

Cause Marketing: Spillover Effects of Cause-Related Products in a Product Portfolio

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The number of firms carrying a cause-related product has significantly increased in recent years. We consider a duopoly model of competition between firms in two products to determine which products a firm will link to a cause. We first test the behavioral underpinnings of our model in two laboratory experiments to demonstrate the existence of both a direct utility benefit to consumers from cause marketing (CM) and a spillover benefit onto other products in the portfolio. Linking one product in a product portfolio to a cause can therefore increase sales both of that product and, via a spillover effect, of other products in the firm's portfolio. We construct a CM game in which each firm chooses which products, if any, to place on CM. In the absence of a spillover benefit, a firm places a product on CM if and only if it can increase its price by enough to compensate for the cost of CM. Thus, in equilibrium, firms either have both products or neither product on CM. However, with the introduction of a spillover benefit to the second product, this result changes. We show that if a single firm in the market links only one product to a cause, it can raise prices on both products and earn a higher profit. We assume each firm has an advantage in one product and show that there is an equilibrium in which each firm links only its disadvantaged product to a cause. If the spillover effect is strong, there is a second equilibrium in which each firm links only its advantaged product to a cause. In each case, firms raise their prices on both products and earn higher profits than when neither firm engages in CM. We also show that a firm will never place its entire portfolio on CM. Overall, our work implies that, by carrying cause-related products, companies can not only improve their image in the public eye but also increase profits.

Key words: cause marketing; experimental economics; marketing and pricing strategy; product policy

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1. Introduction

Just over a year ago, the rock star Bono started Red, a campaign that combined consumerism and altruism. ...companies pay Red a licensing fee to label one or more of their products "(RED)." Then, they pay a portion of sales from those products to the Global Fund, a public-private charity set up six years ago to fight AIDS, malaria and tuberculosis in Africa. ...In return, the companies can market themselves as socially conscious and, ideally, increase sales. (Neither Red nor the companies would disclose revenue or total contributions by company or product.) (Nixon 2006)

At the same time,

[D]etractors say Red has fallen short. They criticize a lack of transparency at the company and its partners over how much they make from Red products, and whether they spend more on Africa or advertising. (Nixon 2006)

Firms are increasingly engaging in cause marketing (CM), i.e., joining with charities or social causes to market a product or service. American Express is generally credited with pioneering the concept of CM in 1983 by linking card usage with support for

the Statue of Liberty renovation (Advertising Age 2003). CM is now a strategy adopted by hundreds of firms and is used to increase sales for a wide variety of products from coffee to cars. A common form is transactional CM, in which firms donate part of the proceeds from sales of certain products to a specified cause. In addition to project Red, which encompasses Gap, Motorola, Apple, Converse, Dell, Microsoft, American Express, Emporio Armani, and Hallmark, several examples of transactional CM abound. For example, in 2004, 3M introduced Post-it Super Sticky Notes imprinted with pink ribbons, with a portion of sales donated to cancer research and treatment. Ethos Water, now owned by Starbucks, gives a nickel from each bottle to provide clean water, and Snapple devotes a certain percentage of its SNAP 2.0 bottled water sales to build playgrounds in poor communities.

Cause marketing is often associated with price increases. For example, in April 2008, Gap offered its cause-related Gap Red T-shirt at \$28.00 while most Gap T-shirts were priced at \$16.50 (prices taken from the Gap website, (<http://www.gap.com>), suggesting

a direct link between CM and an increase in price. This T-shirt was the best-selling item across the entire Gap product line in October 2006, and by early 2007 had become the best-selling T-shirt in Gap history (see *Promo Magazine* 2007).

Cause marketing endeavors therefore raise several questions for managers. How do consumers react to cause marketing? When should a firm use cause marketing? What effect will cause marketing be on price and profit? Which of its products should a firm link to a cause in a competitive context? We consider these questions in this paper.

We explain how CM can increase sales and prices of the cause-linked product as well as other products in the firm's portfolio (i.e., create a spillover effect), thus increasing a firm's profits. We posit that consumers obtain both a direct utility benefit from purchasing a product linked to a cause, and also a spillover utility benefit from purchasing other non-cause-marketed products in the CM firm's portfolio. These behavioral properties are tested in two laboratory experiments. We then consider a duopoly model in which two firms compete in each of two products. We examine a realistic scenario in which firms are asymmetric, with each firm having an advantage in one product. After firms have chosen which products (if any) to place on CM, each firm prices optimally to maximize its profits. When there are no spillover benefits, a firm will engage in CM only if it can increase the price of the product enough to compensate for the money being donated to the cause. Thus, in equilibrium firms will have either both products on CM or neither product on CM.

We then introduce a spillover utility benefit into the model. We show that if only one firm links (say) its disadvantaged product to a cause, it raises prices on both products. The other firm will also raise its price on the product linked to CM by its competitor, and will lower its price on the non-cause-marketed product. In this situation, the CM firm will make a higher profit, whereas the profit of the non-CM firm depends on the strength of the direct and spillover effects. In equilibrium, both firms adopt CM and choose to link their disadvantaged product to a cause, raising prices on both products (the cause-marketed product and the non-cause-marketed product) and making higher profits. If the spillover benefit is sufficiently high, there is also an equilibrium in which both firms link only their advantaged product to a cause. Therefore, firms will avoid head-to-head competition in cause marketing by placing different products on CM. Each firm earns a higher profit in the equilibrium in which the disadvantaged products are placed on CM. However, in each of the equilibria mentioned, compared to the case in which neither firm engages in CM, both firms earn a higher profit and have higher prices on

both their products. Finally, we show that firms will only link a subset of their portfolio to a cause, rather than the entire portfolio.

Our results have many implications for firms, government officials, and consumers. For firms, our results indicate that CM can allow them to increase prices not only on the cause-marketed product but also on other products, and hence increase profits. For public policy officials and consumers who may believe that CM firms are more caring firms and are genuinely interested in help others, it may be insightful to understand that CM also allows firms to increase their prices and profits.

2. Corporate Social Responsibility and CM

Corporate social responsibility (CSR) is a broad term that covers corporate-level donations to nonprofits (e.g., the Metropolitan Opera) and causes (e.g., breast cancer research), and corporate commitment to the community and the environment (e.g., green products, pollution reduction, recycling, elimination of animal testing). CM focuses more narrowly on a specific cause that can be linked to the corporation as a whole or to a specific product of the firm (transactional CM). Prior CM literature, which has generally focused on corporate-level CM, is quite similar in nature to CSR research. Product-level CM research has only recently been conducted. We begin by discussing the CSR literature, followed by firm-level CM research, and then product-level CM research.

Most experimental studies have concluded that CSR improves a company's image and brand equity (e.g., Brown and Dacin 1997, Hoeffler and Keller 2002), although many moderators affect the creation of positive consumer perceptions, including genuineness of the company's motives (Sen et al. 2006), sponsor-cause compatibility (Trimble and Rifon 2006), and the specific CSR issue the company chooses to address (Sen and Bhattacharya 2001). Furthermore, Klein and Dawar (2004) find that CSR has a positive effect on consumers' attributions in a product-harm crisis situation.

Some researchers have also examined the effect of CSR on purchase intent. Mohr and Webb (2005) find that positive CSR has a significant positive effect on evaluation of the company and on purchase intent (measured on three seven-point self-reported scales). Additionally, they find that the effect of CSR is larger for people who scored high on a measure of socially responsible behavior. Lafferty and Goldsmith (1999) find that corporate credibility has a significant impact on consumer attitudes and purchase intent. Lichtenstein et al. (2004) show that CSR initiatives that allow the consumer to identify with the corporation

can increase customer purchase behavior as well as increase customer donations to corporate-sponsored nonprofits. Similarly, Barone et al. (2000) show that firms with positive motivation underlining their CSR efforts can enhance the likelihood of choice for their product compared with firms with neutral or negative motivation. Several marketplace polls also suggest positive effects of CSR on consumer behavior (e.g., Cone Inc. 2004), although Sen and Bhattacharya (2001) show that CSR initiatives can, under certain conditions, actually decrease consumer purchase intent.

Similar to the literature on CSR, corporate-level CM research has examined how CM effects are moderated by the donation situation, congruency of the donations with the firm's core business, effort exerted by the firm, and commitment of the firm to the cause (Ellen et al. 2000). This stream of research has shown that respondent evaluations are more positive for disaster-related causes (versus ongoing campaigns) and for donations involving greater effort by the firm (e.g., product rather than cash contribution). Bloom et al. (2006) use conjoint analysis to show that companies receive a better return on their investment (i.e., consumers will prefer the products) when they associate themselves with a cause-marketed product versus a sports event.

More recently, Arora and Henderson (2007) focused on product-level CM. They consider a cause-marketed product as a sales promotion strategy (or "embedded premium") and compare CM with traditional approaches such as discounts and rebates. They find that at low denominations (e.g., low discounts) the enhanced product is more effective than an equivalent price discount in increasing sales. They also show that an enhanced product benefits an unknown brand more than a known brand.

Thus, prior studies (with the exception of Arora and Henderson 2007) have concerned themselves with the overall image of a company being positively or negatively motivated to engage in CSR or CM. However, as discussed previously, firms often cause market specific products within their portfolio. We focus on cause marketing. In addition, unlike previous research, we examine the effect of one cause-related product in a firm's portfolio on the sales of other products.

3. Laboratory Experiments: Individual-Level Response to CM

We begin with an examination of individual consumer response to CM. Webster (1975, p. 188) defines a socially conscious consumer as "a consumer who takes into account the public consequences of his or her private consumption or who attempts to use

his or her purchasing power to bring about social change" (see also Mohr et al. 2001, p. 47). Experimental research in economics has also shown that fairness motives and regard for others often affect behavior (Andreoni and Miller 2002, Bolton and Ockenfels 2000, Charness and Rabin 2002, Fehr and Schmidt 1999, Levine 1998, Palfrey and Prisbrey 1997).

Thus, we posit that consumers derive utility from the product itself and also from socially responsible behavior. If firm j places product i on CM, a consumer experiences an extra utility δ from being socially responsible and purchasing product i . The corporate social responsibility literature also suggests that a firm's link to causes can increase purchase intent for all products of the firm (Lichtenstein et al. 2004, Mohr and Webb 2005). Thus, we assume that when firm j offers a CM product, there is a spillover effect onto other products offered by firm j . CM therefore has two potential advantages for the firm as follows.

Behavioral Implication 1 (direct benefit of CM): Cause marketing will increase a consumer's utility for the product linked by a firm to a cause.

Behavioral Implication 2 (indirect benefit of CM, or spillover effect): Cause marketing will increase a consumer's utility for other products offered by a firm.

Although consumers' desire to be socially responsible is addressed in prior research, previous studies have relied on self-reports to measure social responsibility. However, some responses are obviously more socially acceptable and are more likely to be given by participants in surveys and laboratory experiments when no costs (however small) are involved. To avoid this predisposition toward projecting a socially responsible image, we run laboratory experiments in which consumers incur an actual monetary cost for choosing a lower-preference cause-marketed product.

