Australian Agricultural and Resource Economics Society

AARES conference 2004

Melbourne

February 11-13, 2004

Dynamic Industry Structure and Benefit Pass Through Rates from Generic Advertising

Benjamin Shank, Ellen Goddard, John Freebairn,
Garry Griffith

Title: Dynamic Industry Structure and Benefit Pass Through Rates from Generic Advertising

Authors: Benjamin Shank, Dr. Ellen Goddard, Prof John Freebairn, Dr. Garry Griffith

Introduction

In most food industries there have been dramatic increases in the concentration of food processors and retailers. As part of a sustainable profit maximization plan, the various processors must determine optimal strategies around selling branded, where they carry the cost of product development and branding, versus selling 'generic' product to grocery stores. Different grocery chains may have different strategies they are pursuing for their store shelves which involve maintaining a balance between generic product, branded production and private label product. Processors are of significantly different sizes selling to grocery store chains that are national in scope, in an industry with very thin margins. In economic jargon these marketing strategies can be considered 'games' played by the various market participants. Given the gaming nature of industry participants and the possibility to exploit market power it becomes interesting to examine the outcomes of various strategies followed by particular processors and retailers in light of competing processor and retailer choices. The strategic planning processes of processors and retailers are becoming industry defining characteristics and not only affect processors and retailers but primary producers and consumers alike.

The proposed paper will expand upon the previous research of Cotterill (2000), Dhar and Cotterill (2002), maintaining noncompetitive, differentiated product, dual stage market channel assumptions but also including brand and generic product advertising and farm supply effects. While previous agricultural commodity research has addressed advertising effects under different assumptions about competitive structure, none have used a non-cooperative, dual stage marketing channel with explicit game structures. Much of the marketing channel research has focused on the cost past through rates with constant (farm level) marginal costs. The addition of farm level positively sloped supply equations rather than constant marginal costs will be explored. The potential implications for market participants (including farmers) from changes in advertising expenditure will be examined using the noncompetitive differentiated product, dual stage market channel assumptions.

Related Literature

Although there is an abundance of literature on the economic impacts of generic advertising and there is an understanding of the link between producer returns and market structure, the literature on returns to generic advertising under imperfect competition is not that voluminous. A summary of some of the relevant literature in this area is provided in Table 1.

Table 1: Studies Examining Generic Advertising under Imperfect Competition

Study and Year	Analysis	Conclusion
Zhang and Sexton (2002) ***Optimal commodity promotion when downstream markets are imperfectly competitive***	General model formulation, simulation for the cases of oligopoly, oligopsony and oligopoly/oligopsony	As compared to competitive markets: Optimal advertising intensity lower under oligopoly, unless the advertising makes demand more elastic and reduces the distortion from oligopoly power. Optimal advertising intensity always lower under oligopsony or oligopoly/oligopsony power
Zhang, Sexton and Alston (2002) ***Brand advertising and farmer welfare***	General model formulation, simulation	Brand advertising can: Increase demand for farm products or Increase market power of the advertising firm, leading to reduced farm sales
Depken, Kamerschen and Snow (2002) ***Generic advertising of intermediate goods: theory and evidence on free riding***	General model formulation, econometric dairy model example	Generic advertising can arise voluntarily, positive contributions will be linked to high advertising elasticities, lower price elasticities and larger firm size. The problems of free riders can be handled through making advertising contributions mandatory.
Wohlegenant and Piggott (2003) ***Distribution of gains from research and promotion in the presence of market power***	General model formulation, simulation For the case of oligopoly power	Results suggest a more important role for processor input substitutability than for market power in affecting level and distributional effects of promotion and research
Cardon and Pope (2003) ***Agricultural market structure, generic advertising and welfare***	General model formulation, comparative statics	Generic advertising can be socially beneficial in the case where competitive farm industry competes with a monopoly/monopsony downstream distributor. Generic advertising would lead to an increase in the monopolist's output

All of the above studies are essentially exploratory in nature and provide us with meaningful insights as to expected reactions to generic advertising under different market structures. The suggestion that market power has the potential to increase producer surplus response to generic advertising is particularly important. While it is clear that prices, quantities and revenues/profits are higher for primary producers in competitive markets than in markets where they face monopoly/oligopoly and/or monopsony/oligopsony market power, the returns to advertising can potentially be higher under the market power scenario. To illustrate this finding, reported above by Zhang and Sexton, a simple example can be used.

