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Abstract

We examine whether cooperative advertising programs could constitute an effective tool to coordinate competitive marketing channels. While previous studies showed that such programs increase total channel profits in bilateral monopolies, no evidence of such a result has been provided for channels where competition is present at manufacturing and/or retailing levels. In this paper, we consider a distribution channel formed of two manufacturers and two retailers and propose a model that accounts for brand and store competitive interactions. The efficiency of the coop plan is investigated by comparing Nash equilibria of two non-cooperative games; one where manufacturers do not offer any promotional support to the retailers, and one where manufacturers do offer such a support. We show that when competition is introduced at a channel level, the efficiency of the coop program is no more guaranteed for members who operate at that level. Further, for symmetric channel members, we find that cooperative advertising programs are indeed implemented only under some conditions on brand and store substitution rates. Finally, for all competitive scenarios, we show that cooperative programs are optimal for consumers.

Résumé

Cet article analyse l'efficacité des programmes de publicité coopérative pour coordonner des canaux de distribution où deux marques nationales concurrentes sont distribuées dans deux magasins concurrents. Dans la littérature, ces programmes sont efficients dans des canaux constitués seulement de deux membres. L'objectif de cet article est d'étendre ces résultats au cas de canaux avec compétition. On considère que chaque détaillant engage des dépenses pour la promotion locale des deux produits (publicité sur le lieu de vente, circulaires, etc.) et chaque manufacturier envisage de s'engager dans un programme coopératif aux termes duquel il rembourserait aux détaillants une part de leurs dépenses promotionnelles. L'efficacité du programme promotionnel est étudiée en comparant les résultats de deux jeux non-coopératifs : 1) les manufacturiers n'accordent aucune aide financière aux détaillants et 2) les détaillants reçoivent une participation des manufacturiers dans leurs dépenses promotionnelles. Dans le cas symétrique, les résultats montrent que le programme de publicité coopérative devrait être adopté si les taux de substitution entre magasins et entre marques sont peu élevés. Dans le cas asymétrique, les résultats montrent que l'entrée d'un concurrent dans un marché où le manufacturier (le détaillant) est en situation de monopole pourrait menacer l'efficacité du programme de coopération promotionnelle pour ce manufacturier (détaillant).

Mots clés : théorie des jeux, circuit de distribution, compétition, programme de coopération promotionnelle.

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1 Introduction

A cooperative advertising program is a financial arrangement in which a manufacturer pays part of the cost of local advertising and promotion undertaken by a retailer for his products (Bergen and John 1997). These coop programs are by no mean a marginal phenomenon in distribution channels. Sen (1992) estimated that 25-40% of local advertisements and promotions are funded on a cooperative basis. Roslow and al. (1993) and Somers and al. (1990) estimate the yearly amount spent on cooperative advertising programs by American manufacturers to more than $10 billion. In 2002, approximately $60 to $65 billion are given by manufacturers to retailers to promote their products (Arnold, 2003).

The percentage of the coop cost paid for by the manufacturer seems to vary with the industry, the firms involved, etc. Bergen and John (1997) report that appliance retailers would get back more than 75% of their total advertising dollars from manufacturers, whereas, according to Brennan (1988), IBM offers a 50-50 split of advertising costs with retailers. In the automobile industry, GM offers a 25% coop-rate to its dealers (Green 2000) and provided huge amounts to car rental agencies : $7-$8 million a year to Avis, $2 million to National, and $5 million to Alamo Rent-A-Car (Teinowitz 1992) while Ford spent $20 million on coop funds in 1990 (Serafin 1990). In the computer industry, Intel has implemented since 1991 the world's biggest coop advertising program "Intel Inside" with the collaboration of computer marketers. The cooperative funds, earmarked for the promotion of Intel's microprocessors, were given at a basis of 60% participation rate, reached approximately $800 million in 1999 and grew up to $1.5 billion in 2001 (Elkin 2001 and 1999). Another example is that of Microsoft who assigned $200 million to promote WindowsXP in 2001 and received much more funds from coop programs initiated by Intel, Compaq, Dell and others (Elkin 2001).

The relationship between a manufacturer and a retailer falls in the classical bilateral monopoly paradigm where bargaining models and noncooperative games have now an established tradition. In this framework, number of contributions attempted to assess the impact of coop programs on such marketing channels. Berger (1972), Dant and Berger (1996) and Li and Huang (2001) showed that cooperative advertising increases total channel profits and retailer's level of local advertising in a one retailer — one manufacturer channel. This stipulates that a coop advertising program can be seen as an incentive scheme designed by the manufacturer to improve channel's efficiency (as measured by total profit). Recently, some studies considered the issue of assessing coop programs and determining equilibrium participation rule in a dynamic setting where advertising has some carry over effects. Cooperative advertising programs are again shown to improve total channel profits for a variety of demand functions and goodwill accumulation processes (Chintagunta and Jain 1992 and Jørgensen and al. 2000). Jørgensen and Zaccour (2002) and Jørgensen and al. (2003) studied, under different assumptions and model formulations, the relevance of coop programs when retailer's promotions harm the brand goodwill. They showed that the manufacturer may still find it optimal to support retailer's promotion. It has also been shown that one can devise a side-payment mechanism to ensure that each channel's member is better-off with the coop program (Jørgensen and al. 2001).

In the above mentioned papers, the focus is on vertical coordination in channels without any horizontal competition. The objective of this paper is to explore the relevance of coop advertising programs in conventional channels i.e. when competition is present, at manufacturing and/or retailing levels. The literature which dealt with the coordination problem under such channel's structures were mainly concerned with pricing issues. The case of a manufacturer dealing with competing retailers has been studied by, e.g. Jeuland and Shugan (1983), McGuire and Staelin (1983), Coughlan (1985), Moorthy (1988) and Ingene and Parry (1995) and Choi (1991) studied a channel with two manufacturers and one retailer. Recently, some papers explored pricing decisions in conventional channels with two manufacturers and two retailers (see, e.g. Lee and Staelin 1997, Lal and Villas-Boas 1998 and Trivedi 1998).

Looking now at other mechanisms than pricing, it is striking to see how the literature is sparse although the message from the contributions with a dyad structure was clear that marketing effort could also be a good candidate for coordinating the channel. Iyer (1998) proposed a spatial model of demand to account for service and price decisions of retailers when one manufacturer is leading the channel. The basic model was then extended to include upstream competition between two manufacturers with the result that coordination is not always desirable for channel members. Bergen and John (1997) studied the so-called open-ended coop programs, that is when manufacturers propose a participation rate into retailers' marketing efforts, to study competitive distribution channels. They proposed a model that accounts for competition in retailing with the aim of investigating its effect on manufacturers' coop participation rates. The authors show that the coop advertising program, along with a two-part tariff pricing scheme, is an efficient coordinating mechanism (i.e. permits to reach the cooperative solution). However, they did not deal with efficiency issue when upstream competition between manufacturers is included in the model. Kim and Staelin (1999) have also studied a conventional channel but to assess advertising allowance program that aims to determine a lump sum or side-payment transfers from the manufacturer to the retailer and the latter pass-through rates.

