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Dynamic co-marketing alliances: When and why do they succeed or fail?

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Abstract

We investigate the dynamic aspects of a co-marketing alliance and offer guidelines to establish profitable and self-sustaining alliances. Our specific objective is to assess the attractiveness of forming a medium-term exclusive alliance between two brands or their manufacturers to produce a series of co-branded products jointly against the alternative of separate production. Relying on a diffusion framework, our study examines two questions. First, under what market-driven characteristics (e.g., size of each brand's customer base) should either brand manufacturer forge or sustain the alliance. Second, what product market characteristics should the alliance promoter (e.g., a recording company) seek or alter to increase its payoffs from the alliance. The model identifies the market-driven characteristics of the partnering brands at the start of the alliance and tracks their changes over time. Results show that a brand manufacturer would be better off not to form (or sustain) the alliance unless the market is expected to expand by an amount suggested by the model. From the alliance coordinator's standpoint, for a given overall strength, the alliance is most attractive if the strengths of the partnering brands are comparable. We demonstrate the real-world applicability of the model using survey data on three real alliances in the music CD industry. Limitations and future research directions are discussed.

Keywords: Co-marketing; Strategic alliances; Normative models

1. Introduction

Co-marketing alliances among brand manufacturers are gaining much visibility among marketers and academics alike. According to Bucklin and Sengupta (1993), a co-marketing alliance is a lateral relationship among firms (or individuals) intended to amplify or build user awareness of the benefits that they offer. Products from co-marketing alliances span such diverse contexts as entertainment (e.g., CDs featuring Stevie Nicks and Tom Petty, CNN/TIME Newsstand episodes with anchors Bernard Shaw and Jeff Greenfield), high technology (e.g., Compaq PCs with Intel microprocessors), hardware (e.g., Martha Stewart's signature paint made by Sherwin Williams) and food products (e.g., Diet Coke with NutraSweet, Beech Nut baby foods with Chiquita bananas).

Co-marketing alliances such as the above attract considerable consumer attention and generate high

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expectations (cf. McClellan, 1993). The motivation to form many of these alliances often arises out of demand side considerations such as favorable consumer preferences for the products that come out of these alliances (in contrast to personality factors such as mutual liking among partners or supply side factors such as cost minimization) (Buck, 1993). Such alliances also help marketers expand into new markets by tapping their partners' customer base (cf. Sherman, 1992). However, many of these alliances fail while several others end up with one partner dominating the other (see Main, 1990) by grabbing a larger share of the profits.

Extant academic work on co-marketing alliances falls into two streams. One stream of research (see Bucklin and Sengupta, 1993) centers around literature on interorganizational exchange and transaction cost economics to assess the governance aspects of alliances. Another is the work on brand alliances (cf. Rao and Ruekert, 1994; Park et al., 1996; Venkatesh and Mahajan, 1997). Drawing on theories of categorization, signaling, and product bundling, the latter studies offer strategic rationales for brand alliances (e.g., Rao and Ruekert) and explicit methods for partner selection and pricing (e.g., Venkatesh and Mahajan).

Recent studies recognize that co-marketing alliances often yield asymmetric benefits to the partnering brands (see Park et al., 1996; Venkatesh and Mahajan, 1997). Further, drawing on studies on context effects (cf. Bhargava, 1990; Rathneshwar and Shocker, 1991), one could argue that an alliance context may highlight the differential caliber of the partners. This in turn would induce some consumers to switch their preferences from one player to the other leading to asymmetry in payoffs for the partners. In essence, co-marketing alliances are breeding grounds for endogenous competition, even when such competition is unintended.

Our study attempts to embellish this emerging stream of research by focusing attention on a notable omission in literature, namely, the issue of alliance *dynamics*. Extant articles on co-marketing alliances are all set in a static context. They have completely ignored the important issue of how the alliances may evolve over time and what that means to the formation of a new alliance or the sustenance of one already in existence. The dynamics are closely linked to (a) the changes in the perceived quality and reputation of the partnering brands in the marketplace over time and (b) the endogenous competition by way of the partners' jockeying for preferential position in the consumers' minds. Our study seeks to fill this gap. In particular, we develop a dynamic model of a co-marketing alliance and use it to offer specific guidelines on alliance formation and management to prospective partners who focus on their individual payoffs as well as alliance promoters who are concerned about aggregate payoffs.

While our model and its findings are applicable to a range of industries, we keep the entertainment industry as a reference for such things as our examples, the stylization of the model, data and implications. This orientation is to partially correct the overarching focus of extant co-marketing literature on firms as distinct from individuals. Individuals, especially, celebrity performers, are also brand names and forge numerous co-marketing alliances. The element of competition among partnering celebrities to generate consumer preference and variations in their reputation over time make celebrity alliances well suited to articulate the dynamic aspects of co-marketing alliances.

Before presenting the specific questions of our study, let us present a brief overview of the model. Our model is most appropriate for situations in which the following decision makers exist: (a) two reputed and prospective alliance partners (i.e., two star players) and (b) an alliance promoter.[1] They may form an exclusive co-marketing alliance. In that case, they produce and release a series of new products within the same category such as several CDs. Each new product may be visualized as a combination of two integral components. Each player has the competence to produce one of them. As an alternative to forming the co-marketing alliance, the prospective

[1] This partner–promoter analogy covers several marketing situations. For example, SONY records could promote a series of albums by Stevie Nicks and Tom Petty. Ingram Micro assembles and markets Compaq PCs with Intel inside (cf. Spooner and Nobel, 1999). Pinacor brings together Apple's Power PC and Linux's operating system and promotes the composite product to consumers. In the hardware business, K-Mart promotes Martha Stewart's signature paint made by Sherwin-Williams (Perman, 1997).

partners may go their own separate ways forming alliances with less known functional partners. In this case, the functional partners supply the ''other'' component.

In the pre-alliance scenario, the potential market is comprised of two segments, each segment preferring the products of one of the two focal players. The size of either segment is treated as the manifestation of the corresponding player's ''reputation''. The dynamics of the alliance arise in the following manner. Formation of the co-marketing alliance offers the opportunity for consumers to experience their preferred player as well as his/her partner jointly. Consumption experience causes two specific types of effects — ''shift in preference'' and ''word-of-mouth influence''. The alliance offers each player the opportunity to reach the segment that prefers his/her partner. However, joint exposure to the two players could cause consumers who prefer either player to reassess their preference. In other words, each player is vulnerable to a shift in preference of a portion of his/her customers to its partner. We recognize two such ''shifts in preference'', one from each performer to the other. In the absence of market expansion, the weaker player will have a smaller payoff from forging the co-marketing alliance compared to the baseline scenario. The other aspect of alliance dynamics that we accommodate is ''word-of-mouth influence'' originating from the adopters and targeted at the untapped consumers in each of the two segments discussed above. Such influence is especially relevant for alliances producing durable products.

We use this conceptualization to provide a broad range of normative guidelines for the formation and management of dynamic co-marketing alliances.[2] The specific questions that we address are outlined below:

1. *Perspective of (prospective) alliance partner(s):*
   - What is (are) the key market-driven characteristic(s) of an attractive alliance partner? Is it the partner's consumer base, intensity of following (word-of-mouth influence), or his or her vulnerability (shift in preference)?
   - What is the market expansion needed for each partner to agree to form the co-marketing alliance or sustain one that is in existence? When would an alliance partner face a probable threat of complete erosion of his/her consumer base?
   - Is the evolution of the market in terms of changes in preference shares of the two players slow or rapid?
2. *Perspective of alliance promoter:*
   - Is the promoter better off forming a co-marketing alliance of equals (in terms of market size and ability to generate word-of-mouth influence) or unequals?
   - For a given pair of alliance partners, should marketing efforts be aimed at promoting both partners equally or differentially based on factors such as the size of their customer base, in order to maximize profits?

Our results suggest that from the perspective of the alliance partners, the alliance is (a) unlikely to form, or (b) once formed unlikely to sustain, unless the market can expand by an amount suggested by our model. This amount is purely a function of the initial sizes of the segments that prefer the two players and parameters that capture shift in preference. If this specified market expansion is not forthcoming, at least one of the partners will end up being worse off forming the alliance. However, neither partner need to be concerned about the threat of complete domination by the other (i.e., loss of one's entire market) — such a scenario is remote.

From the alliance promoter's standpoint, the alliance is most attractive if the strengths of the partners are balanced for a given overall strength. In other words, if the promoter has the ability to make adjustments to the endowments of players 1 and 2, she/he should strive to neutralize the asymmetry in the relative market strengths of the alliance partners.

[2] We focus on situations in which the promoter does not charge a price premium for the product that comes out of the alliance. Rather the intention is to reach a larger market. This is characteristic of most of the co-marketed products that we consider. For example, music CD prices are often standard for a particular category of music with success measures such as a CD going ''Platinum'' based on the unit sales. The success of TV or movie alliances is again based on audience size. Manufacturers (e.g., Coca-Cola) often do not charge higher prices for co-branded products (e.g., Diet Coke) relative to regular products (e.g., Coke Classic).

That is, profits are more sensitive to improvements in the weaker rather than the stronger partner's position.

We also present an empirical section in which we provide a survey-based approach to illustrate how the new parameters included in our model may be estimated in the real world. We apply this approach to draw implications for partners in three actual co-marketing alliances in the entertainment industry.

In the next section, we present a categorizing framework of co-marketing alliances to highlight the inherent similarities and differences, and delineate the scope of the paper.

2. A categorizing framework of co-marketing alliances

The diverse examples of co-marketing alliances mentioned up front bear several key similarities and distinctions. The purpose of this section is to identify a categorizing framework among co-marketing alliances based on (a) the types of products that come out of the alliances and (b) the related adoption and/or repeat purchase behavior of consumers of these products. Our model and its implications may be better understood in light of the proposed framework.

We see three interrelated and product-specific dimensions for classifying co-marketing alliances. These are durability of products, purchase incidence, and number of new product releases from an alliance.

- *Durability of products*: Products coming out of the alliances may be durable or nondurable. A music CD album produced by a Stevie Nicks and Tom Petty alliance, for example, is a durable in the sense that it can be inventorized and used over an extended period of time. In contrast, a live concert featuring Nicks and Petty is an example of a nondurable.
- *Purchase incidence*: We see two relevant aspects of purchase incidence: (a) number of units of the product consumed by a typical consumer during its lifetime and (b) timing of purchase. Durables arguably fall into the category of ''unit purchase per consumer, staggered adoption across consumers''. Nondurables could either be ''unit purchase per consumer, simultaneous adoption across consumers'' (e.g., a one-time, special concert featuring ''Michael and Janet Jackson'') or repeat purchase items with purchases staggered both within and across consumers (e.g., Diet Coke with NutraSweet).
- *Number of new products released*: An alliance may release a single new product (e.g., a one-time album featuring ''Paul McCartney and Michael Jackson'') or a series of new products (e.g., a series of episodes of ''CNN/TIME Newsstand'' featuring Jeff Greenfield and Bernard Shaw) during its tenure.

A classification of a cross-section of visible co-marketing alliances based on the above dimensions is presented in Table 1.

The above distinctions are significant as they affect the adoption and/or repeat purchase behavior of consumers in different ways. Drawing on the work in new product diffusion (cf. Rogers, 1983, Mahajan et al., 1993) and brand switching (e.g., Silk and Urban, 1978), we consider three distinct effects.