It is possible to construct a simple synthetic model of a marketing channel with one product produced at farm level, transformed by processors and retailers, and sold at retail level to final consumers. The exact marketing relationships will vary depending upon the market structure, as illustrated in Table 2.

Table 2: Different Market Structure Hypotheses with homogeneous product produced and consumed

Market Structure: Competition	Market Structure: Oligopoly	Market Structure: Monopoly
Assume a commodity market with fixed proportion processing technology, producers pay for generic advertising • Retail Demand Q=a - b*P-c/ADV • Processor Demand Q=f + d*P-e*PF • Farm Supply Q=g + h*PF • Producer Surplus PS=PF*Q-((.5/h)*Q**2-g/h*Q)-ADV	Assume a commodity market with fixed proportion processing technology, producers pay for generic advertising and processor/retailer oligopoly market power exists: • Retail Demand Q=a-b*P-c/ADV • Processor Demand Q=f + d*P-e*PF • Retail Price P=PF/(1-θ/(η)) (θ=conjecture, η=elasticity) • Farm Supply Q=g + h*PF • Producer Surplus PS=PF*Q-((.5/h)*Q**2-g/h*Q)-ADV	Assume a commodity market with fixed proportion processing technology, producers pay for generic advertising and processor/retailer monopoly market power exists: • Retail Demand Q=a-b*P-c/ADV • Processor Demand Q=f + d*MR-e*PF • Marginal Revenue MR= -a/b + c/(b*ADV) + 2/b*Q • Farm Supply Q=g + h*PF • Producer Surplus PS=PF*Q-((.5/h)*Q**2-g/h*Q)-ADV

Although it is quite clear even from the above that the producer surplus will get progressively lower as you move from left to right, the real question of what happens when you increase advertising expenditure is not so clear. With some example numbers the following empirical results are illustrative.

Table 3: Example Results from Increasing Advertising Expenditure with the base for each structure calibrated to produce the same price and quantity

Variable	**Base**	**Perfect Competition**	**Oligopoly (θ=.1)**	**Monopoly**
η_{adv}=.5		*Double generic advertising*	*Double generic advertising*	*Double generic advertising*
Retail Price	$6.85	$7.71	$7.70	$7.63
Farm Price	$5.00	$5.31	$5.32	$5.36
Quantity	320	350	350.4	354
Processor Profit	$592	$838 **(41.5%)**	$835 **(41%)**	$806 **(36%)**
Producer Surplus	$473	$513 **(9.4%)**	$519 **(9.7%)**	$534 **(12.8%)**

Since the increased advertising makes the demand 'more elastic' (certain with linear functional forms) the 'distortion from market power is reduced' and the actual benefit (return per dollar invested in advertising) to producers is higher under monopoly conditions than under competitive market conditions. The question of whether or not processors/retailers also benefit from the generic advertising is interesting but not critical to the measurement of producer benefit; it provides a clue as to whether or not the advertising could partially be funded by processors and/or retailers, an innovation which could increase producer benefit more. If producer returns to advertising are affected by market structure; does it also matter what type of games result in the oligopoly market power? In the above conjectural elasticity example the type of market power does not change when advertising changes. The question of whether the outcome from different games, remaining within the oligopolistic structure, is also different for producers remains open.

