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One of the more intriguing developments in e-commerce has been the emergence of Internet referral services, or "infomediaries," across a broad range of industries. Services such as Autobytel.com and Carpoint.com in the automobile industry, Avviva.com in real estate, and Healthcareadvocates.com in medicine allow consumers to obtain credible price quotes from enrolled retailers as well as product prices, reviews, and specifications. Internet referral services also direct consumer traffic to their member retailers.

The emergence of these new virtual agents was predicted to create large-scale disintermediation in traditional wholesale and retail channels of distribution. However, it seems that the real effect of these new agents has been in more mediation and reintermediation of traditional channels of distribution (i.e., the addition of new agents and institutions).

In this report, authors Chen, Iyer, and Padmanabhan isolate the key economic properties of "infomediaries" and examine their impact on consumer behavior and hence retail competition.

Their game-theoretic analysis develops the implications of these two economic properties for retail competition, individual retailer performance, contractual mechanisms, and overall channel coordination. They find that these new institutions significantly impact the behavior and performance of retail markets, as follows.

A fundamental insight is that the referral infomediary endows a retailer with a powerful new mechanism for price discrimination between consumers who come through the service and those who come through the physical store. The economic benefit of price discrimination impacts retailer strategies in a very significant manner and results in a major shift in the reallocation of retail dollars across retailers in the market.

However, the benefits of price discrimination are strictly contingent on the infomediary's distribution strategy. It is optimal for the infomediary to adopt a strategy of exclusive distribution in a given market. Any other choice eliminates the price discrimination benefit to a retailer and consequently their willingness to pay for the infomediary's service.

In other words, the value proposition of an infomediary that relies purely on empowering a retailer's price-discrimination capabilities is contingent on the reach of the Internet. The increasing reach of the Internet translates to a strict decrease in the economic benefit of the infomediary for the retailer. Consequently, it is in

the infomediary's interest to invest in complementary services. The growing reach of the Web is a greater threat to their existence than to the existing players in the distribution channel.

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Introduction

The exponential growth of the Internet is an important business development of the last decade.[1] The growth of e-commerce has been accompanied by changes in the traditional ways of doing business in several industries. The emergence and growth of so-called "infomediaries" (or Internet referral services) such as Autobytel.com and Carpoint.com in the automobile industry, Avviva.com in real estate, Austinlrs.com in legal services, and Healthcareadvocates.com in medicine evidence the impact of these institutions on the functioning of conventional markets.

The performance of these infomediaries and their impact on the traditional retail marketplace have been closely watched in the automobile industry. Infomediaries such as Autobytel, Autovantage, and Carpoint provide consumers with information on invoice prices, specifications, reviews, and the opportunity to get a price quote from a local retailer who is enrolled with the service. Third-party referral infomediaries are affecting the way consumers shop for and buy their cars. Forrester Research reports that more than two million households used these Internet companies to research car purchases and estimates that 50 percent of new car buyers will research purchases on-line in the next five years. A recent *Consumer Reports* survey (*Wall Street Journal*, March 17, 2000) indicates that consumer experience with these infomediaries has been positive and that 60 percent of those who used this service to generate a price quote will go back to them in the future. In fact, the National Automobile Dealers Association (NADA), after fighting with these independent Internet services for several years, has finally decided to launch its own car-shopping website (*Wall Street Journal*, March 16, 2000). A consortium of European car makers (DaimlerChrysler, Ford, GM, PSA/Peugeot-Citroen, among others) are creating their own multi-brand online referral service (*Automotive News Europe*, April 9, 2001).

The conventional wisdom on these infomediaries is that they are valuable to consumers who can use these services to research car prices and get binding price quotes from retailers. Less clear is the role of these intermediaries for the retailer and manufacturer and for retail competition. A recent survey by J. D. Power found that 48 percent of the retailers surveyed perceived Internet referral services to be a threat to the existing system. Automakers' concern about the role these independent intermediaries play in the channel is reflected in their attempts to start rival referral services. At the very least, these reports indicate a growing consensus that referral infomediaries are likely to have an economic impact on retail markets. The analysis presented in this paper is aimed at contributing to an understanding of this phenomenon and its effect on retail markets.

A Brief Overview of the Model, Results, and Intuition

We develop a model of distribution channel institutions and interactions that captures what we believe are the two key economic characteristics of a referral infomediary. From the downstream (i.e., consumer) perspective, a referral infomediary performs the function of *price discovery*. This is the notion that a consumer who uses the service can get a credible retail price quote prior to purchase. From the upstream (i.e., retailer, manufacturer) perspective, a referral service endows the selling institution with a *price discrimination mechanism*. The retailer now has the option to set different prices for consumers who come to them through the service and those who walk into the retail store.

Our model consists of a referral infomediary and a market with two retailers who compete in price. The market is comprised of three segments: a segment loyal to each retailer and a comparison shopping segment that shops on the basis of lowest price. The segment of loyal consumers for a retailer can be thought of as having negligible transaction costs of travel and price discovery at that retailer, but having prohibitively high costs at the competing retailer. The comparison shopping segment has negligible transaction costs of considering both retailers before purchase.

The referral infomediary is modeled as an independent entity that reaches some proportion of the total consumer population (a function of the reach of the Internet in this market). The consequences of the two key economic characteristics of the infomediary (i.e., price discovery for consumers and price discrimination for retailer) are most powerfully illustrated when only one of the two retailers is enrolled with the referral institution. The enrolled retailer now has the ability to offer two prices—a referral price to consumers who come through the referral service and a brick-and-mortar retail price to consumers who come to the store. In contrast, the other retailer can only offer a single store price. This endogenously changes the behavior of consumers who use the institution. Consumers who would have shopped at the enrolled retailer in the absence of the infomediary can now choose from the lower of the referral price and the store price at that retailer. Consumers who would have shopped at the non-enrolled retailer in the absence of the infomediary will now be able to choose from the lower of that retailer's store price and the referral price. The comparison shoppers who originally searched both the stores will now be able to choose from the lowest of the two store prices plus the referral price. Obviously, the behavior of consumers who do not use the infomediary remains unchanged.

Formal game theoretic analysis of the price discovery and price discrimination effects of a referral infomediary provide several important implications. We outline the key results and the intuition below.

Retail Prices

On average, prices quoted to consumers over the Web will be lower than prices quoted in the retail outlet at the enrolled retailer. The reason is that the retailer uses the on-line referral price to entice the comparison shoppers as well as the loyal consumers of the non-enrolled retailer. The use of the on-line mechanism for pricing allows the enrolled retailer to quote higher prices in the retail outlet. In contrast, the prices quoted by the non-enrolled retailer at the retail outlet will be lower than what the retailer would have charged in a world without a referral service.

Retailer Profit

The profits of the enrolled retailer are in the form of an inverted U with respect to the reach of the Internet (i.e., the reach of the infomediary). In other words, the profits to the enrolled retailer first increase, then peak, and finally decrease with the reach of the infomediary among the population of consumers. The intuition for this result stems from the impact of the reach of the Web/infomediary on three effects that govern the enrolled retailer's profits.