In the experiments, we use two firms, each carrying five brands, to make the task more realistic. Intrinsic product preference is manipulated and is assumed homogenous across consumers. Each of the 10 products is assigned an intrinsic utility. Products are not described by attributes or price to avoid unnecessary confounds, but merely by utility (see Table 1 for experimental stimuli). In the experiment, the assigned utility for the brand therefore represents the value of all features (including price). For instance, the assigned utility of a Gap Red T-shirt may be lower because of higher price or lower quality. In other words, a product could have low utility because of a low quality or a high price. Utility from being socially responsible is invoked by telling participants that purchase of the cause-marketed product will result in a specific monetary donation to a charity (chosen by the experimenter).

When consumers make a product choice, their actual monetary payoff from the experiment is linked

Table 1 Experiment 1 Stimuli

	Indifference between Firms			Preference for Firm 1		
	No CM product	CM product		No CM product	CM product	
	Utility to participant	Utility to participants	Utility to charity	Utility to participant	Utility to participant	Utility to charity
Firm 1						
Beverage 1	100	100		100	100	
Beverage 2	90	90		90	90	
Beverage 3	80	80		80	80	
Beverage 4	70	70		70	70	
Beverage 5	60	60		60	60	
Firm 2						
Beverage 1	100	100		90	90	
Beverage 2	90	90		80	80	
Beverage 3	80	80		75	75	
Beverage 4	70	70	20	70	70	20
Beverage 5	60	60		60	60	

Notes. Utility is given in cents. Whether Firm 1 or 2 was carrying the cause-related product was counterbalanced. Beverage 4 with a utility of 70 was always the cause-related product.

to the assigned utility. In treatment cells in which a cause-marketed product is found, we inform participants how much money the charity would get (in cents) per unit of product sold (the money collected was donated to a charity that supports children’s education in a developing country; participants were not given this information). Note that the cause-marketed product is deliberately chosen to be a product that does not offer the highest assigned utility of all available products. Thus, consumers must make a sacrifice (i.e., take a lower monetary payoff) if they choose the cause-marketed product, and such a choice then implies that consumers obtain an additional utility from knowing that the product was on CM, i.e., that a donation is being made to a cause.

To reiterate, consumers are paid the assigned product utility of the product they choose to purchase (in cents). However, they are not paid the utility from being socially responsible, which is expected to be an innate reward (i.e., they are expected to feel good about contributing to the charity through their purchase choice). Therefore, the experiment is designed to test whether participants engage in socially responsible behavior.

We consider both in a situation in which consumers are indifferent between the two brands (labeled “Indifference between Firms”) and another situation in which they have a clear preference for the best product of one firm over the best product of the other (labeled “Preference for Firm 1”).

3.1. Procedure

Participants chose 1 beverage among 10 beverages offered—5 each by two stores. The only descriptor of each product was the assigned utility to the participant (i.e., reflecting how much they liked the product

and the possible contribution to a charity. Appendix A contains the instructions to participants in the Indifference between Firms condition.

Participants were recruited from an undergraduate student pool but were also paid a specific amount of money equal to the utility of the product they chose (in cents). The payment ranged from 70 to 100 cents. Care was taken to ensure that students thought of each beverage line as an individual profit center (i.e., they believed that each beverage line paid for itself and that one line did not subsidize another line). This was done to make certain that participants understood that only the purchase of the cause-marketed product (and not of any other products) would benefit the charity. Table 1 shows the stimuli used in the first experiment.

3.2. Design and Method

We use a 2 × 2 between-subjects design. We examine the effects of each of the 2 (cause-marketed versus non-cause-marketed product) × 2 (Indifference between Firms versus Preference for Firm 1) features on consumers’ choices over products. In the Indifference between Firms situation, participants’ intrinsic utilities from the two firms were the same for each of the five pairs of products; in the Preference for Firm 1 scenario, participants’ intrinsic utilities from four products of the CM store were lower than those from the rival, and a fifth pair (with the cause-marketed product) had the same intrinsic utility.¹ The CM firm was therefore disadvantaged. We counterbalanced whether firm 1 or firm 2 appeared first. Our sample included 216 participants, with each session consisting of 10 or fewer subjects. Subjects were told that at the end of the experiment they would be paid the assigned utility of their chosen product in cents.

3.3. Results

The proportion of participants who bought a product from the CM firm (and those who bought the cause-marketed product) and the proportion who bought from the non-CM firm are shown in Table 2.

Behavioral Implication 1 on the direct utility benefit from CM is strongly seen in the Indifference between Firms situation. Here, 66.7% of subjects gave up 30 cents (the difference between the utility of the product with the highest assigned utility and the assigned utility of the cause-marketed product) and chose the cause-marketed product. In the Preference for Firm 1 situation, a similar proportion (69.2%) gave up 30 cents. Thus, we establish that a large proportion

¹ This model ensures that the intrinsic utility of the cause-marketed product is not confounded with whether the CM firm is in the Indifference between Firms or the Preference for Firm 1 (disadvantaged) situation.

Table 2 Results for Experiment 1—Probability of Choosing Various Products

Firm	Beverage	Money earned by subject (\$)	Indifference between Firms				Preference for Firm 1			
			No CM product available		CM product available		No CM product available		CM product available	
			<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
1 (non-CM)	1	1.00	26	52	6	11.1	60	100	14	26.9
2 (CM)	4 (CM product)	0.70	0		36	66.7	0	0	36	69.2
2 (CM)	1	1.00	24	48	12	22.2	NA	NA	NA	NA
2 (CM)	1	0.90	NA		NA	NA	0	0	2	3.9
Total			50		54		60		52	

of our subjects did experience a direct utility benefit from choosing the cause-marketed product.

Behavioral Implication 2, on the indirect benefit or spillover effect on utility, is also seen in the experiments. In the Indifference between Firms situation, 12 subjects (22.2%) purchased the highest-assigned-utility product from the CM firm for a payoff of 100 cents, whereas only 6 subjects (11.1%) bought the highest-assigned-utility product from the non-CM firm. Thus, it appears that in this population, subjects who do not buy the cause-marketed product are still very likely to buy from the CM firm.

It is easier to check whether the utility for non-cause-marketed products offered by the CM firm increases (indirect benefit) in the Preference for Firm 1 case. In this case, the highest-assigned-utility non-cause-marketed product offered by the CM firm is not the highest-assigned-utility product overall, and has no sales without CM. If it has some sales in the CM case, its utility must have increased. Consumers lose 10 cents if they buy the highest-assigned-utility product from firm 2, the CM firm, versus the highest-assigned-utility product from firm 1. Even in this situation we see that two subjects give up 10 cents and purchase the highest-assigned-utility product from the CM firm (which earns them 90 cents), whereas none buy this product otherwise. The expected purchase probability for this product is 0% (borne out in the experiment when no cause-marketed product is available), because it is not a cause-marketed product and offers lower utility than the highest-utility product available from firm 1. Thus, this increase in the number of subjects purchasing a non-cause-marketed product from the CM firm is attributable to the spillover effect on utility.

The rest of the subjects (14 subjects or 26.9%) purchased the highest-assigned-utility product overall, which is product 1 from the non-CM firm and earns them 100 cents. Without CM, 100% of the subjects chose this option.

Put together, in both the indifference and preference cases, carrying a cause-marketed product increased sales for the cause-marketed firm significantly (Indifference between Firms scenario: 88.9% versus 48%,

$t = 4.52, p < 0.01$; Preference for Firm 1 scenario: 73.1% versus 0.0%, $t = 8.16, p < 0.01$).

Thus, both Behavioral Implications 1 and 2, the direct and indirect benefits of CM, are supported in the experiment.

3.4. Replication of Experiment with Higher Cost for Consumers

One may question whether we got our results because the stakes were low, i.e., subjects did not give up much to purchase the cause-marketed product. In the second experiment, all utilities (and payoffs) in the Preference for firm 1 case in Table 1 were increased fivefold. Thus, the highest payoff for subjects was \$5.00 from buying Beverage 1 from firm 1. The cause-marketed product, Beverage 4 from firm 2, offered \$3.50 (i.e., there was a cost of \$1.50 for buying the cause-marketed product) and the highest-utility cause-marketed product gave \$4.50 (a loss of \$0.50 versus the highest-utility product from the non-CM firm).

The results of the second experiment are shown in Table 3. Even with the higher stakes, we find evidence of both direct and indirect benefits from CM. Although consumers lose \$1.50 by purchasing the cause-marketed product, 18 of 40 subjects (45%) buy the cause-marketed product. Another two (5%) buy the highest-assigned-utility product from the CM firm (losing \$0.50 in the process), showing an indirect or spillover utility benefit. Twenty of 40 people (50%) buy

Table 3 Results for Experiment 2—Probability of Choosing Products in the High-Stakes Case

Firm	Beverage	Money earned by subject (\$)	Preference for Firm 1			
			No CM product available		CM product available	
			<i>n</i>	%	<i>n</i>	%
1 (non-CM)	1	5.00	10	100	20	50
2 (CM)	1	4.50	0	0	2	5
2	4 (CM product)	3.50	0	0	18	45
Total			10		40	

the highest-assigned-utility product (earning \$5.00), which is Beverage 1 from firm 1 (the non-CM firm).

Our results are consistent with those obtained in experiments of social preference. For example, it has been found that decision makers sometimes do not choose the highest-payoff strategy. A significant proportion of individuals reward others who treat them nicely and punish those who intend to harm them even at a cost to themselves (see Camerer 2003, Chap. 2).

4. Competition in Cause Marketing

Overall, therefore, our experimental results confirm the existence of both a direct utility benefit to consumers when a firm offers a product on CM, and a spillover effect on to other products of the firm. We use these two features to construct a CM game between two firms. In the game, each firm optimally chooses which (if any) of two products to place on CM, and then optimally chooses prices for each of the two products.

Our model builds off the model proposed by Desai (2001), which focuses on firms choosing product qualities and prices. We focus on the choice of offering CM on different products. There are two firms, A and B, each of which produce two goods, a high-quality one and a low-quality one. Let q_{ah} denote the quality of the high-quality good produced by firm A, with q_{al} being the quality of firm A's low-quality good. Correspondingly, q_{bh} and q_{bl} denote the qualities of the two goods produced by firm B. As in Desai (2001), quality q is a summary measure of the more-is-better attributes of a product (e.g., CPU speed and memory for a laptop, softness for a cotton T-shirt). For each firm i , $q_{ih} > q_{il}$. The production cost of the low-quality good is normalized to zero, and the production cost of the high-quality good is c per unit, for both firms. There are two consumer segments, differentiated by their marginal valuation of quality. The high-quality segment, segment H , values quality at θ_h per unit of quality, and the low-quality segment, segment L , values it at θ_l per unit of quality. There is an equal number of consumers in each segment.

