Association for Information Systems
AIS Electronic Library (AISeL)

ICIS 2004 Proceedings

International Conference on Information Systems (ICIS)

December 2004

The Impact of an Internet Shopping Infomediary on Channel Competition with Multiple Brands

Ling Xue
University of Texas at Austin

Gautam Ray
University of Texas at Austin

Andrew Whinston
University of Texas at Austin

Follow this and additional works at: http://aisel.aisnet.org/icis2004

THE IMPACT OF AN INTERNET SHOPPING INFOMEDIARY ON CHANNEL COMPETITION WITH MULTIPLE BRANDS

Ling Xue, Gautam Ray, and Andrew B. Whinston
Department of Management Science and Information Systems
University of Texas at Austin
Austin, TX U.S.A.
lingxue@mail.utexas.edu   Gautam.Ray@mccombs.utexas.edu
abw@uts.cc.utexas.edu

Abstract

This paper builds a game-theoretic model to examine the impact of the Internet shopping infomediary on the competition between the product or service supplier's direct online channel and the independent online multi-brand retailer. It is found that by facilitating cross-channel competition, the infomediary may even help the supplier to place its brand on the retailer's shelf. The main insight is that when competing with the supplier's direct channel, the independent retailer may prefer to engage in inter-brand competition (i.e., to promote the competitive substitute brand). In this case, the retailer may decline to carry the supplier's brand to avoid direct competition with the direct channel over the same brand. However, by joining an infomediary, the supplier can make its direct channel more competitive and limit the retailer's strategic benefit from the inter-brand competition. This may increase the possibility that the retailer gives up the inter-brand competition and agrees to carry the supplier's brand.

Keywords: Infomediaries, channel competition, price discrimination, E-commerce

Introduction

The rapid growth of the online shopping infomediary, the Internet institution that helps consumers search prices and compare brands before purchase, has received significant attention. According to Nielsen/Net Ratings, about 21 million U.S. Internet visitors surfed through one or more comparison-shopping sites in August 2003, up 34 percent from the previous year. The number comparison site, *shopping.com*, sends about $3.6 million worth of business to online merchants per day, and the top four shopping-comparison sites (with *BizRate*, *NexTag*, and *PriceGrabber* ranking second, third, and fourth) were estimated to turn $150 million to $200 million in combined revenue in 2003.

Researchers have noted the role of the Internet infomediary in intensifying the competition between independent retailers (Baye and Morgan 2001; Chen et al. 2002; Ghose et al. 2003; Iyer and Pazgal 2002). Similarly, the Internet infomediary may also intensify the competition between the product or service supplier's direct channel and the independent retailer's site. For example, leading Internet infomediaries can display offers from direct channels and independent retailers (see Table 1 for examples). This facilitates the direct channel to challenge the retailer's site. More importantly, suppliers may even strategically engage in such competition through the infomediary. For example, the hotel brand InterContinental takes an aggressive approach in using its brand name in paid-for Internet searches. It has spent heavily in bidding up the keyword "InterContinental" (at $3, while Hilton bids just 58 cents for its own brand names) in search engines to have its Website come at the top of the lists consumers see (Liu and Yee 2004).

The direct versus retailer channel competition has been identified as a source of conflict, even without considering the impact of an Internet infomediary. Distributors and dealers tend to desert those suppliers who sell directly and only carry products from suppliers who do not compete with them (Wilson 1998). For example, Wal-Mart and Home Depot warned Black and Decker that

**Table 1. Sample Offers from Direct Channels versus Retailers Found at the
Top Four Internet Shopping Infomediaries**

	Shopping.com	*Bizrate.com*	*Nextag.com*	*PriceGrabber.com*
Product	IBM ThinkPad T40 2373 (237372U) PC Notebook	HEWLETT PACKARD PhotoSmart 945 5.3 Megapixels Digital Camera	Wyndham Franklin Plaza Philadelphia, PA (1-Adult room, 12/10/04-12/11/04)	Fossil Abacus Wrist Net Watch
Direct Channel	IBM.com	HPshopping.com	Wyndham.com	Fossil.com
Retailer	Buy.com	OfficeDepot.com	HotelWeb.com	Circuitcity.com
Price	Lower price at Buy.com	Same	Marginally lower rate at Wyndham.com	Same

they would take its products off their shelves should Black and Decker expend direct sales (Lee et al. 2003). Therefore, considering both the retailer's strategic brand assortment and the Internet infomediary's capability in intensifying the cross-channel competition, we ask the following specific question concerning the impact of the Internet infomediary:

> When the Internet shopping infomediary facilitates the competition between the supplier's direct channel and the multi-brand independent retailer, does it necessarily decrease the chance that the retailer carries the supplier's brand?

In this paper, we build up a game-theoretic model to study the competition between a supplier's direct channel and an independent retailer which can potentially carry multiple brands. Our model also incorporates an infomediary which can strategically determine its contractual relationship with each channel. Interestingly and surprisingly, we find that the infomediary's facilitation of cross-channel competition may even help the supplier to place its brand on the retailer's shelf. The key insight is that the direct channel and independent retailer favor different types of cross-channel competition. The supplier's direct channel favors *intra-brand* competition over its own brand, while the independent retailer favors *inter-brand* competition over different brands (for differentiation). Therefore, if the retailer carries a competitive substitute brand to engage in *inter-brand* competition with the direct channel, it will decline to carry the supplier's brand which leads to *intra-brand* competition. However, the presence of an infomediary, as a mechanism for price discrimination and profit squeezing, limits the retailer's incentive to benefit from *inter-brand* competition. As a consequence, the retailer will be encouraged to expand the brand assortment rather than concentrating more on cross-channel competition. In this sense, the infomediary is indispensable to the supplier's strategic design of multi-channel online distribution system.

The rest of the paper is organized as the follows. First, we review related literature on Internet infomediaries, shopping agents, and cross-channel competition. A game-theoretic model is then presented to compare between different cases of cross-channel competition with and without the infomediary. The major managerial insights generated from the analysis are discussed and the conclusions presented.