1. The first is the so-called *demand effect* of the infomediary on the retailer's profit. This is the ability that the infomediary provides the enrolled retailer to reach a set of consumers who were previously inaccessible to the retailer (namely, the other retailer's loyal consumers). Clearly, the positive impact of the demand effect for the enrolled retailer increases unambiguously with the reach of the infomediary.

2. The second is the *competitive effect*. The fact that the infomediary can poach on the other retailer's loyal consumers is not lost on the non-enrolled retailer. The obvious consequence is that the non-enrolled retailer responds by competing more aggressively on price in order to protect its base of consumers. This behavior gets more aggressive as the reach of the infomediary increases. Hence, the negative impact of the competitive effect increases with the reach of the infomediary.

3. The third and final impact of the infomediary on the enrolled retailer is from the *price discrimination effect*. The enrolled retailer can use the online price quote mechanism to discriminate between users and non-users of the referral service by charging them different prices and thereby improve the ability to extract consumer surplus. This impact is always positive on the profit of the enrolled retailer. However, the magnitude of this impact depends on the relative sizes of the user and non-user segments of the referral service. It reaches its maximum when the sizes of the segments are relatively close.

The implication from aggregating these three effects is that when the reach of the infomediary is not too large, the positive impact of the demand effect and the price discrimination effect dominate the negative impact of the competitive effect. However, as the reach of the infomediary increases beyond a critical threshold, the benefits of the price discrimination effect diminish and the retail competition becomes so intense that the profit of the enrolled retailer decreases with the increasing reach of the Internet.

Infomediary's Distribution Strategy

The optimal strategy for the infomediary is to pursue exclusivity in distribution. In our model, this implies that the infomediary allows only one of the two retailers to enroll. The rationale is best understood by considering what happens when the infomediary allows both retailers to enroll. This implies that users of the referral service get price quotes from both retailers. This drives the quoted prices over the Web down and retailers' profits as well. In fact, once either of the retailers enrolls with the infomediary, the other retailer is strictly better by staying out (even if the infomediary allows them to enroll for free).

The Impact of Increasing Reach of the Web among Consumers

The increasing reach of the Web is a threat to the existence of a pure referral service. The intuition is that an increase in the reach of the Web implies that the enrolled retailer can poach a larger and larger proportion of the other retailer's consumers. This intensifies the price competition among the retailers.

The rest of the paper is organized as follows. The next sections briefly review related research, present the basic model, derive the effect of the infomediary for retailer decision making and retail competition, and examine the contracting strategies of the infomediary. The final section concludes with a summary and directions for future research.

Related Research

Recently, Scott Morton, Zettelmeyer, and Silva-Risso (2001) have used transaction data obtained from Autobytel to compare online prices to retailer showroom prices and find that on average customers with an Autobytel referral pay 2 percent less for their cars. They attribute this result to Autobytel's selection of low-cost retailers, to the bargaining power of the referral service, and to the lower costs of serving an online customer. Our analysis of the referral infomediary as a price discrimination mechanism provides a different explanation for why Internet referral prices can be lower than the prices offered to consumers who do not use these services.

Other papers have also empirically investigated the impact of the Internet on prices and on market behavior (Brown and Goolsbee 2002; Brynjolfsson and Smith 2000) and have shown that while the Internet does lead to lower average online prices, it does not lead to a fully frictionless market implying zero economic profits for firms. A paper by Lal and Sarvary (1999) also makes similar arguments for non-search goods. Our paper shows another important context for this view: the context of an Internet institution acting to provide a price discrimination and demand re-allocation mechanism. While the referral infomediary might imply lower Internet prices, it does not mean zero profits for the competing retailers.

Our paper also adds to the emerging research on Internet institutions. For example, Iyer and Pazgal (2002) analyze the impact of Internet comparison shopping agents on retail competition and show why some online retailers might join a shopping agent despite the fact that this institution allows costless search among all member retailers. While the infomediary does reduce search costs, it also distinguishes between online and offline consumers and thus allows a retailer to price-discriminate between these two groups. It is this second key feature that we address here.

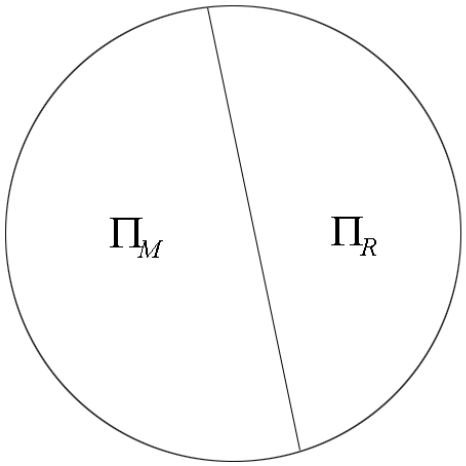
The Model

We first discuss the specifics of the market in a world without Internet referral infomediaries.

The Pre-Internet Channel

We consider a setting wherein a manufacturer, *M*, markets to consumers using two competing retailers (R_i, i = 1, 2) who compete on prices. At an aggregate level, the revenues of the channel can be represented as $\Pi = \Pi_M + \Pi_R = \Pi_M + \pi^{R1} + \pi^{R2}$. Podolny, Shepard, and Saloner (2001) advance the concept of PIE or potential industry earnings. We adapt this concept to our setting to refer to the earnings of a manufacturer's channel. In other words, Π is the total channel earnings that need to be divided up between the institutions in the channel. Figure 1 represents this pictorially.

Figure 1. Total Channel Earnings



We focus on retail competition. The manufacturer's wholesale price is assumed to be exogenously determined (e.g., through competition among manufacturers). We assume that the retailers are identical in terms of selling costs and set these costs at zero. This allows us to develop the demand-side implications of the Internet institutions on retail competition and channel performance.

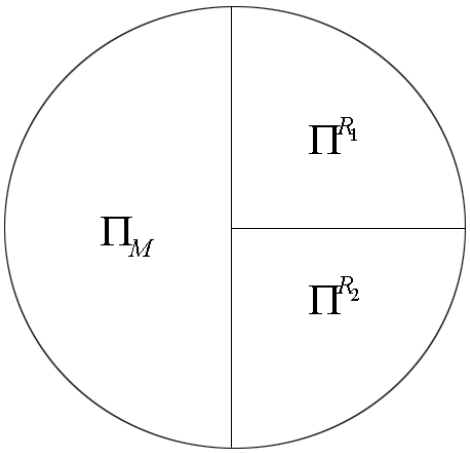
The market consists of a unit mass of consumers. Consumers buy at most one unit of the product and have identical reservation prices which can be normalized to one without any loss of generality.[2]

However, consumers are heterogeneous in terms of their transaction costs of shopping at a retailer. These costs include the cost of price discovery as well as any travel costs that are incurred for buying the product at a retailer. A proportion, a, of consumers have zero transaction cost of considering both retailers before making the buying decision. We will call these consumers "comparison shoppers" in the paper.

