Coordinating Channels Under Price and Nonprice Competition

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Abstract

This paper analyzes how manufacturers should coordinate distribution channels when retailers compete in price as well as important nonprice factors such as the provision of product information, free repair, faster check-out, or after-sales service. Differentiation among retailers in price and nonprice service factors is a central feature of markets ranging from automobiles and appliances to gasoline and is especially observed in the coexistence of high-service retailers and lower price discount retailers. Therefore, how a manufacturer should manage retail differentiation is an important channel management question. Yet, the approach in the existing literature has been to examine channel coordination under the standard "symmetric contracting" assumption that offering a uniform contract to all the retailers in a market will be sufficient for coordination. I bring this assumption into question and ask when is it optimal for the manufacturer to use the channel contract to deliberately induce retail differentiation (even if the retailers were ex-ante identical in their cost and other characteristics). The paper identifies the type of channel contracts that can endogenously induce symmetry as opposed to differentiation among retailers.

Next, the paper highlights a type of channel conflict that arises from the very nature of retail price-service competition. A manufacturer might find the retailers to be excessively biased towards price competition at the cost of service provision or vice-versa. The paper establishes when a manufacturer is likely to stimulate greater price as opposed to greater service competition among the retailers.

The framework that I develop to address these issues highlights the role of two basic types of consumer heterogeneity. Consumers are heterogeneous in their locations (as in the spatial models of horizontal differentiation) and in their willingness to pay for retail services (as in the models of vertical differentiation). The model also uses a natural relationship in retail markets between the travel/time cost incurred by a consumer and her willingness to pay: The more affluent consumers who have a higher willingness to pay for retail services also have a higher cost for their personal time. Given these market features, the paper analyzes the problem faced by a manufacturer who sells to competing retailers.

The paper shows that the standard notion in the literature of offering similar contracts to all the retailers is sufficient only in markets with substantial locational differentiation relative to the differences in the willingness to pay. Effective channel management in these markets simply requires mechanisms that ensure that retailer interests are aligned so that they compete by offering a mix of price and service that is desirable from the manufacturer's point of view. However, in markets with small locational differentiation and substantial diversity in consumer willingness to pay, the manufacturer's problem is not just to align retailer interests, but to also use the channel contract to induce the correct level of retail differentiation. This helps the manufacturer to better cater to the diversity in consumer willingness to pay and to prevent the cut-throat competition that the retailers would otherwise have indulged in. The manufacturer can achieve this through the use of menu-based contracts. Menu-based contracts induce differentiated retailer behavior despite the fact that the retailers are not "forced" into accepting different terms of trade. This aspect can be useful in shielding manufacturers from litigation under the Robinson-Patman act.

The paper also shows that for relatively high-ticket items retailers tend to be excessively biased towards competing in the provision of retail services. The correlation between consumer willingness to pay for service and travel costs implies that for high-ticket products, the competing retailers will focus on the more service-sensitive customers at the cost of ignoring the price-sensitive consumers in the market. The manufacturer is therefore likely to encourage greater price competition among the retailers. In contrast, for low-ticket items the manufacturer prefers to reduce price competition and encourage greater provision of services. This provides an endogenous rationale for the use of price ceilings versus floors.

The basic model is also extended to consider the effect of upstream competition between manufacturers. Under upstream competition, coordinating retail price and service decisions is not always optimal for an individual manufacturer. This extension to manufacturer competition provides a basis for understanding the role of retail price-service differentiation in the context of a channel duopoly. It also shows that a mixed distribution channel (a channel in which one manufacturer chooses to be coordinated while the other chooses to be noncoordinated) can be an equilibrium in markets with weak brand loyalty.

(*Channel Coordination*; *Retail Differentiation*; *Retail Services*; *Menu-Based Contracts*; *Consumer Heterogeneity*)

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1. Introduction

In coordinating distribution channels through contractual arrangements, manufacturers must deal with retailers who compete not only in price, but also in important nonprice factors such as in-store services, after sales support or faster check-out.[1] Coordinating the price and nonprice competition among retailers can be a difficult task as illustrated by the following example.