As in Desai (2001), there are taste differences among consumers, representing product attributes that consumers do not agree on. Thus, both for a laptop and a T-shirt, different consumers may want different sizes. Within each quality segment, consumers tastes are uniformly distributed over $[0, 1]$, with location denoting a consumer's ideal product. A consumer incurs a disutility from using a product other than her ideal product. This disutility is captured by a cost t per unit of distance between the consumer's ideal taste product and the product considered. In each consumer segment, we assume that the firms are located at

opposite ends of the $[0, 1]$ taste interval, with firm A at 0 and firm B at 1.

Suppose first that neither firm engages in CM. Then, if a consumer in segment k buys a good of quality q at price p from a firm located at a distance d , her overall utility is $u_k(q, p, d) = f + \theta_k q - p - td$. Here, f is a constant that does not affect the relative choice across goods or firms, but is chosen to be sufficiently large that each consumer strictly prefers to use a product than to not consume at all. As shown in Lemma B.1 in Appendix B, competition between the firms ensures that f does not affect the prices they charge. A consumer who chooses to not buy a good has a reservation utility of zero. A consumer evaluates her utility for all four goods (high- and low-quality goods of both firms) and buys one unit of the good that maximizes her utility, provided the good offers at least zero overall utility. Thus, for example, a consumer in the low-quality segment may choose to buy a high-quality good if it yields a higher utility than either low-quality good.

In Desai (2001), the focus is on quality, and he solves for optimal qualities and prices. Because our focus is on cause marketing, we assume qualities ($q_{ah}, q_{al}, q_{bh}, q_{bl}$) are fixed, but solve for the choice of products to place on CM and the resulting optimal prices. The effects of CM are as follows. Suppose firm A engages in CM only on good h . The firm agrees to pay an amount $m > 0$ per unit of good h sold to a social cause, thus reducing its profit per unit of good sold. This captures the firm's cost of doing CM. For simplicity, we treat consumers as homogeneous in their utility from socially responsible behavior so that all consumers, across both segments and regardless of which product they may have purchased in the absence of cause marketing, experience an increase in the utility they obtain from good h of firm A. Specifically, the direct effect of CM is that their utility for good h of firm A increases by an amount $\delta > 0$. In addition, firm A benefits from a spillover effect on to good l (even though no CM is being done directly with good l). All consumers experience a utility increase of $\gamma > 0$ from good l of firm A. In general, if firm i engages in CM only on good j , there is a direct effect in consumer utility on good j , a direct increase in the cost of good j , and a spillover effect on good $j' \neq j$ of firm i . Both the direct and spillover effects stem from the amount m per unit being spent by the firm on the CM good. We assume that the magnitude of the direct and spillover effects, and of the cost of CM, does not depend on the good being placed on CM. If firm i engages in CM on both its goods, the spillover effect is lost, and only the direct effect remains.

There are three stages to the game. At stage 1, each firm simultaneously chooses whether to engage in

CM on product h , product l , both products, or neither product. At stage 2, given the products that each firm has on CM, and given the qualities of all goods, firms simultaneously choose prices. Each firm maximizes its overall profit, that is, the sum of its profit from sales of good h and its profit from sales of good l . At stage 3, each consumer buys one unit of the product that yields her maximum utility, provided this utility exceeds zero. Overall, we consider subgame-perfect equilibria of the game, so that, regardless of firms' CM choices at stage 1, each firm's price at stage 2 is optimal in the sense of being a best response to the price chosen by its rival, and consumers behave optimally at stage 3, given both the CM and price choices made by firms.

We assume that $q_{ah} > q_{bh}$ and $q_{al} < q_{bl}$. Thus, each firm has an advantage in one of the two goods, firm A in good h , and firm B in good l . We make the following additional assumptions on model parameters. For notational brevity, let $\rho_j = \theta_j(q_{aj} - q_{bj})$ for $j = h, l$.

ASSUMPTION 1.

- (a) $\gamma + |m - \delta| \leq 3t - \max\{\rho_h, -\rho_l\}$.
- (b) (i) $\theta_h(q_{ah} - q_{al}) \geq c + (\rho_h - \rho_l)/3 + |m + \gamma - \delta|$.
- (ii) $\theta_h(q_{bh} - q_{bl}) \geq c - (\rho_h - \rho_l)/3 + |m + \gamma - \delta|$.
- (iii) $\theta_l(q_{ah} - q_{al}) \leq c + (\rho_h - \rho_l)/3 - |m + \gamma - \delta|$.
- (iv) $\theta_l(q_{bh} - q_{bl}) \leq c - (\rho_h - \rho_l)/3 - |m + \gamma - \delta|$.

These assumptions ensure that, regardless of which products firms engage in CM, demand is well behaved. Assumption 1(a) implies that both market segments are fully covered in equilibrium; that is, each consumer in each segment H and L buys one of the four products on offer. Assumption 1(b) ensures that for consumers in each segment H and L , self-selection constraints are satisfied. That is, at equilibrium prices, consumers in segment H buy the high-quality good h , and consumers in segment L buy the low-quality good l .

In Lemma B.1 in Appendix B, we solve for optimal prices and resultant profits of each firm in good j in isolation, i.e., assuming there is no crossover of consumers across product qualities. In Lemma B.2 in Appendix B, we show that the equilibria are consistent with our assumptions, such that whichever products each firm places on CM, the market is fully covered, and there is no crossover of consumers: Consumers with a high valuation for quality buy a high-quality good and those with a low valuation for quality buy a low-quality good. Furthermore, equilibrium prices and profits for each good are as given in Lemma B.1.

4.1. Cause Marketing Game

Now, consider the overall CM game. As mentioned earlier, in this game each firm has four actions: it can put only product h on CM, put only product l on CM, put both products on CM, or not use

CM at all. Using Lemma B.1 in Appendix B, the payoffs corresponding to each pair of choices made by the firms can be calculated in a straightforward manner. Let $\bar{\pi}_a = \sum_{j=h,l} (1/(2t))[t + \rho_j/3]^2$ and $\bar{\pi}_b = \sum_{j=h,l} (1/(2t))[t - \rho_j/3]^2$. These are the profits earned by the two firms in equilibrium if neither firm engages in CM, and are found from the expressions in the statement of Lemma B.1 when the benefit for each firm from doing CM is zero and the cost of each firm for CM is also zero (in the notation of the lemma, when $g_{aj} = g_{bj} = 0$ and $r_{aj} = r_{bj} = 0$ for each good j). Similarly, it may be noted directly from Lemma B.1 that whenever firms engage in CM on the same good, their profits remain $\bar{\pi}_a$ and $\bar{\pi}_b$. To obtain other cells in the table, consider, for example, the case in which firm A engages in cause marketing on good h , and firm B does not do any CM. Then, in the notation of Lemma B.1, we have $g_{ah} = \delta$, $g_{al} = \gamma$, and $r_{ah} = m$, with the other g and r variables being zero. Substitute these expressions into the profit equations in the statement of the lemma and simplify to obtain the profits shown in this cell.

The overall payoff matrix is shown in Table 4. The payoff matrix of the 4×4 CM game embeds the notion that firms will choose prices optimally, given the products both firms have on cause marketing. Thus, we can consider the CM game to be a simultaneous move game with payoffs as given in the payoff table above. We consider pure-strategy Nash equilibria of the CM game. Note that these equilibria are subgame perfect in the three-stage game outlined earlier, with firms choosing prices at stage 2, and consumers choosing a product at stage 3.

To highlight the importance of spillovers across products, we first consider the case in which there are no spillovers, so that $\gamma = 0$. It is straightforward to show that, if the direct utility benefit of CM (δ) exceeds the cost per unit of CM (m), the unique equilibrium has both firms placing both products on CM. Similarly, if $\delta < m$, the unique equilibrium has both firms not engaging in CM on either product. Proofs of Proposition 1 and all other results are in Appendix B.

PROPOSITION 1. *Suppose that $\gamma = 0$ so that there are no spillover effects. If $\delta > m$, there is a unique equilibrium of the CM game in which both firms place both products on CM. If $\delta < m$, there is again a unique equilibrium in which neither firm engages in CM.*

This proposition illustrates the costs and benefits of CM to a firm when there are no spillovers. The marginal cost of CM is simply the amount donated to the cause, which is m per unit of the product sold. The consumers experience a direct utility increase of δ per unit when a product is placed on CM. In the pricing subgame, this utility increase is then recovered entirely by the firm via a higher price, so that δ then