Of the remaining $1 - a$ consumers, a segment of them with a size, b_1, incur zero transaction cost of considering retailer 1 (R_1), but a prohibitively high cost of considering retailer 2 (R_2). Consequently, they only shop at R_1 in the absence of an Internet referral infomediary. In the rest of the paper we will label this segment of consumers as R_1-shoppers. The remaining segment of size, b_2, are R_2-shoppers. They have zero cost of considering R_2, but have a prohibitively high cost for R_1. We assume that $b_1 = b_2 = b = \frac{1}{2}(1-a)$.[3]

This model of consumer behavior and retail competition corresponds to Varian (1980) and Narasimhan (1988). Hence, their results hold. The central result is that there is no pure strategy equilibrium. In other words, retailers will find it optimal to fluctuate their prices. This strategy induces the comparison shoppers to buy at their outlet while minimizing the loss of profits from the loyal consumers. The interpretation of these fluctuating prices is that retailers indulge in price promotions or sales. The key point is that the price reductions appear random in the sense that knowing a sale occurs today with a particular discount is not diagnostic about when the next sale (and the corresponding discount) will occur. In technical terms, this is referred to as a mixed strategy equilibrium. Let $H_1(p)$ = Probability $(p_1 \geq p)$ and $H_2(p)$ = Probability $(p_2 \geq p)$, where p_1 and p_2 are the prices offered by R_1 and R_2 respectively. Here, H_1 and H_2 refer to the probability distributions that govern each retailer's choice of retail price. The equilibrium price distributions are $H_i(p) = \frac{b}{a}(\frac{1}{p} - 1)$, where $(\frac{b}{b+a} < p < 1)$. Firms' equilibrium profits are $\pi_i = b$ and firms' average equilibrium prices are $E(p_i) = \frac{b}{a}\ln(\frac{b+a}{b})$. Figure 2 captures pictorially the implications of this model for the partitioning of the total channel earnings (i.e., Π). Since retailers have been assumed identical they have equal profits. The partitioning of earnings between the manufacturer and retailers is governed by the actual value of the key parameters of the model.

Figure 2. The Pre-Internet Channel



The Impact of the Internet: The Case of the Infomediary

Suppose now that a referral infomediary emerges. A recent J. D. Power study (April 2000) reveals that nearly 5 percent of all new car buyers now use an online referral infomediary. Clearly, this number will change over time as the reach and familiarity of the infomediary evolves. To model this, we assume that a fraction, k (where $0 < k < 1$), of all consumers use the referral infomediary. Here, k is the reach of the referral institution. We assume that this reach is identical across all consumer segments.[4] We assume that reach of the institution translates to use of the infomediary service. In other words, the proportion k of referral service users is equivalent to the reach of the Internet among the population of consumers. Modifying this assumption to reflect variations in usage of the Web relative to usage of the referral service is easy and we do not pursue this in the paper.

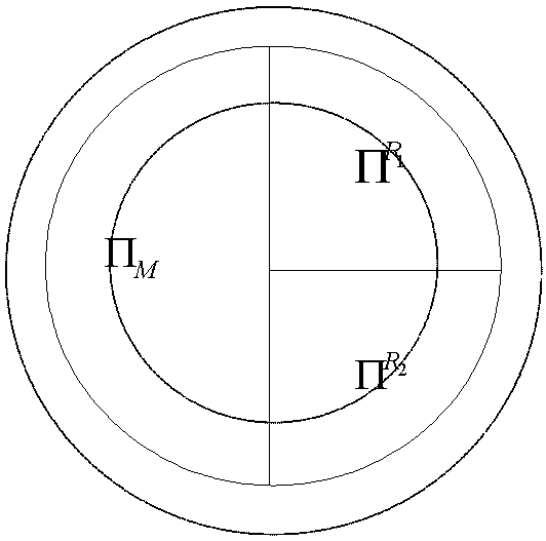
The emergence of the referral infomediary could change total channel earning or Π in a variety of ways (see Figure 3).

- The first possibility is that it could lead to an enlarging of the total channel earnings (i.e., the pie gets bigger). This could happen due to demand-side effects or supply-side effects or both. For instance, it could be argued that the emergence of the Internet institutions could allow demand from new segments to be articulated and satisfied. This is one of the points being made for intermediaries such as Priceline.com (e.g., Dolan 2000). The notion is that the ability to bid for a route (as opposed to a specific flight by a specific airline) allows demand to be articulated by a segment (route-sensitive as opposed to brand-sensitive) that could not be catered to earlier. Other things being equal, this translates to higher demand and hence bigger channel earnings.

- In contrast, the supply-side argument posits that the emergence of Internet institutions makes the channel more efficient (eliminating waste) and hence lowers the cost of doing business. This is one of the points being made for intermediaries such as Freemarkets.com (e.g., Rangan 1998). Other things

being equal, the reduction in the costs of doing business implies bigger channel earnings. The second possibility is that it could lead to a reduction in channel earnings. This could happen if one of the consequences of the Internet institutions is an increase in price transparency and a consequent increase in price competition. Other things being equal, this results in a net reduction of the total channel earnings. For instance, the drop in profitability of online brokerage firms is attributed to this effect of the Internet.