We focus on non-price competition and assume that retailers choose the level of marketing effort (e.g., local advertising, displays, etc.) and manufacturers control their participation rate into the retailers' marketing efforts if a coop program is an option. To assess the impact of the cooperative advertising program on the conventional channel, we shall consider the following two scenarios:

- A non-cooperative simultaneous game where manufacturers do not support the retailers. In this case, the manufacturers are not actually optimizers and a Nash equilibrium in marketing effort strategies is computed with two competing retailers as players. Manufacturers' outcomes result simply from selling the equilibrium quantities to retailers. The result of this case will serve as a benchmark.
- A sequential non-cooperative game where the manufacturers participate in the retailers' marketing efforts. In the first stage, manufacturers play a Nash game and set

their equilibrium coop participation rates. In the second stage, retailers play Nash and determine their marketing efforts as functions of manufacturers' participation rates and equilibrium outcomes result.

This paper attempts to assess the impacts of implementing a cooperative advertising program in a conventional channel for consumers and channel members in terms of marketing efforts, sales and profits. The main results are the following:

- Coop advertising program increases retailers' marketing efforts. This result extends to a competitive setting the one obtained previously in a dyad channel.
- The cooperative support rates offered by manufacturers to retailers increase as brand competition intensifies and spatial competition decreases.
- Consumers are always better off when a coop advertising program is implemented.
- Coop advertising programs do not always improve channel members' profits in a competitive setting. Our findings show that a cooperative plan will be indeed implemented, i.e. offered by manufacturers and accepted by retailers, only if the store and brand competition rates are not "too high".

The rest of the paper is organized as follows. Section 2 introduces the model and Section 3 derives Nash equilibria for the conventional channel with and without a coop plan. Section 4 investigates the cooperative program efficiency for some special situations and Section 5 concludes.

2 Coop Advertising in a Conventional Channel

Let the conventional channel be formed of two manufacturers (indexed by $j = 1, 2$) and two retailers (indexed by $i = 1, 2$). In the sequel, we shall use synonymously manufacturer, brand and product as well as retailer, store and outlet. Denote by E_j^i retailer's i marketing effort (e.g., non-price promotions, local advertising, in-store display) for brand j. Let demand rate Q_j^i for brand j in store i be given by

$$Q_j^i = 1 + E_j^i - \gamma\,(1-\theta)\,E_j^{3-i} - \theta\,(1-\gamma)\,E_{3-j}^i - \theta\gamma E_{3-j}^{3-i}, \qquad i, j = 1, 2. \tag{1}$$

where $\theta, \gamma \in [0, 1)$. The linear form of our demand function follows a long tradition of research in modeling channel's strategic pricing decisions in competitive marketing channels (McGuire and Staelin 1983, Jeuland and Shugan 1988, Choi 1991, Lee and Staelin 1997 and Trivedi 1998). We adopt a similar specification to study competitive effects of marketing efforts. The assumption of the above specification, adapted from Trivedi (1998), is that the demand for any brand at any outlet depends on marketing efforts for both brands in both outlets. Note that the baseline sales, i.e. sales that would occur if none of the brands in none of the stores were advertised, and the direct marginal effect (or efficiency) of marketing effort on sales are normalized to one. The parameter θ captures the degree of product substitutability and γ the degree of store substitutability. We assume that the direct marginal effect of marketing effort is higher than the marginal brand or store substitution effects,[1] that is

$$1-\gamma-\theta+\theta\gamma \geq 0. \tag{2}$$

Note that a sufficient condition for satisfying the above inequality is to have $\theta \leq 1/2$ and $\gamma \leq 1/2$ which is obtained by considering that effects of marketing efforts for competing product in competing store are lower than the other competitive actions[2] (Trivedi 1998). For the sake of clarity and tractability and without loss of generality we shall assume in the sequel that this condition is satisfied.

A further interpretation of the demand specification could be obtained from the decomposition of competitive effects. Indeed, expand (1) to get

$$Q_j^i = 1 + E_j^i - \gamma E_j^{3-i} + \theta\gamma E_j^{3-i} - \theta E_{3-j}^i + \theta\gamma E_{3-j}^i - \theta\gamma E_{3-j}^{3-i}, \quad i,j=1,2.$$

We see that an incremental increase in efforts for the competing product in this store $\left(E_{3-j}^i\right)$ generates two opposite effects on its demand rate. On one side, it decreases demand through a pure product substitution effect $\left(-\theta E_{3-j}^i\right)$, but on the other side it benefits the demand rate through a cross product-store substitution effect $\left(+\theta\gamma E_{3-j}^i\right)$. Similarly, marketing efforts for the same brand in the competing outlet $\left(E_j^{3-i}\right)$ harms demand through a pure store substitution effect $\left(-\gamma E_j^{3-i}\right)$ and increases it by a cross-competition mechanism $\left(+\theta\gamma E_j^{3-i}\right)$. Therefore, an underlying assumption of this demand formulation is that marketing efforts undertaken by a retailer generate simultaneously positive and negative effects on the demand rate. Note that this formulation extends the one in Bergen and John (1997) and allows for a wider range of positive cross-competitive effects. It considers

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[1] A similar assumption is made in oligopoly theory. Indeed, in pricing models where demand for a firm i is given as a function of all prices, i.e.

$$q_i = f_i(p_1, \ldots, p_n),$$

it is assumed that

$$\sum_i \frac{\partial f_i(p_1,\ldots,p_n)}{\partial p_i} < 0.$$

meaning that if all firms increase their price, each one of them will see its demand decreasing. Here however, the effect would be positive since we are dealing with marketing efforts.

[2] Another rationalization for the specified ranges for γ and θ can be obtained from an assumption on marginal rates of substitution. Indeed, if we assume that

$$\begin{aligned} \frac{\partial Q_j^i / \partial E_{3-j}^i}{\partial Q_j^i / \partial E_{3-j}^{3-i}} &\geq 1 \Leftrightarrow \frac{1-\gamma}{\gamma} \geq 1, \\ \frac{\partial Q_j^i / \partial E_j^{3-i}}{\partial Q_j^i / \partial E_{3-j}^{3-i}} &\geq 1 \Leftrightarrow \frac{1-\theta}{\theta} \geq 1, \end{aligned}$$

then necessarily θ and γ must be less than one half.

indeed positive impact on demand rate generated by the retailer's efforts for the competing brand in her own outlet. To get yet more insight into the functional form of (1), we discuss the following three special reduced demand models obtained by setting the product and/or store substitution parameters at some extreme values:

Reduced Model	Demand Q_j^i	Values of θ and γ
1	$1 + E_j^i$	$\theta = \gamma = 0$
2	$1 + E_j^i - \theta E_{3-j}^i$	$\theta \in [0, 1/2], \gamma = 0$
3	$1 + E_j^i - \gamma E_j^{3-i}$	$\theta = 0, \gamma \in [0, 1/2]$