Table 4 Payoff Matrix for Cause-Marketing Game

Firm A	Firm B			
	No CM	<i>h</i> on CM	<i>l</i> on CM	Both on CM
No CM	$\bar{\pi}_a, \bar{\pi}_b$	$\bar{\pi}_a - \frac{\delta - m}{3} \left[1 + \frac{2\rho_h - (\delta - m)}{6t} \right] - \frac{\gamma}{3} \left[1 + \frac{2\rho_l - \gamma}{6t} \right]$ $\bar{\pi}_b + \frac{\delta - m}{3} \left[1 - \frac{2\rho_h - (\delta - m)}{6t} \right] + \frac{\gamma}{3} \left[1 - \frac{2\rho_l - \gamma}{6t} \right]$	$\bar{\pi}_a - \frac{\gamma}{3} \left[1 + \frac{2\rho_h - \gamma}{6t} \right] - \frac{\delta - m}{3} \left[1 + \frac{2\rho_l - (\delta - m)}{6t} \right]$ $\bar{\pi}_b + \frac{\gamma}{3} \left[1 - \frac{2\rho_h - \gamma}{6t} \right] + \frac{\delta - m}{3} \left[1 - \frac{2\rho_l - (\delta - m)}{6t} \right]$	$\bar{\pi}_a - \frac{\delta - m}{3} \left[2 + \frac{2\rho_h - (\delta - m)}{6t} + \frac{2\rho_l - (\delta - m)}{6t} \right]$ $\bar{\pi}_b + \frac{\delta - m}{3} \left[2 - \frac{2\rho_h - (\delta - m)}{6t} - \frac{2\rho_l - (\delta - m)}{6t} \right]$
<i>h</i> on CM	$\bar{\pi}_a + \frac{\delta - m}{3} \left[1 + \frac{2\rho_h + \delta - m}{6t} \right] + \frac{\gamma}{3} \left[1 + \frac{2\rho_l + \gamma}{6t} \right]$ $\bar{\pi}_b - \frac{\delta - m}{3} \left[1 - \frac{2\rho_h + \delta - m}{6t} \right] - \frac{\gamma}{3} \left[1 - \frac{2\rho_l + \gamma}{6t} \right]$	$\bar{\pi}_a, \bar{\pi}_b$	$\bar{\pi}_a + \frac{\delta - m - \gamma}{3} \left[\frac{2\rho_h + \delta - m - \gamma}{6t} - \frac{2\rho_l - (\delta - m) + \gamma}{6t} \right]$ $\bar{\pi}_b + \frac{\delta - m - \gamma}{3} \left[\frac{2\rho_h + \delta - m - \gamma}{6t} - \frac{2\rho_l - (\delta - m) + \gamma}{6t} \right]$	$\bar{\pi}_a + \frac{\gamma - (\delta - m)}{3} \cdot \left[1 + \frac{2\rho_l + \gamma - (\delta - m)}{6t} \right]$ $\bar{\pi}_b - \frac{\gamma - (\delta - m)}{3} \cdot \left[1 - \frac{2\rho_l + \gamma - (\delta - m)}{6t} \right]$
<i>l</i> on CM	$\bar{\pi}_a + \frac{\gamma}{3} \left[1 + \frac{2\rho_h + \gamma}{6t} \right] + \frac{\delta - m}{3} \left[1 + \frac{2\rho_l + \delta - m}{6t} \right]$ $\bar{\pi}_b - \frac{\gamma}{3} \left[1 - \frac{2\rho_h + \gamma}{6t} \right] - \frac{\delta - m}{3} \left[1 - \frac{2\rho_l + \delta - m}{6t} \right]$	$\bar{\pi}_a + \frac{\gamma - (\delta - m)}{3} \left[\frac{2\rho_h + \gamma - (\delta - m)}{6t} - \frac{2\rho_l - \gamma + (\delta - m)}{6t} \right]$ $\bar{\pi}_b + \frac{\gamma - (\delta - m)}{3} \left[\frac{2\rho_h + \gamma - (\delta - m)}{6t} - \frac{2\rho_l - \gamma + (\delta - m)}{6t} \right]$	$\bar{\pi}_a, \bar{\pi}_b$	$\bar{\pi}_a + \frac{\gamma - (\delta - m)}{3} \cdot \left[1 + \frac{2\rho_h + \gamma - (\delta - m)}{6t} \right]$ $\bar{\pi}_b - \frac{\gamma - (\delta - m)}{3} \cdot \left[1 - \frac{2\rho_h + \gamma - (\delta - m)}{6t} \right]$
Both on CM	$\bar{\pi}_a + \frac{\delta - m}{3} \left[2 + \frac{2\rho_h + \delta - m}{6t} + \frac{2\rho_l + \delta - m}{6t} \right]$ $\bar{\pi}_b - \frac{\delta - m}{3} \left[2 - \frac{2\rho_h + \delta - m}{6t} - \frac{2\rho_l + \delta - m}{6t} \right]$	$\bar{\pi}_a + \frac{\delta - m - \gamma}{3} \cdot \left[1 + \frac{2\rho_l + \delta - m - \gamma}{6t} \right]$ $\bar{\pi}_b - \frac{\delta - m - \gamma}{3} \cdot \left[1 - \frac{2\rho_l + \delta - m - \gamma}{6t} \right]$	$\bar{\pi}_a + \frac{\delta - m - \gamma}{3} \cdot \left[1 + \frac{2\rho_h + \delta - m - \gamma}{6t} \right]$ $\bar{\pi}_b - \frac{\delta - m - \gamma}{3} \cdot \left[1 - \frac{2\rho_h + \delta - m - \gamma}{6t} \right]$	$\bar{\pi}_a, \bar{\pi}_b$

becomes the benefit to a firm of placing a product on CM. Thus, overall, $\delta - m$ represents the direct benefit to a firm from placing a product on CM.

4.2. Effect of Spillovers

We now turn to the model with spillovers. Compared to the case with no spillovers, the intuition is that when spillovers are sufficiently high, firms may find it optimal to engage in CM even though the direct benefit does not compensate for the cost of CM. Furthermore, the value of spillovers will depend on the relative advantage a firm has in a particular product. Thus, for concreteness, we assume that $q_{ah} > q_{bh}$ and $q_{al} < q_{bl}$. Thus, each of the firms has an advantage in one of the two goods, and if the prices were equal, all

consumers would have a strict preference for firm A in good *h* and firm B in good *l*. At the end of the section, we examine the case in which neither firm has an advantage in either product.

We further assume that $0 < \gamma < \delta < m$, and $\delta + \gamma > m$. As noted above, the term $(\delta - m)$ may be thought of as the direct effect of CM. Both intuitively and from our experiments, we certainly expect the spillover effect on utility to be less than the direct effect, so $\gamma < \delta$. It is important to note that the direct and spillover effects, δ and γ , operate on different goods produced by the firm, so that the second assumption ($\delta + \gamma > m$) merely says that the spillover effect is sufficiently large to place a product on CM.

ASSUMPTION 2. $0 < \gamma < \delta < m$, and $\delta + \gamma > m$.

To illustrate the impact of CM, consider the following situation. Suppose firm B does not engage in CM at all, and firm A does CM on product l . Then, compared to the situation in which neither firm does CM, the profit of firm A on product l falls, and that on product h increases. Both firms increase their price on product l . Firm A experiences the direct utility benefit of δ on product l , and its cost increases by m . Both effects lead to an increase in p_{al} . Because the cost increase for firm A is greater than the utility benefit, firm B responds by increasing its own price, p_{bl} . On product h , firm A experiences a positive spillover from its CM on product l . It rationally responds to this spillover by increasing the price on product h . The spillover puts firm B at a competitive disadvantage, and it responds by reducing its own price on product h . The overall effect on firm A's profit is unambiguously positive. The effect on firm B's profit, however, depends on the respective strengths of the spillover effect γ and the direct utility effect δ .

PROPOSITION 2. *Suppose firm B does not engage in any CM, and firm A does CM on product l . Then, compared to the situation in which A also does no CM, (i) both firms raise their prices on product l . On product h , firm A raises its price and firm B lowers its price. (ii) Firm A loses market share and profit on product l and obtains a higher market share and profit on product h . (iii) Overall, the profit of firm A increases. The profit of firm B increases if the spillover effect γ and the direct utility benefit δ are low, and decreases if these effects are high.*

Recall that firm A has an advantage in product h , and firm B in product l . We first demonstrate that there is a pure-strategy equilibrium in which each firm places its disadvantaged product on cause marketing. The intuition is that a firm loses money on the product directly placed on CM (because it cannot raise its price by enough to compensate for the cost of CM), but benefits on the second product due to the spillover effect. Thus, each firm prefers to obtain the spillover effect on the advantaged product.

PROPOSITION 3. *There is a pure-strategy equilibrium in which firm A engages in CM on product l , and firm B on product h . Thus, each firm places its disadvantaged product on CM. For each firm, the prices of both products and overall firm profit are all higher compared to the situation in which neither firm engages in CM.*

The key driving force here is that the spillover γ is sufficiently high to compensate for the direct loss on CM. As we show in Proposition 1, in the absence of spillovers, neither firm would engage in CM when $\delta < m$. The spillover effect induces each firm to operate its disadvantaged product as a loss leader: the firm loses money on this product when it is placed

on CM, compared to not engaging in CM at all. However, the spillover onto the advantaged product results in each firm earning a higher overall profit. Furthermore, each firm raises the price of both products in equilibrium.

The equilibrium in Proposition 2 exists for all parameter values that satisfy Assumption 1. In the spirit of completeness, we now investigate whether there are other pure-strategy equilibria in the game. Because CM campaigns are typically committed to for a long period of time (months to years), each firm has ample time to respond to the specific action of its rival. Hence, we do not consider mixed-strategy equilibria, which inherently assume firms' continuous changing from one strategy to another.

We first show that the strategy in which both products are placed on CM is strictly dominated for both firms. Thus, there can be no equilibrium in which either firm links its entire portfolio to CM.

PROPOSITION 4. *For firm A, placing product l on CM strictly dominates placing both products on CM. Similarly, for firm B, placing product h on CM strictly dominates placing both products on CM.*

Having ruled out any equilibrium in which either firm places both products on CM, we next consider whether they can be a pure-strategy equilibrium in which a firm does not place either of the two products on CM. Suppose there exists a pure-strategy equilibrium in which firm A does not engage in CM. Then, this strategy must be a best response against one of the four pure strategies of firm B. Proposition 1 above shows that if firm B does not engage in CM, firm A earns a higher profit from placing product l on CM, compared to not engaging in CM at all. In the same vein, Proposition 2 shows that if firm B places product h on CM, the best response of firm A is to place product l on CM. In Lemma B.3 in Appendix B, we show that if firm B places product l on CM, the best response of firm A is to place either product h or product l on CM. Thus, there is no pure-strategy equilibrium in which firm A does not engage in CM. An exactly similar analysis for firm B shows that there is no pure-strategy equilibrium in which firm B does not engage in CM.

Therefore, in any equilibrium, each firm places exactly one product on CM. In Proposition 2, we exhibit the equilibrium in which each firm places its disadvantaged product on CM. It turns out that the only other pure-strategy equilibrium is one in which each firm places its advantaged product on CM. This equilibrium occurs if the spillover effect γ is large enough (in a manner made precise in the proof of Proposition 5).

PROPOSITION 5. (i) *If the spillover effect γ is sufficiently high, there is a second pure-strategy equilibrium*

in which each firm places its advantaged product on CM. That is, firm A places product h and firm B places product l on CM. Each firm's profit in this equilibrium is strictly lower than in the equilibrium in which each firm places its disadvantaged product on CM. However, for each firm, the prices of both products and the overall profit of the firm are higher than when neither firm engages in CM.

(ii) If the spillover effect γ is sufficiently low, the unique equilibrium in pure strategies is one in which each firm places its disadvantaged product on CM.

Intuitively, when the spillover effect is sufficiently high, the benefit of obtaining the spillover even on the disadvantaged product provides enough of a reason to incur the direct loss from placing the advantaged product on CM. Thus, there is also an equilibrium in which each firm has its advantaged product on CM. In equilibrium, firms effectively coordinate, in the sense that they always have different products on CM. However, note that each firm has higher profits in the equilibrium in which it has its disadvantaged product on CM. The intuition behind this result is that we have been considering the case in which a firm takes a direct loss on the cause-marketed product, because $\delta < m$, whereas it increases its profit on the non-cause-marketed product. A firm obtains a higher profit when it can obtain the benefit of the spillover on its advantaged product, which requires placing the disadvantaged product on CM.

Although we focus on pure-strategy equilibria in this paper, it is important to note that, because the firms' strategy spaces are discrete, for many parameter values the cause-marketing game will exhibit mixed-strategy equilibria as well. For example, if there are two pure-strategy equilibria as described in Proposition 5(i), there will also be a mixed-strategy equilibrium in which each firm randomizes over which product it places on CM. We ignore these equilibria in favor of the pure-strategy equilibria. Although our model is static, CM campaigns run over a period of time, and it is hard to imagine a firm switching CM products back and forth.

4.3. Symmetry in Qualities

Finally, to highlight the effects of firms being asymmetric over quality in our model, we consider the case in which firms are symmetric in quality; that is, $q_{ah} = q_{bh}$ and $q_{al} = q_{bl}$. In the symmetric case, there are two pure-strategy equilibria, in which the firms place different products on CM. Both firms earn the same profit. Thus, even in the symmetric case, firms avoid head-to-head competition in CM. Asymmetry in qualities preserves this feature of CM, and also provides higher profits for firms when each firm places its disadvantaged product on CM.