Figure 3. The Impact of the Infomediary

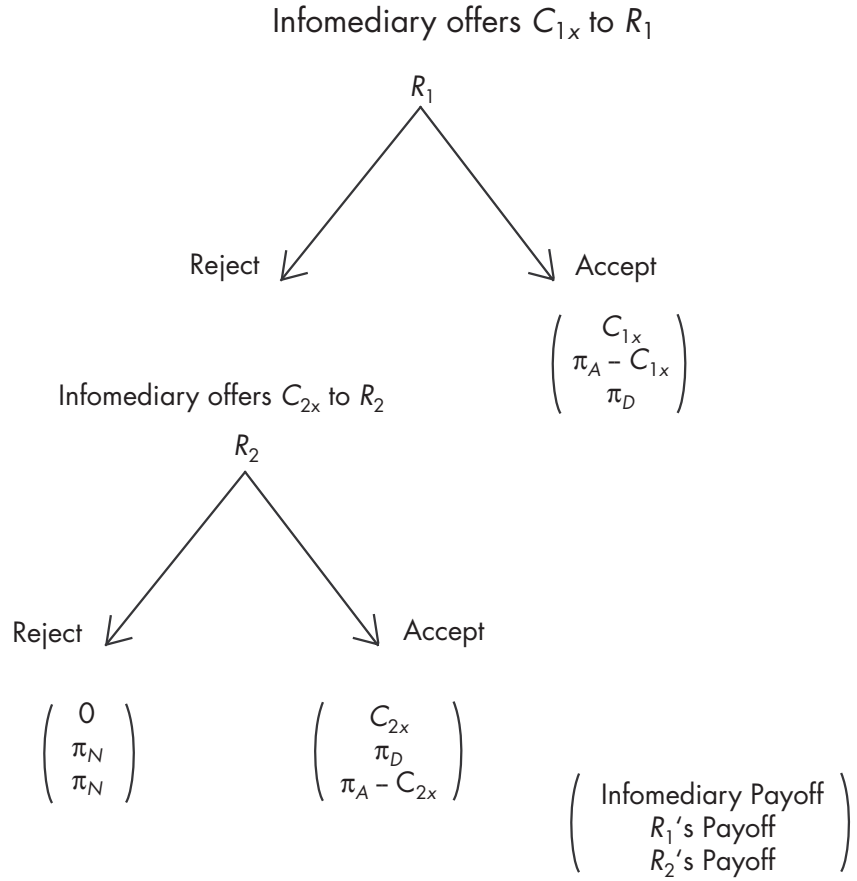


Clearly, any and all of these effects could be present in our scenario as well. However, we focus in this paper on the impact of the infomediary on the demand-side behaviors and derive its implications. This is not to imply that supply-side effects are unimportant. However, extant studies reveal considerable confusion about the direction as well as magnitude of supply-side influences of infomediaries (e.g., Scott Morton, Zettelmeyer, and Silva-Risso 2001). We believe that the resolution of some of these confusions is underway and suggest future research investigate these phenomena more carefully.

The objective of this paper is to study how retail competition will respond to the emergence of a referral infomediary and also to analyze how the infomediary should organize its marketing strategy with retailers. We therefore analyze a two-stage game. In the first stage the referral infomediary chooses a contract that has two specific dimensions. The first is a decision on whether to sell the service exclusively to only one retailer in a market (denoted by the subscript x) or non-exclusively to both retailers (denoted by the subscript n). Contingent on this, the referral infomediary also has to choose the payment contract which we denote as C_{iz} (where i denotes the retailer and $z = x, n$).

Consider first the exclusive contract under which the referral infomediary makes an exclusive offer to one of the two retailers. Figure 4 indicates the timing of the contracting game. If the first retailer rejects the offer, the infomediary has the option of offering the service to the second retailer. Thus under the strategy of enrolling only one retailer, say, retailer 1, the referral infomediary's contracting strategy consists of an offer of C_{1x} to retailer 1 and an offer of C_{2x} to the other retailer, retailer 2, in the event that retailer 1 rejects the infomediary's offer. Given this game structure, the infomediary's problem is to choose C_{1x} and C_{2x} to maximize its profit. A retailer will join the institution only if its net gain from joining is positive. In cases where a retailer is indifferent between enrolling the referral service and staying out, we assume that it will choose not to enroll. Contingent on the contract, the game involves price competition between retailers in which both retailers simultaneously choose prices. If a retailer is enrolled in the referral institution it can choose an online referral price as well as a store price. A retailer that is not enrolled chooses only a store price.

Figure 4. Contracting Game (if R_1 is the enrolled retailer in equilibrium)



Depending upon the first-stage contract, there are two possibilities: one in which only one retailer joins the referral institution and the other in which both retailers join. We begin our analysis with the case where only one retailer is enrolled.

Only One Retailer Is Enrolled

Suppose that R_1 is the enrolled retailer. R_1 can therefore set two prices—a store price, p_1, for the consumers who come directly to the store, and a price, p_{1e}, for the consumers who come through the referral infomediary. However, the other retailer, R_2, who is not enrolled in the infomediary can set only one price, p_2, for consumers who come to its store.

Let us now examine how the referral infomediary changes consumer behavior. The segment of ak comparison shoppers will consider both retailers and will also get an online referral price. This segment will make its choice based upon the lowest price of p_1, p_2, and p_{1e}. A segment of kb of R_1-shoppers makes purchase decisions based upon the prices p_1 and p_{1e}. The segment of kb of R_2-shoppers will make a purchase decision based upon the prices p_2 and p_{1e}. Finally, the behavior of the group of $(1 - k)$ consumers who do not use the referral infomediary will obviously not change from what we specified above (the pre-Internet channel). In other words, the group of $(1 - k)a$ comparison shoppers will still consider both retailers and buy at the lower price of the two prices p_1 and p_2, while the group of $(1 - k)b$ R_1-shoppers (R_2-shoppers) will visit R_1 (R_2) and buy at p_1 (p_2).

It is easy to show, as in the earlier section on pre-Internet channel, that there exists no pure strategy equilibrium. This leads to the intuition that the optimal strategies for the retailers are to choose prices from a distribution. The distinction from the previous case is that the enrolled retailer chooses prices from two different probability distributions: one draw from a distribution, H_{11}, to determine the price that he or she charges for a consumer who comes in through the retail storefront (p_1) and another draw from another distribution, H_{1e}, as the quote to provide the consumers who come in through the Internet referral institution (p_{1e}). The non-enrolled retailer chooses from a distribution, H_2, to determine the price to be charged for consumers who walk in to the storefront. The key insights of the paper are from the characterization of these distributions and their implications for retail competition, channel performance, and contractual mechanisms.[5]

> **Proposition 1.** In equilibrium, the support for the prices charged by R_1 is continuous with $p_1 \in (p_m, 1)$ and $p_{1e} \in (p_b, p_m)$ where,
>
> $p_m = \frac{b(1-b)}{(1-b)^2-(1-2b)k}$ and $p_b = p_m(1 - k)$ *if* $k < (1 - b)$ and,
>
> $p_m = 1$ and $p_b = b$ otherwise.
>
> The price support for R_2 is also continuous with $p_2 \in (p_b, 1)$.

This proposition establishes the first result of the paper, namely, the relationship between the online referral price and the store price offered by the retailer enrolled in the infomediary. The referral price will be lower than the store price. Therefore,

the emergence of the infomediary and its role as a mechanism for price discrimination leads to unambiguously lower online referral prices.

To understand why the online market is more price elastic, consider the relative proportion of R_1-shoppers to the comparison shoppers that R_1 faces among the referral service users as opposed to non-users. A lower value of this relative proportion implies higher price elasticity in the segment. Denoting the relative proportions as γ_I and γ_s for the infomediary users and non-users segments that R_1 faces respectively, we have that

$$\gamma_I = \frac{kb}{ka+kb} < \gamma_S = \frac{(1-k)b}{(1-k)a} \tag{1}$$

The above inequality obtains because R_1 has the incentive to use the referral price to also compete for the kb R_2-shoppers who were previously inaccessible (in addition to competing for the comparison shoppers). Thus, the price discrimination mechanism enabled by the infomediary and the incentive of R_1 to compete for the consumers who were otherwise captive to R_2 leads to lower online prices than its store prices.

This result helps to clarify the available empirical evidence regarding the impact of referral infomediaries on retail price competition. As discussed earlier, a study by Scott Morton, Zettelmeyer, and Silva-Risso (2001) shows that consumers who came to Autobytel retailers with an online referral paid on average 2 percent less than those who went directly to the retailer without a referral. Conditional on the retailer and the car chosen, consumers with a referral paid on average $379 less than an offline consumer.