- *Reputation effect*: Consumers' willingness to buy a product coming out of the alliance is based on prior expectations from consuming products manufactured by either one of the alliance partners. The size of the potential market is a useful surrogate measure of this effect (see Mahajan et al., 1993). Our focus here is on whether consumers are willing to buy a new product coming out of an alliance based on their prior expectations of what benefits the product may or may not offer.
- *Shift in preference*: For co-marketing alliances, the nature of a consumer's consumption experience following purchase is likely to drive his/her preference between the partnering brands. For example, although a consumer may purchase a CD featuring Stevie Nicks and Tom Petty primarily because of Nicks, his/her ''consumption experience'' may shift his/her preference in favor of Petty. Our alliance attractiveness and profit sharing results depend in part on the extent of such shift in preference.
- *Word-of-mouth influence*: For durable products, the adoption decision across consumers is staggered over time. Two determinant influences on the timing of adoption are external or advertising

Table 1
A categorization of co-marketing alliances, illustrative examples and important mechanisms of consumers' adoption/repurchase behavior

		Durability of Product and Consumers' Purchase Incidence		
		Durable: One Time, Staggered Adoption of each new product release	Non Durable	
			One Time, Simultaneous Adoption of each new product release	Repeat Purchase of each new product release
Number of New Product Releases from the Alliance (Length of Alliance)	Single Release	Cell 1 One time special CD featuring Paul McCartney and Michael Jackson Limited Edition of Honda Passport made by Mazda (*Reputation and Diffusion Effects are important*)	Cell 3 Special Concert featuring Elton John and Billy Joel Holyfield vs. Tyson boxing title bout (*Reputation Effects are important*)	Cell 5 Diet Coke with NutraSweet Beechnut baby foods with Chiquita bananas *(Reputation and Shift in Preference Effects are important)*
	Multiple Releases	Cell 2 Series of CDs featuring Jimmy Page and Robert Plant Generations of Compaq PCs with Intel Inside (*Reputation Effects, Shift in Preference Effects, and Diffusion Effects are important*)	Cell 4 CNN/TIME Newsstand episodes featuring Greenfield and Shaw Team teaching of a course by two star professors (*Reputation and Shift in Preference Effects are important)*	Cell 6 McDonald's offering special characters from a series of Disney movies *(Reputation and Shift in Preference Effects are important; Diffusion Effects are somewhat important)*

Conceptual, analytical and empirical issues addressed by our study are most applicable here.

Most conceptual and empirical issues of our study and some analytical issues are applicable here.

Outside the focus of the current study.

influence and internal or word-of-mouth influence (see Mahajan et al., 1993). These two effects are collectively labeled diffusion effects. Such effects are either irrelevant or weak for products that can only be adopted simultaneously (e.g., a reunion concert featuring Simon and Garfunkel). We capture these effects in our model. Given our focus on demand side factors, we will emphasize the influence of the word-of-mouth effect on alliance attractiveness.

As pointed out in Table 1, not all effects are important for all types of co-marketing alliances. As we see it, a very general type of co-marketing alliance from a modeling standpoint is one that produces multiple releases of new durable products such as a series of CD albums during its tenure. In such an alliance, all three key influences that we seek to capture, namely, reputation effect, shift in preference, and word-of-mouth influence, are relevant. We will focus on this context. This general model nests several of the other types of co-marketing alliances mentioned above (discussed later).

3. Model development

3.1. Conceptual underpinnings

Two star players (brand manufacturers or individuals) designated '1' and '2' are the prospective partners in a medium-term co-marketing alliance. We define a medium-term alliance as one that is intended to release several new products and/or extends over a time period of a few years. In other

words, the alliance is not intended to be a one-shot deal, nor is it intended to last forever.[3] (Also, an alliance that is resurrected after a long period of dormancy is considered a new alliance in our study.) The ith product release featuring player k ($k = 1, 2$) in case she/he does not form the co-marketing alliance is denoted $C_{k(i)}$. Instead, if the co-marketing alliance is formed, then the ith new product released by the alliance is denoted $C_{12(i)}$. The star players are assumed to refrain from retaining other co-marketing alliances and from selling individual products $C_{k(i)}$ when the co-marketing alliance is in effect.

The market in the baseline situation (i.e., when the co-marketing alliance is not formed) comprises two segments of sizes M_1 and M_2 that prefer players 1 and 2, respectively. That is, consumers in segment of size M_k consider player k ($= 1$ or 2) to be the primary or preferred reason to buy the product. Therefore, the market size for product $C_{k(i)}$ is M_k. Sales from these segments is generated by consumers' adoption of new products released from time to time. The adoption or diffusion of each new product $C_{k(i)}$ is modeled as a Bass type diffusion process (cf. Bass, 1969) with external and internal (word-of-mouth) influences captured by coefficients a_k and b_k, respectively (for player $k = 1, 2$). The payoff for either player k in a certain time period is captured by a ''royalty'' factor that is directly proportional to his/her units sold in that time period.

In the alternative scenario, if the players forge an exclusive alliance to market products $C_{12(.)}$, the products act as vehicles for consumers who prefer a particular player (or his product) to experience the other player (or her product). The combined product is assumed to be attractive to at least $M_1 + M_2$ consumers of whom M_k ($k = 1, 2$) consumers make their first adoption because of player k. Thus, by aligning with player 2 (say), player 1 is able to reach M_2 additional consumers. Stated differently, the opportunity for consumers who prefer one player to experience the other player's competence is pre-empted if the co-marketing alliance is not formed.[4]

Post-adoption experience with products $C_{12(i)}$ is expected to impact the consumers' preferences in the following manner: A certain fraction of consumers whose purchase is driven by preference for player 1 or 2 may have their preferences reinforced. The remaining consumers *shift their preference* (for ''adopting'' a new product release) from one player to another for reasons discussed earlier. Let ''h_{12}'' be the proportion of consumers who shift their preference from player 1 to 2 after adopting the ith product $C_{12(i)}$. Similarly, let ''h_{21}'' represent the proportion of consumers who shift their preference from player 2 to 1.

If every consumer whose primary or preferred reason for adopting product $C_{12(i)}$ is player 1 remains or is expected to remain committed to this player, then h_{12} would be zero. That is, experiencing player 2 via product $C_{12(i)}$ does not change the allegiance of consumers preferring player 1. In this case, we may characterize player 1 as commanding an absolutely robust preference. On the other hand, if all adopters who chose to adopt product $C_{12(i)}$ due to player 1 are expected to shift their preference to 2, then $h_{12} = 1$. Analogous reasoning holds for h_{21}.

The shifts in preference among certain adopters affect the adoption process of each new product release in two ways: First, within each adoption cycle, they impact the number of adopters who provide favorable word-of-mouth publicity for player 1 or 2 and thereby influence the speed of adoption of

[3] We do not stipulate whether the alliance, if formed, is contractually bound to last the entire duration or may be terminated sooner. This is a legal issue that the prospective alliance partners and the promoter would have to make in light of the types of implications that we present.

[4] We hasten to point out that our assumption that market size remains unchanged after alliance formation is only a benchmark. Instead of this scenario, the market could shrink if there is a certain overlap in the baseline segments; that is, some consumers who might have purchased both products $C_{1(i)}$ and $C_{2(i)}$, are likely to purchase only one unit of product $C_{12(i)}$. Perceived mismatch in partner characteristics could cause some consumers to choose not to purchase $C_{12(i)}$. Alternatively, the market could expand due to perceived positive interaction between the players attracting consumers who are unlikely to purchase the baseline products. In some instances, there could be a combination of shrinkage and expansion effects.

As shown later in this paper, a certain minimal increase in the size of the market is necessary for the alliance to form or sustain. The starting point of a combined market size of $M_1 + M_2$ actually helps clarify the strategic implications better as will be seen later.

product $C_{12(i)}$ in their respective constituencies. For example, when a fraction of adopters of product $C_{12(i)}$ shift their preference from player 1 to 2, the pool of adopters who provide favorable word-of-mouth about player 2 goes up (all else remaining the same). Second, shifts in preference affect each player's share of preference at the end of each adoption cycle. This is explained through a conceptual model in Fig. 1.

In Fig. 1, treat $i = 1$; i.e., refer to the adoption occasion for $C_{12(1)}$, the first product released. In this case, consumers' preferences are for their original favorite players. By their adoption of product $C_{12(1)}$, consumers are able to compare the two players 1 and 2 simultaneously. The experience influences referral and replacement behavior of these consumers.

A proportion h_{12} of the M_1 consumers who originally adopted product $C_{12(1)}$ because of player 1 shift their preference to player 2 while the remaining $(1 - h_{12}) \times M_1$ continue to perceive player 1 as their preferred reason for purchase. Similarly, in the case of player 2, a proportion h_{21} of his or her consumer base (of size M_2) shift their preference to player 1. The remaining $(1 - h_{21}) \times M_2$ consumers retain their preference for player 2. Therefore, at the time of purchasing the second product release $C_{12(2)}$, a total of $(1 - h_{12}) \times M_1 + h_{21} \times M_2$ adopters have player 1 as their preferred reason for purchasing the product. Correspondingly, the preferred reason is player 2 for $h_{12} \times M_1 + (1 - h_{21}) \times M_2$ consumers. The process builds up with every new product release $C_{12(i)}$.

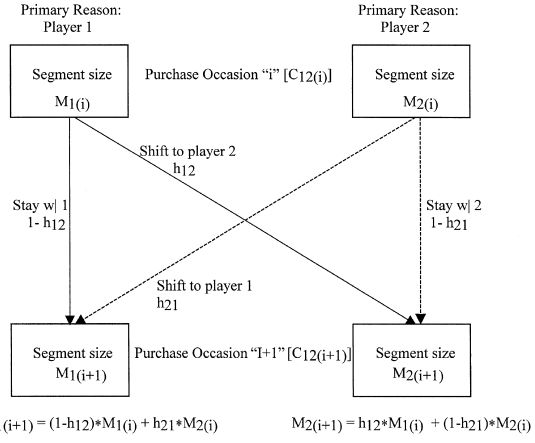

Fig. 1. Model of evolution of alliance between star players 1 and 2. *Notation:* $C_{12(i)}$ = the ith new product release from the alliance between players 1 and 2; $M_{1(i)}, M_{2(i)}$ = number of consumers whose primary reasons to adopt $C_{12(i)}$ are players 1 and 2, respectively; h_{12}, h_{21} = proportion of consumers who shift their primary reason for adopting $C_{12(i)}$ from player 1 to 2 or player 2 to 1.

Our formulation of h_{12} and h_{21} is consistent with an alternative interpretation as well. One could treat each market segment as comprised of two sub-categories of ''loyalists'' and ''switchers'' (terms used somewhat loosely). For example, an h_{12} value of 0.2 may be interpreted as segment M_1 comprised of 80% ''loyalists'' (or ''stayers'') and 20% ''switchers''. We, however, do not identify such sub-segments explicitly as we wish to accommodate the possibility of some ''loyalists'' making occasional switches or some ''switchers'' showing sporadic loyalty.

As evident from this discussion, the coefficients of shift in preference h_{12} and h_{21} and in turn their ratio are not modeled as time-dependent parameters. We base these on the need of parsimony, the lack of evidence to the contrary and a third very important reason. The decision makers are about to make a *strategic* decision: whether or not to form or sustain a medium-term alliance. As such, basing our normative guidelines on the likely magnitude of these parameters seems fair in our view. Violation of the assumption (which would mean that the coefficients fluctuate) implies that sales of product $C_{12(i)}$ attributable to either player would be more or less in reality even when the trajectory that we predict is correct on average. The alliance partners would be well advised not to hastily terminate the alliance based on some transient bumps in h_{12} and h_{21}. Such premature termination conveys lack of alliance commitment and trust, and is likely to be irreversible. We see the fluctuations as having a greater bearing on operational matters such as deciding the production volume for each new release rather than on the strategic decision of alliance formation.

The model provides a basis to address the questions facing the decision makers raised earlier. We defer answers to these questions till we have provided the analytical development.

3.2. Analytical underpinnings

The summary of the notation used to describe the model is as under the following section.

3.2.1. Baseline alliance (i.e., Star players do NOT align with each other)

M_k Potential market for product $C_{k(i)}$, ith product release of player k ($k = 1, 2$).

$x_{k(i)}(t)$ Cumulative adopters of product $C_{k(i)}$ up to time ''t''.

$X_{k(I)}(t)$ Cumulative sales of all of the I products $C_{k(.)}$ released up to time ''t''.

a_k Coefficient of external influence affecting adoption of products $C_{k(i)}$ ($k = 1, 2$).

b_k Coefficients of word-of-mouth (internal) influence affecting adoption of products $C_{k(i)}$ ($k = 1, 2$).

r Discount rate for the star player(s). The discount rate is assumed to be the same for the two star players.

π Royalty per unit sold of product $C_{k(i)}$ that accrues to player k. The per unit royalty rate is assumed to be the same for the two players — the rationale appears later.

For notational simplicity, we drop the argument ''t'' in $x(t)$ and $X(t)$ hereafter.