Related Literature

Baye and Morgan (2001) and Iyer and Pazgal (2002) model the competition in homogenous good market where Internet shopping agent allows consumers to easily compare prices among different retailers. In these two models, retailers can choose whether or not to disclose their exact store prices to the shopping agent, but do not quote a different price (from the store price) to the shopping agent. In the models developed by Chen et al. (2002) and by Ghose et al. (2003), however, retailers can quote a different price (from their offline store prices) to the Internet infomediary, who then helps consumers compare among different retailers. Therefore, in these two models, the Internet infomediary is a way for retailers to price discriminate. Chen et al. and Ghose et al. focus on the automobile retail environment where posted store prices are not common. However, we adopt this approach of modeling the infomediary as a price discrimination mechanism in the study of general retail environments. We consider that this price discrimination assumption is not unreasonable. For example, the recent industry watch (Salkever 2003) reports that the real-

time pricing data listed in comparison sites are increasingly being actively fed by major retailers themselves with elaborate Web sites and technology staff, rather than being passively extracted by comparison sites. In addition, aside from directing traffic, the shopping agents also sell to retailers the data that tracks shopper behavior. Therefore, it is clear that soon online retailers will combine such information with individual marketing strategies (e.g., electronic coupons) to target and discriminate specific shopper segments.

In terms of modeling technique, this paper also blends the research by Chiang et al. (2003), which examines the competition between a manufacturer's direct channel and an independent retailer over a single brand, and by Lal and Villas-Boas (1998), which examines the retail channel competition over multiple brands. Our model examines the competition between the supplier's direct channel and an independent retailer over multiple brands.

Model

There is a risk-neutral supplier (supplier A) selling brand A of a product. Supplier A owns a direct channel (i.e., an official direct-transaction Website) through which it sells directly to consumers. There is an independent risk-neutral retailer already carrying brand B of the same product, and the retailer also owns a Website selling the product to consumers. Aside from brand B, the retailer can decide whether or not to carry brand A.

In the world with no infomediary, the direct site charges a regular price p_D for brand A. The retailer charges a regular price p_B for brand B, and charges a regular price p_A for brand A if it carries brand A. In the world with an infomediary, if a site is enrolled by the infomediary, the site can quote to the infomediary a referral price for a specific brand which can be different from the corresponding regular price on this brand. For notational convenience, we use p_{Si} to denote the price quote in addition to the corresponding regular price p_i, $i \in \{A, B, D\}$ (e.g., in addition to p_D, the direct site can quote a p_{SD} on brand A to be displayed in the infomediary site for the purpose of referral, etc.). All prices are set simultaneously. Figure 1 depicts the channel competition in the presence of the infomediary (suppose the retailer carries both brands A and B, and the infomediary enrolls both sites).

We assume a unit density of consumers in the market. Consumers have a unit demand for the product. The consumers' reservation value of the product is normalized to 1. Regarding both consumer brand preferences and searching behaviors, we assume that there are a total of six groups of consumers, as shown in Figure 2.

Regarding consumers' brand preferences, we assume that there are three types of buyers. First, there is a segment of retail shoppers who have no special brand preference and would like to buy the cheaper brand. We call these consumers *R-buyers* and assume that a proportion *R* of the whole consumer population is *R-buyers*; second, there is a segment of consumers who only buy brand B. We call these consumers *B-buyers* and assume that a proportion *B* of the whole consumer population is *B-buyers*; third, there is a segment of consumers who only buy brand A. We call these consumers *A-buyers* and assume that a proportion *A* of the whole consumer population is *A-buyers*. Therefore, *A + B + R = 1*.
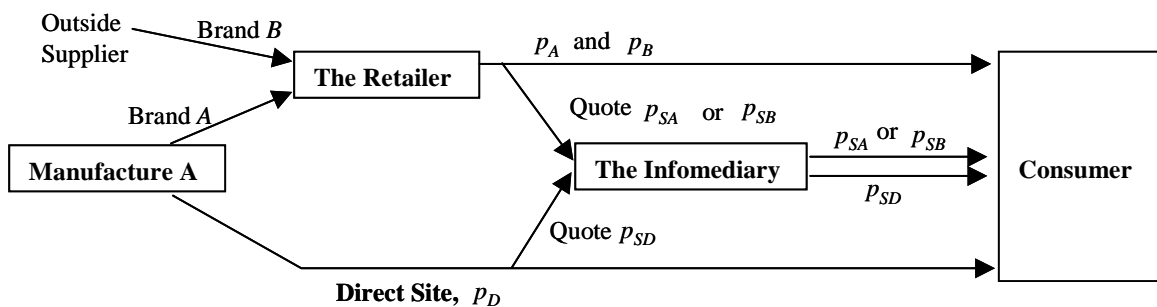

Figure 1. Multi-Brand, Cross-Channel Competition with the Infomediary

6 groups

buy cheaper
brand   *search*   *R-searcher ($R\alpha$)*

    R-buyer (R)   *not search*   *R-non-searcher ($R(1 - \alpha)$)*

                 search   *B-searcher ($B\alpha$)*

Consumers   *B-buyer (B)*

(1)   buy   *not search*   *B-non-searcher ($B(1 - \alpha)$)*

brand B

                 search   *A-searcher ($A\alpha$)*

    A-buyer (A)

buy   *not search*   *A-non-searcher ($A(1 - \alpha)$)*

brand A

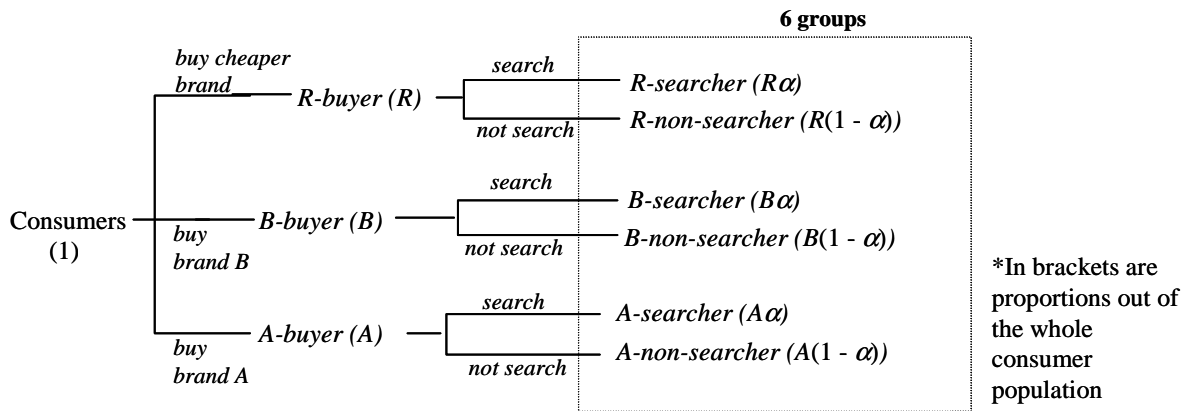*In brackets are proportions out of the whole consumer population

Figure 2. Consumer Segmentation Based on Brand Preferences and Searching Behaviors

Regarding consumers' searching behaviors, we assume that there are two types of consumers: searchers and non-searchers. We assume that for each segment of *i-buyers* ($i \in \{A, B, D\}$), a fraction α of them are searchers and we call them *i-searchers*; a fraction $1 - \alpha$ of them are non-searchers and we call them *i-non-searchers*. (For example, a fraction α of *B-buyers* are *B-searchers* and a fraction $1 - \alpha$ of *B-buyers* are *B-non-searchers*, etc.).