Reduced model 1 corresponds to what has been extensively studied in the literature, i.e. a dyad marketing channel. In this context, although the retailer under scrutiny may be carrying other products than the brand of the manufacturer and the latter selling to other retailers, the assumption is that this is not relevant to the analysis of the relationship between the two protagonists. The second model stipulates that demand for a brand is a decreasing function in marketing effort for the competing brand. This model better fits the case where the products considered compete within a store and where competition between outlets is irrelevant (e.g., the stores operate in non-overlapping territories). The last reduced model represents a situation where the competition is between stores selling the same product. This model fits probably the case where consumers are already committed to a brand and the only left decision is where to buy it. For this segment, it does not really matter if a store is carrying or not an alternative brand.[3]

The full demand model (1) accounts for both substitution effects and is of interest to mass distribution industries where substitutable brands are sold in competing stores. Admittedly however, this is not the most general model in the sense that a "symmetry" assumption has been made regarding substitution effects. Indeed, it is readily seen that

$$\begin{aligned}
\frac{\partial Q_j^i}{\partial E_{3-j}^i} &= -\theta\,(1-\gamma)\,, & j &= 1,2.\\
\frac{\partial Q_j^i}{\partial E_j^{3-i}} &= -\gamma\,(1-\theta)\,, & i &= 1,2.\\
\frac{\partial Q_j^i}{\partial E_{3-j}^{3-i}} &= -\theta\gamma, & i,j &= 1,2.
\end{aligned}$$

We believe that this assumption is acceptable in the context of consumer products belonging to the same category and where the stores carrying them are of the same type. Moreover, symmetric substitutability effects are considered in previous literature dealing

[3] An illustrative example would be teenagers visiting different stores looking for a pair of sport shoes of their favorite brand.

with competitive marketing channels (Bergen and John 1997 and Trivedi 1998). However, note that the above assumption **does not** imply symmetric elasticities.

Let retailer's i marketing efforts cost be given by the following convex function

$$C^i(E^i_j, E^i_{3-j}) = 1/2w\left[(E^i_j)^2 + (E^i_{3-j})^2\right], \qquad i = 1, 2.$$

where w is a positive constant parameter[4]. This specification has been used in recent literature dealing with advertising decisions[5] (Chintagunta and Jain 1992, Chu and Desai 1995, Bergen and John 1997 and Jørgensen and al. 2001).

Denote by D^i_j the participation rate of manufacturer j in the marketing effort cost of retailer i. We assume that $0 \leq D^i_j \leq 1$. To avoid price discrimination, some countries prohibit manufacturers of offering different participation rates to their dealers (e.g., the Robinson-Patman Act, Section 3, Act 15, in U.S.A). If this was to be true, one would then reformulate the model imposing $D^i_j = D^{3-i}_j$.

Let π_j be manufacturer's j transfer price, similar to both retailers, and denote by π^i_j the retail price of brand j in store i. Since the model is static and again to keep the focus on coop advertising programs, we assume that these prices are given constant. Denote by c_j the unit production cost of manufacturer j. Let $m_j = \pi_j - c_j$ be the margin of manufacturer j and $M^i_j = \pi^i_j - \pi_j$ be the margin of retailer i on product j.

In the presence of a coop advertising program, retailer's i profit function is the difference between her revenues and her share in the marketing effort costs, that is

$$P^i = \sum_j \left[M^i_j Q^i_j - 1/2w\left(1 - D^i_j\right)(E^i_j)^2\right], \quad i = 1, 2. \tag{3}$$

where demand rates Q^i_j are given by (1).

Similarly, manufacturer's j profit function is given by

$$P_j = \sum_i \left[m_j Q^i_j - 1/2wD^i_j(E^i_j)^2\right], \qquad j = 1, 2. \tag{4}$$

3 Equilibrium Marketing Strategies

We now characterize in turn Nash equilibria without (benchmark scenario) and with coop programs and compare them. We shall superscript marketing effort equilibrium values and sales in the presence of a coop program by C. Note that in the absence of such program, the manufacturers become passive players and the retailers play a one-stage noncooperative game. Retailer's i optimization problem is then given by

$$\max_{E^i_j, E^i_{3-j}} P^i = \left(M^i_j Q^i_j + M^i_{3-j} Q^i_{3-j}\right) - 1/2w\left[(E^i_j)^2 + (E^i_{3-j})^2\right], \qquad i = 1, 2.$$

[4]Results do not change qualitatively if we assume brand and store specific cost parameters.

[5]Solutions to a problem with linear demand and quadratic advertising costs is equivalent to those obtained for a linear cost problem with quadratic demand. Hence, even if our demand function does not account for decreasing marginal effects of marketing efforts, solutions do not change qualitatively.

Proposition 1 *In the absence of a coop advertising program and assuming an interior solution, Nash equilibrium marketing effort strategies are given by*

$$E_j^i = \frac{M_j^i - M_{3-j}^i \theta (1-\gamma)}{w}, \qquad i,j = 1,2. \tag{5}$$

Proof. Straightforward from first-order conditions. ■

The above result shows that retailer i's marketing effort for brand j depends on its margin and competitive brand margin as well as on product and store substitution parameters. The equilibrium level is determined by the familiar condition stating that marginal cost (wE_j^i) must be equal to marginal revenue. The latter corresponds to the difference between the marginal revenue from this brand (M_j^i) and the net marginal revenue (or net marginal loss) from the competing brand ($M_{3-j}^i \theta (1-\gamma)$). If this difference is negative, then this brand will not be advertised.

Given the equilibrium levels in (5), one can easily compute manufacturers' and retailers' profits and also demand rates under this scenario.

The next proposition summarizes results for the case where manufacturers are active players and offer coop advertising programs. In such a scenario, the game is a two-stage sequential one. Nash equilibrium is determined recursively by first obtaining retailers' marketing efforts as response functions of manufacturers' participation rates and then determining manufacturers' optimal participation rates.

Proposition 2 *Assuming that the manufacturers offer coop advertising programs and an interior solution, manufacturers' and retailers' Nash equilibrium strategies are given by*

$$\left(E_j^i\right)^C = \frac{2m_j \left[1-\gamma(1-\theta)\right] + \left[M_j^i - M_{3-j}^i \theta (1-\gamma)\right]}{2w}, \qquad i,j = 1,2. \tag{6}$$

$$D_j^i = \frac{2m_j \left[1-\gamma(1-\theta)\right] - \left[M_j^i - M_{3-j}^i \theta (1-\gamma)\right]}{2m_j \left[1-\gamma(1-\theta)\right] + \left[M_j^i - M_{3-j}^i \theta (1-\gamma)\right]}, \qquad i,j = 1,2. \tag{7}$$

Proof. See Appendix. ■

To interpret the result, we write down retailer i's response function

$$\left(E_j^i\right)^C = \frac{M_j^i - M_{3-j}^i \theta (1-\gamma)}{w\left(1 - D_j^i\right)}, \qquad i,j = 1,2. \tag{8}$$

and note that the same interpretation as for $\left(E_j^i\right)$ still holds with the modification that the marginal cost for the retailer is now $w\big(1-D_j^i\big)\big(E_j^i\big)^C$.

