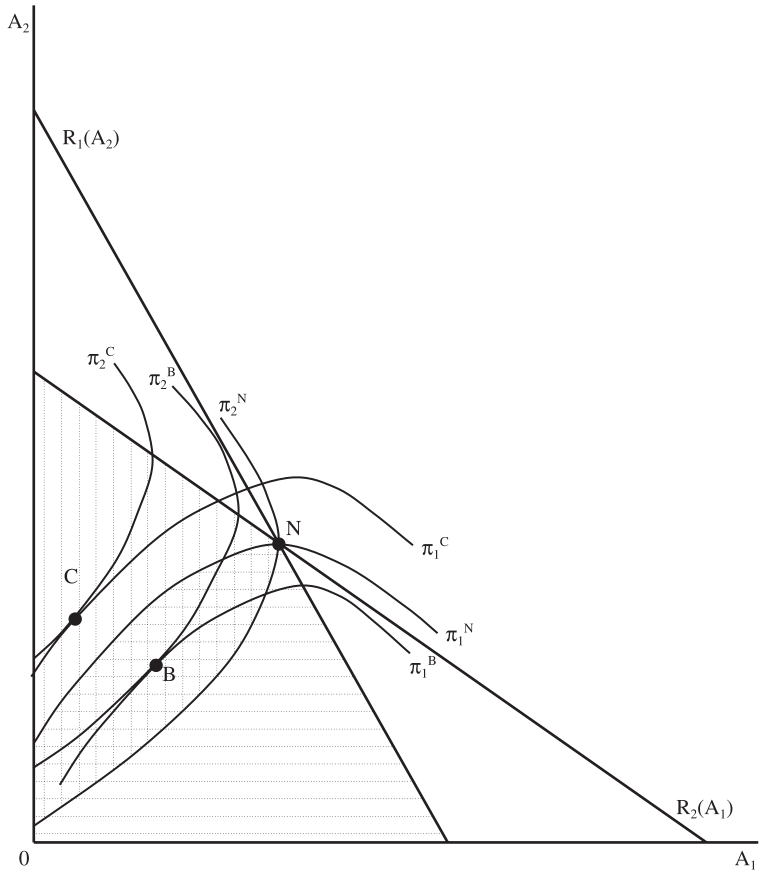

Figure 1 Non-cooperative, cooperative and bargaining equilibria.

to the horizontal axis represent higher profits for group 1 (and similarly for group 2).

AFJ were interested in the optimal advertising when commodity groups could cooperatively choose each member's advertising expenditure – in other words, a cartel's choice of advertising spending. At points enveloped by the reaction functions in Figure 1 (the area with vertical and/or horizontal hatching), at least one producer group is made better off relative to the non-cooperative equilibrium. Optimisation of the combined profits of the two groups yields a point in the single- or double-hatched area, but if the optimal combined profits fall in one of the single-hatched areas, one group will actually do worse than in the non-cooperative outcome as illustrated by an example case of point *C*. Hence, as AFJ show, it is in these areas where a group would need to be compensated through a 'lump-sum transfer to compensate the group experiencing a loss' (Alston *et al*. 2001, p. 895). This observation is consistent with Schmalensee's (1987) result that cartel solutions from aggregated profit equations of asymmetric firms are unstable in the absence of side payments.

In this paper, we are interested in the optimal choice of advertising among commodity groups who agree to undertake a level of advertising expenditure under a type of bargaining cartel. Because a group can always leave a cartel and act on its own, π_i^N is then the opportunity cost of undertaking any other amount of advertising. Because of the Pareto efficiency requirement, under the Nash bargaining solution, each commodity board must earn at least this amount in order to enter into the bargain. In an optimal bargaining outcome, each producer group should arrive at advertising expenditures that will make its constituents better off while internalising some or the entire side payment amount that might arise under AFJ's solution – that is, the bargaining equilibrium, B, must fall on the locus of tangencies of the iso-profit contours within the double-hatched area of Figure 1.

From the previous section, the Nash optimisation program for the bargaining model with lump-sum advertising is then,

$$\max_{A_1, A_2, \ldots, A_m} \prod_{i=1}^{m} (\pi_i - \pi_i^N).$$

Defining $\phi_i \equiv \pi_i - \pi_i^N$, the i^{th} first-order condition with respect to A_i is

$$\sum_{j=1}^{m} \frac{1}{\phi_j} \frac{d\phi_j}{dA_i} = 0.$$

Solving the maximisation problem under the market-clearing conditions and rearranging terms gives us the bargaining solution for lump-sum ($B|LS$) advertising as implicitly defined by:

$$A_i^{B|LS} = \sum_{j=1}^{m} P_j Q_j \frac{d \ln P_j}{d \ln A_i} \frac{\phi_i}{\phi_j}. \qquad ($$

This bargaining solution is very similar to AFJ's cooperative solution, A_i^C (equation (13) in AFJ). The cooperative solution weighs individual $P_jQ_j(d \ln P_j/d \ln A_i)$ terms by one, reflecting the maximisation of a simple sum of producer group profits. In the bargaining solution, the j^{th} term is weighted by ϕ_i/ϕ_j.