> In 1983 General Motors started selling its cars through "discount dealers" who have little investments in showroom support or inventory. Since then the company has dealt with the conflict between these discount dealers and its conventional dealers. Conventional dealers who have substantial service investments in showroom space, sales staff and merchandised inventory claim that price discounting is ruinous to them. They claim that it does not serve GM's interests either as it jeopardizes the goodwill of customers who have come to expect the full complement of dealer services. A Buick dealer grouses: "These guys are like cockroaches. They louse up more than what they eat." Despite all this, GM continues to sell to deep discount dealers.[2]

Several coordination issues are examined. First, as the example indicates, the presence of retail differentiation can cause intense conflict in a channel. Despite this, companies such as GM continue to sell through both conventional and discount dealerships. When is this a reasonable policy and how should a company manage this conflict? The literature on distribution channels has typically examined channel management only under the standard "symmetric contracting" assumption that offering a uniform contract to all the retailers in a market will be sufficient for coordination (see, e.g., Mathewson and Winter 1984, Perry and Porter 1985, and Winter 1993). This basic assumption is questioned in this paper. To this end, I consider the problem of a manufacturer selling through competing retailers in a market characterized by two critical types of consumer heterogeneity: heterogeneity in spatial location and in consumer valuations for retail services. Given this setting, I ask the following question: Is it ever optimal for the manufacturer to strategically use the channel contract to induce price-service differentiation even if the retailers were ex-ante identical in their cost and other characteristics?[3] This question is even more basic than the one suggested by the General Motors case because in that case the conventional and the discount retailers were not necessarily identical in their cost characteristics. I show that there are conditions under which the manufacturer will indeed want to induce differentiation among ex-ante identical retailers. Understanding the market conditions when symmetric contracting is inadequate and when inducing differentiation is necessary for coordination is the first objective of the paper.

Another type of conflict that is basic in channels with price and nonprice competition is the *conflict over the nature of retail competition itself*: The manufacturer might find the independent retailers to be excessively biased towards price competition at the cost of service provision or vice-versa. In the GM example, the effect of encouraging the discount dealer sector was to increase the price competition between the dealers. Numerous cases, however, exist in which manufacturers attempt to achieve precisely the opposite, i.e., reduce retail price competition and encourage the provision of services. For instance, Ippolito's (1988) study of 203 resale price maintenance cases shows that approximately 80% of the cases involved price floors which were attempts by the manufacturers to reduce price competition among the retailers. Establishing when and how manufacturers should encourage (or discourage) price competition among their retailers is the second objective of the paper.

1.1. Framework and the Intuition

The paper suggests a theory of channel coordination that highlights the role of two critical dimensions of consumer heterogeneity. Consumers differ in their locations and have travel (shopping) costs of going to a

[1]Coordination of a distribution channel is the use of contractual arrangements by a manufacturer to manage independent retailers to achieve the profits that the manufacturer could otherwise get under vertical integration.

[2]See (1) "How Do You Get a Hot GMC Suburban? You Wait For a Computer to Dole it Out," *The Wall Street Journal* 1996; (2) "Car Buyers Caught in the Middle of GM's Battle With Discounters," *The Wall Street Journal* 1985.

[3]I consider retailers who have identical cost characteristics. They also face symmetric demand, in the sense that at equal price and service levels each retailer will face the same level of demand. Despite this, the manufacturer might strategically induce retail price-service differentiation. The fact that retailers would be differentiated if there were cost or other differences is less surprising.

retailer. Retail store locations also differ. This is termed as *locational* heterogeneity or the type of heterogeneity that is present in the spatial models of horizontal differentiation. Consumers also differ in their willingness-to-pay or valuation for retail services. This is labeled as *willingness to pay* (for service) heterogeneity, which characterizes the models of vertical (quality) differentiation in the literature (Shaked and Sutton 1982, Moorthy 1988a). Next, I use the fact that there is a natural relationship in retail markets between the travel/time cost incurred by a consumer and her willingness to pay. In other words, the more affluent consumers who have a higher willingness to pay for retail services also have a higher cost for their personal time. Given these features, I analyze a model consisting of a manufacturer who sells to two competing retailers, and then I present implications for a case with manufacturer competition.

The paper shows that when the locational differences between the retailers are substantial, but the diversity in the willingness to pay of consumers is small, the manufacturer prefers the retail market to be undifferentiated. This is the condition under which the standard approach of offering similar contracts to all the retailers is sufficient for channel coordination. Effective channel management requires mechanisms which ensure that retailer interests are aligned so that they compete by offering a mix of price and service that is desirable from the manufacturer's point of view. Some of the mechanisms which have been prescribed in the literature are resale price maintenance and territorial restrictions (see Mathewson and Winter 1984 and Winter 1993).