We assume that *i-searchers* ($i \in \{A, B, D\}$) have arbitrarily small search cost and can find any site (i.e., the direct site, the retailer site, or the infomediary site if there is one). Therefore, *A-searchers* (*B-searchers*) buy from the site with the cheapest offer on brand A (brand B). *R-searchers* buy from the site with the cheapest offer, regardless of which brand it is. In contrast, we assume that without the infomediary, *i-non-searchers* ($i \in \{A, B, D\}$) do not search and only visit one site. Therefore, they buy from the only site they visit. Specifically, we assume that *B-non-searchers* ($B(1 - \alpha)$) only visit the retailer site to buy brand B. *R-non-searchers* ($R(1 - \alpha)$) only visit the retailer site to buy the cheaper brand. This reflects the fact that online retailer sites are normally the places that can potentially let consumers choose among different brands. Finally, *A-non-searchers* ($A(1 - \alpha)$) only visit the direct site to buy brand A. This reflects the fact that the direct channels are often designed to facilitate the transaction for these brand-loyal consumers. To reflect the fact that the infomediary can reduce search cost, we assume that with the infomediary, in addition to the fraction α of *i-searchers*, another fraction β of *i-buyers*, who are *i-non-searchers*, can access the infomediary. In the rest of the paper, for convenience of expression, we denote $\alpha' = \alpha + \beta$.

It is worth remarking that under our assumptions, selling through the retailer does not generate more sales from brand-loyal consumers (i.e., *A-buyers*) for supplier A. Moreover, if the retailer carries brand A, the direct-versus-retailer channel competition also lowers the direct channel's profits from *A-buyers*. However, placing brand A on the retailer's shelf allows supplier A to expose its brand to those *R-non-searchers* on the retailer's site. Therefore, supplier A is willing to sell through the retailer only when there are enough *R-non-searchers* visiting the retailer's site. To ensure supplier A's incentive to sell through the retailer, we assume that R is reasonably large, i.e., $A < R < A/(1 - \alpha)$. , to facilitate the analysis.

We assume that the marginal costs for both brands are zero and that the retailer earns the same share of total profits generated from selling brand A and from selling brand B. Therefore, the retailer's objective is always to maximize the total revenue from selling all the brands it carries. This assumption simplifies the model by excluding the impact of wholesale competition on the brand assortment decision. We assume that as long as carrying brand A does not hurt the retailer's total expected profit (i.e., weakly increases its total expected profit), the retailer is willing to expand the brand assortment by carrying brand A. We first examine the world without an infomediary. We analyze both the situations where the retailer carries only brand B and where the retailer carries both of two brands. In both cases, the direct site and the retailer site simultaneously choose their prices and compete.

No Infomediary, the Retailer Carries Only Brand B

This case collapses to a standard model of price competition as in Varian (1980) and Narasimhan (1988). The direct site has a *captive segment* of A, since all of the *A-searchers* ($A\alpha$) and half of *A-non-searchers* will patronize and buy brand A from the direct

site. The retailer has a *captive segment* of $B + R(1 - \alpha)$, since all of the *B-buyers* (B) and *R-non-searchers* ($R(1 - \alpha)$ buy brand B from the retailer. Since the *R-searchers* ($R\alpha$) can patronize both the direct site and the retailer and buy from the site offering the lower price, there is a *switching segment* of $R\alpha$.

Following Varian and Narasimhan, it is easy to verify that this price competition does not have a pure-strategy equilibrium but only has a mixed-strategy equilibrium. The expected equilibrium profits for the direct site (denoted as Π_{N1}^{D}) and the retailer (denoted as Π_{N1}^{R}) are contingent on the value of *B*. Proposition 1 presents this result.

Proposition 1: *If* $B < A - R(1 - \alpha)$, $\Pi_{N1}^{D} = A$, $\Pi_{N1}^{R} = \dfrac{A}{A + R\alpha}(B + R)$. *If* $B \geq A - R(1 - \alpha)$ $\Pi_{N1}^{D} = \dfrac{\left[B + R(1-\alpha)\right]}{B + R} \cdot \left[A + R\alpha\right]$,

$\Pi_{N1}^{R} = B + R(1 - \alpha) \cdot$

Proposition 1 can be better explained by the notion of each site's *incentive to lower price*. Following Lal and Villas-Boas (1998), a site's incentive to lower price on brand *i* can be measured by

$$\frac{\textit{the size of switching segment for brand i}}{\textit{the size of a site's captive segment for brand i}}$$

The larger this measure, the more willing a site is to offer a lower price on brand ^{i} to attract the *switching segment* of consumers. For example, the direct site has a *captive segment* A on brand A, and the *captive segment* for the retailer is $B + R(1 - \alpha)$. The *switching segment* on brand B is $R\alpha$. Therefore, the direct site's *incentive to lower* p_D is $R\alpha/A$, and the retailer's *incentive to lower* p_B is $R\alpha/[B + R(1 - \alpha)]$. Note when $B \geq A - R(1 - \alpha)$, the direct site's *incentive to lower* p_D is (weakly) higher than the retailer's *incentive to lower* p_B Then in equilibrium, the average level of p_D is (weakly) lower than the average level of p_B, and the retailer's expected profit is equal to its guaranteed profit level $B + R(1 - \alpha)$ (i.e., as if it charges $p_B = 1$ and only sells to its *captive segment* $B + R(1 - \alpha)$; Narasimhan has the formal proof of this feature). Similarly, when $B < A - R(1 - \alpha)$, the retailer's *incentive to lower* p_B is higher than the direct site's *incentive to lower* p_D. In equilibrium, the average level of p_D is higher than the average level of p_B, and the direct site's expected profit is equal to its guaranteed profit level A.

