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Optimal Advertising and Free-Riding Under a Voluntary Beef Checkoff Program

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The beef checkoff program began in 1987 and has collected $1 for each head of cattle marketed in the U.S. and a $1 per head equivalent fee for imported beef. The mandatory beef checkoff program has recently faced constitutional challenges. Since the mandatory checkoff fees are used for collective advertising and promotion efforts, some have argued this violates individual's right to free speech. There have been many lower court legal rulings on this issue and the U.S. Supreme Court is expected to rule soon on the fate of this mandatory checkoff program. Despite these lawsuits against the beef checkoff program, almost two-thirds of beef cattle and dairy cattle producers support the current program according to a recent survey by the Cattlemen's Beef Promotion and Research Board. The survey results indicate that some type of voluntary program could emerge if the court eliminates the mandatory program. Immediate questions surrounding the possible voluntary program include: If the program changes from mandatory to voluntary participation, can the collected checkoff funds be large enough to finance the ongoing advertising and promotion programs? Will this spending on advertising and promotion be optimal in markets where retail and processing sectors are imperfectly competitive? What would be the extent of the expected free-rider problem? To our knowledge, no study has addressed these questions for the beef industry.

The objective of this study is to examine optimal advertising and free-rider problems in the U.S. beef industry under a possible voluntary checkoff program. The study analyzes whether the collected checkoff funds will be sufficient enough to reach the optimal advertising expenditure in markets where retailers and processors exercise oligopoly and oligopsony power. If the collected funds from the voluntary checkoff program will not be sufficient to cover the optimal level of advertising expenditures, the producer loss (caused by the reduced advertising expenditures from the current level) will be estimated. Furthermore, the study estimates the extent of free-ridership gained by domestic producers and importers. There will be a free-rider problem when some domestic producers benefit from generic advertising programs without paying checkoff dollars, and a similar problem will occur when importers do not pay checkoff fees voluntarily. Data from the past five years (1998-2002) demonstrate that U.S. imports averaged over $2 billion annually for beef (fresh, chilled, frozen) from various sources mainly Canada and Australia. The imports account for about ten percent of total domestic consumption.

Optimal Advertising and Free-Riding

Several studies in the literature have examined optimal investment in advertising. Although results of these studies vary under alternative market structures, a basic concept of analytical derivations has been that the optimality of advertising investment is a function of total sales, elasticities of demand, supply, and advertising, and opportunity cost of alternative investments. We develop an optimal advertising model with consideration of trade and imperfectly competitive market structure in processing and retailing sectors. In this framework, retailers' and processors' market power are allowed in both procuring raw materials and selling products (a complete derivation of the model is available upon request).

The newly derived optimal rule is consistent with those in the literature when an integrated retail and processing sector is assumed and international trade is restricted to zero. The optimal advertising rule indicates that as retailers' oligopoly power increases the optimal advertising intensity decreases. Retailers' oligopsony power as well as processors' market power are not relevant to the determination of optimal advertising intensity. The optimal advertising rule also suggests that as import supply elasticity becomes more elastic, the optimal intensity decreases. Consistent with previous studies, as demand becomes more elastic, the optimal advertising intensity decreases while the advertising intensity increases as the advertising effectiveness increases.

The free-rider effect is measured as the amount of farm price decrease due to the increased production from nonparticipating producers. The extent of the free-rider problem is estimated via numeric simulations in the next section.

Application to a Voluntary Beef Checkoff Program

The optimal advertising rule derived in this study is applied to a possible voluntary checkoff program for the U.S. beef industry. We first examine if advertising expenditures under the voluntary checkoff program would be optimal. If advertising expenditures under the proposed voluntary checkoff program are sub-optimal, the potential producer loss would be estimated. Finally, the free-riding problem is also numerically estimated.

Advertising intensities derived from a range of parameters are reported in Table 1. Parameter values are obtained from previous studies. In Table 1, η_A, η_P, η_m and ζ are the advertising elasticity, the price elasticity of demand; the import elasticity, and the conjectural elasticity reflecting retailers' oligopoly power, respectively. Simulation results indicate that the U.S. beef industry would be under-invested under the voluntary programs. The simulated optimal advertising intensities are much greater than the current advertising intensity, 0.0005. Case 1 assumes competitive retail and processing sectors without consideration of trade. Results show that the optimal advertising intensity increases as advertising effectiveness increases while it decreases as demand is more elastic. Case 2 considers imperfectly competitive retail and processing sectors. Since retailers' oligopsony power and processors' market power are not relevant to the estimation of advertising intensity, only retailers' oligopoly power is considered. As the retail market becomes more imperfectly competitive, the optimal advertising intensity becomes smaller. Case 3 considers both market power and trade parameters. The optimal advertising intensity decreases as import supply elasticity becomes more elastic. In most cases results show that estimated optimal advertising intensities are higher than current advertising-sales ratio except a few cases where advertising is extremely ineffective and import supply elasticity is highly elastic under the assumption of a highly imperfectly competitive retail market.