The unit sales of the ith product $C_{k(i)}$ of kth player may be described by the following diffusion equations (see Bass, 1969):

$$\frac{\mathrm{d}x_{k(i)}}{\mathrm{d}t} = \left(a_k + b_k \frac{x_{k(i)}}{M_k}\right)\left(M_k - x_{k(i)}\right) \quad \text{for } k = 1, 2. \tag{1}$$

Note that $X_{k(I)} = \sum_{i=1}^{I} x_{k(i)}$, for $k = 1, 2$, for the I products that each player ''k'' releases up to time ''t'' in the baseline situation.

The net present value of the stream of cash flows for player k from the ith product launched at time T_i is:[5]

$$\mathrm{NPV}(k; \text{baseline}) = \int_{T_i}^{\infty} \pi\left(\frac{\mathrm{d}x_{k(i)}}{\mathrm{d}t}\right)\mathrm{e}^{-rt}\,\mathrm{d}t \quad \text{for } k = 1, 2. \tag{2}$$

3.2.2. Co-marketing alliance between star players

We use the following additional notation:

$z_{12(i)}(t)$, $w_{12(i)}(t)$ Cumulative adopters of the ith product $C_{12(i)}$ up to time ''t'' whose primary reason for purchase are players 1 and 2, respectively.

$Z_{12(I)}(t)$, $W_{12(I)}(t)$ Cumulative sales of all I products $C_{12(.)}$ up to time ''t'' to consumers whose primary reason to purchase the ith product are players 1 and 2, respectively.

Note that $z_{12(i)}(t)$ and $w_{12(i)}(t)$ occur simultaneously. If we incorporate the coefficients of shift in preference to capture the adoption pattern in the presence of the co-marketing alliance, we have the following adoption pattern of the first new product release $C_{12(1)}$ attributable to each player:

1. *Periodwise sales of product $C_{12(1)}$ to consumers whose preference is player 1:*

$$\frac{\mathrm{d}z_{12(1)}}{\mathrm{d}t} = \left(a_1 + b_1 \frac{(1 - h_{12})\, z_{12(1)} + h_{21} w_{12(1)}}{M_1}\right) \times \left(M_1 - z_{12(1)}\right). \tag{3}$$

2. *Periodwise sales of product $C_{12(1)}$ to consumers whose preference is player 2:*

$$\frac{\mathrm{d}w_{12(1)}}{\mathrm{d}t} = \left(a_2 + b_2 \frac{h_{12}\, z_{12(1)} + (1 - h_{21})\, w_{12(1)}}{M_2}\right) \times \left(M_2 - w_{12(1)}\right). \tag{4}$$

Total sales of the first product $C_{12(1)}$ in a given period is the sum of sales from Eqs. (3) and (4). Notice that the impact of word-of-mouth influence is a function of two factors: (a) the cumulative number of adopters who provide word-of-mouth influence; for example, in Eq. (3), it is $(1 - h_{12}) \times z_{12(1)} + h_{21} \times w_{12(1)}$, and (b) the strength of such influence from an individual adopter; this is denoted by b_1 in Eq. (3) and b_2 in Eq. (4). We assume that the coefficient of word-of-mouth (internal) influence is the same irrespective of whether one has switched preference

[5] A concern might arise whether ''∞'' is the true upper limit of integration when the alliance is over a medium term of about 3 years. We believe that the relevant life cycle time for most products we consider is well below the tenure of the alliance. In the movie industry context, for example, Eliashberg and Shugan (1997, p. 74) find that the average life of a film is about 14 weeks and approximately 16% of the adoption occurs within 1 week. As such, the notional limit of ''∞'' would be reached during the tenure of the alliance for all but the final new product releases.

recently (i.e., part $h_{21}w_{12(1)}$ in Eq. (3)) or has maintained his/her preference (i.e., part $(1-h_{12})z_{12(1)}$ in Eq. (3)). This is because there is no a priori reason to believe that such ''recent switchers'' provide weaker or stronger word-of-mouth influence than ''stayers''. Moreover, this assumption helps to retain the spirit of parsimony in Bass-type diffusion models. An approach to relax this assumption is discussed later in the paper.

For the second product from the alliance, the number of consumers who adopt because of players 1 and 2 being the primary reason would be $(1-h_{12})M_1 + h_{21}M_2$ (as against M_1 for the first product) and $h_{12}M_1 + (1-h_{21})M_2$ (as against M_2 for the first product), respectively.

As in the no-alliance situation, $Z_{12(I)} = \sum_{i=1}^{I} z_{12(i)}$ and $W_{12(I)} = \sum_{i=1}^{I} w_{12(i)}$ for the I products released up to time ''t''. It is apt to note here that the only assumption we make on new releases is that we rule out simultaneous release of two or more new products.

A key implication of Eqs. (3) and (4) for the co-marketing alliance is with regard to the pie splitting arrangement between the two players. If one overlooks the aspect of shift in preference, the payoffs for the players would be in the ratio $M_1 : M_2$ — the relative sizes of their market potential at the start of the co-marketing alliance. By factoring in the coefficients of shift in preference, we let the players split the returns in any given period in the same proportion as the share of preference that they command in that period. This arrangement represents an equitable apportioning of the returns as it is purely in proportion to their contributions. In support of this apportioning rule, Amaldoss et al. (1999) find that partner commitment in profit sharing arrangements is typically better when profits are shared proportional to the resources committed (equivalently, the contributions made) by either partner rather than on an equal basis.

The net present value of the stream of earnings for player 1 during the life cycle of the alliance would be

$$\text{NPV}(1; \text{co-marketing alliance}) = \int_0^{\infty} \pi \left(\frac{\mathrm{d}Z_{12(I)}}{\mathrm{d}t} \right) \mathrm{e}^{-rt}\,\mathrm{d}t \qquad (5)$$

Similarly, for player 2,[6]

$$\text{NPV}(2; \text{co-marketing alliance}) = \int_0^{\infty} \pi \left(\frac{\mathrm{d}W_{12(I)}}{\mathrm{d}t} \right) \mathrm{e}^{-rt}\,\mathrm{d}t \qquad (6)$$

The linkages between the parameters of the model just set up and the three effects discussed in Section 2 are as follows. The market potential pair $(M_1,\ M_2)$ represents the reputation of the two star players at the start of the prospective alliance. The $(h_{12},\ h_{21})$ pair captures the anticipated shift in preference effects. The coefficient pair $(b_1,\ b_2)$ represents the intensities of word-of-mouth influence that the star players command in their respective constituencies.

Let us use our model to address the decision questions raised earlier.

4. Results and propositions

This section has two parts. The first part contains two results that help to address the decision questions relevant to the star players. We provide the intuition and managerial implications of the results. In the second part, we present and prove three propositions that assess the alliance attractiveness from the perspective of the promoter (e.g., recording company). Relying on these propositions, we offer directions to the promoter in choosing a co-marketing alliance or managing one in existence.

4.1. Characteristics favoring alliance formation / sustenance — perspective of star players

We raised three key issues concerning co-marketing alliance formation and sustenance from the perspective of each star player. Briefly, these are (i) identifying the key characteristic(s) (e.g., market size) to look for in a (prospective) partner, (ii) the market

[6] Is it reasonable for both of the players to have the same royalty π per unit given that they might enjoy different levels of clout? Notice that in our formulation, the total returns for each star player are a function of $\mathrm{d}Z_{12(I)}/\mathrm{d}t$ or $\mathrm{d}W_{12(I)}/\mathrm{d}t$, variables that depend on the players' clout. Keeping two values of π for the players implies double counting these differences in clout.

expansion needed to form or sustain an alliance, and (iii) nature of alliance evolution in terms of changes in the players' preference shares (i.e., slow vs. rapid). To address these issues, we rely on a general principle that a star player would not be averse to alliance formation provided she/he is not worse off compared to his or her baseline alliance with only a functional performer.

4.1.1. Relative market size (i.e., $M_1 : M_2$) and projected equilibrium (steady-state) market shares

A potentially attractive characteristic for a player (1, say) is the segment of consumers whose primary reason for adoption is the other player (2). Player 1 would gain if customers who prefer player 2 find 1 more appealing in a direct comparison and shift their preference for purchase in favor of 1. However, some customers could possibly shift their preference from player 1 to player 2 causing a loss for 1. We may readily infer that the share of preference will change from the original level of $M_k/(M_1 + M_2)$ ($k = 1$ or 2) to an equilibrium (i.e., steady-state) level of $h_{21}/(h_{12} + h_{21})$ for player 1 and $h_{12}/(h_{12} + h_{21})$ for player 2, barring the extreme case in which the shift coefficients are simultaneously zero. When both h_{12} and h_{21} are zero, preference shares are unchanged and the co-marketing alliance has no incremental impact over the baseline alliance.

It may seem here that our model has some resemblance to Markov models. For example, the coefficients of shift in preference h_{21} and h_{12} and their complements $1 - h_{21}$ and $1 - h_{12}$ seem like transition probabilities in a two-state Markov chain. Nevertheless, some fundamental distinctions must be noted. One, Bhat (1972, p. 1) defines a stochastic process as ''a collection of random variables that are indexed by a parameter such as time and space''. We see ourselves as proposing a deterministic model. Two, unlike articles on Markov models in diffusion (e.g., Hauser and Wisniewski, 1982a,b; Horsky and Mate, 1988), we use a system of differential equations of the Bass type to capture the diffusion process. Thus, we capture word-of-mouth influence, a missing element in Markov diffusion models. Three, to the best of our knowledge, we do not duplicate any results or propositions that are available in Markov models in the Marketing literature.

Two implications are relevant here for the players such as Stevie Nicks and Tom Petty. First, irrespective of the initial share of preference of either player, the eventual share is purely a function of the coefficients of shift in preference for the two players. Second, complete erosion of a player's (say, Petty's) customer base is unlikely as it would require this player to be vulnerable to losing customers (i.e., $h_{12} > 0$), whereas the partner (Nicks) has an absolutely robust market following (i.e., $h_{21} = 0$). Even some amount of variability would ensure that each player is at least partly vulnerable (i.e., $h_{ij} > 0$).

4.1.2. Market expansion required for alliance formation or sustenance

If the market size remains unchanged by alliance formation, we have a zero sum game with the player whose steady-state share of preference is higher (or lower) than the initial share emerging as the beneficiary (or loser) from the alliance. So it is evident that ''some'' market expansion is needed for the alliance to be formed or sustained. The question is: What is the minimal market expansion required for alliance formation or sustenance?

Result 1. Alliance can be formed or sustained if the (anticipated) market expansion contingent on the alliance formation is sufficient; i.e., at least

$$\text{Max}\{M_1(h_{12}/h_{21}) - M_2,\ M_2(h_{21}/h_{12}) - M_1\}$$
$$\text{for } h_{12},\ h_{21} \neq 0.$$

Proof. The proof is in Appendix A.

In addition, the market expansion required as a percentage of the original market (i.e., $M_1 + M_2$) is shown graphically in Fig. 2. Here we consider two scenarios of relative initial market size. In Fig. 2A, the initial sizes M_1 and M_2 are equal. In Fig. 2B, $M_1 = 0.5 \times M_2$. We plot the graphs for various levels of the coefficients of shift in preference h_{12} and h_{21}.

It can be seen in Fig. 2A, for example, that in some cases (e.g., $h_{12} = 0.4$ and $h_{21} = 0.1$), the market expansion required is rather large (at least 150% of the original market size). Such situations are a priori weak prospects for alliance formation. In contrast, several other scenarios (e.g., $h_{12} = 0.4$ and

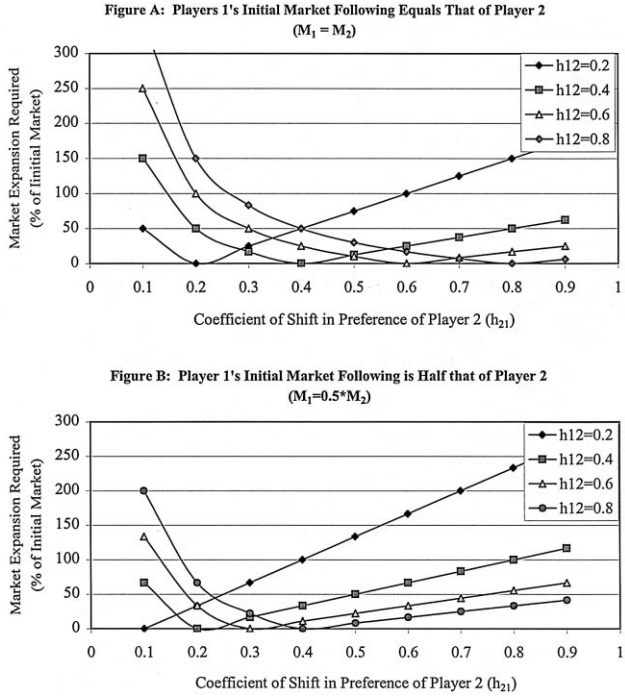

Fig. 2. Minimum level of market expansion required for alliance formation or sustenance.