The data that we acquired from a Carpoint-affiliated Volkswagen retailer also shows that the online referral prices offered are lower than the retailer showroom prices.[6] Proposition 1 provides a basis for why referral infomediaries have been perceived as beneficial for consumers and for the growth in their usage.

The following proposition derives the implications of these pricing strategies for retailer profits.

> **Proposition 2.** In the case where retailer 1 enrolls in the referral infomediary but retailer 2 does not, both retailers adopt mixed strategies in equilibrium. In equilibrium, we have that,
>
> 1. if $k < 1 - b$, then $\pi_1 = \pi_{11} + \pi_{1e} = b(1-k)\frac{(1-b)^2+bk}{(1-b)^2-(1-2b)k}$, where $\pi_{11} = b(1-k)$,
>
> $\pi_{1e} = b[\frac{(1-b)k(1-k)}{(1-b)^2-(1-2b)k}]$; $\pi_2 = b[\frac{(1-b)^2(1-k)}{(1-b)^2-(1-2b)k}]$
>
> 2. if $k \geq (1-b)$, then $\pi_{11} = (1-k)b$, $\pi_{1e} = kb$, $\pi_1 = \pi_{11} + \pi_{1e} = b$; $\pi_2 = b(1-b)$.

The key takeaway from the result is that the impact of an infomediary on retail competition (and hence retailer's profits) depends critically on the reach of the

Internet. This point merits careful elaboration. We discuss the intuition by focusing first on the case where the reach of the infomediary/Internet is small.

The Reach of the Institution Is Not Too Large ($k < 1 - b$). The behavior of R_1's (the enrolled retailer) profit as a function of reach is easily characterized by taking the derivative of π_1 with respect to k. It shows that R_1's profit first increases and then decreases with the reach of the infomediary. In other words, the Web is not a uniform blessing for the enrolled retailer. Increasing reach of the Internet beyond a critical point actually hurts the enrolled retailer's bottom line.

The reason for the non-monotonic response of retailer profits with respect to the reach of the Web is the interaction between the three effects of the Web on retail profits. First, an increase in the reach of the infomediary creates a positive demand effect for R_1. Among the consumers who use the referral infomediary, R_1 can now potentially get additional demand from the segment of consumers who would have previously shopped only at R_2. Furthermore, the infomediary allows R_1 to offer an additional lower price to attract the comparison shoppers online. However, an increase in k also creates a competitive effect. Because R_1 can now use a low referral price p_{1e} to poach on the previously guaranteed consumers of R_2, the strategic response of R_2 is to price aggressively and charge a lower p_2 in order to protect its customer base (i.e., R_2-shoppers).[7]

This leads to more intense price competition imposing a negative effect on both retailers' equilibrium profits. Finally, there is a price discrimination effect. The enrolled retailer can price-discriminate the users and non-users of the referral infomediary by offering an online referral price different from its store price. This price-discrimination ability has a positive effect on the profit of the enrolled retailer. The magnitude of this effect reaches its maximum when the sizes of the infomediary user and non-user segments are relatively close, and declines thereafter with further increases in the reach.[8] As a result, when the reach is small enough, the benefit from the increased demand and the price discrimination effect for the enrolled retailer dominates the cost of the increased competition created by the referral institution. This results in the enrolled retailer's profit increasing with the reach of the institution. However, as the reach further increases, the benefit from the price discrimination effect diminishes and retail competition becomes so intense that profit of the enrolled retailer declines with increasing reach. An alternate way to understand this result is to notice that R_1's profit from consumers who do not use the infomediary, π_{11} (i.e., the profit associated with the store price p_1), decreases with the reach of the institution, whereas its profit from consumers who use the infomediary, π_{1e} (which is associated with the referral price p_{1e}), increases with the reach. Consequently, R_1's total equilibrium profit has an inverse U relationship with k.

The profit expressions help illuminate the impact of the infomediary on the reallocation of retailer profits within a channel. Recall that we do not allow for any demand expansion effects due to the infomediary. Hence, the total number of consumers (i.e., aggregate demand for the product) is the same with the Web as without the Web. Consequently, the total channel earnings can change if and only if the prices at which the products are sold changes with the Web as compared to

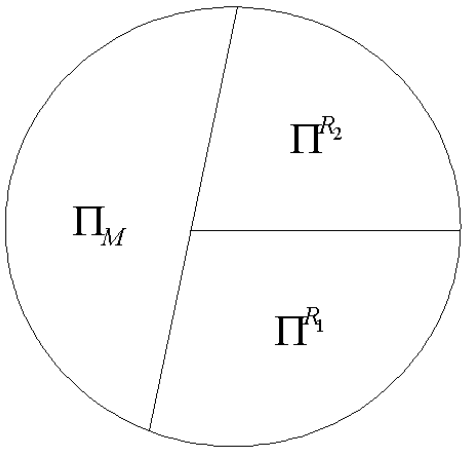
without the Web. Proposition 1 demonstrates that retail prices with the infomediary are very different. Consequently, total channel earnings with the Web are strictly different from the total channel earnings without the Web.

The profit expressions allow us to explicitly compare the profits at the retail level when there is no infomediary and when there is one. The total profits at the retail level of a channel are the sum of the retailer profits. Hence, total retail profits without a referral infomediary are $\pi^{R}_{noweb} = \pi_1 + \pi_2 = 2b$. Total retail profit with the infomediary is $\pi^{R}_{web} = \pi_1 + \pi_2 = \frac{2b(1-b)^2(1-k)+bk}{(1-b)^2-(1-2b)k}$ from Proposition 2. It is easy to show that $\pi^{R}_{web} - \pi^{R}_{noweb} > 0$ when $k < (1 - b)$. In other words, when the reach of the Web is not too large, the total retail profits are strictly larger.[9]

A direct consequence of this result is that the total channel earnings with the infomediary are strictly greater than the total channel earnings without the infomediary. We are now in a position to discuss the allocation of earnings between and within the layers in the channel. Recall that the manufacturer's choice of a wholesale price is assumed exogenous in this model. This implies that the manufacturer's slice of Π is the same in both scenarios. As a result, the increase in the size of Π reflects the improvements in the retailer's earnings.

To summarize, the total channel earnings increase. The manufacturer's actual earnings remain the same but their relative share of the pie decreases (because the pie got larger). The retailer's share of the pie increases. The individual retailer's share of the retail sector earnings also changes in the obvious fashion. The enrolled retailer strictly improves his or her earnings as well as share of the retail slice of the pie. The non-enrolled retailer loses. Figure 5 illustrates these insights pictorially.

Figure 5. Impact of Infomediary When Reach Is Not Too Large



It turns out that this picture is the key to understanding the economic value proposition of the infomediary and developing its optimal distribution strategy. We develop this argument in the next section.