However, the task of coordination is more complex in markets with small locational differentiation and substantial diversity in consumer willingness to pay. In these markets, the standard "uniform contracts" are no longer optimal. A manufacturer's problem now is not just to align retailer interests, but to also use the channel contract to promote the correct level of retail differentiation. A *menu* of contractual mechanisms is now necessary to coordinate the channel. An example of such a menu is one consisting of retail price restraints linked to particular wholesale prices and fixed fees. Retailers have the freedom to choose any option from the menu. But the menu design is such that in equilibrium retailers end up self-selecting into the different options. In this manner, menu-based contracts allow manufacturers to induce differentiated retailer behavior despite the fact that the retailers are not "forced" into accepting different terms of trade. This aspect is very useful in practice because it can shield manufacturers from antitrust litigation under the Robinson-Patman act.

In markets for relatively high-ticket items retailers tend to be excessively biased towards service competition. A manufacturer therefore prefers that they compete more on price. Given that consumers with higher willingness to pay for service are also those who have higher costs of traveling, a retailer who focuses relatively more on the high-type segment faces a benefit as well as an associated cost. The benefit is that these consumers are more profitable due to their higher willingness to pay for service. But these consumers also have greater time/travel costs, which reduce the price they are willing accept. Therefore, competing for these consumers is optimal only if a sufficiently high level of service can be provided to counterbalance the higher travel costs. Retailers do not mind investing in higher absolute service levels for high-ticket products such as automobiles. For these products, retailers are biased towards competing for the high-type consumers even at the cost of not serving some of the low-type consumers. A maximum retail price restraint helps the manufacturer by preventing the retailer from focusing "too much" on the high-type consumers. By setting and advertising a suitable maximum retail price (as is frequently observed in automobile markets), a manufacturer can make retailers more price competitive. This curtails the loss of demand from the more price sensitive consumers. In contrast, the manufacturer will desire to stimulate more competition in service provision and use a minimum price floor for low-ticket products. In this manner, the paper provides an endogenous rationale for the use of price ceilings versus price floors.

I extend the model to consider upstream competition between manufacturers. The analysis suggests that with upstream competition, a manufacturer might intentionally *not* want to achieve full coordination, even if it were contractually feasible. The extension

also provides a basis for understanding the role of retail price-service differentiation in the context of a channel duopoly as in McGuire and Staelin (1983). In addition, it identifies a strategic rationale for mixed distribution channels (in which one manufacturer chooses to be coordinated and the other intentionally chooses to be non-coordinated).

1.2. Related Research

Jeuland and Shugan (1983) analyze the problem of a manufacturer managing the decisions of a single monopolist retailer using a quantity discount schedule. Subsequently, Moorthy (1987) showed that in such a channel, an even simpler contract (i.e., a two-part tariff) consisting of a fixed fee and a variable wholesale price is sufficient for coordination. This paper considers the impact of retail competition in price and nonprice factors on coordination. It highlights the manufacturer's problem of serving a market in which consumers have travel costs and differ in their location and in their service valuations. It also emphasizes the role of the correlation of travel costs and service valuations in retail markets. Note that the paper examines the coordination of a channel for a single product by inducing competing retailers to be differentiated in their price and service levels. Villas-Boas (1996) looks at the case of differentiation in the manufacturer's offering where the manufacturer sells a product line with different quality levels through a retailer.

Research in industrial organization has examined channel coordination under the implicit (symmetric) contracting assumption that offering uniform contracts to all the retailers in the market is always optimal (see Mathewson and Winter 1984, Perry and Porter 1985, and Katz 1989 for a review of this literature). Winter (1993) analyzes markets with consumer heterogeneity in time costs. But Winter's paper, too, deals with channel management under the assumption that offering uniform contracts will be optimal. The present paper identifies the market conditions when symmetric contracts fail to achieve coordination. The following section develops the model. Section 3 presents the results. The managerial implications and legal issues are discussed in §4. The final section concludes and details some testable implications and extensions to the paper.

2. The Model

I begin with a base model of a channel comprising of a single manufacturer selling a product to two downstream retailers. The assumptions of the model and their implications are described below.