It is readily seen from the results of Propositions 1 and 2 that $\left(E_j^i\right)^C > E_j^i$ and hence coop advertising programs do indeed provide an incentive to retailers to do more marketing effort. The result in (7) shows that the support provided by a manufacturer to a retailer depends on substitution parameters (hence competitive effects are captured) and on his margin (m_j) as well as on that retailer's margins on the two products. Note that this participation rate formula does not include the margins of the other manufacturer neither the margins of the other retailer. The participation rate obtained here generalizes to a competitive setting the ones suggested in a one-manufacturer one-retailer context in Jørgensen and al. (2000, 2001). In these references, the manufacturer also supports his exclusive retailer if his marginal revenue is higher than half of retailer's marginal one. We have here a similar result with the difference that marginal revenues involve the substitutability parameters to account for the competitive channel's structure. From (5) and (8), we get the following simple relationship between the marketing efforts with and without cooperative support

$$\frac{\left(E_j^i\right)^C - E_j^i}{\left(E_j^i\right)^C} = D_j^i, \qquad i,j = 1,2.$$

showing that retailer i increases the marketing effort for brand j at the same rate as the support provided by the manufacturer of that brand.

Further, if $\left(E_j^i\right)^C > 0$, then the denominator of D_j^i is strictly positive. Hence, to have a positive participation rate, we need the following to hold true

$$m_j\left[1-\gamma\left(1-\theta\right)\right] > \frac{1}{2}\left[M_j^i - M_{3-j}^i\theta\left(1-\gamma\right)\right], \qquad i,j = 1,2.$$

The right-hand-side of the above inequality is half the marginal revenue of retailer i, and the left-hand-side is manufacturer j's marginal revenue. Note also that $D_j^i < 1$ is then automatically satisfied.

The formula providing the support rates involve margins and competitive parameters. The following two propositions provide the impact of varying these parameters on the support rates.

Proposition 3 *The support rate D_j^i, $i,j = 1,2$, is*

- *increasing in manufacturer j's margin;*
- *decreasing in retailer i's margin on the same brand and increasing in that retailer's margin on competing brand;*
- *insensitive to competing manufacturer's and store's margins on both brands.*

Proof. It suffices to compute the following derivatives of (7) to get the results:

$$\frac{\partial D_j^i}{\partial m_j} = \frac{4\left(1-\gamma\left(1-\theta\right)\right)X}{(X+Y)^2} > 0,$$
$$\frac{\partial D_j^i}{\partial M_j^i} = \frac{-2X}{(X+Y)^2} < 0, \qquad \frac{\partial D_j^i}{\partial M_{3-j}^i} = \frac{2\theta(1-\gamma)X}{(X+Y)^2} > 0,$$
$$\frac{\partial D_j^i}{\partial M_j^{3-i}} = \frac{\partial D_j^i}{\partial M_{3-j}^{3-i}} = \frac{\partial D_j^i}{\partial m_{3-j}} = 0.$$

where

$$X = 2m_j\left[1-\gamma\left(1-\theta\right)\right], \qquad Y = \left[M_j^i - M_{3-j}^i\theta\left(1-\gamma\right)\right].$$

■

Given the absence of price competition and the participation rate formula, the above results are fairly intuitive. Each manufacturer's participation rate is increasing in his own margin meaning that as he gains more funds, he has a greater possibility to boost retailers' marketing efforts. Further, as a retailer gains higher margin on a manufacturer's product, she has more available funds and could improve her marketing efforts with less coop support from that manufacturer. However, a higher coop participation rate should be offered as the retailer's margin on the competing brand increases in order to boost the outlet's revenue through a higher sales volume.

Proposition 4 *The support rate D_j^i, $i, j = 1, 2$, is*

- *increasing in brand substitutability parameter;*
- *decreasing in store substitutability parameter.*

Proof. It suffices to compute the following derivatives of (7) to get the results:

$$\frac{\partial D_j^i}{\partial \theta} = \frac{4m_j}{(X+Y)^2}\left[M_j^i\gamma + M_{3-j}^i\left(1-\gamma\right)^2\right] > 0,$$
$$\frac{\partial D_j^i}{\partial \gamma} = -\frac{2}{(X+Y)^2}\left[m_j(1-\theta)Y + M_{3-j}^i\theta X\right] < 0.$$

■

The above results show that the manufacturer's participation rate is increasing in product substitutability and decreasing in store substitutability. Hence, when competition between brands is tense, manufacturers should adopt an aggressive advertising behavior and increase their contribution to the dealers' marketing costs. Further, the more substitutable are the retail stores, the lower should be the support rate, meaning that manufacturers should not encourage store competition by giving more coop funds to both outlets.

It is interesting to note that Bergen and John (1997) have found the opposite results, albeit without accounting for positive cross-competition effects of store and brand substitutability on demand rates. They obtained indeed that lower brand substitutability results in higher manufacturers' margins and therefore induce the latter to increase their coop participation rates. They also showed that when store substitutability is tense, there is more need to subsidize local advertising and higher coop rates should be provided.

4 Efficiency of Coop Advertising Programs

The previous section showed that cooperative advertising programs increase marketing effort of retailers. Although this may be seen as a positive effect, the central issue remains however whether or not such programs are efficient. Efficiency can be assessed from the point of view of consumers and the players involved in the channel. Given that we have assumed constant transfer and retail prices, consumers' interest in such a program could be easily represented by its impact on total demand. Players' interest will be assessed in terms of profits.

The following proposition shows that if consumers have a say in the management of the channel, they will vote in favor of the establishment of cooperative advertising programs. Indeed, it turned out that such programs increase total demand irrespective of the intensity of substitution between products and stores. The rationale is that marketing efforts provide more and better information to consumers and then increasing these efforts, thanks to coop programs, boosts demand.

Proposition 5 *Assuming* $\left(E_j^i\right)^C > 0,\ \forall\ i,j = 1,2,$ *coop advertising programs increase total demand.*

Proof. Using (5), (6), (1) and computing the difference in total demand with and without coop advertising program gives

$$\sum_i \sum_j \left[\left(Q_j^i\right)^C - Q_j^i\right] = \sum_i \sum_j \left[1-\gamma-\theta+\theta\gamma\right]\left[\left(E_j^i\right)^C - E_j^i\right]$$

We have established that if $D_j^i \geq 0$, then $\left(E_j^i\right)^C - E_j^i \geq 0$. It suffices to invoke assumption (2) to get the result. ■