The Reach of the Institution Is Large ($k > 1 - b$). We show in this section that the increase in the reach (i.e., popularity of the Internet) is not always a good thing for marketing institutions. A greater degree of reach for the infomediary implies that a greater chunk of the loyals of each retailer and the switcher segment will now avail of the option of receiving a price quote prior to the purchase process. What the referral institution allows is the ability for an enrolled retailer to offer a price quote even to customers who would otherwise have not shopped at their store. Price discrimination that involves poaching on the other retailer's loyal consumers is a key feature of the infomediary that is highlighted in this paper. The immediate consequence is that the non-enrolled retailer relies even more aggressively on price to defend his or her consumers. The retail competition in this situation turns out to be so extreme that there is no net profit advantage to R_1 from enrolling with the infomediary. It is this result of the increased reach of the Web that leads to the unraveling of the infomediary in the sense that there is no incentive for the retailer to join, even if the entry is free.

Summary Observations on the Impact of the Infomediary on Retail Prices. We utilize this section to highlight some of the key implications of the infomediary for a retailer's pricing strategy. Recall that the infomediary allows the enrolled retailer to charge two prices—a price, p_1, to charge consumers who walk into the retail storefront, and a price, p_{1e}, to consumers who are referred through the infomediary. In contrast, the non-enrolled retailer can only charge a single price, p_2, to consumers who walk into the retail storefront. Note further that the optimal strategy for both retailers is to fluctuate these prices. In other words, it is important to understand that these prices are drawn from a probability distribution. Hence, the prices charged to different consumers will be different and these differences are due to different realizations of the random draw process.

The first observation is that mean store price charged by R_1, $E(p_1)$, is strictly higher than the mean store price, $E(p_2)$, of R_2. However, R_1's mean quoted price for consumers referred by the infomediary, $E(p_{1e})$, is lower than $E(p_2)$. This illustrates the benefit of the price discrimination capabilities that the infomediary endows on the enrolled retailer. By using two prices, R_1 is able to bracket R_2's pricing capabilities. In mathematical terms, $E(p_{1e}) < E(p_2) < E(p_1)$.

How does this reach of the Internet influence the pricing strategies? We find that the difference between R_1's average store price and average Internet price, $E(p_1) - E(p_{1e})$, increases with the reach of the Web. This illustrates the strategic impact of the infomediary on the retailer's strategy. As the reach of the Web increases, R_1 uses the storefront to increasingly target loyal consumers and appropriate greater consumer surplus through higher prices. This strategy works because the retailer can lower the online price and use that as the device to capture the switchers as well as R_2's loyal consumers. Obviously, the average price of R_2, $E(p_2)$, decreases as the reach of the Web increases. The only way for R_2 to convert consumers is through aggressive prices. The need to be aggressive increases with the reach of the Web because more consumers are now able to be poached by R_1.

The relationship between R_1's expected Internet referral price, $E(p_{1e})$, and the reach of the Web is also interesting. It increases with the reach of the Web when both

the reach (k) as well as the size of the loyal segment (b) are small but decreases otherwise. This result is best understood by focusing on the evolution of R_2's strategy as a function of the reach of the Web. When the size of the loyal segment is small, the biggest segment in the market is the comparison shoppers. When reach is small, the biggest segment in this market is the comparison shoppers who do not use the referral service. R_2's pricing strategy at this point is driven by this segment. This implies that R_2 chooses p_2 to compete with R_1's store price p_1 and not its referral price p_{1e}. Consequently, R_1 feels less competitive pressure in the choice of p_{1e} and it moves higher. However, as the reach of the Web increases, R_2 increasingly faces the need to compete for the Web-savvy shoppers. This implies that R_2's choice of p_2 is now driven by p_{1e} and vice versa and hence $E(p_{1e})$ decreases as the reach increases beyond a critical point.

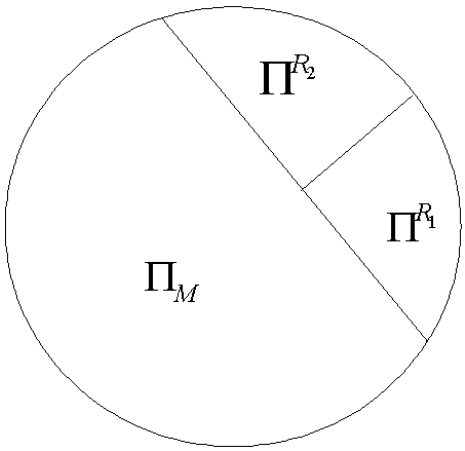
Both Retailers Enroll with the Infomediary

Consider now the sub-game in which both retailers are enrolled in the referral infomediary. This implies that both the retailers will have the ability to offer two prices: a store price p_i and a referral price p_{ie} (i = 1, 2). The implications for consumer behavior are as follows. Within the comparison shopping segment, ak consumers will use the infomediary and receive referral prices from both retailers and their purchase decisions will be based on $\min(p_1, p_2, p_{1e}, p_{2e})$. In the remaining market, a total of $2bk$ consumers will receive referral prices, p_{1e} and p_{2e}, and also the store prices from respective stores that they search. A set of bk consumers will choose $\min(p_1, p_{1e}, p_{2e})$, while the remaining bk of them will choose $\min(p_2, p_{1e}, p_{2e})$. Finally, the behavior of the set of $(1 - k)$ consumers who do not use the referral infomediary will remain unchanged from that specified above (the pre-Internet channel). The following proposition formalizes the equilibrium in this setting.

> **Proposition 3.** If both retailers are enrolled in the infomediary, the equilibrium profit of each retailer is $\pi_i = (1 - k)b$. The equilibrium price strategies are $p_{ie} = 0$ and $H_i(p) = \frac{b}{a}(\frac{1}{p} - 1)$, where $\frac{b}{b+a} < p < 1$.

When both retailers are enrolled, consumers who use the infomediary ($ka + 2kb$) will get price quotes from both the retailers (i.e., p_{1e} and p_{2e}). Since online prices are lower than storefront prices, this implies that the Web-savvy consumers will choose to buy at the lower of the two price quotes. This leads to the most intense form of price competition and the equilibrium choice for both retailers is to set prices at marginal cost (which was set at zero). Hence, the result in the proposition that $p_{1e} = p_{2e} = 0$. When both retailers enroll with the infomediary, the retailers make zero profits from the set of consumers who use the infomediary. The retailer profits are now determined by the proportion of consumers, $(1 - k)$, who do not use the Web and go directly to the stores. Consequently, the equilibrium profit of each retailer goes down to $b(1 - k)$, which is lower than in a world without the referral infomediary. Figure 6 illustrates this situation. The size of the pie, the total channel earnings, with both retailers enrolled is strictly smaller than the pie without the Internet. This has implications for the infomediary's strategy; we discuss this issue in the next section.