PROPOSITION 6. *Suppose the firms are symmetric in quality, with $q_{ah} = q_{bh}$ and $q_{al} = q_{bl}$. Then, there are two pure-strategy equilibria, in each of which one firm places product h on CM and the other firm places product l on CM. Each firm earns the same profit in both equilibria.*

For convenience, in our model we assume that the magnitudes of the direct and spillover effects on utility are the same regardless of which product is placed on CM. Suppose, instead, the direct utility effect was proportional to quality. Each firm would then anticipate a higher profit margin from placing the high-quality product on CM as long as its rival did not also do so. In that case, when firms are symmetric in quality, each firm would rather be in a scenario in which it places product h on CM while its rival places product l on CM.

4.4. Relationship Between CM Investment and Direct and Spillover Utility Benefits

For simplicity, in our model we keep the investment in cause marketing fixed at m per unit of the product sold. In principle, both δ , the direct utility effect, and γ , the spillover effect, can be thought to be functions of the investment in cause marketing. For example, suppose δ and γ are modeled as continuous and concave functions of m , so that a pure strategy for a firm specifies the amount of money being spent on CM for each of its products. One benefit of such an approach may be that a suitably specified model will admit only pure-strategy equilibria.

Intuitively, in such a case, in equilibrium a firm equalizes the marginal benefits and marginal costs of CM for each product, so that CM still leads to higher profits and higher prices. However, the amount spent on CM for each product would depend on the particular functions $\delta(\cdot)$ and $\gamma(\cdot)$ and the nature of the spillover effects when different amounts are invested on CM for different products. For example, suppose we assume that $\delta'(0) > 1$, so that if the firm is not doing CM on a product (i.e., $m = 0$), the marginal benefit of CM exceeds the marginal cost of CM. Then, if the spillover effects are sufficiently small, it would be optimal for the firm to place both products on CM. Conversely, suppose there is a minimum threshold amount of CM, \underline{m} , such that if $m \leq \underline{m}$, both δ and γ are 0. Then, we may expect results similar to those we obtain: firms will avoid head-to-head competition in CM, and choose to engage in CM on different products.

In practice, firms tend to link a part of their product portfolio to CM rather than engage in CM with all of their products. Thus, despite its limitations, our model with a fixed investment m , and fixed utility benefits δ and γ , offers powerful insight into firms' CM decisions. Whereas the parameters m , δ , and γ

in our model are exogenous, we note that a similar choice has been made in the literature on firms' coupon decisions (e.g., Krishna and Zhang 1999, Raju et al. 1994, Zhang et al. 2000), where the face value of the coupon is typically assumed to be exogenous and fixed.

5. Conclusions and Future Research

We focus on several questions related to cause marketing: How do consumers react to cause marketing? When should a firm use cause marketing? What effect will cause marketing have on price and profit? Which products should a firm link to a cause in a competitive context? Through laboratory experiments and a theoretical model, we then explain how CM can increase sales and prices of the cause-linked product as well as other products in the firm's portfolio (i.e., create a spillover effect), thus increasing a firm's profits.

Our experiments show that consumers obtain both a direct utility benefit from purchasing a product linked to a cause, and also obtain a spillover utility benefit from purchasing other non-cause-marketed products in the CM firm's portfolio. We then build a duopoly model in which two firms compete in each of two products, with each firm having an advantage in one product. In this model, firms first decide which (if any) product to place on CM, and then decide what price to charge. The model indicates that when there is no spillover benefit, a firm will engage in CM only if it can increase the price of the product enough to compensate for the money being donated to the cause. Thus, in equilibrium, firms will have either both products on CM or neither product on CM. With a spillover effect, however, both firms will adopt CM and choose to link their disadvantaged product to a cause. If the spillover benefit is sufficiently high, there is also an equilibrium in which both firms link only their advantaged product to a cause, but each firm earns a higher profit in the equilibrium in which the disadvantaged products are placed on CM. Thus, firms will only link a subset of their portfolio to a cause, rather than the entire portfolio, and will avoid head-to-head competition in cause marketing by placing different products on CM. Regardless of which equilibrium occurs, consumers will be charged higher prices for both goods (the cause-marketed product and the non-cause-marketed product) by both firms, and each firm's profit will be higher than if neither firm had engaged in CM. Our results therefore suggest that after affiliating with project Red, Gap may have increased the prices of not just their Red products (including the Gap Red T-shirt) but also of other non-Red products.

These results have implications for firms, public policy officials, and consumers. Firms can use CM to increase prices and profits, but should be aware of the implications of placing different products on

CM. Our results suggest that actions of CM firms should be looked on with some skepticism by consumers and government officials—although the firms may be helping with charitable causes, they are also using CM to increase their own prices and profits.

Some caveats are in order in interpreting our results. In the model, we assume that all consumers obtain an increase in utility from purchasing from the CM firm, either directly from the cause-marketed good or via a spillover effect on to the other good. This is corroborated to a large extent in our laboratory experiments, in which a large proportion of consumers bought a good from the CM firm in the Indifference between Firms case. However, in practice one may expect that only a fraction of consumers would be so affected, which would weaken the magnitude of our results without changing the qualitative implications. Furthermore, it is possible only a fraction of customers have knowledge of cause marketing, again reducing the magnitude of the effects. On the other hand, it may also happen that some consumers think that a firm engaged in CM has linked all its brands to a cause, which would make our results stronger because the direct utility effect exceeds the spillover effect. Another possible behavior is that some consumers may be skeptical of CM and shy away from a firm doing CM, or may be upset with a firm for doing CM only on an obviously weak product. Intuitively, the latter reaction would imply that firms engaged in CM would tend to link their stronger products to causes.

Our experiments also offer avenues for future research. In our laboratory experiments, subjects lost money if they purchased a cause-marketed product, but this was an opportunity cost (i.e., subjects were paid "after" making their purchasing choices, and the CM cost was not an "out-of-pocket" cost). It is possible that experimental subjects make different choices if the expense is out of pocket. We feel that our basic experimental results (i.e., consumers derive a positive utility from purchasing a cause-marketed product, and also from purchasing a non-cause-marketed product from the CM firm) should hold even with out-of-pocket expenses. For example, this can also be seen in the higher prices that consumers pay for cause-marketed products versus equivalent non-cause-marketed products (such as the Gap Red T-shirt for \$28.00 compared to other equivalent Gap T-shirts for \$16.50). However, in future research, it may be interesting to conduct experiments with a scenario in which subjects are given a fixed sum of money up front and then asked to spend it.

In addition to cause-marketed products, our findings extend to other situations in which there may be spillover effects from having a product in a firm's portfolio. Consider the phenomenon of socially

beneficial products. For example, fair-trade products continue to grow in North America, most of them representing one product among many carried in a portfolio. In a similar vein, some automobile manufacturers are introducing a more “green” or more environmentally friendly car (e.g., Toyota’s Prius and Ford’s Escape hybrid). If Ford introduces a hybrid car, it is plausible that the utility from the presence of this car in Ford’s portfolio spills over to other Ford cars. If so, then our model and results would apply to such a situation as well: Ford would experience an increase in sales of other products as a result of the introduction. Our model also applies to other aspects of a product such as “superior design” or “great quality control,” as long as there are spillover benefits of these aspects on to other products in a firm’s portfolio. Although we consider substitute products in our model, it is likely that spillover effects are even stronger for complementary products. As such, our results and their managerial implications have broad applicability.

Finally, we hope with this paper to increase interest in analytical work on social phenomena. This paper makes a start in this direction by considering the phenomenon of cause marketing.

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Appendix A. Instructions to Participants in the Indifference Between Firms Condition

In this short experiment you will be making a purchase of a beverage (e.g., coffee). There are two stores in this market each of which sells five different beverages. The purchase of each beverage gives some utility to you (this reflects how much you would enjoy it), profit to the firms, and may also give some money to a charity. This is an actual charity, which we will give money to depending on your actions. At the end of the experiment, we will actually pay you your utility in actual money.

Both firms treat each beverage line as individual profit centers, i.e., each beverage line pays for itself. One line does not subsidize another line.

Now please turn the page to do the exercise.

Please do not talk to each other during this exercise.

[page break]

The numbers below reflect what the sale of the beverage brings to you (in cents) and to the charity (in cents).

Please choose one beverage (check one of the 10 options) from the two firms below:

Firm 1

- Beverage 1: 100, 0 _____
- Beverage 2: 90, 0 _____
- Beverage 3: 80, 0 _____
- Beverage 4: 70, 0 _____
- Beverage 5: 60, 0 _____

Firm 2

- Beverage 1: 100, 0 _____
- Beverage 2: 90, 0 _____
- Beverage 3: 80, 0 _____
- Beverage 4: 70, 20 _____
- Beverage 5: 60, 0 _____

Appendix B. Proofs and Supporting Results

LEMMA B.1. Consider the market for good *j*. Suppose there is no crossover of consumers; that is, consumers with quality valuation θ_j do not buy product $j' \neq j$ and vice versa. Let (q_{aj}, q_{bj}) be the qualities of the two firms, and let c_j be the production cost of product *j*. Suppose that, as a result of cause marketing, firm *i* experiences a utility benefit of g_{ij} and incurs a cost per unit for the product of r_{ij} on product *j*, where $-3t \leq \rho_j + (g_{aj} - r_{aj}) - (g_{bj} - r_{bj}) \leq 3t$. Then, if the constant in the utility function, *f*, is sufficiently large, the market is fully covered in equilibrium, and the equilibrium prices and profits in the market for good *j* are as follows:

$$p_{aj} = c_j + t + \frac{\rho_j}{3} + \frac{g_{aj} - g_{bj}}{3} + \frac{2r_{aj} + r_{bj}}{3} \quad \text{and}$$

$$p_{bj} = c_j + t - \frac{\rho_j}{3} - \frac{g_{aj} - g_{bj}}{3} + \frac{r_{aj} + 2r_{bj}}{3},$$

$$\pi_{aj} = \frac{1}{2t} \left[t + \frac{\rho_j}{3} + \frac{(g_{aj} - r_{aj}) - (g_{bj} - r_{bj})}{3} \right]^2 \quad \text{and}$$

$$\pi_{bj} = \frac{1}{2t} \left[t - \frac{\rho_j}{3} - \frac{(g_{aj} - r_{aj}) - (g_{bj} - r_{bj})}{3} \right]^2.$$

PROOF. Suppose firm *i* chooses a price p_{ij} . For now, assume that the market is fully covered in equilibrium; i.e., each consumer buys from either firm A or firm B. Later, we will show that each consumer has a strictly positive utility in equilibrium.

Let x_j denote the location of the consumer who is exactly indifferent between buying good *j* from firm A and buying good *j* from firm B. Then,

$$f + \theta_j q_{aj} + g_{aj} - p_{aj} - tx_j = f + \theta_j q_{bj} + g_{bj} - p_{bj} - t(1 - x_j),$$

so that $x_j = \frac{1}{2} + (\rho_j + (g_{aj} - g_{bj})) / (2t) - (p_{aj} - p_{bj}) / (2t)$. Thus, firm A sells to consumers in the region $[0, x_j]$, and firm B sells to consumers in the region $[x_j, 1]$.