$h_{21} = 0.3$ in Fig. 2A) require only a modest expansion. (Some extreme scenarios, e.g., $h_{12} > 0$ and $h_{21} = 0$, that will push the graph out of range are ignored.) In Section 5, we will present an approach to estimate these coefficients of shift in preference in three real-world situations and draw appropriate conclusions.

It is apt to note that in presenting the above result, we show that the additivity assumption made earlier has to be relaxed for the alliance to be attractive to both players.

Implications for the star players: Besides specifying the threshold level of market expansion required to form or sustain a dynamic co-marketing alliance, Result 1 offers the insight why an alliance would breakup. If there is a sizable overlap of consumers preferring both players, far from realizing a market expansion, one might see a shrinkage in unit sales after alliance formation (i.e., interaction effect could be adverse). Even if the total market size expands, the result suggests that the alliance is likely to breakup if the expansion (i.e., the positive interaction effect) is not sufficient. The equilibrium shares and the market expansion required are two explicit benchmarks to facilitate an initial decision on alliance formation or an intermediate decision on alliance sustenance.

4.1.3. Duration to reach equilibrium shares of preference

From the star players' point of view, it is important to know whether the equilibrium shares of preference are reached quickly (i.e., within a few new product releases) or slowly. If the equilibrium is slow in coming, the players could form an alliance and get out of it without much damage even when their interim evaluation reveals that the anticipated market expansion is lower than the benchmark prescribed by Result 1. On the other hand, our guidelines have a more ''immediate'' significance when the equilibrium is approached rapidly.

Result 2.1. The shares of dominant reason of players 1 and 2 will reach an equilibrium (a) with the first release itself if $M_1/M_2 = h_{21}/h_{12}$, (b) with the second release if $h_{12} + h_{21} = 1$ for any M_1/M_2.

Proof. See Table 2.

Result 2.2. Barring the extreme scenario when h_{12} or h_{21} (but not both) equals zero, the players' relative shares of dominant reason approach the equilibrium ''rapidly''.

Proof. We show in Fig. 3 the number of releases it takes for the stronger player (i.e., with lower coefficient of shift in preference) to approach to within $\pm 3\%$ of its equilibrium share.

As shown here, in a large number of cases, a level equal or close to the equilibrium share is reached quite rapidly. Approach to equilibrium is slow only in some extreme cases — when one of the star players commands an absolutely robust preference within her segment (say, $h_{21} = 0$) and the other commands a slightly weaker preference in his segment (i.e., say, $h_{12} \to 0$).

Implications for the players: The rapid approach to equilibrium means that there is not much room for a casual trial-and-error approach to alliance formation. If two star players jump into an alliance, the ''weaker'' player could quite possibly suffer quick losses. Our results imply that instead of forming alliances in a hurry, the players should create representative prototypes or pilot capsules of the products they seek to introduce, carry out suitable research and then take a ''Go vs. No Go'' decision. Section 5 is likely to be helpful in this regard.

4.2. Co-marketing alliance formation and management — perspective of promoter

The promoter (e.g., recording company) seeks to maximize its aggregate, discounted payoff. Some decision rules for the promoter are self-evident:

In choosing between two possible co-marketing alliances:

- Choose the alliance that generates significantly larger sales, all else being the same and subject to star players' willingness.

For a chosen pair of prospective alliance partners:

- Promote the prospective partners jointly, (i.e., as an alliance) if the market is expected to expand consequent to alliance formation. That is, the market is expected to perceive a positive interaction.

Table 2
Alliance evolution: number of new product releases to reach equilibrium

Stage of alliance	Relative size of customers who prefer player 1	Relative size of customers who prefer player 2	Condition for equilibrium to be reached at this stage[a]
0 (Pre-Release)	$m(=M_1/M_2)$	$1(=M_2/M_2)$	Not applicable.
1 (First Release)	$(1-h_{12})m + h_{21}$	$h_{12}m + (1-h_{21})$	For $m = h_{21}/h_{12}$, equilibrium is reached with the *first* release itself.
2 (Second Release)	$(1-h_{12})^2 m + (1-h_{12})h_{21} + h_{21}h_{12}m + h_{21}(1-h_{21})$	$h_{12}(1-h_{12})m + h_{12}h_{21} + (1-h_{21})h_{12}m + (1-h_{21})^2$	Equilibrium is reached with the *second* release if the sum total of the two players' vulnerabilities equals unity (i.e., $h_{12} + h_{21} = 1$).
3 (Third Release)	$(1-h_{12})^3 m + (1-h_{12})^2 h_{21} + (1-h_{12})h_{21}h_{12}m + (1-h_{12})h_{21}(1-h_{21}) + h_{21}h_{12}(1-h_{12})m + h_{12}h_{21}^2 + h_{21}(1-h_{21})h_{12}m + h_{21}(1-h_{21})^2$	$h_{12}(1-h_{12})^2 m + h_{12}(1-h_{12})h_{21} + h_{21}h_{12}^2 m + h_{12}h_{21}(1-h_{21}) + (1-h_{21})h_{12}(1-h_{12})m + (1-h_{21})h_{12}h_{21} + (1-h_{21})^2 h_{12}m + (1-h_{21})^3$	Above two conditions continue to hold; no additional information.
4 (Fourth Release)	…[b]	…[b]	…

[a] Equilibrium conditions obtained by equating a player's relative preference shares from the nth and $(n-1)$th releases.
[b] Algebraically very messy. Numerical approximation appears in Fig. 3.

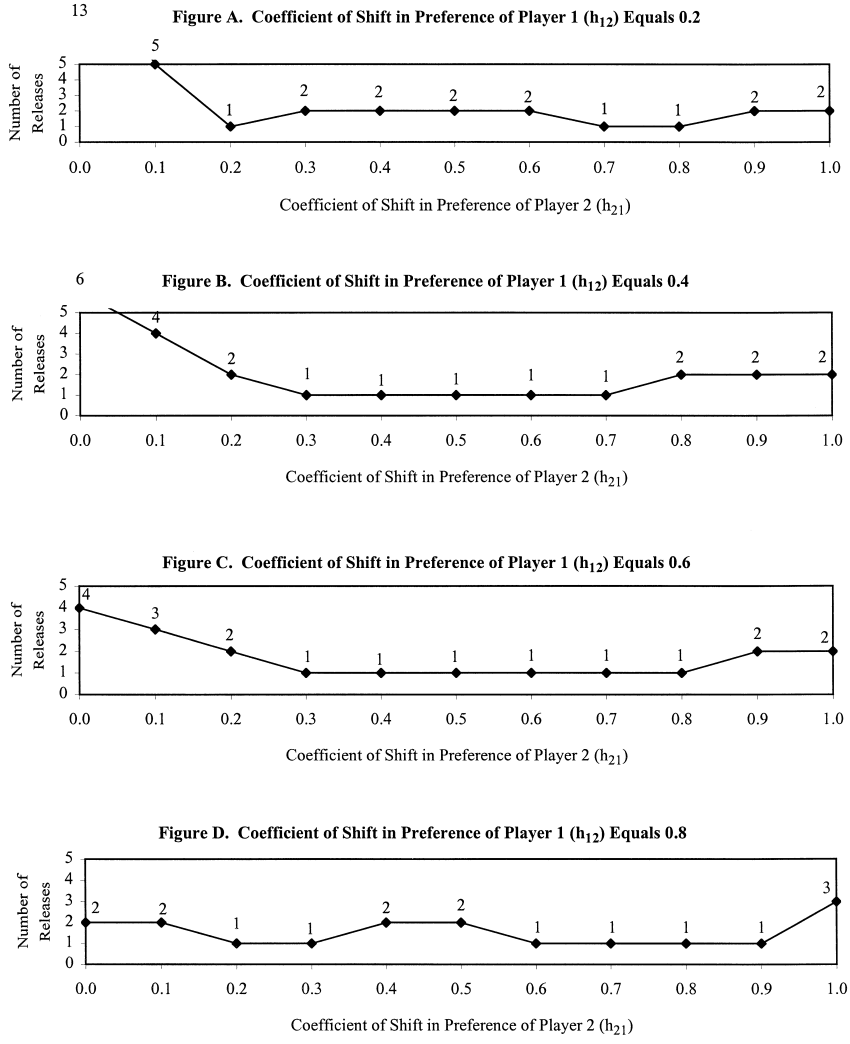

Fig. 3. Number of releases for players' shares of preference to approach within $\pm 3\%$ of equilibrium level.

- Promote the players separately if the market is expected to shrink after alliance formation either because of negative interaction between the players (e.g., incompatibility) or due to (a sizable) overlap in consumers constituting M_1 and M_2.

A more intriguing situation arises when two alternative co-marketing alliances are expected to generate about the same unit sales either when the market size is relatively unchanged by alliance formation or expands by the same amount. Alliance selection and management are quite intricate in such situations. A crucial determinant of the promoter's discounted profits (NPV) from the co-marketing alliance is the timing of adoption (sooner vs. later) of the new products. We assess the impact on the adoption rate and NPV of three important market-related characteristics of the star players: (a) the relative sizes of coefficients of shifts in preference (i.e., $h_{12} : h_{21}$), (b) the relative sizes of coefficients of internal influence (i.e., $b_1 : b_2$), (c) the relative sizes of the segments that prefer them (i.e., $M_1 : M_2$).

A question may arise as to why the promoter looks at discounted profits and the star players look at their equilibrium shares, but not vice versa. The

recording company's unit sales are unaffected by which of the two partners gains or loses in terms of equilibrium share. Its payoffs are purely based on overall, discounted profits. Discounted profits are relevant for the star players too (for example, see Eqs. (5) and (6)). For a given player 1 (with known diffusion parameters) and a given (prospective) alliance partner (i.e., known (M_1, M_2)), its discounted profits from the co-marketing alliance are better (or worse) than those from its baseline alliance if its equilibrium share is higher (or lower) than $M_1/(M_1 + M_2)$. That is, knowing the equilibrium share is enough (i) to predict which of the two alternative alliances yields higher discounted profits and (ii) to derive the required market expansion for the co-marketing alliance to be more attractive. However, for the promoter that may have to choose between two or more alliances (see below), the analysis is more complicated. We have to look at discounted profits explicitly to identify the better alliance.

To prove the following three propositions, we focus on the adoption pattern of the first product release $C_{12(1)}$. Results with subsequent releases will be similar in direction to those based on the alliance's first release. To draw strategic implications of the propositions for the promoter, we do the following:

- First, for the alliance formation question, we assume that the promoter has to choose from two pairs of prospective partners. For each proposition, one pair (Pair I) is assumed to exhibit symmetry on the focal variable, whereas the other (Pair II) exhibits asymmetry.
- Second, for the alliance management issue, we treat one of the above pairs as given. We discuss the desirable direction of marketing efforts to enhance overall profits.

4.2.1. Impact of relative sizes of coefficients of shift in preference (i.e., $h_{12} : h_{21}$) on alliance attractiveness

The strategic import of coefficients of shift in preference from the perspective of the individual players was clarified in the earlier section. Our concern here is whether such shifts in preference have an impact at the aggregate level affecting the promoter. As seen from Eqs. (3) and (4), a larger h_{12} (vis-à-vis h_{21}) means that at any instant, ceteris paribus, adoption in the segment that prefers player 2 is faster compared to the baseline situation, whereas that corresponding to player 1 is slowed down.

Coefficient h_{12} equals h_{21} for Pair I (symmetric alliance), whereas $h_{12} > h_{21}$ for Pair II (asymmetric alliance) for the same overall $h_{12} + h_{21}$. Let all else remain the same within the two alliances (i.e., $a_1 = a_2$; $b_1 = b_2$; $M_1 = M_2$). What are the implications for the promoter?