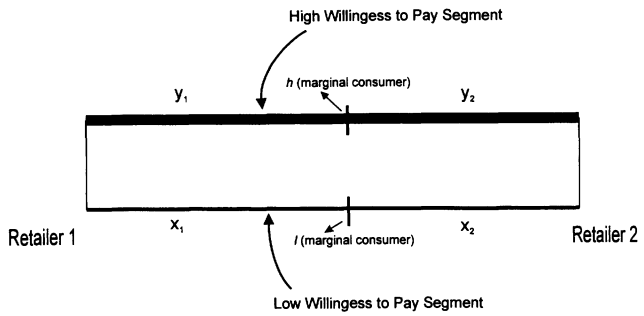
2.1. Manufacturer and Retailers

A manufacturer produces a product and sells to consumers through two retailers indexed by $j = 1,2$. The manufacturer's marginal cost of producing the product is constant and is assumed to be zero without any loss of generality. The retail market is represented by a unit line with the two retailers located at the ends of the line. Retailers purchase the product from the manufacturer under a contract denoted by Ω. Ω can either be a uniform wholesale price (w) or a contract consisting of the wholesale price plus a mix of mechanisms that control retail decisions on price, quantity, or other terms of sale. Retailers accept any contract that gives them a profit greater than their reservation profits. The reservation profits for both the retailers are normalized, without any loss of generality, to zero. Retailers sell the product to consumers for a retail price which is denoted by P_j (j denotes the retailer) and they also offer retail service the level of which is denoted by S_j. The cost of service provision is increasing and strictly convex. This cost is assumed to have the functional form $c(S_j) = S_j^2/2$. Such a quadratic cost function is fairly common in previous research (e.g., Mussa and Rosen 1978, Moorthy 1988a). The insights of the paper are valid for any increasing and strictly convex cost function.

2.2. Consumers

The consumer market is assumed to be of unit size. There are two segments of consumers ($i = 1,2$) which vary in their willingness to pay for any service that they may get from a retailer. Let θ_1 and θ_2 denote the willingness to pay for retail service of the two segments, where $\theta_2 > \theta_1$. The proportion of high willingness to pay (θ_2) consumers in the market is λ. Therefore the proportion of the low willingness to pay consumers is $(1 - \lambda)$. Consumers of each segment are uniformly distributed on the unit line between the two retailers. Figure 1 is a schematic representation of the consumer market.

Figure 1 Schematic Representation of the Consumer Market



Consumers can travel from their location to either of the two retailers by incurring a travel cost to purchase the product. A consumer belonging to the segment i has a per-unit travel cost of $t\theta_i$, where $t \in [0,\infty)$ is a travel cost parameter. This assumption implies that the per-unit travel costs of a consumer is related to her willingness to pay for service. This is because both the differences in the time/travel costs and also the differences in the willingness to pay across consumers originate from differences in consumer incomes. Evidence in Hill (1985) and Hill and Juster (1985) supports the assumption that higher income consumers have a higher cost of personal time and also a higher willingness to pay for services.

Each consumer has a maximum demand of one unit for the product for which she has a reservation value V. Note that V is common for all consumers in the market. It represents the maximum price that the consumers are willing to pay for the manufacturer's basic product that is independent of any services offered by the retailer and of consumer travel costs. Thus this reservation value is distinct from the value for the retail service which the retailer "chooses" to add to the basic product. This ensures that the consumer would find it worthwhile to visit a retailer and buy the basic product for a positive price even if the retailer chose to provide no service.[4] In sum, a higher level of V implies that the manufacturer's basic product is a relatively high-ticket item. In the analysis, I will use this parameter to draw out implications for different types of the basic product.

Given these assumptions about the consumer market, the surplus Φ_{ij} which a consumer of segment i who is at a distance of $d_{ij} \in [0,1]$ from retailer j gets is,

$$\Phi_{ij} = V + \theta_i S_j - t\theta_i d_{ij} - P_j, \quad i, j = 1, 2. \quad (1)$$

Recall that the parameter θ_i is the willingness to pay for service and it is also related to the consumer's per-unit travel cost. Each consumer purchases the product from the retailer who maximizes this surplus function. However, if a consumer gets a surplus less than zero from both retailers, she will purchase a competitive substitute for the manufacturer's product. These assumptions imply that the consumers served by a retailer are determined by the relevant individual rationality and incentive compatibility constraints. For example, the constraints for retailer 1 are as shown in (2) and (3) below (the conditions for retailer 2 are analogous):

$$\begin{aligned} V + \theta_1 S_1 - t\theta_1 x_1 - P_1 &\geq 0, \\ V + \theta_2 S_1 - t\theta_2 y_1 - P_1 &\geq 0. \end{aligned} \quad (2)$$

$$\begin{aligned} \theta_1 S_1 - t\theta_1 x_1 - P_1 &> \theta_1 S_2 - t\theta_1 x_2 - P_2, \\ \theta_2 S_1 - t\theta_2 y_1 - P_1 &> \theta_2 S_2 - t\theta_2 y_2 - P_2. \end{aligned} \quad (3)$$