Comparisons between the cooperative and bargaining solutions are similarly derived when advertising is funded with a per-unit or *ad-valorem* check-off; the only change is the choice variable (T_i or t_i), and, hence, the optimisation program that determines π_i^N. In the case of per-unit financing, π_i^N is the result of the choice of T_i to maximise $\pi_i = (P_i - T_i)d_i(P_1, P_2, \ldots, P_n, A_1, A_2, \ldots, A_m) - TVC_i(Q_i(\cdot))$ subject to the condition that all checkoff funds are spent (i.e. $A_i = T_iQ_i$) and the market-clearing conditions. As above, the bargaining solution from the program in Equation (4), but now under the choice of per-unit checkoff ($B|PU$) financing may be derived implicitly as:

$$A_i^{B|PU} = \sum_{j=1}^{m} P_j Q_j \frac{d \ln P_j}{d \ln T_i} \frac{\phi_i}{\phi_j}.$$

We have written Equation (7) in terms of the resultant advertising expenditure in order to show its similarity with Equation (6). Finally, in the case of *ad valorem* financing, π_i^N is the result of the choice of t_i that optimises $\pi_i = P_i(1 - t_i)d_i(P_1, P_2, \ldots, P_n, A_1, A_2, \ldots, A_m) - TVC_i(Q_i(\cdot))$, subject to all checkoff funds being spent ($A_i = t_iP_iQ_i$) and the market-clearing conditions. The bargaining solution for advertising funded by an *ad valorem* check-off ($B|AV$) is derived similarly:

$$A_i^{B|AV} = \sum_{j=1}^{m}(1 - t_j)P_jQ_j\frac{d \ln P_j}{d \ln t_i}\frac{\phi_i}{\phi_j}.$$

As in the case of the lump-sum advertising result, the cooperative solutions for the per-unit and *ad valorem* programs from AFJ differ from the bargaining solutions only by the inclusion of the ϕ_i/ϕ_j weights.

It is interesting to consider the implications of Equations (6)–(8) in light of AFJ's results. These equations show that the cooperative and bargaining solutions would coincide if the producer cartel chose to maximise a weighted sum of producer profits, using ϕ_i/ϕ_j as weights, giving less weight in the determination of advertising expenditures to the price effects in markets where producer groups gain more by bargaining. What the bargaining solutions offer, then, is a way of embedding the side payments in the advertising outlays themselves by adjusting the expenditures in proportion to the relative gains from entering into the bargaining arrangement. The ϕ_i/ϕ_j terms do not reflect bargaining power, but rather adjust the groups' advertising influences on all commodities. While aggregate profits can never be higher than under AFJ's cooperative model, all groups are made better off than they would be under the non-cooperative scenario. If the gains are equal ($\phi_i/\phi_j = 1$) then Equations (6)–(8) revert to AFJ's cooperative solutions and there is no difference between arriving at the optimal advertising by bargaining or joint-profit maximisation.

Equations (6)–(8) suggest that commodity groups have an alternative to both non-cooperation and AFJ's cooperative model that has the potential to increase industry profits entirely through the board's choice of the advertising expenditure and transfers to competing industries need not be considered.

4. Simulations and comparison to AFJ's results

In order to examine the effects of a bargaining outcome, the numerical simulations in AFJ were repeated using the objective functions from the Nash bargaining model. Demand functions for beef, pork, and poultry were specified, using the same functional form and parameter values as in AFJ. Supply functions were specified, again using the same functional form and elasticity values. The Solver tool in Microsoft Excel was used to find beef and pork advertising expenditures that maximised the Nash bargaining objective functions vis-à-vis the non-cooperative fallback position, subject to market-clearing conditions. Table 1 provides the results from the non-cooperative,

Table 1 Effects of funding methods and behavioural assumptions on optimal advertising

Variable of interest	Non-cooperative competition	Beef and pork producers cooperate	Beef and pork producers bargain
Lump-sum funding			
Optimal advertising expenditure (US$ million/year)			
Beef producers	32.44	23.47	14.99
Pork producers	13.28	0.00	5.35
Total beef and pork	45.72	23.47	20.34
Optimal advertising intensities (per cent of revenue)			
Beef producers	0.06	0.05	0.03
Pork producers	0.04	0.00	0.02
Total beef and pork	0.05	0.03	0.02
Benefits from advertising (US$ million/year)			
Beef producers	246	656	251
Pork producers	33	–319	36
Poultry producers	–291	–35	–275
Beef and pork producers	279	338	287
All producers	–13	303	13
Ad valorem funding			
Optimal advertising expenditure (US$ million/year)			
Beef producers	41.77	31.43	20.72
Pork producers	21.47	0.00	9.49
Total beef and pork	63.24	31.43	30.21
Optimal advertising intensities (per cent of revenue)			
Beef producers	0.08	0.06	0.04
Pork producers	0.06	0.00	0.03
Total beef and pork	0.07	0.04	0.04
Benefits from advertising (US$ million/year)			
Beef producers	248	647	253
Pork producers	38	–304	41
Poultry producers	–296	–48	–283
Beef and pork producers	287	343	294
All producers	–9	294	12