Proposition 1. *A co-marketing alliance is most profitable when, ceteris paribus, the coefficients of shift in preference are equal (i.e.,* NPV(products $C_{12(I)}$) *is the highest when $h_{12} = h_{21}$).*

Proof. See Appendix A. It shows that for a given total magnitude of the coefficients of shift in dominant reason (i.e., $h_{12} + h_{21} = l_1$, a constant), the maximum profits are realized when the shift coefficients are each equal to $l_1/2$.

Implications for the promoter:

Alliance formation: The net result of asymmetry in shift coefficients is one of delayed market adoption. Therefore, all else being the same, symmetry in coefficients of shift in preference would make one co-marketing alliance (Pair I) more attractive to the promoter than the other (Pair II) in which the coefficients are asymmetric.

Alliance management: As discussed earlier, $h_{12} : h_{21}$ is market-driven and specific for a given pair of prospective alliance partners.[7] As such, the promoter can only act on it by promoting the ''right'' alliance(s). For example, in the asymmetric case ($h_{12} > h_{21}$), the players should be promoted separately (baseline situation) as adoption of products from the co-marketing alliance would be slower than that from the two baseline alliances put together.

[7] Can the promoter change the h_{12}/h_{21} ratio? The ratio represents how the combined market responds to the alliance by experiencing a product created by the alliance. Technically, a promoter may be able to change this ratio in at least three ways. In an entertainment context, a recording company could (i) alter this experience by deliberately altering the performance quality of one of the star players, (ii) order the names of players to favor one of them or (iii) control the number of seconds each star sings on a particular album. Either player should remain alert to such issues and negotiate them up front.

4.2.2. Impact of relative sizes of coefficients of work of mouth (internal) influence (i.e., $b_1 : b_2$) on alliance attractiveness

An important determinant of the adoption rate and discounted profits is the word-of-mouth influence as captured by the coefficients of internal influence b_1 and b_2 in the pair of Eqs. (3) and (4) or in Eq. (1). As these equations suggest, adoption of products due to player 1, say, would be faster if this player is talked about with greater intensity, all else being equal.

Let $[b_1 = b_2]$ for one pair (Pair I, say) and $[b_1 > b_2]$ for the other (Pair II) even though the players' combined intensities of word-of-mouth influence are the same for both pairs (i.e., $b_1 + b_2 = l_2$, a constant). Let all else be kept the same within the two alliances (i.e., $a_1 = a_2$; $h_{12} = h_{21}$; $M_1 = M_2$.) What are the alliance formation and management implications?

Proposition 2. *A co-marketing alliance is most profitable when, ceteris paribus, the strength of word-of-mouth influence of the adopters who prefer player 1 is equal to that for adopters who prefer player 2 (i.e.,* NPV(products $C_{12(I)}$) *is the highest when $b_1 = b_2$).*

Proof. See Appendix A.

Implications for the promoter:

Alliance formation: The result implies that asymmetry in the intensities of word-of-mouth in favor of the two players, ceteris paribus, slows down the adoption process overall. Pair I would be more profitable for the promoter as the coefficients of internal influence are comparable.[8]

Alliance management: Suppose the promoter is managing the strategically trickier asymmetric alliance [Pair II; i.e., $b_1 > b_2$]. Here, marketing actions must be focused on the player with the lower coefficient of word-of-mouth influence. For example, in a music CD context, promotional activities such as providing free samples or sneak previews that generate additional word-of-mouth may be targeted at consumers for whom this ''weaker'' player is the primary attraction.

4.2.3. Impact of relative sizes of preference (i.e., $M_1 : M_2$) on attractiveness of the alliance

Given a choice between two pairs that have comparable market potential (i.e., $M_1 + M_2 = 2M$, a constant), which alliance would be more profitable for the promoter: one in which the players have a roughly similar market potential (i.e., $M_1 = M_2$), or another alliance in which the players' market potential are different (say, $M_1 > M_2$)? For the chosen co-marketing alliance, should the promoter promote the joint alliance or the baseline alliances? (Here, let $a_1 = a_2 = a$ and $b_1 = b_2 = b$ across the two alliances.)

Proposition 3. *In the absence of shift in preference, for a given market size, ceteris paribus, the players' relative initial sizes of market potential ($M_1 : M_2$) has no impact on the speed of adoption and profits from the alliance.*

Proof. See Appendix A.

Implications for the promoter:

Alliance selection: So long as the coefficients of shift in preference are negligible, for a given overall market potential for a pair, its breakup ($M_1 : M_2$) between the two players has no impact on the speed of adoption and the discounted profits for the promoter. That is, so long as the market ($M_1 + M_2$) is covered, ceteris paribus, both co-marketing alliances would be equally attractive.

Alliance management: The proposition also means that in the absence of shift in preference, it is immaterial for the promoter whether it promotes two prospective alliance partners jointly, as part of the co-marketing alliance, or separately as two baseline alliances.

[8] Proposition 2 is seemingly contradictory to a result in an article by Mahajan and Muller (1994) (MM for short). In studying the impact of European unification on the diffusion of new products, MM find that *asymmetry* in the coefficients of word-of-mouth (or internal) influence leads to faster diffusion. In reality, there is no contradiction as the two models are unrelated. Our result is driven by consumers' preferences for either of the two partners (e.g., Stevie Nicks or Tom Petty) — a notion that is irrelevant to MM.

In other words, from the alliance coordinator's standpoint, it is the notion of shift in preference that makes the co-marketing alliance formation important and potentially rewarding.

5. Application

The proposed model may be applied to real-world co-marketing situations. We provide an illustrative application in the context of music CD albums featuring two partnering celebrity performers. Here we show how the key parameters can be estimated with real-world data and provide a feel for the types of inferences that can be drawn. We start with an overview of the industry that reinforces certain important aspects of our model formulation.

Brief Overview of the Music Phonogram Industry: The music industry is huge. The international music industry based on the sales of phonograms (records, cassettes and CDs) had an annual worldwide turnover of US$33 billion (International Federation of the Phonographic Industry (IFPI) 1995). It consists of recording companies and artists (as needed by our model) as well as several middlemen. Celebrity performers receive royalties based on actual sales. According to Burnett (1996), a portion of the anticipated royalties is paid to the artist as advance — a kind of guarantee to the artist that the album would be promoted actively by the promoter. A contract between a recording company and an artist could have exclusionary clauses (Hurst, 1979) giving the company the right to stop the artist from recording for anyone else (cf. Soocher, 1993). Contracts could run either for a period of time or for a certain number of album releases or a combination thereof (Blake, 1992, pp. 33–34). We could not find any information on profit sharing arrangements within celebrity alliances in the music industry that would either support or contradict our apportioning rule.

5.1. Data requirements

These fall into two categories:

(i) *Individual level preference data*: We need preference data from a random sample of potential consumers. A survey approach to collecting such data and the follow-up analysis are explained below. Sample product(s) from the alliance are needed for data collection. For an alliance that is only under preliminary negotiation, one could use pilot recordings of the performers. The relative sizes of customers who prefer either player, the expected coefficients of shift in preference for a celebrity pair and the expected market expansion may be estimated using this data. These estimates suffice to assess whether the alliance is worthy of formation or sustenance from the standpoint of the alliance partners.

(ii) *Aggregate unit sales data*: The alliance promoter (e.g., recording company) who may have competing alternatives for alliance promotion needs periodwise adoption of representative past CDs featuring each of the prospective partners in the baseline scenario. The coefficients of external and word-of-mouth (internal) influence (a_k, b_k) of either player ($k = 1$, 2) as well as his/her market potential (M_k) of the Bass-type diffusion models (Eq. (1)) can then be estimated using non linear least squares procedure (cf. Srinivasan and Mason, 1986). We do not estimate these parameters as we do not have access to such data. The alliance promoter, who would have such access, may use these estimates in conjunction with those from the survey.

5.2. Details of the empirical study

The remainder of this section will focus on using the data under category (i) above. Accordingly, our conclusions are at the level of the star players only. Based on discussions with three avid music enthusiasts, we identified 12 pairs of celebrity performers who have performed at least once together (e.g., Billy Joel and Elton John) or have produced at least one CD jointly. (We hasten to point out that our procedure applies even for alliances on the ''drawing board''. The prospective partners would, in their own interests, produce and use pilot samples in such situations.) Each of the performers has also produced solo albums as required by our baseline scenario. The potential market for our study was identified as the population of part-time MBA students in a city in northeastern USA.

We then conducted our empirical study in two stages. The first stage was the pretesting and screening phase. The pretest involved administering a short survey to 44 part-time MBA students. Each respondent was asked to identify performers from our pool whose solo albums she/he owned. For each of the 12 celebrity pairs, we asked each respondent to reveal his/her preference between a CD album featuring the celebrity pair and US$10 in cash. To keep their preference information realistic, respondents were told in advance that five of them would be selected at random and each would be awarded a CD or cash based on the stated preference.

Analysis of the data led to the elimination of four pairs of celebrity performers in which neither performer commanded a reasonable following among the potential audience. From the remaining options, we selected three pairs, namely, Stevie Nicks and Tom Petty, Eddie Vedder and Nusrat Fateh Ali Khan, and Jimmy Page and Robert Plant. Our pretest data suggested that these three pairs represent an assortment of possible outcomes and, therefore, help explain the implications more broadly. The pretest also helped iron out rough spots in the questionnaire.

The second phase of our empirical study involved 59 respondents who are all part-time MBA students. To elicit accurate preference information and to compensate for the greater demands on time, each respondent was offered an incentive in the form of a CD or its retail cash equivalent based on his or her responses to unidentified questions.

Recall that the two key parameters in our model — the coefficients of shift in dominant reason h_{12} and h_{21} — and the required market expansion ΔM are inferred from shifts in consumer preference which, in turn, are based on their experience of the product quality. To obtain these estimates, data collection in the second phase consisted of two parts. The survey instrument used for this purpose is presented in Appendix B. In part I, for each of the three sets (or pairs) of performers, we asked respondents to indicate which of the two star performers' solo CD albums they would prefer without knowing the album's title. If a respondent did not prefer either performer's solo album, she/he could indicate that by checking the ''Neither'' option.

In part II of the main study, the respondents were exposed to three songs — one from each of the three pairs of celebrity performers. Each song features a celebrity pair performing jointly. Immediately after listening to each song, consumers were asked to respond to two questions on their preferences (see questions 1-A and 1-B in Appendix B, part II). This approach of exposing subjects to songs and eliciting their preference immediately thereafter is consistent with literature (see Ratner et al., 1999). The sequence of the performers' names (Stevie Nicks with Tom Petty) is consistent with that on the album label. Question 1-A is intended to capture the post-consumption preference of the respondents for either performer. Question 1-B is used to infer the extent of market expansion or shrinkage (to be discussed shortly).

The analysis is performed in two stages. Stage I is restricted to respondents who are part of the segments of sizes M_1 and M_2 in the pre-alliance scenario. The relevant respondents are those who checked star performer 1 or 2 but not either under section I of part I of the survey. This preference information is tabulated as follows:

Pair I:		Post-exposure to joint performance	
Performers (1, 2)		Performer 1	Performer 2
Pre-exposure to joint performance	Performer 1	n_{11}	n_{12}
	Performer 2	n_{21}	n_{22}

Suppose the performer pair is Stevie Nicks and Tom Petty. The cell value n_{11} represents the number of respondents who checked Stevie Nicks (Performer 1) under set II (in section I of part I) *and* question I-A (in section I of part II). The row total, $n_{11} + n_{12}$, represents the number of respondents who belong to the segment that prefers Stevie Nicks in the pre-alliance scenario.

If respondents have been randomly drawn from the potential market, we have:

$$\text{Estimated initial preference share of performer ''}i\text{''} = \frac{M_1}{M_1 + M_2} = \frac{\sum_{j=1}^{2} n_{ij}}{\sum_{i=1}^{2}\sum_{j=1}^{2} n_{ij}} \quad \text{for } i = 1, 2. \qquad (7)$$

The coefficients of shift in preference based on the single exposure to music featuring the celebrity pair are then obtained in the following manner:

Estimate of coefficient of shift in preference from Performer 1 to 2

$$= \hat{h}_{12} = \frac{n_{12}}{n_{11} + n_{12}}, \quad (8)$$

Estimate of coefficient of shift in preference from Performer 2 to 1

$$= \hat{h}_{21} = \frac{n_{21}}{n_{21} + n_{22}}. \quad (9)$$

Statistical details of the estimates of coefficients h_{12} and h_{21} are reported in Table 3.