Modelling Vertical Structure

The study of competitive interaction in market channels which are vertical in nature, i.e. producer to processor, processor to retailer, retailer to consumer, has evolved considerably in the marketing literature. Early agricultural economics studies concentrated on homogeneous products and models that assumed that the market channel was a single industry with competitive firms (Gardener, 1975; Heien, 1980; Kinnucan and Forker, 1987). McCorriston, Morgan, and Rayner (1998) maintain the assumptions of a homogeneous product and a single stage industry but relax the competitive industry assumption, much like the example above. It is not until one examines the marketing literature that one finds more sophisticated assumptions regarding the actual structure of the marketing channel with products distinguished by brand/product attribute. Recent marketing studies have explored conjectural variation, non-cooperative game theory models under Nash equilibrium (for example, Lal, 1990; Raju, Srinivasan, and Lal, 1990). Two notable studies by the University of Connecticut, Department of Agricultural Resource Economics, Food Marketing Policy Center are of interest. In these articles Cotterill (2000) and Dhar and Cotterill (2002) it is recognized that agricultural markets are often successive stage oligopolies. These research studies, as well as ones by Liang (1987) and Kadiyali, Vilcassim and Chintagunta (1996) use menu approaches to model non-competitive, differentiated product, dual or single stage market channels. The possibility of differentiating even a homogeneous farm product into different brands and examining the determination of various brand retail prices is potentially of some importance since there are many trends to either brand generic products (companies branding fresh meat products) or to move already branded products back to simpler lines, predominantly using generic and private label products (recent movements in eggs and milk in Australia). The one way in which these brand level demand models do not match up with the earlier agricultural economics literature is through the simple assumptions made regarding marginal costs faced by processors or retailers. In some empirical examples in the literature the implied marginal cost is derived as an econometric parameter, rather than included as an explanatory variable. In other it is assumed to be fixed, making the models inapplicable to determining the producer benefits of generic advertising.

Following Cotterill (2000) it is possible to identify a market structure based on some limiting assumptions:

Horizontal competition both at processing and retail level is Nash in prices

Vertical nature of competition between processors and retailers is captured by

1. a two stage vertical Nash model where each retailer chooses an exclusive processor and processors and retailers maximize profit simultaneously by determining wholesale and retail price
2. a two stage vertical Stackelberg game where in the first stage processors maximize profit by determining the retail price based on a reaction function of the retailer and in the second stage retailers maximize profit given a wholesale price.

Dyadic relationships, each retailer deals only with one processor .

For that model the demand functions of retailers can be defined as :

$q_1 = a0 + a1\ p_1 + a2\ p_2$

$q_2 = b0 + b1\ p_1 + b2\ p_2$

The retailer's cost function can be defined as :

$TC_1 = w1 * q_1$

$TC_2 = w2 * q_2$

The retailer's profit function can thus be defined as:

$\Pi_1^R = (p_1 - w1)q_1$

$\Pi_2^R = (p_2 - w2)q_2$

In the Vertical Nash game a linear mark-up at retail is conjectured by the processor on retail price so retail price can be assumed by the processor to be:

$p_1 = w1 + r1$

$p_2 = w2 + r2$ where r1 and r2 are the linear mark-ups for each retailer.

In the Vertical Stackelberg game, each processor develops a conjecture from the first order condition of the retailer so retail price can be assumed by the processor to be:

$p_1 = ½\ w1 - 1/2a1\ (a0 - a2p_2)$

$p_2 = ½\ w2 - 1/2b2\ (b0 - b1p_1)$

The processor marginal cost curves can be expressed as :

$wmc1 = m + m1$

wmc2 = m + m2 where m is the industry specific marginal cost (farm price) and m1 and m2 are processor specific cost components.

Given those costs the processor profit functions can be written as:

$\Pi_1^P = (w1\text{-}m\text{-}m1)\ q_1$

$\Pi_2^P = (w2\text{-}m\text{-}m2)\ q_2$.

The solution of the set of simultaneous equations, under the two hypothesized market structures, results in 'cost-pass-through' rates that are the same regardless of the structure of the game. This is illustrated in Table 4 below.