Notes: Values in the 'Non-cooperative competition' and 'Beef and pork producers cooperate' columns come from Alston *et al.* (2001), table 3. Actual advertising expenditures for 1998 were used to parameterise the model: US$25.51 million for beef, and US$13.79 million for pork.

cooperative and bargaining solutions (the results for the non-cooperative and cooperative solutions are from AFJ's table 3) for two types of funding.

The results for both the lump-sum financing and the *ad valorem* financing tell very similar stories. When beef and pork commodity groups set their advertising budgets not as a cartel but rather through bargaining, total spending on advertising is less than in the non-cooperative and cooperative cases. Further, as discussed above, advertising can be seen to be split more evenly between beef and pork producers, rather than all advertising being conducted for beef, as in the cooperative case. The bargaining model essentially 'embeds' the side payments from the cooperation model within the advertising itself. Under a bargaining model with lump-sum financing, for example, although the benefits from advertising to beef and pork producers combined are less than in the cooperative case (US$287 million vs US$338 million), they are an improvement over the non-cooperative case (US$279 million), with both commodity groups enjoying positive benefits.

Interestingly, in this example, the optimisation strategy has a pronounced effect on poultry producers: the cost to poultry producers of beef and pork advertising is reduced greatly when the groups cooperate, but the bargaining outcome is only slightly more favourable than for the non-cooperative case. While beef and poultry producers benefit from cooperation at the expense of pork producers, all three groups benefit from a switch from the non-cooperative to the bargaining outcome.

5. Extensions

For demonstration purposes, we restricted our attention to the original Nash model where each group is assumed to have the same bargaining strength. Clearly the simulations demonstrate that an assumption of symmetric bargaining strength does not imply that the gains will be symmetric, as much depends upon the market conditions and fallback positions of the parties. Nonetheless, our analysis could be extended to a model with asymmetric bargaining power provided the degree of bargaining strength could be determined. A simple extension of Nash's model to allow for an exogenous bargaining-strength parameter can be found in Eichberger (1993, p. 255).[2] The result would include the bargaining strength parameters in the optimal advertising solutions.

The bargaining model may also be a very useful tool within a commodity program itself. For example, organic producers or producers of particular varieties often express a preference to differentiate their product rather than to be part of a generic promotion program. Generic advertising of differentiated products covered in one marketing order could, likewise, result in beggar-thy-neighbour effects among members of a commodity group. A bargaining arrangement where advertising expenditures are set as proposed here offers a practical improvement for allocating promotional budgets for a checkoff program. In this case, subgroups could form their own micromarketing boards covering their particular commodity and then bargain over the checkoff rates or advertising expenditures for these subsets of products covered in the macro marketing order. Legislative changes to the checkoff programs would be needed to accommodate different rate structures within the program and additional costs would be incurred to prevent individual farmers in one group from cheating by claiming they are part of another group. The benefit

[2] Specifically, the solution would be to the following extension of the Nash model: $\max_{s_1,\ldots,s_n} \prod_{i=1}^{n}(\pi_i(s_i) - \pi_i(d_i))^{\gamma_i}$ where γ_i represents an exogenous bargaining strength parameter and $\Sigma\gamma_i = 1$.

of a bargaining framework, though, may be that producer organisations would be able to keep all producers under the umbrella of an overarching program but allow for adjustments of advertising expenditure by subgroups within the program.[3]

6. Conclusion

The beggar-thy-neighbour aspects of commodity advertising, where one group benefits from advertising its own product at the expense of other commodities, are mitigated by cooperation among groups as shown by Alston *et al*. (2001). The drawback to the AFJ analysis, however, is that some cooperative outcomes require side payments from one producer group to another. In the US, side payments are practically impossible unless commodity boards and commissions were legislatively granted authority to make them. We have shown that while bargaining is not as effective as cooperation at reducing beggar-thy-neighbour effects, it may be both more feasible and perceived as more equitable by commodity groups because all that is required is an alteration of advertising spending by each of the commodity boards. Since the alteration of the advertising expenditure as shown here will increase industry profits, bargaining would be in keeping with a board's mandate to increase grower returns through advertising. Certainly, other decision rules, legislative specifications or board organisations may provide feasible or more efficient solutions to the beggar-thy-neighbour problem. The benefit of the bargaining process outlined here is that it would require relatively small institutional changes.

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[3] A reviewer pointed out that the content of advertising may be another dimension of bargaining, particularly within a commodity group with heterogeneous products. The CTFA, discussed above, does use a production-share weighting of each fruit's assessments to pay for generic stone-fruit advertising. Theoretically, the shares could be determined through bargaining.

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