Table 3A contains the sample sizes, parameter estimates and standard errors associated with our estimation. In interpreting these figures, it is apt to note that the study is illustrative and no hypotheses are being tested. Where resources are not a constraint, the sample sizes suggested in Table 3B may be used for reliable estimates. We have used our estimates as the seed values for the sample size calculation in Table 3B.

The equilibrium share based on our model (in the absence of market expansion) is:

Estimated equilibrium share of performer i

$$= \frac{\hat{h}_{ji}}{\hat{h}_{ij} + \hat{h}_{ji}} \quad \text{for } i, j = 1, 2 \text{ and } i \neq j. \quad (10)$$

Suppose Performer 1's (i.e., Stevie Nicks') estimated equilibrium preference share is less than the

Table 3
Coefficients of shift in preference: statistical details

No.	(Prospective) alliance partners	Parameter (p)	Sample size for parameter estimation (n)	Parameter estimate ($\hat{p}$)	Standard error $\left(\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$
(A) Key details in parameter estimation					
I	Stevie Nicks (1)	h_{12}	13[a]	0.1538	0.1000
	Tom Petty (2)	h_{21}	35	0.2286	0.0710
II	Eddie Vedder (1)	h_{12}	32	0.0625	0.0428
	Nusrat Fateh Ali Khan (2)	h_{21}	3	0.3333	0.2722
III	Jimmy Page (1)	h_{12}	6	0.0000	0.0000
	Robert Plant (2)	h_{21}	14	0.0000	0.0000

(B) Desired sample size for reliable estimates[b]

No.	(Prospective) alliance partners	Desired sample size	Target standard error
I	Stevie Nicks (1)	200	0.0255 (in all cases)
	Tom Petty (2)	271	
II	Eddie Vedder (1)	91	
	Nusrat Fateh Ali Khan (2)	342	
III	Jimmy Page (1)	139[c]	
	Robert Plant (2)	139[c]	

[a] To be read as: ''13 out of the 59 respondents checked Stevie Nicks in set II of section I of part I of the questionnaire'' (see Appendix B). That is, 13 is the sample size for the Stevie Nicks subgroup.

[b] Desired sample size for each subgroup $= z^2_{\alpha/2}(\hat{p}(1-\hat{p})/\text{ME})$, where $\hat{p}$ is the parameter estimate from the pilot study (above), $z_{\alpha/2}$ is the critical z-value ($= 1.96$) for 95% confidence level α ($\alpha = 5\%$) and ME is the margin of error ($= \pm 5\%$ for these calculations).

[c] The pilot estimate would yield a desired sample size of zero. So $\hat{p}$ has been set to 0.1 to obtain these more conservative numbers. *Note*: For very conservative sample size estimates, $\hat{p}$ may be set to 0.5. This would yield a desired sample size of 385.

initial preference share (i.e., $\hat{h}_{21}/(\hat{h}_{12}+\hat{h}_{21}) < M_1/(M_1+M_2)$), this performer is expected to be unwilling to enter the alliance unless the market expansion conforms to Result 1. In other words,

$$\begin{aligned}
&\text{Market expansion required}\\
&= \frac{M_1\left(\frac{h_{12}}{h_{21}}\right) - M_2}{M_1+M_2}\\
&\quad \times 100\% \text{ of original market (i.e., } M_1+M_2)\\
&= \left(\frac{M_1}{M_1+M_2}\left(\frac{h_{12}}{h_{21}}\right) - \frac{M_2}{M_1+M_2}\right)\times 100\%\\
&= \left(\frac{M_1}{M_1+M_2}\left(\frac{h_{12}}{h_{21}}+1\right)-1\right)\times 100\%\\
&= \left(\frac{\text{Initial share of Performer 1}}{\text{Equilibrium share of Performer 1}}-1\right)\\
&\quad \times 100\% \text{ of initial market size} \qquad (11)
\end{aligned}$$

This is computed by plugging in the estimates of initial and equilibrium shares from Eqs. (7) and (10).

Stage II of the analysis ties in the above estimates with the anticipated expansion. To assess expansion into the previously untapped market, we use feedback from respondents who were not part of the potential market in the pre-alliance scenario (i.e., respondents who chose ''Neither'' of Stevie Nicks and Tom Petty under section I of part I). The number of these respondents who opt for a CD featuring both performers over its retail cash equivalent represents the expansion within the sample. It is also possible that some respondents who prefer a ''solo'' album by Tom Petty or Stevie Nicks (part I of questionnaire in Appendix B) may choose not to buy a joint CD featuring these performers (question I-B under part II). This represents shrinkage of the original market. The estimated expansion will be the net of the expansion into the untapped market and shrinkage within the existing market. We will denote this n_{12}^* within the respondent pool.

$$\begin{aligned}
&\text{Anticipated market expansion}\\
&= \left(\frac{n_{12}^*}{\sum_{i=1}^{2}\sum_{j=1}^{2} n_{ij}}\right)\times 100\% \text{ of initial market size}
\end{aligned} \qquad (12)$$

If the anticipated market expansion is at least equal to the required expansion (Eq. (11)), then forging the co-marketing alliance is a ''GO'' from the perspective of both star players. Otherwise, it is not in the weaker player's interest to form the alliance.

The results for the three pairs of star performers are summarized in Table 4.

Table 4A contains the specific measures or estimates of the main variables of interest. The key implications for the alliance partners are summarized in Table 4B. For the Stevie Nicks with Tom Petty example, the initial shares of preference in the ''pre-co-marketing alliance'' scenario are heavily in Petty's favor (72.9% versus 27.1% for Nicks). Actual experience with the music featuring Nicks and Petty jointly swings the equilibrium share in Nicks' favor (59.8% versus 40.2% for Petty). Unless the market expands by at least 81.3% compared to the initial value, Petty will be worse off from where he started. However, the anticipated market expansion is only 4.2%. Thus, the alliance is strongly unfavorable to Tom Petty. Based on our illustrative study, we would suggest that Petty should not agree to this alliance.[9]

In contrast, our data suggest that both of the other alliances are likely to succeed as the anticipated market expansion exceeds the minimum required level.

[9] It must be noted, however, that a tepid market reaction to the first release from a co-marketing alliance does not rule out the possibility of a later surge. For example, some of the popular music bands were slow starters. Yet it seems to us that such instances are more likely with alliances among relative unknowns than with co-marketing alliances between well-known players. Nevertheless, we would advice the affected players to conduct further research on the causes for weak market reaction before they terminate an alliance.

Table 4
Results and key implications of empirical study

No.	(Prospective) alliance partners	Estimated initial share of preference	Estimated coefficients of shift in preference	Estimated equilibrium share of preference	Market expansion required from 'weaker' celebrity's point of view	Anticipated market expansion
(A) Results						
I	Stevie Nicks (1) with	27.1%	$\hat{h}_{12} = 0.1538$	59.8%	–	4.2%
	Tom Petty (2)	72.9%	$\hat{h}_{21} = 0.2286$	40.2%	81.3%	
II	Eddie Vedder (1) with	91.4%	$\hat{h}_{12} = 0.0625$	84.2%	8.6%	17.1%
	Nusrat Fateh Ali Khan (2)	8.6%	$\hat{h}_{21} = 0.3333$	15.8%	–	
III	Jimmy Page (1) with	30.0%	$\hat{h}_{12} = 0.0000$	30%	–	15.0%
	Robert Plant (2)	70.0%	$\hat{h}_{21} = 0.0000$	70%	–	

(B) Key implications for prospective alliance partners

No.	(Prospective) alliance partners	Implications of initial share of preference	Implications of equilibrium share of preference	Implication of anticipated market expansion	Recommendation
I	Stevie Nicks (1) with Tom Petty (2)	Considerable asymmetry in shares in Petty's favor.	Petty is expected to suffer a significant net loss of preference share.	Market expansion is inadequate to compensate for Petty's loss of preference share.	Alliance is a ''NO GO'' from the standpoint of Tom Petty.
II	Eddie Vedder (1) with Nusrat Fateh Ali Khan (2)	Considerable asymmetry in shares. Vedder is the leader in this market.	Slight loss in Vedder's share likely; Big gain for Khan.	Market expansion more than offsets Vedder's loss of preference share.	Alliance is a ''GO'' from the standpoint of either performer.
III	Jimmy Page (1) with Robert Plant (2)	Considerable asymmetry in shares in Plant's favor.	Neither celebrity loses his preference share to the other.	Market expansion makes the celebrity alliance certainly worth forming.	Alliance is a ''GO'' from the standpoint of either performer.

6. Discussion

The objective of this paper was to investigate the dynamic aspects of a co-marketing alliance and offer guidelines to establish profitable and self-sustaining alliances. We have proposed a stylized model applicable to a specific type of dynamic co-marketing alliance, namely, a medium-term, exclusive alliance of two well-known players promoted by a third person. By bringing in the coefficients of shift in preference, we have modified a system of Bass-type diffusion models (traditionally used to examine category level diffusion of new products) to capture a key aspect of endogenous competition among alliance partners. Our model helps us offer recommendations to (a) the prospective partners who seek to maximize individual payoffs, and (b) the promoter who intends to maximize combined, discounted payoffs.

We briefly review the managerial implications of our findings.

For the alliance partners, our results show that not only should there be an anticipated positive interaction effect manifested as market expansion, but also the expansion should exceed a significant threshold in many cases. Without the requisite market expansion, the weaker partner would be better off sticking to a baseline alliance with a functional partner. The results also suggest that in the alliance context, the change in clout of a partner could happen quite rapidly. The change from the baseline position toward a new and (often) quite different equilibrium occurs within just a few new product releases. With this said, it is pertinent to note that the notion of shift in preference is at the heart of the dynamics of the alliance. Where such shifts are absent, the co-marketing alliance is no better and no worse to a partner than a baseline alliance.

From the standpoint of the promoter, it is obvious that an alliance that appeals to more customers is preferable to a competing alternative. We considered the trickier case when two alliances have similar market potential. Our results show that all else being the same, for a given total strength, the alliance is most profitable when the strengths are balanced. The strength variables are (a) the coefficients of shift in consumers' preferences from one player to the other and (b) the intensities of word-of-mouth influence that the players can induce. Where possible, the promoter would be better off directing marketing efforts toward bolstering the ''weaker'' of the two players.

An important highlight of the study is Section 5 in which we use survey data to illustrate how the model could be implemented in a real-world context. This section would have been more illuminating if we had access to adoption data from the baseline scenario.

6.1. Linking the proposed approach to other types of co-marketing alliances in Table 1

The model development and results/propositions have been developed for a general case such as a series of releases of a durable product (e.g., CD albums) for which reputation effects, diffusion effects and shift in preference effects are all likely to be important. Alliances falling under this context are in cell 2 of Table 1. Let us indicate the linkages of our approach for certain other scenarios contained in cells 1, 3 and 4.

When the alliance is expected to release only one new durable product (cell 1 in Table 1), all model parameters are relevant from the promoter's standpoint. All three propositions discussed earlier would apply. However, Results 1, 2.1 and 2.2 are likely to be of limited import because the short alliance duration may encourage apportioning payoffs based on the starting shares of preference (i.e., initial reputation) instead of the operationally more complex apportioning rule that we propose. When the product is a nondurable (cells 3 and 4), the role of diffusion effects in the adoption process is mitigated or absent. Thus, the aspects of the model that lead to Propositions 1–3 are less relevant at best. Between the scenarios in cells 3 (single release) and 4 (multiple release), the latter is closer to our model as the shift in preference effects are of much importance over such longer duration. Our Results 1, 2.1 and 2.2 are relevant for cell 4. In contrast, apportioning of payoffs among players in cell 3 may proceed based on initial reputation only.

6.2. Two extensions of the main model

Our main model is based on the assumption that the intensity of word-of-mouth influence in favor of

a particular player is the same irrespective of whether adopters have only recently shifted their preference in favor of this player or have maintained their preference over time. We have added Appendix C to show how this assumption could be relaxed. This suggests an interesting point. If recent adopters offer more intense word-of-mouth influence, shifts in preference may be beneficial to the players. In other words, even if a player's initial and equilibrium shares are the same, the relative attractiveness of the co-marketing alliance over the baseline alliance would increase if consumers shift their preferences more often.