Figure 1 shows the set of consumers served by retailer 1 based upon these expressions. In this picture the marginal low and high-type consumers for retailer 1 are labeled, respectively, as l and h. The distances (from the edges of the market) of the l consumer from retailers 1 and 2 are x_1 and x_2, respectively. Similarly, y_1 and y_2 denote the analogous distances for the h consumer. The expressions in (2) require that the marginal consumers get a nonnegative surplus from the retailer 1 if they are to consider buying from the retailer (individual rationality). Clearly if the expressions in (2) are satisfied, all consumers to the left of l and h (in the line segments of lengths x_1 and y_1) will get positive surplus from retailer 1. The expressions in (3) require that the l and h consumers get more surplus from retailer 1 than from retailer 2 (incentive compatibility). They would therefore prefer to buy from retailer 1 (and so would

[4]In this model the differences in the willingness to pay arise from differences in the valuations for retail service (θ_1 and θ_2). This is because service is the choice variable and my intention is to examine the coordination of retail price-service competition. It is also possible for the differences in the willingness to pay to be due to differences in V. Because V is not a choice variable, allowing for differences in V does not change the insights of this paper.

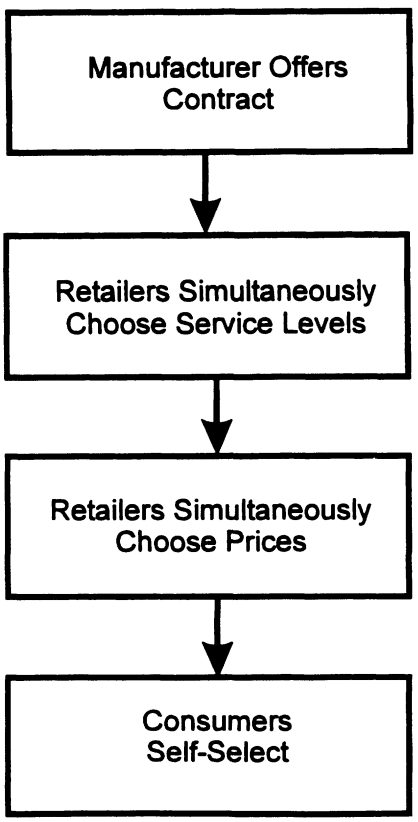
all consumers to the left of l and h in the line segments of lengths x_1 and y_1).[5]

2.3. Sequence of Moves

Figure 2 shows the sequence of moves in the game. The manufacturer moves in a prior stage and chooses the contract Ω. This is followed by a two-stage retail game. First, the service levels S_j are simultaneously chosen by the two retailers and fixed. Then the retail prices P_j are also chosen simultaneously contingent on the choice of the service levels. A two-stage game is used because the service decision is strategic and therefore more difficult to change than prices. There are two reasons why retail services may have a strategic role. First, services such as after-sales support involve capital investments which may not be easily reversible in the short run. Second, even if capital investments were easily reversible, the retailer may still be locked-in because of reputational constraints. A retailer who constantly changes service levels could dilute the image consumers have of the retailer. Finally, after the retail service and price decisions are made, each consumer decides to buy the product from the retailer who maximizes her surplus or to buy the competitive substitute. Since the game described above is a multi-stage game, the equilibrium should satisfy the subgame perfection criterion of Selten (1975).

[5]These constraints are also subject to $\Sigma x_j \leq 1$ and $\Sigma y_j \leq 1$; the length of the market served by both retailers cannot be greater than the total market size.