No Infomediary, the Retailer Carries Both Brands

Next, consider the case that in addition to brand B, the retailer also carries brand A at no additional cost. Since there is no difference between the profit margins of these two brands, the retailer is willing to promote only one brand at most. The appendix shows that when the retailer carries both brands, it always charges $p_B = 1$ and $p_A \leq 1$ in any equilibrium. In other words, the retailer will only use brand A to compete with the direct site for those searching consumers. The intuition is that if the retailer promotes brand B, the retailer can only compete with the direct site for those *R-searchers*, whereas, by promoting brand A, the retailer can compete for both *A-searchers* and *R-searchers*. Therefore, the retailer engages in direct competition with the direct channel over brand A to attract more searchers.

Consider the competition between two sites over brand A. The retailer site has a *captive segment* of $R(1 - \alpha)$ on brand A. To see that, note that *R-non-searchers* ($R(1 - \alpha)$) buy brand A from the retailer rather than brand B because $p_A \leq p_B = 1$. The direct site has a *captive segment* of $A(1 - \alpha)$ on brand A. There is a *switching segment* of $(A + R)\alpha$ on brand A since all of *A-searchers* ($A\alpha$) and *R-searchers* ($R\alpha$) will choose between buying brand A from the direct site and buying brand A (since $p_A \leq p_B$) from the retailer site, depending on which site offers the lower price. Therefore, the mixed-strategy equilibrium for this case can also be derived following the standard approach used by Varian and by Narasimhan (see the appendix for the expression of the equilibrium). The expected profits for the direct site (denoted as Π_{N2}^{D}) and the retailer (denoted as Π_{N2}^{R}) are presented in Proposition 2. By comparing Π_{N2}^{R} with Π_{N1}^{R}, Proposition 2 also reveals how the retailer's willingness to carry brand A is contingent on the value of *B*.

Proposition 2: *(a)* In equilibrium, $\Pi_{N2}^R = B + R(1-\alpha)$, $\Pi_{N2}^D = \dfrac{R(1-\alpha)}{R+A\alpha} \cdot [A + R\alpha]$; *(b) When $B \geq (<) A - R(1 - \alpha)$, the retailer is (not) willing to carry brand A, i.e.,* $\Pi_{N2}^R \geq (<) \Pi_{N1}^R$.

As Proposition 2 reveals, the retailer is not willing to carry brand A when the size of *B-buyers* is small enough (i.e., $B < A - R(1 - \alpha)$). The reason is that, in this case, by carrying only brand B, the retailer can benefit from the *inter-brand* competition with the direct site. In such an *inter-brand* competition, the retailer's *incentive to lower p_B* is higher than the direct site's *incentive to lower p_D* and, therefore, the retailer will have a higher probability than the direct site to capture the *switching segment*. However, if the retailer carries two brands, due to the arrangement of the whole category, it can only engage in *intra-brand competition* (over brand A) with the direct site. In such competition, the retailer's *incentive to lower p_A* (which is $\dfrac{(A+R)\alpha}{R(1-\alpha)}$) is lower than the direct site's *incentive to lower p_D* (which is $\dfrac{(A+R)\alpha}{A(1-\alpha)}$), and then the retailer always has a lower probability to capture the *switching segment*.

With Infomediary

When there is an infomediary, we model a sequential bargaining process between the infomediary and the two sites. That is, before the two sites compete, the infomediary can negotiate with each site sequentially and determine with which site to negotiate first. In negotiating with each site, the infomediary makes a take-it-or-leave-it offer and the site decides whether or not to take it. If the retailer (the direct site) agrees to enroll, then the retailer (the direct site) has to pay the infomediary a per-referral-fee $c_R (c_D)$ for every consumer who visits the infomediary and may potentially buy from this site. It is worth noting that in equilibrium, the infomediary can rationally expect the exact proportion of consumers who could potentially buy from each site through the infomediary. Therefore, all the results remain the same if the infomediary implements a lump-sum fixed fee rather than per-referral-fee.

If a site quotes a price p_{Si} to the infomediary, the site will charge the corresponding regular price $p_i = 1$ since only non-searchers will buy at p_i and they will never defect.

The Retailer Carries Only Brand B

In this case, the infomediary cannot enroll both the retailer's site and the direct site. To see that, suppose that the infomediary enrolls both sites, exclusive of the per-referral-fee. Since $p_D = 1, p_B = 1, p_{SD} \leq 1, p_{SB} \leq 1$, the fraction α' of consumers who can access the infomediary site will buy through the infomediary. The direct site's *incentive to lower p_{SD}* is R/A (i.e., a *captive segment* of $A\alpha'$ and a *switching segment* of $R\alpha'$), and the retailer's *incentive to lower p_{SB}* is R/B (i.e., a *captive segment* of $B\alpha'$ and a *switching segment* of $R\alpha'$). If $B < A$, the direct site's *incentive to lower its price p_{SD}* is smaller and its expected profit from searching consumers is just $A\alpha'$. Therefore, the total profit for the direct site is still $A\alpha' + A(1 - \alpha') = A$, which is equal to the direct site's expected total profit if it is not enrolled. Since the direct site cannot improve its expected total profit, it has no incentive to be enrolled. Similarly, if $B > A$, the retailer's expected total profit is still $B + R(1 - \alpha')$ if it is enrolled, and, therefore, the retailer has no incentive to be enrolled.

Since it cannot happen that both sites are enrolled, if the infomediary negotiates with one site first and that site accepts the contract to enroll, the other site will decide not to enroll even if the infomediary can enroll it for free. However, if the first site rejects, there are two different subcases. First, the infomediary can still negotiate with and enroll the other side; second, the other site will never decide to enroll (even if it is free to enroll). Denote $\hat{\pi}_R$ ($\hat{\pi}_D$) as the expected profit for the retailer (the direct site), exclusive of the per-referral-fee, when only the retailer is enrolled; denote $\tilde{\pi}_R$ ($\tilde{\pi}_D$) as the expected profit for the retailer (the direct site), exclusive of the per-referral-fee, when only the direct site is enrolled (see the appendix for the expressions of $\hat{\pi}_R$, $\hat{\pi}_D$, $\tilde{\pi}_R$, $\tilde{\pi}_D$). Consider the first subcase. If $\hat{\pi}_R - \tilde{\pi}_R > (<) \hat{\pi}_D - \tilde{\pi}_D$, it is optimal for the infomediary to first negotiate with the retailer (the direct site), enroll it, and receive a total payment of $\hat{\pi}_R - \tilde{\pi}_R$ ($\hat{\pi}_D - \tilde{\pi}_D$). The negotiation with the other side will not happen and is just an off-equilibrium threat. *Such contract strategies have an important business implication: the infomediary can leverage the competitive threat of one channel to squeeze the total benefit of enrolling from the other channel.* Consider the

second subcase. If $\hat{\pi}_R - \Pi^R_{N1} > (<) \hat{\pi}_D - \Pi^D_{N1}$, it is optimal for the infomediary to first negotiate with the retailer (the direct site), enroll it, and receive a total payment of $\hat{\pi}_R - \Pi^R_{N1}$ ($\hat{\pi}_D - \Pi^D_{N1}$). The infomediary's equilibrium strategies are summarized by Proposition 3 (see the appendix for details). In Proposition 3, Π^D_{I1} (Π^R_{I1}) denotes the expected profit for the direct site (the retailer) in this case.