An implementable advertising program is one which leads to higher profits for the parties involved. In the realm of one manufacturer — one retailer channels, the literature showed that a coop advertising program increases total channel's profit and is Pareto-improving. Note that Pareto-improvement may require a side-payment scheme from one player to another. The differences in profits for retailer i $(\left(P^i\right)^C - P^i)$, manufacturer j $((P_j)^C - P_j)$ and total channel $((P_{ch})^C - P_{ch})$ are given by:

$$\begin{aligned}
&\left(P^i\right)^C - P^i = \\
&\frac{1}{4w}\sum_j \left\{ \left[M_j^i - M_{3-j}^i\theta\left(1-\gamma\right)\right]\left[2m_j\left(1-\gamma\left(1-\theta\right)\right) - M_j^i + M_{3-j}^i\theta\left(1-\gamma\right)\right] \right. \\
&\left. -2\gamma\left[M_j^i\left(1-\theta\right) + M_{3-j}^i\theta\right]\left[2m_j\left(1-\gamma\left(1-\theta\right)\right) - M_j^{3-i} + M_{3-j}^{3-i}\theta\left(1-\gamma\right)\right]\right\}, \\
&\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad i = 1,2. \qquad (9)
\end{aligned}$$

$$\begin{aligned}
&\left(P_j\right)^C - P_j = \frac{1}{8w}\sum_i \left\{\left[2m_j\left(1-\gamma\left(1-\theta\right)\right) - M_j^i + M_{3-j}^i\theta\left(1-\gamma\right)\right]^2\right. \\
&\left. -4m_j\theta\left[2m_{3-j}\left(1-\gamma\left(1-\theta\right)\right) - M_{3-j}^i + M_j^i\theta\left(1-\gamma\right)\right]\right\}, \qquad j = 1,2. \qquad (10)
\end{aligned}$$

$$\left(P_{ch}\right)^C - P_{ch} = \sum_i\left[\left(P^i\right)^C - P^i\right] + \sum_j\left[\left(P_j\right)^C - P_j\right], \qquad i,j = 1,2. \qquad (11)$$

As it is noticeable, these differences involve the nine parameters of the model (margins and substitution rates). From the above expressions, the profitability of the coop plan can be derived only by stating sufficiency conditions, one for each player, without gaining much analytical insight. Actually, unless one makes a long series of assumptions regarding the relationships between the different margins, it will be extremely hard to tell if these conditions do actually intersect or not. Our strategy to assess profitability (and hence implementability) of coop programs is to study some special situations to get some additional hints from results and then state conjectures for the general case. The scenarios examined in details are the following ones:

- Symmetric manufacturers and symmetric retailers,
- Competing brands but no spatial competition, i.e. $\gamma = 0$,
- Spatial competition between retailers and independent brands, i.e. $\theta = 0$.

4.1 Efficiency in a Symmetric Channel

The assumption here is that the two manufacturers and the two retailers are identical, i.e. $M_j^i = M$, $m_j = m$, $i,j = 1,2$. From (5)-(6)-(7)-(11)-(10) and (9), we get easily the following marketing efforts, participation rates and profits:

$$E_j^i = E = \frac{M\left[1-\theta\left(1-\gamma\right)\right]}{w}, \qquad i,j=1,2. \tag{12}$$

$$\left(E_j^i\right)^C = E^C = \frac{2m\left[1-\gamma\left(1-\theta\right)\right]+M\left[1-\theta\left(1-\gamma\right)\right]}{2w}, \quad i,j=1,2. \tag{13}$$

$$D_j^i = D = \frac{2m\left[1-\gamma\left(1-\theta\right)\right]-M\left[1-\theta\left(1-\gamma\right)\right]}{2m\left[1-\gamma\left(1-\theta\right)\right]+M\left[1-\theta\left(1-\gamma\right)\right]}, \qquad i,j=1,2. \tag{14}$$

$$\left(P^i\right)^C - P^i = M\left[1-\theta-2\gamma+\theta\gamma\right]\left[E^C-E\right], \qquad i=1,2. \tag{15}$$

$$\left(P_j\right)^C - P_j = \frac{1}{2}\left[2m\left(1-2\theta-\gamma+\theta\gamma\right)-M\left(1-\theta+\theta\gamma\right)\right]\left[E^C-E\right], \quad j=1,2. \tag{16}$$

$$\left(P_{ch}\right)^C - P_{ch} = \left[2m\left(1-\gamma-2\theta+\theta\gamma\right)+M\left(1-\theta-4\gamma+\theta\gamma\right)\right]\left[E^C-E\right]. \tag{17}$$

Since it is the manufacturer who is offering the support, it makes sense to assume that a necessary condition for the implementation of a coop advertising program is to be profit improving for him. This condition becomes sufficient if it suits the retailer. The following proposition shows that coop programs cannot be implemented for a certain combination of brand and store substitution rates.

Proposition 6 *If $\theta > \frac{1-\gamma}{2-\gamma}$, then both manufacturers will not offer a coop support to retailers.*

Proof. From (16), it is easy to check that manufacturer j, $j=1,2$, increases his profit with a coop advertising program if

$$\left(P_j\right)^C - P_j > 0 \Leftrightarrow \frac{2m}{M}\begin{cases} > \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, & \text{if } (1-2\theta-\gamma+\theta\gamma)>0 \\ < \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, & \text{if } (1-2\theta-\gamma+\theta\gamma)<0 \end{cases}$$

$$\Leftrightarrow \frac{2m}{M}\begin{cases} > \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, & \text{if } \theta<\frac{1-\gamma}{2-\gamma} \\ < \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, & \text{if } \theta>\frac{1-\gamma}{2-\gamma} \end{cases}.$$

Since by definition the margins are positive, we conclude that if $\theta > \frac{1-\gamma}{2-\gamma}$, then $\left(P_j\right)^C - P_j < 0$. ■

This proposition says that if the brand substitution rate is "too high", then none of the manufacturers will find it optimal to support his retailers. Note that the higher is the level of store competition, the narrower is the interval for θ on which the condition could be satisfied.[6] Further, the profitability of the cooperative program for manufacturers could be stated equivalently in terms of store substitution, i.e. $\gamma > \frac{(1-2\theta)}{(1-\theta)}$ or as a combination of the two, i.e. $2\theta - \gamma\theta + \gamma > 1$. Recall that under symmetry, the two manufacturers are identical and hence what holds true for one of them is also true for the other.

We now take a closer look at the condition under which coop advertising programs would improve profits of manufacturers, that is

$$(P_j)^C - P_j > 0 \Leftrightarrow \frac{2m}{M} > f(\theta, \gamma) \tag{18}$$

where

$$f(\theta, \gamma) = \frac{(1 - \theta + \theta\gamma)}{(1 - 2\theta - \gamma + \theta\gamma)} \quad \text{and} \quad \theta < \frac{1-\gamma}{2-\gamma}.$$

From the above condition, we conclude that in absence of store and brand competition, the cooperative program is profitable for each manufacturer only if his margin is higher than half the retailer's margin $(2m > M)$. A similar condition was found in Jørgensen and al. (2000) for a one manufacturer — one retailer channel's structure. Hence, under a competitive setting, we need a stringer condition on manufacturer's relative margin to ensure the profitability of the coop plan. Indeed, the condition is now $2m > Mf(\theta, \gamma)$ where $f(\theta, \gamma) > 1$ and it is harder to satisfy as store and/or brand competition intensify.[7]

Even if the coop program is profit improving for manufacturers, it cannot be implemented in the channel unless it is accepted by retailers. Hence, we look now at the problem from the retailers' perspective and provide the necessary conditions for a profitable implementation of the coop plan at their level.