Table 4: Cost Pass Through Rates, fixed farm prices, two different structural games

Cost Pass Through Rates	**Vertical Nash**	**Vertical Stackelberg**
Effect of Farm Price Change on Retail Price 1 $\frac{\partial p_1}{\partial m}$	$\frac{(4\alpha_1 - 3\alpha_2)b_2}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(4\alpha_1 - 3\alpha_2)b_2}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$
Effect of Farm Price Change on Retail Price 2 $\frac{\partial p_2}{\partial m}$	$\frac{(4b_2 - 3b_1)\alpha_1}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(4b_2 - 3b_1)\alpha_1}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$
Effect of Firm 1 Specific Cost Change on Retail Price 1 $\frac{\partial p_1}{\partial m_1}$	$\frac{(4\alpha_1 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(4\alpha_1 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$
Effect of Firm 1 Specific Cost Change on Retail Price 2 $\frac{\partial p_2}{\partial m_1}$	$\frac{(3\alpha_1 b_1)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(3\alpha_1 b_1)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$
Effect of Firm 2 Specific Cost Change on Retail Price 1 $\frac{\partial p_1}{\partial m_2}$	$\frac{(3\alpha_2 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(3\alpha_2 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$
Effect of Firm 2 Specific Cost Change on Retail Price 2 $\frac{\partial p_2}{\partial m_2}$	$\frac{(4\alpha_1 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$	$\frac{(4\alpha_1 b_2)}{-9\alpha_2 b_1 + 16\alpha_1 b_2}$

The addition of farm supply to the above model significantly increases the complexity of the various cost pass through rates. The farm supply equation selected could be of the following form:

$m = pf = g + h\ (q_1 + q_2)$.

To illustrate the impact of farm supply on the cost pass through rates the following examples of one rate can be expressed:

Table 5: Example Increase in Farm Price: Cost Pass Through Rates for Retail Price 1

	No farm supply $\frac{\partial p_1}{\partial m}$	**Farm supply : Farm Price = g + h** (q_1+q_2) $\frac{\partial p_1}{\partial g}$
Vertical Nash	$\frac{(4a_1-3a_2)b_2}{-9a_2b_1+16a_1b_2}$	$\frac{(b_2(-4a_1+3a_2-3a_2b_1h+3a_1b_2h))}{(3a_2^2b_1h(-3+4a_1h+3b_1h)+ a_1b_2(a_1h(16-15b_2h)+b_1h(13-12b_2h)+ 16(-1+b_2h))+a_2(a_1b_2h(13-12a_1h)+ 3b_1^2h(-3+4b_2h)+3b_1(3-4b_2h+2a_1h(-2+b_2h))))}$
Vertical Stackelberg	$\frac{(4a_1-3a_2)b_2}{-9a_2b_1+16a_1b_2}$	$\frac{(a_1(b_2(4-a_1h)+b_1(-3+a_2h)))}{(-a_2^2b_1h(-3+2a_1h+b_1h)+ a_1b_2(16-8b_2h+b_1h(-5+2b_2h)+ a_1h(-8+3b_2h))+a_2(a_1b_2h(-5+2a_1h)+ b_1^2h(3-2b_2h)+b_1(-9+6b_2h-2a_1h(-3+b_2h))))}$

It is worth noting that with the addition of farm supply the cost pass through rates for the two market structures become different.

It is also possible to illustrate the impact of advertising on the structural model, in the first instance assuming no farm supply. With the addition of advertising the following demand equations can be assumed:

$$q_1 = \alpha_0 + \alpha_1 p_1 + \alpha_2 p_2 + \alpha_3 / adv_1 + x_1 / adv_3$$
$$q_2 = b_0 + b_1 p_1 + b_2 p_2 + b_3 / adv_2 + x_1 / adv_3$$

Three different advertising variables are assumed, adv_1 which is brand advertising for product 1, adv_2 which is brand advertising for product 2 and adv_3 which is generic advertising affecting the demands for both goods.

Under the two different market structures the following example cost pass through rates can be expressed:

Table 6: Advertising Pass Through Rates for ADV_1 and ADV_3

	$\frac{\partial p_1}{\partial adv_3}$	$\frac{\partial p_1}{\partial adv_1}$
Vertical Nash	$\frac{3(3\alpha_2 - 4b_2)x_1}{adv_3^{\,2}(9\alpha_2 b_1 - 16\alpha_1 b_2)}$	$\frac{12\alpha_3 b_2}{adv_1^{\,2}(-9\alpha_2 b_1 + 16\alpha_1 b_2)}$
Vertical Stackelberg	$\frac{3(3\alpha_2 - 4b_2)x_1}{adv_3^{\,2}(9\alpha_2 b_1 - 16\alpha_1 b_2)}$	$\frac{12\alpha_3 b_2}{adv_1^{\,2}(-9\alpha_2 b_1 + 16\alpha_1 b_2)}$

From the above it is clear with fixed marginal costs the impact of a change in advertising expenditure on retail price is the same regardless of which game is being played vertically between processors and retailers. However from the above two examples it is clear that the addition of endogenous farm supply would make the impact of the two advertising variables different.