Figure 2 **Sequence of Moves**



Given the model as described above, decentralized retailers optimize the following objective function subject to the individual rationality and the incentive compatibility constraints shown in (2) and (3). For $j = 1,2$:

$$\begin{aligned} &\text{Max}_{(S_j)} \hat{\pi}_{rj}\ [\hat{P}_1(S_1, S_2), \hat{P}_2(S_1, S_2), S_j] \\ &\quad \text{where}\quad \hat{P}_j(S_1, S_2) = \text{argmax}_{(P_j)}\ \pi_{rj} \\ &\quad = ((1 - \lambda)x_j + \lambda y_j)(P_j - w) - \frac{S_j^2}{2}. \end{aligned} \tag{4}$$

The retailer's profit as shown in the third line of (4) is the retail margin times the demand net of the cost of service provision. The coordinated manufacturer maximizes the total profits of the channel:

$$\begin{aligned} &\text{Max}_{(S_1,S_2)}\ \hat{\Pi}_v(\hat{P}_1(S_1, S_2), \hat{P}_2(S_1, S_2), S_1, S_2) \\ &\quad \text{where}\quad \hat{P}_j = \text{argmax}_{(P_j)}\ \Pi_v \\ &\quad = ((1 - \lambda)x_1 + \lambda y_1)P_1 \\ &\quad + ((1 - \lambda)x_2 + \lambda y_2)P_2 - \frac{1}{2}(S_1^2 + S_2^2). \end{aligned} \tag{5}$$

For the analysis, it is assumed that the relevant second-order sufficiency conditions for profit maximization are satisfied so that the coordinated and the decentralized retailer profit functions are concave in the choice variables.[6]

3. Channel Coordination Mechanisms

Coordination in distribution channels implies the use of contracts to manage the behavior of independent

[6]As shown in the appendix the coordinated profit function is nonconcave when t is small (see the proof of Proposition 2 for details). Nonconcavity of the coordinated profit results in the optimal service tending to infinity. Also when the decentralized retailer profits are nonconcave, an equilibrium in the decentralized game does not exist.

retailers to achieve the profits that would have otherwise been generated under vertical integration. For the manufacturer this means designing a contract which (1) maximizes the total channel profits and (2) transfers the profits at the retail level back to the manufacturer. A contract which achieves both these objectives is termed a "sufficient" contract. In contrast, in a non-coordinated channel arrangement, the manufacturer will sell the product to the retailers for a simple wholesale price. The first step in the analysis is to identify the conditions under which channel coordination involves competition among the retailers.

PROPOSITION 1. *Retailers do not compete with each other and are local monopolies if*

$$V < \text{Min } \{V^H; V^L\} \quad \text{where}$$

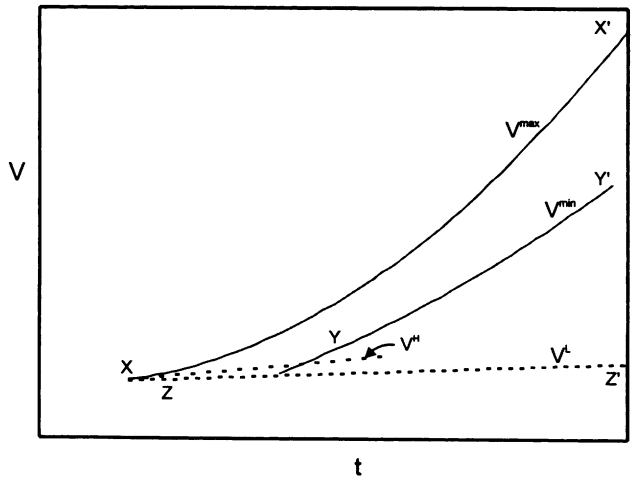
$$V^L = \frac{t[\lambda\theta_1 (2t - \theta_2) + t\theta_2(1 - \lambda)]}{2\lambda[t + (\theta_1 - \theta_2)\lambda]},$$

$$V^H = \frac{t[(1 - \lambda)\theta_2 (2t - \theta_1) + t\theta_1\lambda]}{2(1 - \lambda)[t + (\theta_2 - \theta_1)(1 - \lambda)]}. \quad (6)$$

The proposition identifies the conditions for the competitive and the local monopoly regimes to exist. The conditions for V^H *and* V^L are shown in Figure 3. Note that both V^H and V^L are increasing in t. As expected, retail competition is possible only in markets where the reservation price for the basic product V is sufficiently large. As I show later, there are two possible types of competitive regimes: one in which the high type consumers are always fully served and the other in which the opposite is true.[7] The two types of competitive regimes have an important implication for channel management: *They determine whether manufacturers should take actions to enhance price competition or service competition among their retailers.* I will identify the precise conditions which characterize these two regimes and will discuss the resulting contractual issues in Proposition 4. The results of this section are derived for the case when the high-type segment is fully served. However, all the insights are equally applicable for the other type of competitive regime.