Proposition 3: *In equilibrium, suppose that $A\alpha' - R(1 - \alpha') > 0$, then*

(a) *If $A\alpha' - R(1 - \alpha') < B \le A (A < B < A/\alpha')$, the infomediary negotiates with the retailer first and enrolls only the retailer (the direct site). In equilibrium, c_R (c_D) is chosen such that it satisfies that $\Pi^R_{I1} = B + R(1 - \alpha')$ and $\Pi^D_{I1} = A$.*

(b) *If $B \le A\alpha' - R(1 - \alpha') (B \ge A/\alpha')$, the infomediary negotiates with the retailer (the direct site) first and enrolls only the retailer (the direct site). In equilibrium, c_R (c_D) is chosen such that it satisfies that $\Pi^R_{I1} = \Pi^R_{N1}$ and $\Pi^D_{I1} = \Pi^D_{N1}$.*

The Retailer Carries Both Brands

When the retailer carries both brands, it cannot happen that both the retailer and supplier A enroll with brand A. If so, the price competition will force both sites to engage in marginal-cost-pricing in quoting prices (i.e., exclusive of the per-referral-fee, $p_{SA} = p_{SD} = 0$), and both sites cannot improve their profitability by selling to searching buyers. This is the standard outcome of Bertrand competition.

However, it is possible that the two sites are both enrolled but quote prices on different brands to the infomediary, i.e., the direct site quotes p_{SD} on brand A and retailer quotes a p_{SB} on brand B. This can happen when B is sufficiently small so that the retailer's *incentive to lower p_{SB}* is larger than the direct site's *incentive to lower p_{SD}*. In this case, the purpose for the direct site to be enrolled by the infomediary is to use the quote price p_{SD} to attract those *A-searchers* as well as *R-searchers*, while the purpose for the retailer site to be enrolled is to use p_{SD} to attract only *R-searchers*. However, if B is not small enough, the retailer has no incentive to enroll with brand B since brand B is not sufficiently competitive to attract those *R-searchers*. Proposition 4 summarizes the equilibrium of the case when the retailer carries both brands.

Proposition 4: *There exists a $\hat{B} < A$ such that:*

(a) *If $B \ge \hat{B}$, the infomediary negotiates with the direct site first and enrolls only the direct site. In equilibrium, c_D is chosen such that it satisfies that $\Pi^R_{I2} = B + R(1 - \alpha')$, $\Pi^D_{I2} = A(1 - \alpha')$.*

(b) *If $B < \hat{B}$, either of the following two equilibrium cases may occur:*
   (b1) The infomediary negotiates with the retailer first and enrolls only the retailer with brand A.
   (b2) The infomediary negotiates with the direct site first and negotiates with the retailer second. The direct site is enrolled with brand A and the retailer is enrolled with brand B.

In either case, the per-referral-fee c_R and c_D (if applicable) are chosen such that it satisfies that $\Pi^R_{I2} = B + R(1 - \alpha')$ and $\Pi^D_{I2} = A(1 - \alpha')$.

The enrolling of two sites with different brands reflects the retailer's intention to differentiate itself in order to avoid direct price competition (Brynjolfsson et al. 2003). It also allows the infomediary to extract profits from both sites. However, the sequence of negotiation matters. The infomediary should negotiate with the direct site first and with the retailer second. If the direct site chooses not to enroll (in off-equilibrium), then the infomediary can enroll the retailer with brand A and the direct site suffers a loss. Therefore, by doing so, the infomediary can leverage the threat of enrolling the retailer with brand A to extract more profit from the direct site.

The comparison between the retailer's expected profits in Propositions 3 and 4 immediately concludes the retailer's willingness to carry brand A in presence of the infomediary. Proposition 5 illustrates this result.

Proposition 5: *Suppose that* $A\alpha' - R(1 - \alpha') > 0$.

(a) *In the presence of the infomediary, if* $B \geq (<) A\alpha' - R(1 - \alpha')$, *the retailer is (not) willing to carry brand A, i.e.,*
$$\Pi_{I2}^R \geq (<) \Pi_{I1}^R.$$

(b) *If* $\alpha' < A(1 - \alpha)/(A + R)$, *then for* $A\alpha' - R(1 - \alpha') \leq B < A - R(1 - \alpha)$, *the retailer is (not) willing to carry brand A in presence (absence) of the infomediary.*

Proposition 5 also characterizes the situation where the presence of infomediary can increase the possibility that the retailer carries brand A. Recall that Proposition 2 reveals that when $B < A - R(1 - \alpha)$, the retailer can benefit from *inter-brand competition* with the direct channel if there is no infomediary. However, with an infomediary, such a capability of the retailer is limited. Consider the case when the retailer only carries brand B. When $A\alpha' - R(1 - \alpha') \leq B < A - R(1 - \alpha)$ and only the direct channel is enrolled, the direct site's *incentive to lower p_{SD}* will be larger than the retailer's *incentive to lower p_B*. Therefore, the expected profit for the retailer cannot be more than its guaranteed profit level $B + R(1 - \alpha')$ if it only carries brand B. Note in equilibrium, even though it may be the case that the retailer (rather than the direct site) is enrolled or both channels are enrolled, the infomediary can still leverage the competitive threat from the direct site to squeeze profit from the retailer so that the retailer's expected profit, net of the total payment to the infomediary, is still $B + R(1 - \alpha')$.

Since $\alpha' = \alpha + \beta$, $\alpha' < A(1 - \alpha)/(A + B)$ is equivalent to $\beta < \dfrac{A}{A + R} - \dfrac{2A + R}{A + R}\alpha$. It implies that when either α or β becomes larger, the presence of infomedairy is less likely to enhance the opportunity that the retailer carries brand A. The intuition is that as α or β increases, more brand-loyal consumers of brand A will buy through the infomediary. Hence, it also becomes harder for the direct site to quote a competitive p_{SA} to discourage the retailer from promoting the other brand. The role of the infomediary as a weapon for price discrimination is thus undermined.