Modelling games between two processors and retailers with generic and branded products

It is possible to illustrate a somewhat more realistic market scenarios if one allows for the existence of both generic and branded products. For illustrative purposes another market scenario can be constructed assuming that the two retailers each sell some branded and some generic product. Each processor produces some branded and some generic product, each retailer still has a dyadic relationship with only one processor. The last simplifying assumption is that the generic product is sold at the same price by each processor and retailer. This scenario requires the addition of a third product demand relationship and the determination of the share of generic product sold by each retailer and processor (s_1).

The demand equations can be expressed as:

$$q_1 = \alpha_0 + \alpha_1 p_1 + \alpha_2 p_2 + \alpha_3 p_3 + \alpha_4 / adv_1$$
$$q_2 = b_0 + a_2 p_1 + b_2 p_2 + b_3 p_3 + b_4 / adv_2$$
$$q_3 = c_0 + a_3 p_1 + b_3 p_2 + c_3 p_3 + c_4 / adv_3$$

where product 1 and 2 are the branded products and product 3 is the generic product sold by both retailers. The total costs associated with each product can be expressed as:

$$TC_1 = w_1 * q_1$$
$$TC_2 = w_2 * q_2$$
$$TC_3 = w3 * q_3$$

However the profit equations for each retailer are a function of their sales of the one branded product (either 1 or 2) and their share (s_1 or 1-s_1) of the generic product (3). The two profit functions can be expressed as:

$$\Pi_1^R = (p_1 - w_1) * q_1 + (p_3 - w_3) * s_1 * q_3$$
$$\Pi_2^R = (p_2 - w_2) * q_2 + (p_3 - w_3) * (1 - s_1) * q_3$$

The processor costs for each product are defined as below:

$$wmc_1 = pf + m_1$$
$$wmc_2 = pf + m_2$$
$$wmc_3 = pf + m_3$$

These costs associated with each product lead to the following profit functions for each processor, again related to the sales of their branded product and their share of the generic product sold:

$$\Pi_1^P = (w_1 - pf - m_1) * q_1 + (w_3 - pf - m_3) * s_1 * q_3$$
$$\Pi_2^P = (w_2 - pf - m_2) * q_2 + (w_3 - pf - m_3) * (1 - s_1) * q$$

Following the earlier structure the processors conjectures can either be of the Nash type expressed below:

$$p_1 = w_1 + r_1$$
$$p_2 = w_2 + r_2$$
$$p_3 = w_3 + r_3$$

or of the Stackelberg type where the y are a function of the retailer's first order condition with respect to each price. In a world where each retailer could charge a different price for the generic product the Stackelberg processor price conjectures would be as below:

$$p_1 = \frac{-a4 + adv_1(a_0 + a_2 p_2 + a_3 p_3 + a_3 p_3 s_1 - a_1 w_1 - a_3 s_1 w_3)}{2a_1 adv_1}$$

$$p_2 = \frac{b_0 + b_4 / adv_2 + a_2 p_1 + 2b_3 p_3 - b_3 p_3 s_1 - b_2 w_2 - b_3 w_3 + b_3 s_1 w_3}{2b_2}$$

$$p_3^{\ 1} = \frac{-a_3 adv_3(p_1 + p_1 s_1 - w_1) + s_1(c_4 + adv_3(c_0 + b_3 p_2 - c_3 w_3))}{2adv_3 c_3 s_1}$$

$$p_3^{\ 2} = \frac{c_4 - c_4 s_1 - adv_3(-2b_3 p_2 + c_0(-1+s_1) + a_3 p_1(-1+s_1) + b_3 p_2 s_1 + b_3 w_2 + c_3 w_3 - c_3 s_1 w_3}{2adv_3 c_3(-1+s_1)}$$

In the simulation illustrated here the generic product demand is priced at the same level regardless of which retailer sells the product. With or without the addition of farm supply the complexities of the above model structure make it difficult to illustrate algebraically the impact of advertising on retail and wholesale prices (and farm price in the case of endogenous farm supply).