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[6]Indeed, it suffices to note that

$$\frac{d}{d\gamma} \quad \frac{1-\gamma}{2-\gamma} \quad = -\frac{1}{(2-\gamma)^2} < 0.$$

[7]It is easy to check that $f(\theta, \gamma)$ satisfies the following properties for $\theta < \frac{1-\gamma}{2-\gamma}$ and $0 \leq \gamma \leq 1/2$

$$\begin{aligned} \frac{\partial f(\theta,\gamma)}{\partial \theta} &= \frac{1+\gamma-\gamma^2}{(1-2\theta-\gamma+\theta\gamma)^2} > 0, \\ \frac{\partial f(\theta,\gamma)}{\partial \gamma} &= \frac{1-\theta-\theta^2}{(1-2\theta-\gamma+\theta\gamma)^2} > 0, \\ f(0,0) &= 1, \qquad f(0,\gamma) = \frac{1}{1-\gamma}, \qquad f(\theta,0) = \frac{1-\theta}{1-2\theta}. \end{aligned}$$

Proposition 7 *Retailer i, $i = 1, 2$, will implement a coop advertising program if* $\theta < \frac{1-2\gamma}{1-\gamma}$.

Proof. From (15), it is clear that

$$\begin{aligned}\left(P^i\right)^C - P^i &> 0 \Leftrightarrow [1-\theta-2\gamma+\theta\gamma] > 0, \qquad i = 1, 2.\\ &\Leftrightarrow \theta < \frac{1-2\gamma}{1-\gamma}.\end{aligned}$$

■

At the retailing level, the feasibility of a coop program requires also relative "low" levels of brand competition. A more intuitive result could be derived from the alternative condition on the store substitutability rate obtained equivalently from the above proposition *i.e.* $\gamma < \frac{1-\theta}{2-\theta}$. Therefore, retailers will profit from the coop program implementation only when competition from the other store is not "too high" and this condition gets stringer with higher substitutability between brands.

Putting together the conditions derived for the profit improvement at both the manufacturing and retailing levels, we get the following

$$\frac{2m}{M} > \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, \quad \theta < \min\left\{\frac{1-2\gamma}{1-\gamma}, \frac{1-\gamma}{2-\gamma}\right\}. \tag{19}$$

which is equivalent to the following result

$$\frac{2m}{M} > \frac{(1-\theta+\theta\gamma)}{(1-2\theta-\gamma+\theta\gamma)}, \qquad \theta < \begin{cases} \frac{1-\gamma}{2-\gamma}, \text{ for } \gamma \in \left(0, \frac{3-\sqrt{5}}{2}\right) \\ \frac{1-2\gamma,}{1-\gamma} \text{ for } \gamma \in \left(\frac{3-\sqrt{5}}{2}, \frac{1}{2}\right) \end{cases}.$$

An equivalent condition can be obtained replacing θ by γ in the above expressions[8].

To recapitulate, under full symmetry a cooperative advertising program is implementable for "low" levels of brand and store substitution rates. When competition at one or both channel levels is "too high", the cooperative program can be harmful for channel members although it will increase marketing efforts.

We have shown in the general case that total demand increases under coop advertising program. In the symmetric case, we have the stronger following result stating that sales of each product in each outlet increase if such program is implemented.

[8]Define by

$$\begin{aligned} g(\gamma) &= \frac{1-2\gamma}{1-\gamma} - \frac{1-\gamma}{2-\gamma} \\ &= \frac{\gamma^2-3\gamma+1}{(1-\gamma)(2-\gamma)}. \end{aligned}$$

It is easy to check that $g(\gamma) > 0$ for $\gamma \in \left(0, \frac{3-\sqrt{5}}{2}\right)$.

Proposition 8 *If a coop advertising program is implemented, then*

$$\left(Q_j^i\right)^C - Q_j^i > 0, \qquad i,j = 1,2.$$

Proof. From (13), (12) and (1), one easily gets

$$\left(Q_j^i\right)^C - Q_j^i = [1-\gamma-\theta+\theta\gamma]\left[E^C - E\right], \qquad i,j=1,2.$$

which is positive by the assumption in (2). ■

An obvious implication of the above proposition is that demand rate in each store and for each manufacturer's brand also increases.

4.2 Efficiency in Absence of Spatial Competition

This scenario considers a situation where the stores operate in non-overlapping territories ($\gamma = 0$) but manufacturers' brands still compete in each retailer's outlet. The brand substitutability still can assume any feasible value, i.e. $\theta \in [0, 1/2]$. The demand rate is now independent of the competing retailer's marketing efforts and is given by

$$Q_j^i = 1 + E_j^i - \theta E_{3-j}^i, \quad i,j = 1,2. \tag{20}$$

The optimization problems of retailers and manufacturers read

$$\max_{E_j^i, E_{3-j}^i} P^i = \sum_j \left[M_j^i\left(1+E_j^i-\theta E_{3-j}^i\right) - 1/2w\left(1-D_j^i\right)(E_j^i)^2\right], \quad i=1,2.$$

$$\max_{D_j^i, D_j^{3-i}} P_j = \sum_i \left[m_j\left(1+E_j^i-\theta E_{3-j}^i\right) - 1/2wD_j^i(E_j^i)^2\right], \quad j=1,2.$$

Each retailer's optimization problem is now one of a spatial monopolist selling an assortment of competing products. As previously, when coop programs are not offered, manufacturers are passive players and their profits are obtained simply by inserting the equilibrium retailers' marketing efforts strategies given from (5) by

$$E_j^i = \frac{M_j^i - M_{3-j}^i\theta}{w}, \qquad i,j=1,2.$$

In the case where coop programs are offered and assuming an interior solution, the equilibrium marketing efforts and participation rates strategies become (from (6), (7)):

$$\begin{aligned}
\left(E_j^i\right)^C &= \frac{2m_j + \left[M_j^i - M_{3-j}^i\theta\right]}{2w}, \qquad i,j=1,2.\\
D_j^i &= \frac{2m_j - \left[M_j^i - M_{3-j}^i\theta\right]}{2m_j + \left[M_j^i - M_{3-j}^i\theta\right]}, \qquad i,j=1,2.
\end{aligned}$$

The interpretation of these strategies is very much similar to the general case with the difference that they do not involve now any store competition issue.

The following proposition characterizes the conditions under which a coop program is efficient.

Proposition 9 *In the absence of spatial competition:*

(i) a sufficient condition for manufacturer j, $j = 1, 2$, to implement a coop advertising program in retailer i's, $i = 1, 2$, outlet is

$$4m_j^2 - 4m_j \left[2\theta m_{3-j} - 2\theta M_{3-j}^i + (1+\theta^2)M_j^i\right] + \left(M_j^i - \theta M_{3-j}^i\right)^2 > 0$$

(ii) if offered, retailer i, $i = 1, 2$, will implement the coop program $\forall\theta$.

Proof. (i) Use (10) to compute

$$\begin{aligned}(P_j)^C - P_j &= \frac{1}{8w}\sum_i \Big\{\left[2m_j - M_j^i + \theta M_{3-j}^i\right]^2 \\ &\quad -4\theta m_j\left[2m_{3-j} - M_{3-j}^i + \theta M_j^i\right]\Big\}, \qquad j = 1, 2.\end{aligned}$$

from which one obtains easily the stated condition.