The profit of firm A is $\pi_{aj} = (p_{aj} - r_{aj} - c_j)x_j$, and the first-order condition for profit maximization is $\partial \pi_{aj} / \partial p_{aj} = 0$, which after some simplification yields firm A’s best response condition,

$$p_{aj} = \frac{r_{aj}}{2} + \frac{c_j}{2} + \frac{t}{2} + \frac{\rho_j + (g_{aj} - g_{bj})}{2} + \frac{p_{bj}}{2}.$$

It is straightforward to check that the second-order condition $\partial^2 \pi_{aj} / \partial p_{aj}^2 < 0$ is satisfied.

Similarly, the profit of firm B is $\pi_{bj} = (p_{bj} - r_{bj} - c_j)(1 - x_j)$, and the first-order condition for profit maximization is $\partial \pi_{bj} / \partial p_{bj} = 0$, which after some simplification yields firm B’s best response condition,

$$p_{bj} = \frac{r_{bj}}{2} + \frac{c_j}{2} + \frac{t}{2} - \frac{\rho_j + (g_{aj} - g_{bj})}{2} + \frac{p_{aj}}{2}.$$

Again, it is straightforward to check that the second-order condition is satisfied.

Now, equilibrium prices are found by simultaneously solving the two best response conditions. This yields the expressions for prices in the statement of the lemma. Substituting the optimal prices back into the expression for x_j , the location of the consumer indifferent between the two goods, we obtain

$$x_j = \frac{1}{2} + \frac{1}{2t} \left[\frac{\rho_j + (g_{aj} - r_{aj})}{3} - \frac{r_{aj} - r_{bj}}{3} \right].$$

Substituting the expressions for p_{aj} , p_{bj} , and x_j into the firms' profit functions yields the expressions for equilibrium profits in the statement of the lemma.

Because $-3t < \rho_j + (g_{aj} - r_{aj}) - (g_{bj} - r_{bj}) \leq 3t$, the indifferent consumer x_j lies in $[0, 1]$, and the price of each firm weakly exceeds its own cost per unit of the product. Thus, each firm has a nonnegative profit.

Finally, we show that the consumers' individual rationality constraints are satisfied. Consider the consumer located at x_j . Her utility if she buys good j from firm A is $u_{aj}(x_j) = \theta q_{aj} + g_{aj} - p_j - tx_j$. Substituting in the expressions for p_{aj} and x_j , we obtain $u_{aj}(x_j) = f + \frac{1}{2}[\theta_{aj}(q_{aj} + q_{bj}) + (g_{aj} + g_{bj}) - (r_{aj} + r_{bj}) - 3t] - c_j$. Thus, for any fixed values of the remaining parameters, there exists an f such that, if $f \geq \underline{f}$, $u_{aj}(x_j) \geq 0$. Because all consumers located at $x < x_j$ pay a lower transportation cost than the consumer at x_j , it follows that all these consumers have a strictly positive utility when they purchase good j . Furthermore, because the consumer at x_j is indifferent between buying good j from firm A and buying good j from firm B, she obtains a nonnegative utility if she buys from firm B instead; that is, $u_{bj}(x_j) \geq 0$. Because all consumers with $x > x_j$ pay a lower transportation cost than the consumer at x_j when they buy from firm B, all these consumers have a strictly positive utility when they purchase good j . Thus, for any $f \geq \underline{f}$, every consumer has a zero or strictly positive utility in equilibrium. Thus, the market is fully covered. \square

LEMMA B.2. *Under Assumption 1, regardless of which products each firm places on cause marketing, the equilibrium prices and profits on each good j are as given in Lemma B.1. In particular, the market is fully covered, and consumer self-selection constraints are satisfied: consumers with valuation θ_h buy a high-quality good, and consumers with valuation θ_l buy a low-quality good.*

PROOF. Recall that each firm has four choices in terms of which product to place on CM: none of the products, product h only, product l only, or both products. Thus, the CM game can be represented as 4×4 game. We first show that, for each of the 16 possible outcomes of product combinations firms can place on CM, the assumption in Lemma B.1 is satisfied. Then, we show that there is no crossover of consumers at the prices exhibited in Lemma B.1.

First, consider the condition in Lemma B.1 that $-3t \leq \rho_j + (g_{aj} - r_{aj}) - (g_{bj} - r_{bj}) = 3t$ for each product j . Recall that $\rho_h > 0$ (because $q_{ah} > q_{bh}$) and $\rho_l < 0$ (because $q_{al} < q_{bl}$). Consider the expression $(g_{aj} - r_{aj}) - (g_{bj} - r_{bj})$. If firm i places product j on CM, $g_{ij} = \delta$ and $r_{ij} = m$. If $\delta < m$, the expression $-(g_{bj} - r_{bj})$ is maximized when firm B places product j on

CM. Similarly, if firm i places product $j' \neq j$ on CM, $g_{ij} = \gamma$ and $r_{ij} = 0$. Thus, the maximum value of $(g_{aj} - r_{aj}) - (g_{bj} - r_{bj})$ occurs when firm A places product j' and firm B places product j on CM. This maximum value is $\gamma - (\delta - m)$, or $\gamma + m - \delta$. Similarly, if $m < \delta$, the maximal value of the expression is $\max\{\gamma, \delta - m\}$. In all cases, the right-hand inequality is satisfied if $\gamma + |m - \delta| \leq 3t - \rho_h$.

Consider the left-hand inequality. The minimum value of the expression $(g_{aj} - r_{aj}) - (g_{bj} - r_{bj})$ may be denoted as $-\max\{\gamma, m - \delta, \gamma + m - \delta\}$, so the left-hand inequality is satisfied if $-3t \leq \rho_l - \gamma - |m - \delta|$ or $\gamma + |m - \delta| \leq 3t + \rho_l$. The right-hand side (RHS) of the last inequality may also be stated as $3t - |\rho_l|$, leading directly to Assumption 1(a).

Thus, Assumption 1(a) ensures that the maximal value of the left-hand side is less than the minimum value of the RHS, across the two qualities of goods, h and l . Therefore, for all combinations of products the firms can place on CM, the condition in Lemma B.1 is satisfied, so that if there is no crossover of consumers across quality segments, Lemma B.1 applies.

Next, we show that Assumption 1(b) implies there is no crossover of consumers across quality segments. Consider any consumer with high valuation for quality located at $x \in [0, 1]$. As in Lemma B.1, suppose that, as a result of CM, firm A experiences a utility benefit of g_{aj} on product j . The consumer prefers good h of firm A to good l of firm A if

$$\theta_h q_{ah} + g_{ah} - p_{ah} - tx \geq \theta_h q_{al} + g_{al} - p_{al} - tx \quad \text{or} \\ \theta_h (q_{ah} - q_{al}) \geq p_{ah} - p_{al} - (g_{ah} - g_{al}).$$

We show that the last inequality holds for all 16 pure-strategy combinations across the two firms in the 4×4 CM game. Substitute the values of p_{ah} and p_{al} from Lemma B.1 into the RHS of the last inequality. This yields

$$\theta_h (q_{ah} - q_{al}) \geq c + \frac{\rho_h - \rho_l}{3} + \frac{2}{3} [(r_{ah} - r_{al}) - (g_{ah} - g_{al})] \\ + \frac{1}{3} [(r_{bh} - r_{bl}) - (g_{bh} - g_{bl})].$$

For each firm $i = a, b$, let $\eta_i = (r_{ih} - r_{il}) - (g_{ih} - g_{il})$. Then, the RHS of the last inequality is maximized by maximizing the values of η_a and η_b . Consider firm A. If it does no CM, $r_{ah} = r_{al} = g_{ah} = g_{al} = 0$. Thus, in this case $\eta_a = 0$. If it places product h on CM, $r_{ah} = m$, $r_{al} = 0$, $g_{ah} = \delta$, and $g_{al} = \gamma$. Thus, in this case, $\eta_a = m + \gamma - \delta$. In a similar manner, if firm A places product l on CM, $\eta_a = \delta - (m + \gamma)$. Finally, if it places both products on CM, $\eta_a = 0$. Clearly, η_a is maximal when firm A places only product h on CM, and the maximal value is $|m + \gamma - \delta|$. In an exactly similar manner, η_b is maximal when firm B places only product h on cause marketing, and the maximal value is $|m + \gamma - \delta|$. Thus, across all 16 cells in the 4×4 CM game, the RHS of the last equation attains a maximal value $c + (\rho_h - \rho_l)/3 + |m + \gamma - \delta|$. Therefore, if $\theta_h (q_{ah} - q_{al}) \geq c + (\rho_h - \rho_l)/3 + |m + \gamma - \delta|$, regardless of which products firms place on CM, all consumers with quality valuation θ_h prefer good h of firm A to good l of firm A.

In a similar manner, a consumer with quality valuation θ_h prefers good h of firm B to good l of firm B if $\theta_h (q_{bh} - q_{bl}) \geq p_{bh} - p_{bl} - (g_{bh} - g_{bl})$. Substituting for p_{bh} and p_{bl} from

Lemma B.1, this condition is satisfied under all CM scenarios if $\theta_h(q_{bh} - q_{bl}) \geq c - (\rho_h - \rho_l)/3 + |m + \gamma - \delta|$.

Thus, under Assumptions 1(b), (i) and (ii), no consumer with quality valuation θ_h will buy a good with quality l at the prices exhibited in Lemma B.1.

Next, consider consumers with quality valuation θ_l located at $x \in [0, 1]$. As in Lemma B.1, suppose that, as a result of CM, firm A experiences a utility benefit of g_{aj} on product j . The consumer prefers good l of firm A to good h of firm A if $\theta_l q_{al} + g_{al} - p_{al} - tx \geq \theta_l q_{ah} + g_{ah} - p_{ah} - tx$ or $\theta_l(q_{ah} - q_{al}) \leq p_{ah} - p_{al} - (g_{ah} - g_{al})$.

Substitute the expressions for p_{ah} and p_{al} from Lemma B.1 into the RHS of the last equation, and replicate the analysis above. We find that the minimal value of the RHS across all CM scenarios occurs when both firms place good l on CM, and this minimal value equals $c + (\rho_h - \rho_l)/3 - |m + \gamma - \delta|$. Thus, under Assumption 1(b)(iii), given the prices in Lemma B.1, all consumers with valuation θ_l prefer good l of firm A to good h of firm A.