Supplier A's Dual-Channel Profitability

Note that in the world with infomediary and $\alpha' < A(1 - \alpha)/(A + R)$, $A\alpha' - R(1 - \alpha') \leq B < A - R(1 - \alpha)$, , due to the infomediary's profit squeezing, the direct site's expected profit is only $A(1 - \alpha')$, which is less than its expected profit without the infomediary. However, since the retailer will carry and promote brand A, supplier A can profit from selling to *R-non-searchers* who only buy from the retailer site. For example, if we assume that supplier A earns a share ρ of the total profit of selling brand A at the retailer site, then the total dual-channel profit for supplier A is $A(1 - \alpha') + \rho R(1 - \alpha')$. Since supplier A's expected profit without the infomediary is $\Pi_{N1}^D = A$ (when the retailer does not carry brand B and $A\alpha' - R(1 - \alpha') \leq B < A - R(1 - \alpha)$), if $\alpha' < \dfrac{\rho R}{A + \rho R}$, supplier A benefits by selling through both sites. That is, the infomediary allows supplier A to *profitably* extend the sales of brand A to the retailer site only when α', the proportion of consumers who use the infomediary, is not too high. If α' is too high (i.e., too many consumers can compare the prices from the two sites), the channel competition will be intensified too much and enable the infomediary to squeeze too much profit from the two sites.

Main Managerial Insights

In this section, we summarize the two key insights of our model which explain why the presence of an infomediary can increase the opportunity for the independent retailer to carry a certain brand even if the infomediary may actually intensify the competition between the retail channel and the brand supplier's direct channel.

First, the retailer may decline to carry brand A when it has a competitive substitute brand B to compete with supplier A's direct site. This reflects features of the multi-brand retailer's strategy of *category management*. In category management, which is based on the performance of the whole product line rather than single brand, the retailer may be cautious about cutting the price of a specific brand and intensify the intra-category brand competition (Basuroy et al. 2001). Also, in many cases, multi-brand retailers prefer to avoid head-to-head price competition with the supplier's direct channel over the same brand. For example, to penalize hotels who offer significant price cutting in their own sites, the online intermediary Expedia moves them to the bottom of the hotel list to decrease their attraction to the Expedia visitors (Mullaney and Grover 2003).

Second, the presence of the infomediary may decrease the opportunity for the retailer to benefit from the inter-brand competition with the supplier's direct channel and, therefore, increase the chance that the retailer carries brand A. If the infomediary allows the direct site to quote competitive prices, then the infomediary itself can also take advantage of this competitive threat to squeeze profit from the retailer. This profit squeezing in cross-channel competition decreases the retailer's incentive to engage in intensive inter-brand competition with the direct channel. Consequently, the retailer is less concerned about how to compete with the direct channel by heavily promoting a competing brand, and is more likely to expand its brand assortment by carrying brand A. Supplier A can also benefit by the expansion of its distribution channels.

Concluding Remarks

This paper complements existing literature on the Internet infomediary by considering its impact on direct-versus-retailer channel competition, and the multi-brand retailer's brand assortment decision. The important message conveyed is that the supplier can even rely on the competitive mechanism caused by the infomediary to motivate the independent retailer to carry its brand. Based on its strategic negotiation with different channels, the infomediary can decrease the chance that the retailer excludes the supplier's brand and uses another competitive substitute brand to compete with the supplier's direct channel. There are many promising extensions to remove the limitations of this model and supplement this study. First, we assume that the wholesale relationship between the supplier and the retailer is constant share-of-profit. Other more realistic contract mechanisms in the wholesale relationship, such as per unit wholesale price, can be considered. Second, the analysis can be extended to the scenario where the infomediary cannot discriminate between the direct channel and the independent retailer in terms of enrollment payment. In that case, the infomediary's profit squeezing capability is limited. Third, the analysis can also be extended to the case where the proportion of searchers is different across different consumer segments. Also, empirical study on the infomediary's contract arrangements with different channels is a worthwhile direction for future research.

References

Baye, M. R., and Morgan, J. "Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets," *American Economic Review* (91:3), 2001, pp. 454-474

Brynjolfsson, E., Dick, A. A., and Smith, M. D. "Search and Product Differentiation at an Internet Shopbot," Working Paper, Sloan School of Management, Massachusetts Institute of Technology, 2003.

Basuroy, S., Mantrala, M. K., and Walters, R. G. "The Impact of Category Management on Retailer prices and Performance: Theory and Evidence," *Journal of Marketing* (65), 2001, pp. 16-32

Chen, Y., Iyer, G., and Padmanabhan, V. "Referral Infomediaries," *Marketing Science* (21:4), 2002, pp. 412-434

Chiang, W. K., Chhajed, D., and Hess, J. D. "Direct Marketing, Indirect Profits: A Strategic Analysis of Dual-Channel Supply-Chain Design," *Management Science* (49:1), 2003, pp. 1-21

Ghose, A., Mukhopadhyay, T., and Rajan, U. "Strategic Benefits of Referral Services," Working Paper, Graduate School of Industrial Administration, Carnegie Mellon University, 2003.

Iyer, G., and Pazgal, A. "Internet Shopping Agents: Virtual Co-location and Competition," *Marketing Science* (22:1), 2002, pp. 85-97

Lal, R., and Villas-Boas, J. M., "Price Promotions and Trade Deals with Multi-product Retailers," *Management Science* (44:7), 1998, pp. 935-949

Lee, Y., Lee, Z., and Larsen, K. "Coping with Internet Channel Conflict," *Communications of the ACM* (46:7), 2003, pp. 137-142

Liu, B., and Yee, A. "Hoteliers Try to Evict an Unwelcome Visitor," *Financial Times*, April 19, 2004, p. 6.

Mullaney, T. J., and Grover R. "The Web Mogul," *BusinessWeek*, October 13, 2003 (available online at **http://www. businessweek.com/magazine/content/03_41/b3853001_mz001.htm**).

Narasimhan, C. "Competitive Promotional Strategies," *Journal of Business* (61:4), 1988, pp. 427-449

Salkever, A. "These Sites Are a Shopper's Dream," *BusinessWeek*, November 25, 2003 (available online at **http://www. businessweek.com/technology/content/nov2003/tc20031125_1528_tc136.htm**).

Varian, R. H. "A Model of Sales," *American Economic Review* (70:4), 1980, pp. 651-659

Wilson, R. "Manufacturer's Dilemma: To Sell or Not to Sell Directly," *Web Commerce Today* (10), May 15, 1998 (available online at **http://www.wilsonweb.com/wct1/980515dilemma.htm**).