To use the model as an illustrative tool various price, advertising and supply elasticities are assumed. The own and cross price elasticities are as expressed in the table below

Table 7 Assumed Own and Cross Price and Advertising Elasticities

	P_1	P_2	P_3	ADV
Q_1	-2	.5	.25	.25
Q_2		-1.5	.251	.25
Q_3			-1.75	.25

The assumed supply elasticity is 1.0. The model is run with and without fixed marginal costs (fixed farm price). The complete model results are expressed in Appendix A. The results in terms of aggregate quantity sold and farm price, with producer surplus retailer and processor profit are expressed below.

Table 8 Simulation Results from doubling Generic Advertising Expenditure with Fixed Marginal Cost

Model	**Vertical Nash**	**Vertical Stackelberg**
Farm Price	5	5
Quantity change	3.32 (2.5%)	3.13 (2.6%)
Producer Surplus change	-6.51 (-2.9%)	-6.47 (-2.9%)
Retailer 1 π change	5.29 (4.1%)	4.75 (4.7%)
Retailer 2 π change	5.97(4.4%)	5.72 (5.0%)
Processor 1 π change	10.17 (4.4%)	10.4 (4.4%)
Processor 2 π change	12.25 (4.7%)	12.25 (4.7%)

The results suggest a decline in producer surplus with the additional generic advertising; something that is sensible given that farm price does not change and producers must fund the additional advertising expenditure. The generic advertising expenditure increase affects all quantities sold in the market slightly. The processors and retailers each benefit from the increased generic advertising and sales of all three products increase, product 3 sales increase the most.

The results from the model simulation with endogenous farm supply are more useful and are summarized below.

Table 9 Simulation Results from doubling Generic Advertising Expenditure with Variable Marginal Cost

Model	Vertical Nash	Vertical Stackelberg
Farm Price change	.033 (1.5%)	.036 (1.3%)
Quantity change	2.11 (1.4%)	2.37 (1.6%)
Producer Surplus change	4.67 (3.0%)	5.35 (3.2%)
Retailer 1 π change	2.42 (1.6%)	3.7 (2.4%)
Retailer 2 π change	3.27(2.0%)	3.72 (2.9%)
Processor 1 π change	10.83 (2.6%)	10.93 (2.5%)
Processor 2 π change	13.38 (3.2%)	13.21 (3.1%)

With the endogenous farm supply the results again suggest an increase in quantity sold, with an attendant increase in farm supply and price. The impact on quantity and price are somewhat larger with the Stackelberg structure than with the Nash structure. The increase in farm supply and price results in a positive impact on producer surplus, greater than the cost of the additional advertising expenditure. Retailers and processors both benefit from the additional generic advertising.

Summary

Market structure is potentially an important contributor to the magnitude of producer returns from an activity such as generic advertising. This is particularly important in concentrated markets where processors and retailers are playing 'games' with wholesale and retail prices. To measure the impact of generic advertising in such structured markets requires the modeling and empirical selection of the appropriate market structure from a menu of possible choices. Further research would allow for the simultaneous playing of games with advertising expenditures as well as prices.

Literature Cited:

Cardon, J. H., and R. D. Pope. 2003. Agricultural Market Structure, Generic Advertising, and Welfare. **Journal of Agricultural and Resource Economics** 28, no. 2: 185-200.

Cotterill, R., W. 2000. Dynamic explanations of industry structure and performance Food Marketing Policy Center. **University of Connecticut, Department of Agriculture and Resource Economics** Research report No. 53.

Depken, II C. A., D. V. Kamersonschen, and A. Snow. 2002. Generic Advertising of Intermediate Goods: Theory and Evidence on Free Riding. **Review of Industrial Organization** 20: 205-20.