Finally, replicating the same analysis for firm B, under Assumption 1(b)(iv), given the prices in Lemma B.1, all consumers with valuation θ_l prefer good l of firm B to good h of firm B. Thus, under 1(b), (iii) and (iv), no consumer with quality valuation θ_l will buy a good of quality h . Therefore, under all CM scenarios, the equilibrium prices and profits of each firm will be as given in Lemma B.1. \square

PROOF OF PROPOSITION 1. For each firm, let n denote the strategy of not engaging in CM, h the strategy of placing only product h on CM, l the strategy of placing only product l on CM, and b the strategy of placing both products on CM. Furthermore, let (x, y) denote a strategy profile in which firm A plays x and firm B plays y , and let $\pi_j(x, y)$ be the profit of firm j when this strategy profile is played.

Consider the best response of firm A to each strategy of firm B. First, suppose firm B plays n . Then, from the payoff table, Table 4, setting $\gamma = 0$ (recall there are no spillovers), we obtain $\pi_a(n, n) - \pi_a(l, n) = -((\delta - m)/3) \cdot [1 + (2\rho_l + \delta - m)/(6t)]$. Now, under Assumption 1(a), $1 + (2\rho_l + \delta - m)/(6t) > 0$. Thus, $\pi_a(n, n) > \pi_a(l, n)$ if $\delta < m$ and $\pi_a(n, n) < \pi_a(l, n)$ if $\delta > m$. Next, notice that $\pi_a(l, n) - \pi_a(h, n) = -((\delta - m)/3)[(2\rho_h + 2\rho_l)/(6t)]$. Thus, $\pi_a(l, n) > \pi_a(h, n)$ if $\delta < m$, and $\pi_a(l, n) < \pi_a(h, n)$ if $\delta > m$. Finally, note that $\pi_a(h, n) - \pi_a(b, n) = -((\delta - m)/3)[1 + (2\rho_l + \delta - m)/(6t)]$. Thus, $\pi_a(h, n) > \pi_a(b, n)$ if $\delta < m$, and $\pi_a(h, n) < \pi_a(b, n)$ if $\delta > m$. Putting all three of these relationships together, we obtain that when firm B plays n , the best response of firm A is n if $\delta < m$ and b if $\delta > m$.

In an exactly similar manner, it is straightforward to show that for each of the other pure strategies of firm B (i.e., h , l , and b), the best response of firm A is n if $\delta < m$ and b if $\delta > m$. Therefore, n is a strictly dominant strategy for firm A when $\delta < m$, and b is a strictly dominant strategy for firm A when $\delta > m$.

Finally, following the same steps as for firm A, we obtain that n is a strictly dominant strategy for firm B when $\delta < m$, and b is a strictly dominant strategy for firm B when $\delta > m$. Thus, the unique equilibrium of the CM game is (n, n) when $\delta < m$ (i.e., neither firm engages in CM) and (b, b) when $\delta > m$ (i.e., both firms place both products on CM). \square

PROOF OF PROPOSITION 2. First, suppose neither firm engages in CM. Then, from Lemma B.1, we have $p_{ah}(n, n) = c + t + \rho_h/3$, $p_{bh}(n, n) = c + t - \rho_h/3$, $p_{al}(n, n) = t + \rho_l/3$ and

$p_{bl}(n, n) = t - \rho_l/3$. Next, suppose firm B does not engage in CM and firm A places product l on CM. From Lemma B.1, we have $p_{ah}(l, n) = c + t + \rho_h/3 + \gamma/3$, $p_{bh}(l, n) = c + t - \rho_h/3 - \gamma/3$, $p_{al}(l, n) = t + \rho_l/3 + (\delta + 2m)/3$, and $p_{bl}(l, n) = t - \rho_l/3 + (m - \delta)/3$. By inspection, it follows that $p_{ah}(l, n) > p_{ah}(n, n)$ and $p_{bh}(l, n) < p_{bh}(n, n)$. That is, when firm A engages in CM on good l , firm A raises its price on good h , but firm B lowers its price on good h . Similarly, by inspection it follows that $p_{al}(l, n) > p_{al}(n, n)$ and $p_{bl}(l, n) > p_{bl}(n, n)$. That is, both firms raise their price on good l .

Next, consider the effect on profits. When neither firm does CM, $\pi_{ah}(n, n) = (1/(2t))[t + \rho_h/3]^2$, $\pi_{bh}(n, n) = (1/(2t)) \cdot [t - \rho_h/3]^2$, $\pi_{al}(n, n) = (1/(2t))[t + \rho_l/3]^2$, and $\pi_{bl}(n, n) = (1/(2t))[t - \rho_l/3]^2$. When firm A does CM on product l , $\pi_{ah}(l, n) = (1/(2t))[t + \rho_h/3 + \gamma/3]^2$ and $\pi_{bh}(l, n) = (1/(2t))[t - \rho_h/3 - \gamma/3]^2$. Because $\gamma > 0$, it follows that $\pi_{ah}(l, n) > \pi_{ah}(n, n)$ and $\pi_{bh}(l, n) < \pi_{bh}(n, n)$. That is, firm A earns a higher profit on good h (due to the spillover effect from having good l on CM), and firm B earns a lower profit on good h . Similarly, $\pi_{al}(l, n) = (1/(2t))[t + \rho_l/3 + (\delta - m)/3]^2$ and $\pi_{bl}(l, n) = (1/(2t)) \cdot [t - \rho_l/3 - (\delta - m)/3]^2$. Because $\delta < m$, it follows that $\pi_{al}(l, n) < \pi_{al}(n, n)$ and $\pi_{bl}(l, n) > \pi_{bl}(n, n)$. That is, the direct effect of CM on good l is that firm A earns a lower profit on the good, and firm B earns a higher profit on the good.

To see the results on market share, note that the demand for good h of firm A is $x_h(n, n) = \frac{1}{2} + (1/(2t))[t + \rho_h/3]$ when there is no CM, and $x_h(l, n) = \frac{1}{2} + (1/(2C_t))[t + \rho_h/3 + \gamma/3] > x_h(n, n)$ when good h is placed on CM. Similarly, $x_l(n, n) = \frac{1}{2} + (1/(2t))[t + \rho_l/3]$ and $x_l(l, n) = \frac{1}{2} + (1/(2t))[t + \rho_l/3 + (\delta - m)/3] < x_l(n, n)$.

Finally, consider the overall effect on profits of the two firms. For firm A,

$$\begin{aligned} \pi_a(l, n) - \pi_a(n, n) &= [\pi_{ah}(l, n) - \pi_{ah}(n, n)] + [\pi_{al}(l, n) - \pi_{al}(n, n)] \\ &= \frac{\gamma}{3} \left[1 + \frac{2\rho_h + \gamma}{6t} \right] + \frac{(\delta - m)}{3} \left[1 + \frac{2\rho_l + \delta - m}{6t} \right] \\ &= \frac{\gamma + \delta - m}{3} + \frac{\gamma^2}{18t} + \frac{(\delta - m)^2}{18t} + \frac{\gamma\rho_h}{9t} + \frac{(\delta - m)\rho_l}{9t}. \end{aligned}$$

Because $\gamma + \delta > m$, $\rho_h > 0$, and $(\delta - m)$ and ρ_l are both negative, each term on the RHS of the last equation is strictly positive. Thus, the overall profit of firm A increases when it places product h on CM. For firm B,

$$\begin{aligned} \pi_b(l, n) - \pi_b(n, n) &= -\frac{\gamma}{3} \left[1 - \frac{(2\rho_h + \gamma)}{6t} \right] \\ &\quad - \frac{\delta - m}{3} \left[1 - \frac{2\rho_l + \delta - m}{6t} \right]. \end{aligned}$$

Because $\gamma + |m - \delta| \leq 3t - \max\{\rho_h, -\rho_l\}$, the term $-\frac{\gamma}{3}[1 - (2\rho_h + \gamma)/(6t)]$ is negative and the term $-\frac{(\delta - m)}{3}[1 - (2\rho_l + \delta - m)/(6t)]$ is positive. Now, suppose δ is very close to m . Then, the negative term dominates, and $\pi_b(l, n) < \pi_b(n, n)$. Conversely, suppose γ is close to $m - \delta$. In the limit, if $\gamma = m - \delta$, then $\pi_b(l, n) - \pi_b(n, n) = (\gamma/3)[(2\rho_h + \gamma)/(6t) - (2\rho_l - \gamma)/(6t)]$. Each term within the parentheses is strictly positive, so $\pi_b(l, n) > \pi_b(n, n)$. It follows that if γ is sufficiently close to $m - \delta$, $\pi_b(l, n) > \pi_b(n, n)$. \square

PROOF OF PROPOSITION 3. We show that if firm B places product h on CM, it is a best response for firm A to place product l on CM and vice versa. Consider the payoff to firm A from playing l instead of n . After some simplification, from the payoff table we obtain

$$\begin{aligned} \pi_a(l, h) - \pi_a(n, h) &= \frac{\gamma + \delta - m}{3} + \frac{\gamma}{3} \left(\frac{2\rho_h + \gamma - (\delta - m)}{6t} \right) \\ &\quad + \frac{m - \delta}{3} \left(\frac{-2\rho_l + \gamma - (\delta - m)}{6t} \right) + \frac{m - \delta}{3} \left(\frac{2\gamma}{6t} \right). \end{aligned}$$

By inspection, each of the four terms on the RHS is strictly positive, so $\pi_a(l, h) > \pi_a(n, h)$.

Next, consider the payoff to firm A from playing l instead of h :

$$\begin{aligned} \pi_a(l, h) - \pi_a(h, h) &= \frac{\gamma + \delta - m}{3} \left[\frac{2\rho_h + \gamma - (\delta - m)}{6t} + \frac{-2\rho_l + \gamma - (\delta - m)}{6t} \right] > 0, \end{aligned}$$

because each of the three terms on the RHS is strictly positive.

Finally, consider the payoff to firm A from playing l instead of b :

$$\pi_a(l, h) - \pi_a(b, h) = \frac{\gamma + \delta - m}{3} \left[\frac{2\rho_h + \gamma - (\delta - m)}{6t} + 1 \right] > 0.$$

Therefore, when firm B plays h , it is a strict (and hence unique) best response for firm A to play l .

Next, suppose firm A plays l , and consider the payoffs to firm B from each of its strategies. In a similar fashion as above, we compute

$$\begin{aligned} \pi_b(l, l) - \pi_b(l, n) &= \frac{\gamma + \delta - m}{3} + \frac{m - \delta}{3} \left(\frac{2\rho_h + \gamma - (\delta - m)}{6t} \right) \\ &\quad + \frac{\gamma}{3} \left(\frac{-2\rho_l + \gamma - (\delta - m)}{6t} \right) + \frac{m - \delta}{3} \left(\frac{2\gamma}{6t} \right) > 0, \end{aligned}$$

$$\begin{aligned} \pi_b(l, l) - \pi_b(l, h) &= \frac{\gamma + \delta - m}{3} \left[\frac{2\rho_h + \gamma - (\delta - m)}{6t} + \frac{-2\rho_l + \gamma - (\delta - m)}{6t} \right] > 0, \end{aligned}$$

$$\pi_b(l, l) - \pi_b(l, b) = \frac{\gamma + \delta - m}{3} \left[\frac{-2\rho_l + \gamma - (\delta - m)}{6t} + 1 \right] > 0.$$

Thus, when firm A plays l , it is a strict (and unique) best response for firm B to play h . Therefore, there is a pure-strategy equilibrium in which firm A places l on CM, and firm B places h on CM.