(ii) Use (9) to compute

$$\left(P^i\right)^C - P^i = \frac{1}{4w}\sum_j \left[M_j^i - \theta M_{3-j}^i\right]\left[2m_j - M_j^i + \theta M_{3-j}^i\right], \qquad i = 1, 2.$$

The curly bracket terms correspond to the numerator of E_j^i and $\left(E_j^i\right)^C$ which are assumed nonnegative. ■

The main result established here is that in absence of a competition threat from another store, the retailer is always interested by a coop program irrespective of the competition intensity between manufacturers. The coop plan profitability for each manufacturer depends on a condition involving his margin, competing manufacturer's and retailers' margins as well as the brand substitution parameter. Note that this condition is stated for each manufacturer's profitability at each outlet, and is then sufficient but not necessary for the implementation of the coop program. Compared to the results known in a dyad marketing channel, we see here that a coop plan is not necessarily always profitable. Further, the above condition can be written equivalently as

$$m_j > \frac{1/2wD_j^i\left[(E_j^i)^C\right]^2}{\left(Q_j^i\right)^C - \left(Q_j^i\right)}, \qquad i, j = 1, 2. \tag{21}$$

The numerator is the total cost of the coop program paid by manufacturer j to retailer i and the denominator is the difference in quantities sold of brand j with and without a coop plan. Therefore, if manufacturer j's margin is greater than the per unit cost of incremental sales then the program is profitable for him. This is fairly intuitive. The implicit assumption when stating the condition in (21) is that the solution of the equilibrium problem with support is interior (i.e., $D_j^i > 0$). The denominator is nonnegative if

$$\left(Q_j^i\right)^C - Q_j^i = \left[\left(E_j^i\right)^C - E_j^i\right] - \theta\left[\left(E_{3-j}^i\right)^C - E_{3-j}^i\right] > 0, \quad i,j = 1,2.$$

which is equivalent to

$$\theta < \frac{\left[\left(E_j^i\right)^C - E_j^i\right]}{\left[\left(E_{3-j}^i\right)^C - E_{3-j}^i\right]}, \qquad i,j = 1,2. \tag{22}$$

The above condition shows that the ratio of incremental marketing efforts in the same outlet for the competing brands should be greater than the substitution rate. If it was not the case, the manufacturer will not support the retailer.

Note that in absence of store competition, category sales in each outlet increases and hence grand total sales. Indeed, incremental category sales are now given by

$$\sum_j \left[\left(Q_j^i\right)^C - Q_j^i\right] = \sum_j \left[1-\theta\right]\left[\left(E_j^i\right)^C - E_j^i\right], \qquad i = 1,2.$$

which is clearly positive.

4.3 Efficiency in Absence of Brand Competition

We turn now to the case where retailers have overlapping territories. The two brands are not in competition which amounts to say that they are designated to two different market segments or pertain to independent product categories.

Equilibria and profit functions for this scenario are obtained by setting to zero the brand substitutability parameter in the original model ($\theta = 0$). The demand rates are now

$$Q_j^i = 1 + E_j^i - \gamma E_j^{3-i}, \quad i,j = 1,2. \tag{23}$$

The optimization problems of channel members read

$$\max_{E_j^i, E_{3-j}^i} P^i = \sum_{j=1,2}\left[M_j^i\left(1 + E_j^i - \gamma E_j^{3-i}\right) - 1/2w\left(1 - D_j^i\right)(E_j^i)^2\right], \quad i = 1,2. \tag{24}$$

$$\max_{D_j^i, D_j^{3-i}} P_j = \sum_{i=1,2}\left[m_j\left(1 + E_j^i - \gamma E_j^{3-i}\right) - 1/2wD_j^i(E_j^i)^2\right], \quad j = 1,2. \tag{25}$$

From (5), (6)and (7) one gets the equilibrium strategies:

$$E_j^i = \frac{M_j^i}{w}, \qquad i,j = 1,2.$$

$$\left(E_j^i\right)^C = \frac{2m_j\left(1-\gamma\right) + M_j^i}{2w}, \quad i,j = 1,2.$$

$$D_j^i = \frac{2m_j\left(1-\gamma\right) - M_j^i}{2m_j\left(1-\gamma\right) + M_j^i}, \qquad i,j = 1,2.$$

Although the interpretation of these strategies are very much similar to the ones obtained in the general case, one must stress that the support rate provided by manufacturer j is independent of his competitor's actions. This situation is then equivalent to a monopolistic manufacturer distributing his product in two competing stores. Retailer i's marketing effort decision on brand j is also independent of her decision regarding the competing brand.

Proposition 10 *In absence of brand competition,*

(i) *Manufacturers will offer a coop support* $\forall\gamma$.

(ii) *a sufficient condition for retailer* i, $i = 1,2$, *to implement a coop advertising program for brand* j, $j = 1,2$, *is*

$$M_j^i < 2\left[\left(1-\gamma\right)\left(1-2\gamma\right)m_j + \gamma M_j^{3-i}\right].$$

Proof. (i) Use (9) to compute

$$\left(P^i\right)^C - P^i = \frac{1}{4w}\sum_j M_j^i\left[2\left(1-\gamma\right)\left(1-2\gamma\right)m_j - M_j^i + 2\gamma M_j^{3-i}\right], \qquad i = 1,2.$$

and hence the stated condition.

(ii) Use (10) to compute

$$\left(P_j\right)^C - P_j = \frac{1}{8w}\sum_i \left[2\left(1-\gamma\right)m_j - M_j^i\right]^2, \quad j = 1,2.$$

which is clearly positive $\forall\gamma$. ∎

The above result shows that the cooperative plan is always beneficial for a manufacturer when his product does not face competition in the same outlet. To be beneficial for a retailer, a condition relating margins and store substitution rate must be satisfied. From (9), in absence of brand substitutability, the retailer i increases her profit for each brand j only when the following condition on marketing efforts and store competition is satisfied[9]

$$\frac{\left[\left(E_j^i\right)^C - E_j^i\right]}{\left[\left(E_j^{3-i}\right)^C - E_j^{3-i}\right]} > 2\gamma, \qquad i,j = 1,2.$$

The ratio of incremental marketing effort for the same brand in competing outlets should be twice greater than the store substitution rate. This clearly shows that the efficiency of such programs is not always guaranteed for the retailers. The effect of cooperative advertising in one manufacturer — multiple retailers channel has been investigated by Bergen and John (1997) who obtained a different result. The authors found that a coop advertising plan along with a two-part tariff wholesale pricing program can be an efficient tool to reach the vertically integrated channel profits level.