Appendix

Proposition 1: The mixed-strategy equilibrium can be derived following the approach in Varian (1988) and Narasimhan (1988). Denote $F_B(x) = \Pr(p_B \leq x)$, $F_D(x) = \Pr(p_D \leq x)$. In equilibrium, the direct site (the retailer) randomly charges p_D (p_B) over the same interval $[\underline{p}_S, 1]$ with a distribution function $F_D(x)$ $(F_B(x))$. If $B \geq A - R(1-\alpha)$, $\underline{p}_S = \dfrac{B + R(1-\alpha)}{B+R}$,

$$F_D(x) = \frac{R\alpha - (1-x)(B+R)}{xR\alpha}, F_B(x) = \left[x - \frac{B+R(1-\alpha)}{B+R}\right]\left[\frac{A+R\alpha}{xR\alpha}\right]; \quad \text{if} \quad B < A - R(1-\alpha), \quad \underline{p}_S = \frac{B+R(1-\alpha)}{B+R},$$

$$F_D(x) = \left[x - \frac{A}{A+R\alpha}\right]\left(\frac{B+R}{xR\alpha}\right), F_B(x) = \frac{xR\alpha - (1-x)A}{xR\alpha}.$$ The expected profits are in Proposition 1.

Proposition 2: If the retailer only promotes brand A (brand B) at a price $p < p_D$, it makes a profit of $p[R + A\alpha] + B$ (a profit of $p(B + R)$). Therefore, promoting brand B is always the retailer's best-response strategy. Denote $F_A(x) = \Pr(p_A \leq x)$. In equilibrium, $p_B = 1$, the direct site (the retailer) randomly charges $p_D(p_A)$ over the same interval $[\underline{p}_S, 1]$ with a distribution function $F_D(x)$ $(F_A(x))$. Since $R > A$, $\underline{p}_S = \dfrac{R(1-\alpha)}{A\alpha + R}$, $F_D(x) = \left[x - \dfrac{R(1-\alpha)}{A\alpha + R}\right]\left[\dfrac{A\alpha + R}{x(A+R)\alpha}\right]$,

$$F_A(x) = \frac{x(A+R)\alpha - (1-x)R(1-\alpha)}{x(A+R)\alpha}.$$ The expected profits are in Proposition 2.

Proposition 3: Denote $F_{SB}(x) = \Pr(p_{SB} \leq x)$, $F_{SD}(x) = \Pr(p_{SD} \leq x)$.

Table A1. Equilibrium Contingencies of Proposition 3

	$B \leq A\alpha' - R(1-\alpha')$	$A\alpha' - R(1-\alpha') < B < A$	$A < B < A/\alpha'$	$B \geq A/\alpha'$
When only the retailer is enrolled	$F_{SB}(x) = \dfrac{xR\alpha' - (1-x)A}{xR\alpha'}$, $F_D(x) = \left[x - \dfrac{A}{A+R\alpha'}\right]\left(\dfrac{B+R}{xR}\right)$, $p_B = 1$ $\hat{\pi}_D = A$, $\hat{\pi}_R = (B+R)(1-\alpha') + \left[\dfrac{A}{A+R\alpha'}\right](B+R)\alpha'$			N/A
When only the direct site is enrolled	N/A	$F_{SD}(x) = \dfrac{R\alpha' - (1-x)(B+R)}{xR\alpha'}$, $F_B(x) = \left[x - \dfrac{B+R(1-\alpha')}{B+R}\right]\left[\dfrac{A+R}{xR}\right]$, $p_D = 1$, $\tilde{\pi}_R = (B+R)(1-\alpha')$, $\tilde{\pi}_D = A(1-\alpha') + \left[\dfrac{B+R(1-\alpha')}{B+R}\right](A+R)\alpha'$		
The optimal per-referral-fee	$c_R = \dfrac{\hat{\pi}_R - \Pi_{N1}^R}{(B+R)\alpha'}$	$c_R = \dfrac{\hat{\pi}_R - \tilde{\pi}_R}{(B+R)\alpha'}$ (offered to the retailer only)	$c_D = \dfrac{\hat{\pi}_D - \tilde{\pi}_D}{(A+R)\alpha'}$ (offered to the direct site only)	$c_D = \dfrac{\hat{\pi}_D - \Pi_{N1}^D}{(A+R)\alpha'}$

When $B \leq A\alpha' - R(1 - \alpha')$, the direct site *never* has the incentive to be enrolled but the retailer *always* has the incentive to enroll. It is because the retailer's *incentive to lower* p_B is so large that even when only the direct site is enrolled, the direct site's expected profit is still A, which is equal to Π_{N1}^D. The optimal contract strategy for the infomediary is to first (and also only) negotiate with

the retailer and charge $c_R = \dfrac{\hat{\pi}_R - \Pi_{N1}^R}{(B+R)\alpha'}$ to enroll it. The infomediary obtains a total payment of $\hat{\pi}_R - \Pi_{N1}^R$ (since a total

proportion $(B + R)\alpha'$ of consumers visit the infomediary and can potentially buy from the retailer's site). Similarly, when $B > A\alpha' < R(1 - \alpha')$, A, the retailer *never* has the incentive to be enrolled, and the infomediary only enrolls the direct site with

$$c_D = \frac{\hat{\pi}_D - \Pi_{N1}^D}{(A+R)\alpha'}.$$

When $A\alpha' - R(1 - \alpha') < B \leq A$, the retailer still *always* has the incentive to be enrolled, but the direct site has the incentive to be enrolled *only when* the retailer is not enrolled. It is optimal for the infomediary to negotiate with the retailer first. If (off the equilibrium) the retailer does not accept the offer, later the direct site will be enrolled and the retailer's expected profit would be

$\tilde{\pi}_R$. Therefore the infomediary can charge a per-referral-fee $c_R = \dfrac{\hat{\pi}_R - \tilde{\pi}_R}{(B+R)\alpha'}$ to enroll the retailer. In equilibrium, the

negotiation with the direct site will not happen and is just an off-equilibrium threat. If the infomediary negotiates first with the direct site and second with the retailer, the direct site will not accept any contract due to the potential negotiation threat from the

retailer. Then the infomediary can only enroll the retailer and charge $c_R = \dfrac{\hat{\pi}_R - \Pi_{N1}^R}{(B+R)\alpha'}$. Therefore, the infomediary should

negotiate with the retailer first. Similarly, when $A < B < A/\alpha'$, the direct site *always* has the incentive to be enrolled but the retailer has the incentive to be enrolled *only when* the direct site is not enrolled. The infomediary negotiates first with the direct site and

charges a per-referral-fee $c_D = \dfrac{\hat{\pi}_D - \Pi_{N1}^D}{(A+R)\alpha'}$. In equilibrium, only the direct site enrolls.