Consider the prices of the two products. For each firm i and each good j , let \bar{p}_{ij} be the price when neither firm engages in CM, and let p_{ij} denote the price in the equilibrium being considered. From Lemma B.1, it follows that $\bar{p}_{ah} - p_{ah} = \bar{p}_{bl} - p_{bl} = (\gamma - \delta + m)/3 > 0$, and $\bar{p}_{al} - p_{al} = \bar{p}_{bh} - p_{bh} = (\delta - \gamma + 2m)/3 > 0$. Thus, both firms raise their prices on both goods.

Finally, consider firm profits. We have shown that $\pi_a(l, h) > \pi_a(h, h) = \pi_a$, and $\pi_b(l, h) > \pi_b(l, l) = \pi_b$. Thus, each firm increases its profit, compared to the situation in which neither firm engages in CM. \square

PROOF OF PROPOSITION 4. First, consider firm A. We need to show that, against each pure strategy of firm B, firm A earns a higher profit from the strategy l , compared to the strategy b . In Proposition 2 above, we have shown that $\pi_a(l, h) > \pi_a(b, h)$, so we just need to consider the performance of l and b for firm A against the other three strategies of firm B. From the payoff table, after some algebraic simplification we obtain $\pi_a(l, n) - \pi_a(b, n) = ((\gamma + m - \delta)/3) \cdot [1 + 2\rho_h/(6t)] + (\gamma^2 - (\delta - m)^2)/(18t)$. Because $\delta < m$ by Assumption 1(a), each of the three fractions in the expression is strictly positive. Hence, $\pi_a(l, n) > \pi_a(b, n)$.

Next, $\pi_a(l, l) - \pi_a(b, l) = ((\gamma + m - \delta)/3)[1 + (2\rho_h - (\gamma + m - \delta))/(6t)] > 0$, because $\gamma + m - \delta < 3c_h - \rho_h$.

Finally, $\pi_a(l, b) - \pi_a(b, b) = ((\gamma + m - \delta)/3)[1 + (2\rho_h - (\gamma + m - \delta))/(6t)] > 0$.

Therefore, for firm A, the strategy l strictly dominates the strategy b .

Next, consider firm B. We need to show that, against each pure strategy of firm A, firm B earns a higher profit from the strategy h compared to the strategy b . In Proposition 2 above, we have shown that $\pi_b(l, h) > \pi_b(l, b)$, so we just need to consider the performance of h and b for firm B against the other three strategies of firm A. From the payoff table, after some algebraic simplification we obtain $\pi_b(n, h) - \pi_b(n, b) = ((\gamma + \delta - m)/3)[1 - 2\rho_l/(6t)] + (\gamma^2 - (\delta - m)^2)/(18t) > 0$. Because $\rho_l < 0$ and $\gamma + \delta > m$.

Next, $\pi_b(h, h) - \pi_b(h, b) = (\gamma + m - \delta)/3 > 0$, because $\gamma + m - \delta < 3c_l + \rho_l$.

Finally, $\pi_b(b, h) - \pi_b(b, b) = ((\gamma + m - \delta)/3)[1 - (2\rho_l - (\gamma + m - \delta))/(6t)] > 0$.

Therefore, for firm B, the strategy h strictly dominates the strategy b . \square

LEMMA B.3. Suppose firm B places product l on CM. The best response of firm A is either to place product h on cause marketing, or place product l on CM. Similarly, if firm A places product h on CM, the best response of firm B is either to place product h on CM or product l on CM.

PROOF. Suppose firm B places product l on CM. From Proposition 3, we know it is not a best response for firm A to play b . Thus, the best response of firm A must be one of n , h , or l . From the payoff table, after some algebraic simplification we obtain

$$\begin{aligned} \pi_a(h, l) - \pi_a(n, l) &= \frac{\gamma + m - \delta}{3} + \frac{\gamma(m - \delta)}{18} \left[\frac{2}{t} \right] + \frac{\gamma[2\rho_l + \gamma + m - \delta]}{18t} \\ &\quad - \frac{(m - \delta)[2\rho_h - \gamma - (m - \delta)]}{18t}, \\ \pi_a(l, l) - \pi_a(n, l) &= \frac{\gamma}{3} \left[1 + \frac{2\rho_h - \gamma}{6t} \right] - \frac{m - \delta}{3} \left[1 + \frac{2\rho_l + m - \delta}{6t} \right]. \end{aligned}$$

We show that if $\pi_a(l, l) < \pi_a(n, l)$, then it must be that $\pi_a(h, l) > \pi_a(n, l)$. Thus, the best response of firm A must be either h or l , but cannot be n .

Suppose $\pi_a(l, l) < \pi_a(n, l)$. Then, $(\gamma/3)[1 + (2\rho_h - \gamma)/(6t)] < ((m - \delta)/3)[1 + (2\rho_l + m - \delta)/(6t)]$. Because $\gamma > m - \delta$, it must be that $[1 + (2\rho_h - \gamma)/(6t)] < [1 + (2\rho_l + m - \delta)/(6t)]$, or $(2\rho_h - \gamma)/t < (2\rho_l + m - \delta)/t$. Now, $(2\rho_h - \gamma - (m - \delta))/t < (2\rho_h - \gamma)/t < (2\rho_l + m - \delta)/t < (2\rho_l + m - \delta + \gamma)/t$. Therefore,

$(m - \delta)[2\rho_h - \gamma - (m - \delta)]/(18t) < \gamma[2\rho_l + \gamma + m - \delta]/(18t)$. Now, consider the RHS of the expression for $\pi_a(h, l) - \pi_a(n, l)$. We can write this as

$$\left\{ \frac{\gamma + m - \delta}{3} \right\} + \left\{ \frac{\gamma(m - \delta)}{18} \left[\frac{2}{t} \right] \right\} + \left\{ \frac{\gamma[2\rho_l + \gamma + m - \delta]}{18t} - \frac{(m - \delta)[2\rho_h - \gamma - (m - \delta)]}{18t} \right\},$$

where each of the three terms in the curly braces is strictly positive. Therefore, if $\pi_a(l, l) < \pi_a(n, l)$, then it must be that $\pi_a(h, l) > \pi_a(n, l)$. Hence, n cannot be a best response by firm A when firm B plays l , and the best response must be h or l .

The analysis when of firm B's best response when firm A plays h is exactly similar. □

PROOF OF PROPOSITION 5. (i) Suppose firm B places product l on CM. From Lemma B.3, we know the best response of firm A is to place either product h or product l on CM. From the payoff table, we observe that $\pi_a(h, l) - \pi_a(l, l) = ((\gamma + m - \delta)/3)[(2\rho_l + \gamma + m - \delta)/(6t) - (2\rho_h - (\gamma + m - \delta))/(6t)]$. Because $\gamma + m - \delta > 0$, $\pi_a(h, l) > \pi_a(l, l)$ if and only if $\gamma + m - \delta > \rho_h - \rho_l$. Hence, it follows that if $\gamma > \rho_h - \rho_l - (m - \delta)$, $\pi_a(h, l) > \pi_a(l, l)$. That is, if the spillover effect γ is sufficiently large, it is a best response for firm A to place product h on CM.

Now, recall that $\gamma > m - \delta$. Thus, if $\gamma < \rho_h - \rho_l$, it follows that $\gamma + m - \delta < \rho_h - \rho_l$, so it is a best response by firm A to place product l on CM when firm B places l on CM.

Next, suppose firm A places h on CM, and consider firm B's best response. From the payoff table, we observe that $\pi_b(h, l) - \pi_b(h, h) = \pi_a(h, l) - \pi_a(l, l)$. Thus, the analysis for firm B is exactly similar: if $\gamma < \rho_h - \rho_l$, then h is a best response, and if $\gamma > \rho_h - \rho_l - (m - \delta)$, then l is a best response.

Therefore, if $\gamma > \rho_h - \rho_l - (m - \delta)$, it is a Nash equilibrium for firm A to place product h on CM, and for firm B to place product l on CM. In this equilibrium, each firm places its advantaged product on CM. Note that, from Proposition 2, it is also an equilibrium for each firm to place its disadvantaged product on CM. From the payoff table, we observe that the difference in profits across the two equilibria is the same for the two firms. This difference may be represented as $\pi_a(l, h) - \pi_a(h, l) = ((\gamma + m - \delta)/3)[(2(\rho_h - \rho_l))/(3t)] > 0$. That is, each firm earns a higher profit in the equilibrium in which the firms place their disadvantaged products on CM.

Consider the prices of the two products. For each firm i and each good j , let \bar{p}_{ij} be the price when neither firm engages in CM, and let p_{ij} denote the price in the equilibrium being considered. From Lemma B.1, it follows that $p_{ah} - \bar{p}_{ah} = p_{bl} - \bar{p}_{bl} = (\delta - \gamma + 2m)/3 > 0$, and $p_{al} - \bar{p}_{al} = p_{bh} - \bar{p}_{bh} = (\gamma - \delta + m)/3 > 0$. Thus, both firms raise their prices on both goods.

Finally, we have shown that $\pi_a(h, l) > \pi_a(l, l) = \pi_a$, and $\pi_b(h, l) > \pi_b(h, h) = \pi_b$. Thus, each firm increases its profit, compared to the situation in which neither firm engages in CM.

(ii) Conversely, if $\gamma < \rho_h - \rho_l$, it is a best response by firm A to place product l on CM, regardless of the action chosen by firm B. Similarly, it is a best response by firm B to place product h on CM, regardless of the action chosen by firm A. From Proposition 2, these strategies also constitute a Nash equilibrium of the game. From Proposition 3, there is no Nash equilibrium in which either firm plays b , and from Lemma B.3,

there is no pure-strategy Nash equilibrium in which either firm plays n . Thus, when $\gamma < \rho_h - \rho_l$, the equilibrium in which each firm places its disadvantaged product on CM is the unique equilibrium in pure strategies. □

PROOF OF PROPOSITION 6. Suppose the firms are symmetric in quality, with $q_{ah} = q_{bh}$ and $q_{al} = q_{bl}$. Then, $\rho_h = \rho_l = 0$. It may be noted that the proofs of Propositions 2–4 are not affected by this assumption. Therefore, in particular, from Proposition 3, it follows that there exists a pure-strategy equilibrium in which firm A places product l on CM and firm B places product h on CM.

In Proposition 5, the condition under which the second pure strategy equilibrium exists (with firm A placing product h on CM and firm B placing product l on CM) reduces to $\gamma > -(m - \delta)$. Because this condition holds under our assumptions, the second pure-strategy equilibrium also exists.

Finally, by substituting $\rho_h = \rho_l = 0$ in the payoff table, it follows that the profits of firms A and B are equal across the two equilibria. □

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