Dhar, T.P. and R. W. Cotterill. 2002. Price transmission in Differentiated Product Market Channels: A study of the Boston Fluid Market and the North East Dairy Compact. **University of Connecticut, Department of Agriculture and Resource Economics** Research Report No. 67.

Gardener, B.L. 1975. The Farm-Retail Price Spread in a Competitive Food Industry. **American Journal of Agricultural Economics** 57(3):399-409.

Heien, D.M. 1980. Markup Pricing in a Dynamic Model of the Food Industry. **American Journal of Agricultural Economics** 62(1):10-18.

Kinnucan, H.W. and O.D. Forker. 1987. Symmetry in Farm-Retail Price Transmission for Major Dairy Products. **American Journal of Agricultural Economics** 69(2):285-292.

Lal, R. 1990. Price Promotions: Limiting Competitive Encroachments. **Marketing Science** 9(3):39-57.

Liang. J.N. 1987. An Empirical Conjuctural Variation Model of Oligopoly. Board of Governors of the Federal Reserve System.

McCorriston, S., C.W. Morgan, and A.J. Rayner. 1998. Processing Technology, Market Power and Price Transmission. **Journal of Agricultural Economics** 49(2):185-201.

Raju, J.S., V. Sirinvasan, and R, Lal. 1990. The Effect of Brand Loyalty and Competitive Promotional Strategies. **Marketing Science** 36(3):276-304.

Wohlgenant, M. K., and N. E. Piggott. 2003. Distribution of Grains from Research and Promotion in the Presence of Market Power. **Agribusiness** 19, no. 2: 301-14.

Zhang, M., and R. J. Sexton. 2002. Optimal Commodity Promotion when Downstream Markets are Imperfectly Competitive. **American Journal of Agricultural Economics** 84, no. 2: 352-65.

Zhang, M., R. J. Sexton, and J. M. Alston. 2002. Brand Advertising and Farmer Welfare. **Journal of Agricultural and Resource Economics** 27, no. 2: 365-89.

Appendix A

Simulation Results with Fixed Marginal Cost

Model Structure	P_1	P_2	P_3	Q_1	Q_2	Q_3	S1	W_1	W_2	W_3	**PS**	$R_1\pi$	$R_2\pi$	$P_1\pi$	$P_2\pi$
Vertical Nash															
BASE	10.53	11.64	10.35	60.30	52.92	19.53	.454	8.66	9.39	8.63	228.41	128.21	136.93	232.93	251.16
ADV3*2	10.59	11.71	10.70	60.78	53.30	21.99	.454	8.69	9.44	8.86	221.9	133.5	142.9	243.1	262.9
Vertical Stackelberg															
BASE	10.90	12.03	10.36	51.15	46.03	23.01	.447	9.29	10.05	8.60	222.92	100.224	113.45	236.74	258.24
ADV3*2	10.96	12.11	10.71	51.48	46.29	25.55	.447	9.34	10.10	8.84	216.45	104.97	119.17	247.14	270.49

Simulation Results with Farm Supply Curve

Model Structure	Pf	P_1	P_2	P_3	Q_1	Q_2	Q_3	S1	W_1	W_2	W_3	**PS**	$R_1\pi$	$R_2\pi$	$P_1\pi$	$P_2\pi$
Vertical Nash																
BASE	2.21	10.24	11.28	10.49	68.07	60.32	12.85	.453	8.15	8.95	8.77	155.86	151.03	162.20	423.98	423.16
ADV3*2	2.24	10.32	11.38	10.87	68.05	60.34	14.96	.453	8.23	8.86	9.24	160.54	153.45	165.47	434.81	436.54
Vertical Stackelberg																
BASE	2.27	10.28	11.34	10.05	65.03	56.98	23.58	.454	8.25	8.91	8.09	165.58	152.87	163.49	430.89	432.82
ADV3*2	2.31	10.35	11.43	10.42	65.04	57.02	25.85	.454	8.32	8.99	8.35	170.93	156.57	168.22	441.82	446.30