To conduct numeric simulations on impacts of the voluntary checkoff program on producer benefit, we assume linear functional forms for retail demand and farm supply functions while assuming a perfectly elastic supply function for the processing sector. Producer benefit from advertising is measured as a change in producer surplus. We estimate change in producer benefits for three different levels of voluntary participation rates, 55%, 70%, and 85%, and results are reported in Table 2 and Table 3. Table 2 presents changes in producer benefits (ΔPS) with no consideration of trade and market power in retailing and processing sectors. Results indicate that producers may lose 27 to 72 percent of current advertising benefit, and the extent of loss increases as the advertising effectiveness increases. Table 3 shows that when market power and trade parameters are incorporated in the model, the expected producer loss increases as the retailing and processing market power increases. Here, θ, ε_f^s, and τ represent the conjectural elasticity reflecting the processors' oligopsony power, the farm-level supply elasticity, and the import share from total consumption, respectively. When retailing and processing sectors are imperfectly competitive, the expected producer loss tends to increase, ranging from 27 to 86 percent of current benefit. Finally, Table 4 reports the amount of farm price decrease due to the increased production from non-participating producers. The free-riding problem diminishes as market power in retailing and processing sectors increases. Results show that the free-riding from non-participating producers would lower the market price by 5 to 20 percent.

Discussions and Conclusions

This study develops a framework for the analysis of optimal advertising and the free-rider problem. Previous studies in the literature were extended in two ways. First, the new framework allows retailers' oligopsony power separately from processor's market power. Second, to examine the free-rider problem, we introduce the trade component to the model and divide domestic producers into two groups: participating producers and non-participating producers in the possible voluntary program. Then, the free-rider problem was measured as the amount of domestic price decrease due to the increased production from importers and non-participating producers.

Simulation results for the U.S. beef industry indicate that the industry has under-invested in advertising and promotion programs except for a few cases where advertising effectiveness is extremely low (0.0005), the degree of imperfect competition is exceptionally high (0.3), and import supply elasticity is highly elastic (higher than 5). The possible voluntary program is expected to further under-invest in advertising and promotion programs, and as a result, producers are likely to lose 27 to 86 percent of current promotion benefits. The free-riding from non-participating producers would lower market price by 5 to 20 percent.

Table 1. Optimal Advertising Intensity

Case 1. No trade in competitive Market	
Parameters	**Intensity**
η_A= 0.0005 η_P= -0.282	0.0018
η_P= -0.450	0.0011
η_A= 0.012 η_P= -0.282	0.0426
η_P= -0.450	0.0267
η_A= 0.05 η_P= -0.282	0.1773
η_P= -0.450	0.1111
Case 2. No trade in imperfectly competitive market	
Parameters	**Intensity**
η_A= 0.0005 η_P= -0.282	
ζ= 0.1	0.0009
ζ= 0.223	0.0007
ζ= 0.3	0.0004
η_A= 0.012 η_P=-0.282	
ζ= 0.1	0.276
ζ= 0.223	0.0093
ζ= 0.3	0.0022
Case 3. Trade in imperfectly competitive market	
Parameters	**Intensity**
η_A= 0.0005 η_P= -0.282	
ζ= 0.1	
η_m=1	0.0009
η_m=2	0.0007
η_m=5	0.0004
ζ= 0.223	
η_m=1	0.0003
η_m=2	0.0002
η_m=5	0.0001
η_A= 0.012 η_P= -0.282	
ζ= 0.1	
η_m=1	0.0206
η_m=2	0.0165
η_m=5	0.0102
ζ= 0.223	
η_m=1	0.0069
η_m=2	0.0055
η_m=5	0.0034

Current advertising intensity (in 2001): 0.0005

Table 2. Impact of Voluntary Program on Producer Benefit with No Trade in Competitive Markets

η_A	Participation Rate	ΔPS ($million)	%
0.0005	0.55	14	31.1
	0.70	22	48.9
	0.85	33	73.3
	1.00	45	
0.012	0.58	48	29.0
	0.70	80	48.4
	0.85	118	71.5
	1.00	165	
0.05	0.55	87	27.7
	0.70	145	46.2
	0.85	221	70.3
	1.00	314	

Table 3. Impact of Voluntary Program on Producer Benefit with Trade and Imperfectly Competitive Retail and Processing Sectors[a]

	Participation Rate	ΔPS ($million)	%
θ=0.5 ζ= 0.1	0.55	12	30.0
	0.70	19	47.5
	0.85	29	72.5
	1.00	40	
ζ= 0.223	0.55	8	22.2
	0.70	14	38.9
	0.85	20	55.6
	1.00	36	
ζ= 0.5	0.55	4	14.3
	0.70	7	25.0
	0.85	10	35.7
	1.00	28	
ζ= 0.223 θ= 0.178	0.55	14	30.4
	0.70	22	47.8
	0.85	33	72.7
	1.00	46	
θ= 0.3	0.55	12	28.6
	0.70	20	47.6
	0.85	30	71.4
	1.00	42	

[a] Results are calculated with η_A= 0.012, η_p= -0.282, ε^s_f= 0.15, and τ = 0.097

Table 4. Free-Rider Problem - Farm Price Decrease due to the Increased Production from Non-Participating Producers[a]

	Participation Rate	ΔP (%)
ζ= 0.1, θ = 0.178	0.55	20.2
	0.70	16.3
	0.85	9.5
ζ= 0.223, θ = 0.3	0.55	14.0
	0.70	11.1
	0.85	6.4
ζ= 0.5, θ = 0.5	0.55	11.4
	0.70	8.9
	0.85	5.0

[a] Results are calculated with η_A= 0.012, η_p= -0.282, , ε^s_f= 0.15, and τ = 0.097

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