Figure 6. Both Retailers Enroll with the Infomediary



The Referral Infomediary's Marketing Strategy

We are interested in understanding the economic rationale for the emergence of new institutions, such as the referral infomediary, in traditional channels of distribution. Our analysis up to this point highlighted the impact of the infomediary on consumer behavior and its implication for retailers' strategies and channel earnings. For a new institution to emerge and co-exist in a channel there needs to be a role for it in the economic value chain. Given our conception of the total channel earnings, this implies that this new institution either (1) expands the size of the total channel earnings and derives its economic rents from all or part of this additional increase in earnings, or (2) reallocates channel earnings among the channel institutions and derives its economic rents from this reallocation, or (3) both. Absent either effect, it can only appeal to non-market forces for its continued existence and this is not a compelling rationalization.

We show that the economic rationale for the infomediary is driven in part by its ability to expand total retail earnings and in part by its ability to reallocate retail earnings across the retailers. Interestingly, the infomediary's ability to expand earnings as well as reallocate earnings is contingent on the reach of the Web. When the reach is not too large both effects are present and the infomediary has a compelling economic value proposition. When the reach goes beyond a threshold value these effects vanish and there is no longer an economic story for the infomediary.

We are now in a position to determine the infomediary's marketing strategy. Recall that the marketing strategy comprises two elements: (1) the intensity of distribution (exclusive versus intensive), and (2) the contractual strategy (lump-sum payment, fee per referral to the retailer, fee per sale by the retailer). We begin by examining the optimal distribution strategy.

Proposition 4. The optimal distribution strategy is determined by the reach of the Internet.

- ❒ When the reach of the Web is not too large, $k < 1 - b$, the infomediary chooses an exclusive distribution strategy of enrolling only one retailer in the market.
- ❒ When the reach of the Web is large, the referral infomediary unravels. In other words, there is no economic rationale for its existence. Hence, there is no distribution strategy.

When the reach is not too large, adopting the exclusive strategy always dominates as it allows the infomediary to charge the enrolled retailer for the benefit of exclusive access. Note that the exclusive contract is self-enforcing: Once R_1 accepts the infomediary's offer and enrolls, R_2 will have no incentive to enroll even if the infomediary offers access for free.[10]

Perhaps the more interesting point of this proposition is that it identifies the condition under which the referral infomediary can exist and make positive profits. The referral institution can exist as long as its reach is not too large (i.e., $k < 1 - b$). When the reach of the infomediary becomes too large, the loss of profits from the increased competition that the referral institution creates outweighs the benefits from the increased demand and the price discrimination ability for the enrolled retailer. Consequently, no retailer will have an incentive to join the referral institution. Thus (and somewhat paradoxically), increasing reach can lead to an unraveling of the infomediary.

We now consider the terms of trade that the infomediary could utilize in contracting with the retailer under a strategy of exclusive distribution. We consider three possibilities: lump-sum payment, fee per referral to the retailer, and fee per sale by the retailer.

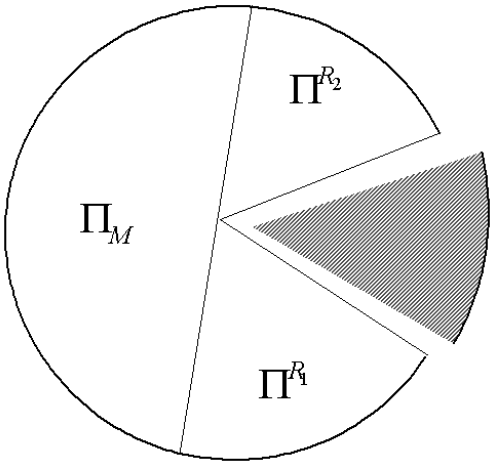
> **Proposition 5.** The infomediary is indifferent between charging a lump-sum payment and fee per referral to the retailer and strictly prefers either to a fee per sale by the retailer.

The contractual problem is illustrated pictorially in Figure 7. The issue is how the infomediary can best leverage its impact on the retailer in terms of expanding total retail sector earnings as well as reallocation of these earnings between the enrolled retailer and non-enrolled retailer. It is not surprising that a lump-sum payment dominates. The lump-sum payment C_{ix} extracts all the rents that are created in the channel due to the emergence of the infomediary. In algebraic terms, $C_{ix} = \pi_1 - \pi_2$ which is the difference in the profits between the enrolled and non-enrolled retailers. The equivalence between a lump-sum payment and fee per referral is again straightforward. Recall that the number of consumers who use the referral service is assumed exogenously defined (i.e., k). Let v denote the charge to the enrolled retailer for every consumer referral. The optimal fee for the infomediary can then be determined as $v = \frac{\pi_1 - \pi_2}{k}$. An observation from this result is that the optimal referral fee decreases with the reach of the institution.

Next, we consider the case where the infomediary adopts a strategy of charging a fee, m, for each unit that the enrolled retailer sells using the infomediary. This model involves reworking the algebra presented earlier.[11]

We find that for $k < (1 - b)(1 - m)$, $\pi_1 > b$ and $\pi_1 > \pi_2$ when $m \rightarrow 0$. Therefore, the infomediary is able to enroll one retailer and make positive profit. However, similar to the previous analysis with the lump-sum fee, when $k \geq (1-b)(1-m)$ the infomediary unravels in the sense that no retailer will want to enroll for any feasible value of the commission. Thus the result of the paper that the infomediary will unravel for higher values of reach continues to be valid with variable fee contracts.

Figure 7. The Infomediary's Contractual Problem



We find that the infomediary's profit with the lump-sum fee always dominates the profit with sales-based commissions. The intuition for this result is as follows: Note that the referral infomediary profit is comprised of two parts. The first part depends on the net gain of profit, $(\pi_1 - b)$, enjoyed by the enrolled retailer compared to the case without the infomediary. The second part is dependent on the potential loss in profit $(b - \pi_2)$ for a retailer if it rejects the contract but its competitor enrolls in the infomediary. A sales-based commission m has both a positive and a negative effect on the profit gain $(\pi_1 - b)$. The increase in the marginal cost of the enrolled retailer by m creates double marginalization. The strategic effect of this is to soften competition for the consumers reached online and this has a positive effect on the profit gain. The commission also increases the retailer's cost of selling online through the infomediary which has a negative effect on $(\pi_1 - b)$. However, the impact of m on $(b - \pi_2)$ is always negative because reduced competition for online consumers leads to less potential loss for the non-enrolled retailer. In other words, the threat which the infomediary can impose on a retailer who rejects the contract is always lower with higher commissions. In sum, the infomediary's profit with a sales-based commission contract is lower than that with a lump-sum fee contract because the threat of not joining the infomediary is lower with the commission contract. This result sheds light on why sales-based commissions are not observed to be used by referral services in the automobile industry.

Closing Comments

Recently, we have seen the emergence of Internet intermediaries that had an impact on the strategies of firms in traditional markets in many industries. Examples include Autobytel in the automobile market, Healthcareadvocates.com in healthcare, and Avviva.com in the real-estate business. The rationale for these intermediaries and their implications for competition between firms in traditional markets are the focus of this paper.