In terms of sales, when $\theta = 0$, we have the following incremental demands

$$\begin{aligned}
\left(Q_j^i\right)^C - Q_j^i &= \left[\left(E_j^i\right)^C - E_j^i\right] - \gamma\left[\left(E_j^{3-i}\right)^C - E_j^{3-i}\right], && i,j = 1,2.\\
\sum_j \left[\left(Q_j^i\right)^C - Q_j^i\right] &= \sum_j \left\{\left[\left(E_j^i\right)^C - E_j^i\right] - \gamma\left[\left(E_j^{3-i}\right)^C - E_j^{3-i}\right]\right\}, && i = 1,2.\\
\sum_i \left[\left(Q_j^i\right)^C - Q_j^i\right] &= \sum_i \left[1-\gamma\right]\left[\left(E_j^i\right)^C - E_j^i\right], && j = 1,2.
\end{aligned}$$

Clearly, each manufacturer sales $\left(\sum_i \left[\left(Q_j^i\right)^C - Q_j^i\right]\right)$ are higher when he offers a coop program to his dealers. Demand for product j in outlet i $\left(Q_j^i,\ i,j = 1,2\right)$ increases if

$$\frac{\left[\left(E_j^i\right)^C - E_j^i\right]}{\left[\left(E_j^{3-i}\right)^C - E_j^{3-i}\right]} > \gamma, \quad i,j = 1,2. \tag{26}$$

[9]In the general model, The retailer i's profits in 9 could also be written

$$\begin{aligned}
P^{i\ \ C} - P^i &= \frac{1}{2}\sum_j \left[M_j^i - M_{3-j}^i\theta\left(1-\gamma\right)\right] \quad E_j^{i\ \ C} - E_j^i \quad , \qquad i = 1,2.\\
&\quad -2\gamma\left[M_j^i\left(1-\theta\right) + M_{3-j}^i\theta\right] \quad E_j^{3-i\ \ C} - E_j^{3-i}
\end{aligned}$$

For $\theta = 0$, the above difference becomes

$$P^{i\ \ C} - P^i = \frac{1}{2}\sum_j M_j^i \quad E_j^{i\ \ C} - E_j^i \ - 2\gamma \quad E_j^{3-i\ \ C} - E_j^{3-i} \quad , \qquad i = 1,2.$$

that is the ratio of incremental marketing efforts by the retailers is lower than the store substitution rate. This result mirrors the one obtained in the previous scenario: absence of spatial competition and presence of brand competition (see (22)).

5 Implications of Findings and Conclusions

Are cooperative advertising programs coordinating mechanisms in competitive channels? For who is it beneficial and under which conditions? This paper provides a novel answer to these questions. Previous studies established the efficiency of such programs to enhance marketing efforts and total channel profits in two-member channels. In realistic settings, outlets and manufacturers are however faced with competition from similar institutions. We investigate whether previous findings for dyad channels still hold when competition is considered at the store and/or the brand levels. Our model provides helpful insights into the analysis of channel structures composed of multiple retailers and manufacturers and accounts for direct and cross-competition effects between brands and stores.

Our results validate previous findings in the cooperative advertising literature for bilateral monopolies and demonstrate that coop plans are efficient tools to coordinate the channel when no competition is present at both levels. For competitive channels, the coop plan increases marketing efforts and is beneficial to final consumers. However, retailers and manufacturers do not necessarily benefit from the cooperative plan in all market conditions. We show indeed that the efficiency of the cooperative advertising program is not always guaranteed for those channel members who are facing competition unless certain conditions on store and brand substitutability as well as on margins are verified. Hence, when competing products are distributed through outlets located in non-overlapping territories, the cooperative program improves each retailer's profit and demand rate but is not always beneficial for manufacturers. Further, in a market structure characterized by competing stores selling highly differentiated products, the implementation of the coop plan is beneficial to each manufacturer's profit and demand rate. However, a retailer would benefit from such a plan only if her marketing efforts for the brand are sufficiently high compared to her competing store's efforts. An important implication of this finding is that monopolistic manufacturers and/or retailers should revise the efficiency of the coop plan after the entry of a new competitor in the market.

In a marketplace where competition is present at both channel levels, and assuming symmetric margins, manufacturers would offer the cooperative program and retailers would agree for it only for low levels of store and brand substitution rates. Hence, in highly competitive markets, cooperative advertising could generate destructive competitive effects that would harm channel members benefits, although it would still be beneficial for consumers. Manufacturers will increase their coop support to retailers as brand competition gets more intense. However, they should offer less coop rates as stores become more substitutable. Again, channel members should consider carefully substitution rates in their market and review the cooperative plan agreement when competition at the store and/or the brand levels get intensified.

Despite these important managerial implications, our results have some limitations related to the simplifying assumptions of the model. In our setup, we assumed that advertising efficiency and baseline sales are equal in all stores. Each retailer could increase both effects by improving her advertising efficiency and engaging in advertising activities for the store. It would be particularly interesting as a future research to investigate whether levels of advertising efficiency in competing stores can influence the efficiency of the cooperative plan.

A further limitation of our model is that we assumed fixed prices. Although this assumption permits to derive analytical results, varying retail and transfer prices in the original model would yield helpful insight to set conditions for the efficiency of the coop plan, especially by specifying the relations between margins and store and brand competition intensity.

Our model could also be enriched by considering endogenous substitutability parameters. The product substitutability parameter can be modelled as a function of manufacturer's advertising levels rather than as an exogenous parameter as suggested in Bergen and John (1997). The store substitutability effect could vary with the retailers' advertising levels for their outlets.

Finally, further work on this topic could also include different forms of demand functions, carry-over effects of advertising activities and different forms of channel competition. The emergence of the e-commerce and the retailers' private labels create indeed vertical competition between retailers and manufacturers.

Appendix: Proof of Proposition 2

We first solve retailer i's problem

$$\begin{aligned}\max_{E_j^i, E_{3-j}^i} P^i &= \sum_{j=1}^{2} \Big\{ M_j^i \left[1 + E_j^i - \gamma (1-\theta) E_j^{3-i} - \theta (1-\gamma) E_{3-j}^i - \theta\gamma E_{3-j}^{3-i} \right] \\ &\quad -1/2w \left(1 - D_j^i\right) (E_j^i)^2 \Big\}, \qquad i = 1, 2.\end{aligned}$$

First order conditions for retailer i, $i = 1, 2$, are obtained by maximizing the right-hand-side of the above expression and are given by

$$\frac{\partial P^i}{\partial E_j^i} = 0 \Leftrightarrow M_j^i - M_{3-j}^i \theta (1-\gamma) - w \left(1 - D_j^i\right) E_j^i = 0, \quad j = 1, 2.$$

which leads to the following reaction functions

$$\left(E_j^i\right)^C = \frac{M_j^i - M_{3-j}^i \theta (1-\gamma)}{w \left(1 - D_j^i\right)}, \qquad i, j = 1, 2.$$

We now resolve the manufacturer j's problem which is given by

$$\max_{D_j^i, D_j^{3-i}} P_j = \sum_{i=1}^{2} \Big\{ m_j \left(1 + E_j^i - \gamma(1-\theta) E_j^{3-i} - \theta(1-\gamma) E_{3-j}^i - \theta\gamma E_{3-j}^{3-i}\right) - 1/2 w D_j^i (E_j^i)^2 \Big\}, \qquad j = 1, 2.$$

Substituting $E_j^i, E_j^{3-i}, E_{3-j}^i$ and E_{3-j}^{3-i} by their expressions in the retailers' reaction functions and maximizing the right-hand-side of the above equation yields the Nash equilibrium solutions for manufacturers. Finally, replacing D_j^i ($i, j = 1, 2$) by their expressions into the retailers' reaction functions gives the equilibrium marketing efforts $\left(E_j^i,\right)^C$, $i, j = 1, 2$.

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