Our main model also assumes that either star player shelves the baseline alliance if and when the co-marketing alliance is in effect. An approach to relax this assumption is presented in Appendix D. Here we let one of the players keep the baseline alliance active. Two points emerge: (i) the main model in the paper extends nicely to this setting albeit with much loss of parsimony and (ii) a player's insistence on retaining independent production activities is likely to diminish the attractiveness of alliance formation for his/her partner. In the latter case, the threshold market expansion needed for alliance formation/sustenance (Result 1) is enhanced. While a more complete investigation of this model is open for further research, we feel that the original assumption of an exclusive alliance in the main model is probably more reasonable as the insistence on parallel production by one player may derail the prospect of co-marketing alliance formation.

6.3. Research limitations and future research directions

Our study has certain limitations that tend to restrict the generalizability of the results. We highlight these limitations and identify the associated opportunities for future research.

Our assessment of the attractiveness of alliance formation and sustenance is based on two issues: (a) the extent of market expansion and (b) the scope for faster adoption among consumers. Our focus is not on premium pricing. In certain alliance contexts, such as a series of entertainment concerts in auditoriums, where there are capacity constraints linked to the venue, other options such as charging a higher price could be more prevalent.

We treat the extent of market expansion or shrinkage to be idiosyncratic to an alliance and have demonstrated an empirical approach to assess this change for any given setting. Alternatively, one could delve into the characteristics of the alliance partners, such as the extent of their similarity or complementarity, to determine when or whether market expansion is likely to occur. Future research efforts may be directed to address such issues (cf. Rao and Ruekert (1994) for insights).

The profit-sharing arrangement that we propose based on the partners' shares of preference in the marketplace is arguably equitable. Yet it is possible that in industries such as entertainment, profit sharing is based on more subjective issues. At a minimum, our results can be used as a benchmark for negotiations that are increasingly managed by professional agents. With this said, we would like to see additional research on the negotiation aspect of the alliance. In celebrity alliances, for example, a popular but declining celebrity may negotiate safeguards via mechanisms such as the severance fee, duration of the alliance, and pie-sharing. These are interesting variables worthy of further research.

Our stylized model is most appropriate for situations in which the alliance partners (or players) and a promoter all exist. Most co-marketing alliances from the entertainment industry seem to fit this requirement quite nicely. While alliances in several other marketing situations are within the study's context, each new setting is likely to have some idiosyncratic features that would require the model to be suitably adapted.

An issue that is not fully addressed by the model is the likely standing of a player after the alliance breaks up. A dynamic co-marketing alliance may cause some irreversible change to a partner's brand equity and market base. In other words, a player who loses some consumers due to the alliance may not regain his/her original consumer base. It would be worth studying the post-alliance share based on factors such as the time lapse since the termination of the alliance, consumers' attributions for the player's poor performance, and the actual changes in the player's reputation over time.

From the standpoint of a star player, we only address whether this player should form a co-marketing alliance (with another star player) or stick to a baseline alliance. We do not consider situations in which the star player may have two alternative co-marketing alliances to form and is pondering which one to choose. With this said, some preliminary answers may be offered. For example, all else (such as the coefficients of external and internal influence) being the same, a co-marketing alliance that offers greater expansion is likely to be more attractive. Also, the approach in Appendix C suggests that between two co-marketing alliances that may yield the same equilibrium share, the one that is likely to induce greater switching (i.e., higher $h_{12} + h_{21}$) is likely to be more attractive if recent ''switchers'' exert more intense word-of-mouth influence. Yet, a comprehensive answer to this broader problem would require a different and more complicated model with four baseline alliances (namely those of players 1, 2 and 3 as part of their functional alliances as well as the co-marketing alliance '12'). One could then examine the relative attractiveness of co-marketing alliance '13'.

Also, our model does not accommodate competitive threats from other alliances in the industry. It also overlooks increases in the consumer pool due to population growth and maturity. If anticipated changes in the size of the consumer pool are significant, the market potential parameter may have to be modified (cf. Mahajan and Peterson, 1978). These factors are important in some industries and are worthy of consideration.

Overall, the topic area of co-marketing alliances is getting serious attention in the practitioner community. There are many important issues in this area that deserve further attention.

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Appendix A. Proofs for results and propositions

Proof of Result 1. Market expansion required for a co-marketing alliance to form/sustain.

Let the sales (per period) of product $C_{k(.)}$ of player k ($k = 1, 2$) in the steady state be fM_k, where ''f'' is a constant multiple of the market size and related to the frequency at which products released in the baseline situation.

For products $C_{12(.)}$, in the equilibrium (steady state):

$$\text{Share of sales due to player 1 (or 2) being the primary reason} = \frac{h_{21}}{h_{12} + h_{21}} \left(\text{or } \frac{h_{12}}{h_{12} + h_{21}} \right).$$

Player 1 will either break off or not enter the alliance if the equilibrium unit sales of products $C_{12(.)}$ due to player 1 being the primary reason is less than the equilibrium sales of products $C_{1(.)}$.

Let the market expansion contingent on the alliance be ΔM.

For player 1, the necessary market size condition to forge/sustain the alliance is

$$fM_1 = f\frac{h_{21}}{h_{12} + h_{21}} (M_1 + M_2 + \Delta M),$$

or

$$\Delta M \geqslant \frac{h_{12} + h_{21}}{h_{21}} M_1 - (M_1 + M_2) = \left(\frac{h_{12} M_1 - h_{21} M_2}{h_{21}} \right),$$

or

$$\Delta M \geqslant M_1\left(\frac{h_{12}}{h_{21}}\right) - M_2.$$

The corresponding requirement for player 2 is $\Delta M \geqslant M_2(h_{21}/h_{12}) - M_1$.
The necessary market expansion for the co-marketing alliance to form/sustain is

$$\Delta M \geqslant \text{Max}\left\{ M_1\left(\frac{h_{12}}{h_{21}}\right) - M_2, M_2\left(\frac{h_{21}}{h_{12}}\right) - M_1\right\}.$$

□

Proof for Proposition 1. The objective function is

$$\Pi = \max_h \int_0^\infty \pi(z'_{12(1)} + w'_{12(1)})\mathrm{e}^{-rt}\,\mathrm{d}t,$$

$$z'_{12(1)} = \left(a + b\frac{(1-h)z_{12(1)} + (l_1 - h)w_{12(1)}}{M}\right)(M - z_{12(1)}),$$

$$w'_{12(1)} = \left(a + b\frac{hz_{12(1)} + (1 - l_1 - h)w_{12(1)}}{M}\right)(M - w_{12(1)}).$$

At $t = 0$, $z_{12(1)} = w_{12(1)} = 0$; at $t = \infty$, $z_{12(1)} = w_{12(1)} = M$.

$$\Pi = \text{Max}\int_0^\infty \pi\left(\begin{array}{l}\left(a + b\dfrac{(1-h)z_{12(1)} + (l_1 - h)w_{12(1)}}{M}\right)(M - z_{12(1)}) \\ + \left(a + b\dfrac{hz_{12(1)} + (1 - l_1 + h)w_{12(1)}}{M}\right)(M - w_{12(1)})\end{array}\right)\mathrm{e}^{-rt}\,\mathrm{d}t,$$

$$\frac{\partial \Pi}{\partial h} = 0 = \int_0^\infty \pi\left(\left(b\frac{(-z_{12(1)} - w_{12(1)})}{M}\right)(M - z_{12(1)}) + b\left(\frac{z_{12(1)} + w_{12(1)}}{M}\right)(M - w_{12(1)})\right)\mathrm{e}^{-rt}\,\mathrm{d}t$$

$$= \int_0^\infty \pi\left(\left(b\frac{(z_{12(1)} + w_{12(1)})}{M}\right)(-M + z_{12(1)} + M - w_{12(1)})\right)\mathrm{e}^{-rt}\,\mathrm{d}t.$$

When $h > l_1/2$, $w_{12(1)} > z_{12(1)}$. Therefore, the term $(z_{12(1)} - w_{12(1)})$ and, hence, the integrand will be negative throughout the diffusion process. In other words, the integral will not become zero. Similarly, when, $h < l_1/2$, $z_{12(1)} > w_{12(1)}$. The term $(z_{12(1)} - w_{12(1)})$ and, hence, the integrand, will be positive throughout the diffusion process. In either case, the integral will not be zero. However, when $h = l_1/2$, $w_{12(1)} = z_{12(1)}$. Then the integrand is zero and the maximum is reached.
The equality (which will correspondingly yield the highest profits) occurs if $h = l_1/2$. In other words, $h_{12} = h_{21} = l_1/2$. □

Proof for Proposition 2. The objective function is

$$\max_b \int_0^\infty \pi(z'_{12(1)} + w'_{12(1)})\mathrm{e}^{-rt}\,\mathrm{d}t,$$

$$z'_{12(1)} = \left(a + b\frac{(1-h)z_{12(1)} + hw_{12(1)}}{M}\right)(M - z_{12(1)}),$$

$$w'_{12(1)} = \left(a + (l_2 - b)\frac{hz_{12(1)} + (1-h)w_{12(1)}}{M}\right)(M - w_{12(1)}).$$

At $t=0,\ z_{12(1)}=w_{12(1)}=0$; at $t=\infty,\ z_{12(1)}=w_{12(1)}=M$.

$$\Pi=\text{Max}\int_0^\infty \pi\left(\begin{array}{l}\left(a+b\dfrac{(1-h)\,z_{12(1)}+hw_{12(1)}}{M}\right)\left(M-z_{12(1)}\right)\\ +\left(a+(l_2-b)\dfrac{hz_{12(1)}+(1-h)\,w_{12(1)}}{M}\right)\left(M-w_{12(1)}\right)\end{array}\right)\mathrm{e}^{-rt}\,\mathrm{d}t,$$

$$\frac{\partial\Pi}{\partial b}=0=\int_0^\infty \pi\left(\left(\frac{(1-h)\,z_{12(1)}+hw_{12(1)}}{M}\right)\left(M-z_{12(1)}\right)\right.$$

$$\left.+\left(-\frac{hz_{12(1)}+(1-h)\,w_{12(1)}}{M}\right)\left(M-w_{12(1)}\right)\right)\mathrm{e}^{-rt}\,\mathrm{d}t,$$

$$=\int_0^\infty \frac{\pi}{M}\Big(\big((1-h)\,z_{12(1)}+hw_{12(1)}\big)\big(M-z_{12(1)}\big)-\big(hz_{12(1)}+(1-h)\,w_{12(1)}\big)\big(M-w_{12(1)}\big)\Big)\mathrm{e}^{-rt}\mathrm{d}t.$$

For a combination of $z_{12(1)}$ and $w_{12(1)}$, one can find a particular r that will make the integral zero. To determine the combination of b_1 and b_2 that will make the integrand zero for any r, consider what happens to

$$\big((1-h)\,z_{12(1)}+hw_{12(1)}\big)\big(M-z_{12(1)}\big)-\big(hz_{12(1)}+(1-h)\,w_{12(1)}\big)\big(M-w_{12(1)}\big),$$

i.e., to

$$(1-2h)\big(z_{12(1)}-w_{12(1)}\big)M-(1-h)\big(z_{12(1)}^2-w_{12(1)}^2\big),$$

i.e., to

$$\big(z_{12(1)}-w_{12(1)}\big)\big((1-2h)M-(1-h)\big(z_{12(1)}+w_{12(1)}\big)\big).$$

Let $b_1>b_2$, so that $z_{12(1)}>w_{12(1)}$. Now consider the term $((1-2h)M-(1-h)(z_{12(1)}+w_{12(1)}))$. This could be positive, zero or negative at different points during the diffusion process. The integrand can be zero only when $z_{12(1)}=w_{12(1)}$; i.e., when $b_1=b_2=b=l_2/2$. □

Proof for Proposition 3.

$$\Pi=\text{Max}\int_0^\infty \pi\left(\left(a+b\frac{z_{12(1)}}{M_1}\right)\left(M_1-z_{12(1)}\right)+\left(a+(k-b)\frac{w_{12(1)}}{M_2}\right)\left(M_2-w_{12(1)}\right)\right)\mathrm{e}^{-rt}\,\mathrm{d}t$$

$$=\int_0^\infty \pi\left(M\left(a+b\frac{z_{12(1)}}{M_1}\right)\left(1-\frac{z_{12(1)}}{M_1}\right)+M_2\left(a+b\frac{w_{12(1)}}{M_2}\right)\left(1-\frac{w_{12(1)}}{M_2}\right)\right)\mathrm{e}^{-rt}\,\mathrm{d}t.$$

Let $z_{12(1)}/M_1=f$ and $w_{12(1)}/M_2=g.\ \therefore\ f(0)=0$ and $g(0)=0$.