Our interest is in understanding this phenomenon of re-intermediation in channels of distribution. What is the rationale for these infomediaries? How do they influence retail competition? What happens to channel performance? We develop the answers to these questions by going back to the basics of marketing. The starting point for our analysis is identifying the implications of these new institutions for consumer behavior. Isolating the consequences of the economic properties of the infomediary enables us to develop a formal characterization of the rationale for an infomediary and their implications for retail competition and channel performance.[12]

We show that the referral infomediary endows an enrolled retailer with the ability to price-discriminate between consumers who shop at the storefront and those who approach through the Web. This provides the rationale for lower online prices in relation to the price at the shop floor. More importantly, the profits to the enrolled retailer are in the form of an inverted U with respect to the reach of the infomediary. It first increases and then decreases with the reach of the institution. We show that the value proposition for the infomediary lies in its ability to increase the total retail earnings as well as re-allocating these earnings across the retailers. Interestingly, the ability of the infomediary to extract the rents it creates in the channel is contingent on its distribution strategy. Consequently, the optimal distribution strategy for the infomediary is exclusive and not intensive distribution.

Perhaps the most interesting result is that the referral institution can unravel (in the sense that neither retailer can gain any net profit from joining the institution) when its reach becomes very high. In this case, any retailer that joins the institution will be able to poach on a large proportion of the competitor's customers. The resulting price competition is so intense that a retailer makes no net gain in profit from joining. It is perhaps this problem that is at the heart of the current attempts by referral services such as Autobytel to diversify into additional service areas such as financing and after-market services. Is there anything else that an infomediary can do to prevent unraveling? We show in Chen, Iyer, and Padmanabhan (2002) that investments by the referral infomediary in consumer identification strategies can be one possible way out of this situation. If the infomediary were able to identify the consumer type to the enrolled retailer (e.g., consumer belongs to R_1's loyal segment or R_2's loyal segment or consumer is a comparison shopper) then its economic viability becomes independent of the reach of the Web. This ability to identify the type of consumer allows the enrolled retailer to implement a more targeted

price discrimination strategy. Consequently, it is now possible for the infomediary to exist for all values of the reach of the institution.

The phenomenon of infomediaries is new and this paper is an attempt at understanding the institution and its implications. There are several interesting areas for future research in this area. We do not explicitly model the role of the infomediary in allowing consumers to bargain with retailers. Consideration of this issue will help us better understand the broader economic question of how competition will be affected in markets moving from bargaining to posted prices. Also, we use a static model to understand the interactions between players in the channel. Clearly, there could be several interesting dynamic trends in this market that merit investigation. For instance, the growing popularity of the Web could by itself lead to a decrease in the size of the loyal consumer segment and this would have concomitant implications. We study the implications of infomediaries for retailers and consumers. It would be useful to explore the implications of infomediaries for players further upstream in the channel (i.e., manufacturers). Do infomediaries represent an alternative means for manufacturers to structure downstream behavior? Finally, it would be interesting to examine competition between infomediaries and the manner in which they would enroll retailers.

Notes

1. Forrester Research has estimated the sales of consumer goods on the Internet to be $7.8 billion in 1998 and estimates them to go up to $108 billion by 2003.

2. Narasimhan (1988) shows that the key pricing results remain unchanged if one models variations in reservation prices across segments. For instance, comparison shoppers may have a lower reservation price, say $1 - d$ (where $0 < d < 1$). Therefore, we do not explicitly consider variation in reservation prices.

3. Allowing b_1 to be different from b_2 does not change any of the results. The details can be obtained from Chen, Iyer, and Padmanabhan (2002).

4. Relaxing this assumption is easy and does not change the results of the model. See Chen, Iyer, and Padmanabhan (2002) for details.

5. The interested reader is referred to Chen, Iyer, and Padmanabhan (2002) for all the relevant analytical details.

6. We have 18 months of data from a Volkswagen retailer in the Midwest. The data comprises the transaction prices and gross profits on every car sold by the retailer for a contiguous period of 18 months in 1999–2000. It also includes the information on whether or not each consumer came to the retailer with a referral. Across all models of Volkswagen cars we found that the average price offered to consumers with referrals was lower by $570.

7. In fact, it can be verified that the average price charged by R_2 decreases with k. See Chen, Iyer, and Padmanabhan (2002) for the technical details.

8. When $k \rightarrow 0$ or $k \rightarrow 1$, R_1 will only face one segment (i.e., nobody uses the referral infomediary or everybody uses it). Therefore, there will be no price discrimination effect if $k \rightarrow 0$ or $k \rightarrow 1$. This means that the benefit of the price discrimination effect is maximum at an intermediate value of k.

9. Obviously, the increase in channel earnings implies that there is a decrease in consumer surplus with the infomediary when the reach of the institution is not too large.

10. This means that the infomediary does not need a contractual guarantee to sell its service exclusively.

11. The interested reader is referred to Chen, Iyer, and Padmanabhan (2002) for the technical details.

12. *Consumer Reports* could be thought of as an information infomediary, albeit, one that only provides price information and no referral service. Does that impact our results? Our research suggests that the price quoting function is critical to the demand-side effects generated by the infomediary. This implies

a pure information vehicle will not create the earnings re-allocation effects highlighted in the paper. This is probably one of the reasons *Consumer Reports* charges consumers for its service and not the retailer.

References

Anupindi, R., and Y. Bassok (1998), "Supply Contracts with Quantity Commitments and Stochastic Demand." In *Quantitative Models for Supply Chain Management*. Boston, Mass.: Kluwer Academic Publishers.

Brown, Jeffrey, and Austan Goolsbee (2002), "Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry." *Journal of Political Economy* 110 (3), 481-507.

Brynjolfsson, Erik, and Michael D. Smith (2000), "Comparison of Internet and Conventional Retailers." *Management Science* 46 (4), 563-85.

Chen, Yuxin, Ganesh Iyer, and V. Padmanabhan (2002), "Referral Infomediaries and Retail Competition." *Marketing Science* (forthcoming).

Dolan, Robert J. (2000), "Priceline.com: Name Your Own Price." Harvard Business School Case 9-500-070.

Iyer, Ganesh, and Amit Pazgal (2002) "Internet Shopping Agents: Virtual Colocation and Competition." *Marketing Science* (forthcoming).

Lal, Rajiv, and Miklos Sarvary (1999), "When and How Is the Internet Likely to Decrease Price Competition?" *Marketing Science* 18 (4), 485-503.

Narasimhan, Chakravarthi (1988), "Competitive Promotional Strategies." *Journal of Business* (October), 427-49.

Podolny, J., A. Shepard, and G. Saloner (2001), *Strategic Management*. New York, N.Y.: JohnWiley.

Rangan, V. Kasturi (1998), "FreeMarkets OnLine." Harvard Business School Case 5-598-109.

Scott Morton, Fiona, F. Zettelmeyer, and J. Silva-Risso (2001) "Internet Car Retailing." *Journal of Industrial Economics* 49 (4), 501-19.

Varian, R. Hal (1980), "A Model of Sales." *American Economic Review* 70 (4), 651-9.

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