Proposition 4: Consider the case when both sites are enrolled, exclusive of any payment to the infomediary. Note the direct site (the retailer) will only quote p_{SD} (p_{SB}) on brand A (brand B), and in equilibrium $p_B = 1$ and $p_D = 1$. The retailer randomizes p_A over an interval $\{k, 1\}$ to compete for *A-searchers* and randomizes p_{SB} over an interval $[\underline{p}_S, k]$ to compete for *R-searchers*, where k and $\underline{p}_S$ are to be determined. The direct site randomizes p_{SD} over an interval $[\underline{p}_S, 1]$ to compete for *A-searchers* as well as *R-searchers*. This case is identical to the model in Chen et al. (2002) where a firm randomizes two prices to compete with the other firm randomizing only one price. Since the direct site's *incentive to lower* p_{SD} is larger than the retailer's *incentive to lower* p_A and smaller than the retailer's *incentive to lower* p_{SB} (otherwise, the retailer has no incentive to be enrolled with brand B), the expected profit that the direct site can earn from the proportion $(A + R)\alpha'$ of consumers who visit the infomediary is $A \alpha' k$.

Denote $\theta = \text{Prob}(p_{sd} \geq k)$. Then k, $\underline{p}_S$, θ can be determined by the following equations:

$$R(1 - \alpha') = k\left[A\alpha' + R(1 - \alpha')\right]\theta + (1 - \theta)kR(1 - \alpha') \tag{1}$$

$$\theta(B + R)\alpha'k + (1 - \theta)B\alpha'k = \underline{p}_S \cdot (B + R)\alpha' \tag{2}$$

$$\underline{p}_S = \frac{Ak}{A + R} \tag{3}$$

Eq. (1) implies that the retailer is indifferent between charging any $p_A \in [k, 1]$. Eq. (2) implies that the retailer is indifferent between charging any $p_{SB} \in [\underline{p}_S, k]$. Eq. (2) implies that $\underline{p}_S$ is the lowest value the direct site is willing to charge for p_{SD}.

Therefore, $\theta = \dfrac{A-B}{A+R}$ and $k = \dfrac{R(1-\alpha')}{R(1-\alpha')+A\alpha'\theta}$. To guarantee that, in this case, the retailer has the incentive to be enrolled

with brand B, we should have $\underline{p}_S > \dfrac{B}{B+R}$, where $\dfrac{B}{B+R}$ is the lowest value of p_{SD} that the retailer is willing to charge if it is

enrolled with brand B. Trivial algebra shows that $\underline{p}_S - \dfrac{B}{B+R}$ is negative at $B = A$, positive at $B = 0$, and monotonically

decreasing in B for $B \in [0, A]$. Therefore, there exists a positive $\hat{B} < A$ such that for $B \leq \hat{B}$, when the direct site is enrolled with brand A, the retailer has the incentive to be enrolled with brand B. In this mixed-strategy equilibrium, the retailer's expected profit

is $\breve{\pi}_R = (R+B)(1-\alpha') + \dfrac{Ak}{A+R} \cdot (B+R)\alpha'$; the direct site's expected profit is $\breve{\pi}_D = A(1-\alpha') + A\alpha'k$. Denote

$F_{SB}(x) = \Pr(p_{SB} \leq x)$ for $x \in \left[\underline{p}_S, k\right]$, $F_{SD}(x) = \Pr(p_{SD} \leq x)$ for $x \in \left[\underline{p}_S, 1\right]$, $F_A(x) = \Pr(p_A \leq x)$ for $x \in [k, 1]$.

Then the equilibrium price distribution functions are $F_{SD}(x) = 1 - \dfrac{(1-x)R(1-\alpha')}{A\alpha'x}$ for $x \in [k, 1]$ and

$F_{SD}(x) = \dfrac{(x - \underline{p}_S)(B+R)}{xR}$ for $x \in \left[\underline{p}_S, k\right)$. $F_{SB}(x) = 1 - \dfrac{A(k-x)}{xR}$. $F_A(x) = 1 - \dfrac{k}{x}$.

When $B > \hat{B}$, the retailer has no incentive to enroll with brand B. Either site is willing to enroll with brand A if the other site is not enrolled. In this case, it is optimal for the infomediary to negotiate with and enroll the direct site. The infomediary can, therefore, earn $\hat{\pi}_D - \tilde{\pi}_D$. Otherwise if the infomediary chooses to enroll the retailer site, it can only earn $\hat{\pi}_R - \tilde{\pi}_R < \hat{\pi}_D - \tilde{\pi}_D$.
The final expected profits (net of referral payment) are as presented in Proposition 4 (a). When $B \leq \hat{B}$, the infomediary has two potential strategies: (1) only enroll the retailer with brand A (since the direct site will not choose to enroll if the retailer does); (2) enroll both sites with different brands. For (1), the infomediary has to negotiate with the retailer first, charge a

$c_R = \dfrac{\hat{\pi}_R - \tilde{\pi}_R}{(B+R)\alpha'}$ and receive a total payment of $\hat{\pi}_R - \tilde{\pi}_R$. For (2), the infomediary has to negotiate with the direct site first and

with the retailer second. It charges a $c_D = \dfrac{\breve{\pi}_D - \hat{\pi}_D}{(A+R)\alpha'}$ to the direct site and a $c_R = \dfrac{\breve{\pi}_R - \hat{\pi}_R}{(B+R)\alpha'}$ to the retailer. In total, the

infomediary receives a payment of $(\breve{\pi}_D - \hat{\pi}_D) + (\breve{\pi}_R - \hat{\pi}_R)$. Therefore, the infomediary will choose strategy (a) (strategy (b))

if $\hat{\pi}_R - \tilde{\pi}_R > (<)(\breve{\pi}_D - \hat{\pi}_D) + (\breve{\pi}_R - \hat{\pi}_R)$. However, in either case, it satisfies that $\Pi_{I2}^R = \tilde{\pi}_R = (A+R)(1-\alpha') + B$ and

$\Pi_{I2}^D = \hat{\pi}_D = A(1-\alpha')$ since the infomediary always extracts all the benefits of being enrolled.