Further, $\mathrm{d}f/\mathrm{d}t=(a+bf)(1-f)$, and $\mathrm{d}g/\mathrm{d}t=(a+bg)(1-g)$. As a and b are the same between the two equations, it follows that $f=g$. The profit equation simplifies to

$$\Pi=\int_0^\infty \pi\big(M_1+M_2\big)\frac{\mathrm{d}f}{\mathrm{d}t}\mathrm{e}^{-rt}\,\mathrm{d}t.$$

In other words, the net present value of returns depends only on the combined size of the loyal clientele of players 1 and 2, and not on their relative sizes $M_1:M_2$. □

Appendix B. Details of the survey instrument used for the main study

B.1. Consumer preferences for music albums: Part I

[Opening paragraph giving an introduction to the study and assuring confidentiality.]

[Second paragraph outlining incentive structure and asking for name.]

Kindly answer the questions below.

Section I: Within each of the following sets of performers, whose (solo) CD album would you prefer more strongly *without knowing the title*? (Check *one* option within each pair).

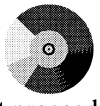
Set I:	___Pearl Jam	vs.	___Nusrat Fateh Ali Khan	vs.	___Neither
Set II:	___Tom Petty	vs.	___Stevie Nicks	vs.	___Neither
Set III:	___Jimmy Page	vs.	___Robert Plant	vs.	___Neither

B.2. Consumer preferences for music albums: Part II

[Opening paragraph clarifying that this is the concluding part of the study, assuring confidentiality, reiterating incentive structure and asking for respondent's name.]

Sections I through III below require you to listen to three songs. Please follow the instructions.

Section I: We will now play a song featuring the following performers.



Stevie Nicks with **Tom Petty**

(Do not proceed further until you have heard a piece from the above album.)

Question I-A: Which **one** of the following options would you prefer to own?

___ A Stevie Nicks (Solo) CD **or** ___ A Tom Petty (Solo) CD **or** ___ Neither

Question I-B: Which **one** of the following options would you prefer to keep?

___ A Stevie Nicks & Tom Petty (Duo) CD **or** ___ Retail Cash Equivalent

[Sections II and III pertained to the pairs ''Eddie Vedder and Nusrat Fateh Ali Khan'' and ''Jimmy Page and Robert Plant'', respectively. Similar questions were asked in those sections.]

Appendix C. Extending the main model to accommodate heterogeneity in intensity of internal influence

The model presented in the text assumes that the intensity of internal or word-of-mouth influence in favor of a particular player is the same across consumers who have preferred this player over time or have only recently

shifted their preference in favor of this player. The assumption is made in the spirit of parsimony of Bass-type diffusion models and in view of the absence of contrary evidence in literature. Here we propose an approach to relax the assumption.

Eqs. (3) and (4) provide the periodwise sales of product $C_{12(1)}$ from the co-marketing alliance that can be attributed to consumers who prefer player 1 and 2, respectively. In Eq. (3), for example, the term $(1-h_{12})z_{12(1)}$ represents those consumers who retained their preference for player 1 after their adoption of product $C_{12(1)}$. In other words, they are ''stayers'' as their preference stayed the same. In contrast, the term $h_{21}w_{12(1)}$ represents those consumers who switched their preference from player 2 to 1 after adopting product $C_{12(1)}$. These consumers could be called ''switchers''. We have assumed that the coefficient of word-of-mouth (internal) influence is the same ($=b_1$ for player 1) for both switchers and stayers.

Suppose the intensity of word-of-mouth influence is significantly different for switchers and stayers, then Eqs. (3) and (4) should be modified as follows:

$$\frac{\mathrm{d}z_{12(1)}}{\mathrm{d}t}=\left(a_1+\frac{b_1(1-h_{12})z_{12(1)}+c_1h_{21}w_{12(1)}}{M_1}\right)(M_1-z_{12(1)}), \tag{3b}$$

$$\frac{\mathrm{d}w_{12(1)}}{\mathrm{d}t}=\left(a_2+\frac{c_2h_{12}z_{12(1)}+b_2(1-h_{21})w_{12(1)}}{M_2}\right)(M_2-w_{12(1)}), \tag{4b}$$

where b_i and c_i represent the coefficients of internal influence for stayers and switchers, respectively of player i (for $i=1, 2$).

In terms of the implications, one conjecture seems reasonable and particularly striking. Suppose the initial preference shares of the two players are equal to their respective equilibrium shares (i.e., $M_i/(M_1+M_2)=h_{ji}/(h_{12}+h_{21})$ for $i,j=$ 1,2 and $i\neq j$) and no market expansion is forthcoming contingent on the co-marketing alliance formation. Under the revised formulation, switching would affect the attractiveness of the co-marketing alliance compared to the baseline alliance. In particular, we conjecture the following: *If $b_i<c_i$ ($b_i>c_i$), even when* (a) *the initial and equilibrium shares of preference of either player are equal and* (b) *the market size remains unchanged, the higher the coefficients of shift in preference, the more attractive (the less attractive) the co-marketing alliance compared to the baseline alliance for either player*.

Although this conjecture has not been proven for a complex setting, it is easily proven in a simple context. Let $M_1=M_2$, $a_1=a_2$, $b_1=b_2$, and $c_1=c_2$ and $h_{12}=h_{21}$. This means that the cumulative adoptions due to either player at any instance are equal, i.e., $w_{12(1)}=z_{12(1)}$. So, Eq. (3b), say, would simplify to:

$$\frac{\mathrm{d}z_{12(1)}}{\mathrm{d}t}=\left(a_1+\frac{(b_1+(c_1-b_1)h_{12})z_{12(1)}}{M_1}\right)(M_1-z_{12(1)}). \tag{3c}$$

The cumulative adoptions would be increasing in (c_1-b_1) and in h_{12} ($=h_{21}$; i.e., in $h_{12}+h_{21}$). [Notice that if $c_1=b_1$ (original assumption), Eq. (3c) would collapse to Eq. (1) and the co-marketing alliance would not have yielded any incremental gain or loss compared to the baseline alliance.]

To conclude, modeling differences in intensities of word-of-mouth influence across groups of consumers has the potential to offer some interesting insights. However, the theoretical and empirical bases of such differences should be established first and the costs and benefits of deviating from parsimony carefully reconciled.

Appendix D. Handling multiple alliances: An approach and some implications

The model described in the text is applicable for situations in which the star players are contemplating the formation or sustenance of an exclusive, dynamic co-marketing alliance. In other words, we assume that if the alliance is formed, the star players would refrain from individual or independent production activities given the cannibalization and commitment implications of doing so.

Here we propose an approach to relax the assumption of exclusivity in alliance formation and offer some preliminary implications. Here we let star player '1' produce his/her products from the baseline alliance (i.e., $C_{1(i)}$) even as the products $C_{12(i)}$ from the alliance with star player '2' are made available. Similar to our approach in the main model, we start with the assumption that that there is no net market expansion or shrinkage as a consequence of alliance formation. This will be relaxed shortly. At the time of release of the first product from the co-marketing alliance, let $p_1 M_1$ represent the number of (potential) consumers who prefer player 1's baseline offering. Correspondingly, $(1 - p_1) \times M_1$ represents those who prefer player 1's co-marketed offering. As before, M_2 represents the number of (potential) consumers who prefer star player '2' (who does not offer his/her baseline product after the formation of the co-marketing alliance).

The schematic representation of the new arrangement is shown in Fig. D.1. As can be seen here, two new coefficients of shift in preference — h_{bc} and h_{cb} — become necessary. Coefficient h_{bc} (or h_{cb}) represents the proportion of consumers who shift their preference from player 1's baseline product to this player's co-marketed product (or vice versa). Coefficients h_{12} and h_{21} are as defined in the text. The model representation underscores that the market evolution may be readily captured analogous to what is discussed in the text.

As an illustration, let $M_1 = M_2$, $h_{12} = h_{21} = 0.2$, $h_{bc} = h_{cb} = 0.2$ and $p_1 = 0.5$. If players '1' and '2' focused exclusively on the co-marketing alliance, Result 1 (in the paper) would suggest that market expansion is not required for either player to form the alliance. However, under the revised scenario, the co-marketing alliance is unattractive for player 2. This player would lose by forming the co-marketing alliance unless the market expands by at least 50% over $M_1 + M_2$. The rationale is as follows: By continuing with the baseline alliance even after the co-marketing alliance formation, player 1 reduces the pool of consumers that she/he brings to the ''table''. While the shift coefficients h_{12} and h_{21} would not change under this arrangement, the number of consumers who would switch their preference from player '2' to '1', would be greater than that from '1' to '2'.

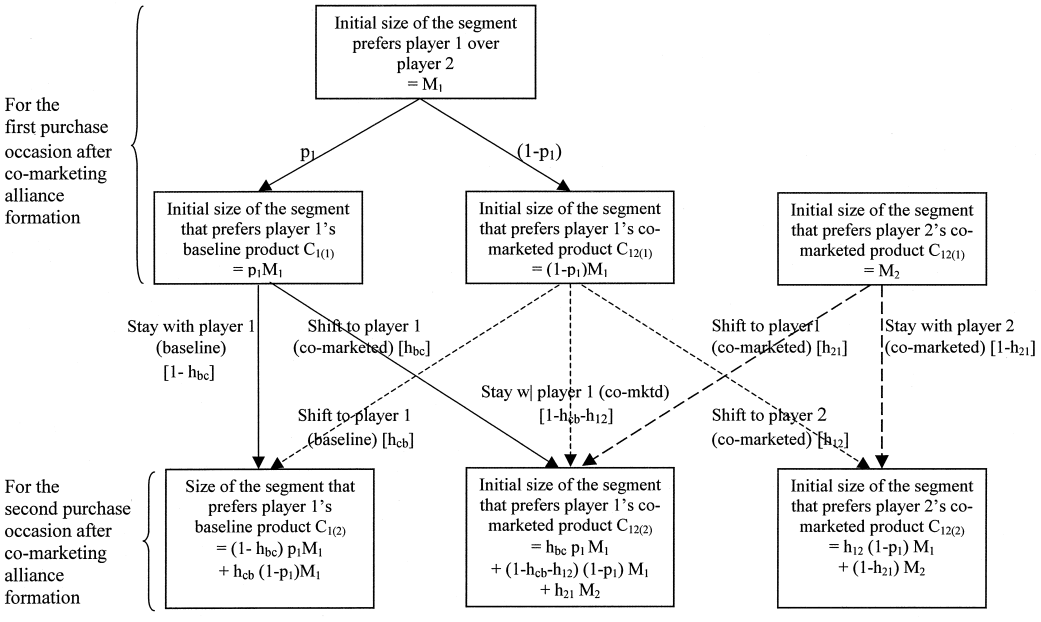


Fig. D.1. Conceptualization of alliance evolution between star players 1 and 2 (when player 1 is involved with both co-marketing and baseline alliances and player 2 with the co-marketing alliance only). *Notation*: $C_{1(i)}$ ($C_{12(i)}$) = the ith new product release from the baseline alliance of player 1 (the co-marketing alliance between players 1 and 2); h_{12} (h_{21}) = proportion of consumers who shift their preference from player 1 to 2 (vice versa) after experiencing the co-marketed product; h_{bc} (h_{cb}) = proportion of consumers who shift their preference from player 1's baseline product to the co-marketed product (vice versa).

Thus, player 1's preference share among consumers of the co-marketed product would increase. Moreover, using the co-marketed product as a bait, player 1 would likely be able to divert the preference of at least a fraction of this growing pool of consumers in favor of his/her baseline product $C_{1(i)}$. This would take the consumers further away from player '2'. Therefore, player 2 should not form or sustain the co-marketing alliance unless the requisite market expansion is anticipated.

From a modeling standpoint, the above discussion underscores that the model discussed in the paper extends readily to multiple alliances albeit with considerable loss of parsimony.

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