[7]As explained in footnote 18 in the Appendix, a regime in which both segments of consumers are fully served (and where the marginal consumers of both segments get positive surplus) is not feasible at the coordinated optimum.

Figure 3 Competitive Regimes



It is useful to identify the particular coordination problems faced by the manufacturer. To coordinate the channel, the manufacturer must ensure that the individual retailers behave as in a vertically integrated channel. This can be understood by highlighting how the objectives of the retailers differ from those of the manufacturer. First, the difference in the objectives can be a result of the "own" price and service effect on demand. This is the double marginalization effect, which occurs because the retailer does not appropriate the change in profits that accrues to the manufacturer through the wholesale price margin when it lowers price or increases the service level. The manufacturer's objective will also diverge from that of the retailer because of the "cross" price and service effect on demand. A retailer does not appropriate the change in channel profits accruing to the competing retailer because of these cross effects. When a given retailer reduces price or increases service, these actions reduce the other retailer's profits. A coordinated manufacturer is concerned about such reductions while the individual retailer is not. From the manufacturer's point of view, retailers may compete too aggressively for consumers who already buy the product at the cost of ignoring the consumers who do not.

3.1. Undifferentiated Retailers and Symmetric Contracting

When would the manufacturer desire that all retailers in a market behave similarly? The analysis begins by

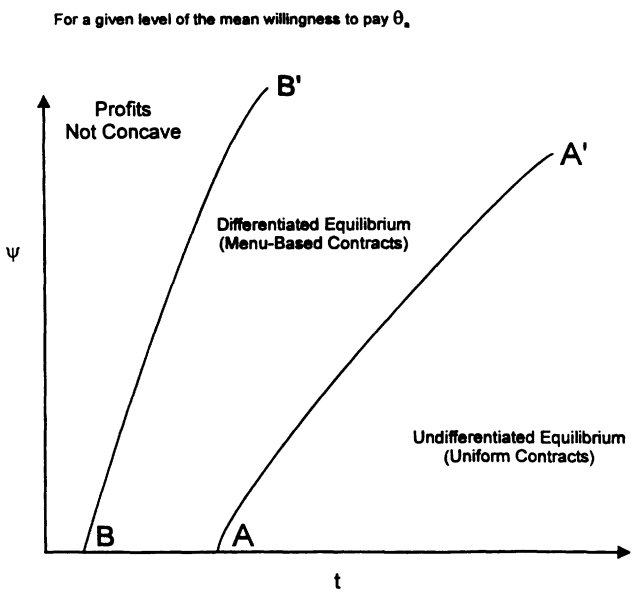
identifying the market conditions under which the manufacturer prefers the retailers to be undifferentiated (and therefore offers similar contracts to all the retailers). In these situations, coordination requires the manufacturer to design a contract that will nullify the two types of effects discussed above. The reader is reminded that the propositions that follow are developed for the case in which the high-type consumers are fully served, unless otherwise specified.

PROPOSITION 2. *Define* $\theta_H = \theta_2\theta_1/((1 - \lambda)\theta_2 + \lambda\theta_1)$.[8] *Then in markets represented by* $t > \theta_H/2$, *the manufacturer always desires the retail market to be undifferentiated in the unique coordinated equilibrium. The sufficient contract* (Ω_s) *in these markets is always symmetric across the two retailers.*

The traditional literature on distribution contracting is based upon the symmetric contracting assumption that manufacturers would find it optimal to coordinate the actions of their retailers by offering similar contracts to all retailers in a market. Given that the retailers are similar in their cost characteristics, an undifferentiated retail market will therefore result. Proposition 2 establishes the market conditions for which this standard assumption is indeed valid. A manufacturer will prefer an undifferentiated retail market and therefore offer similar contracts to both retailers when $t > \theta_H/2$. This condition is represented by the region to the right of A-A′ in Figure 4. This picture is drawn for a given level of θ_a, which is the mean willingness to pay (i.e., $\theta_a = (1 - \lambda)\theta_1 + \lambda\theta_2$). The vertical axis represents $\psi = \theta_H/\theta_1$. This parameter is a measure of the spread between θ_1 and θ_2 in the sense that it decreases with θ_1 and increases with θ_2 ($\partial\psi/\partial\theta_1 < 0$ and $\partial\psi/\partial\theta_2 > 0$). The horizontal axis represents the travel cost parameter t. Since retail locations are fixed, this is a measure of locational differentiation between the retailers. Thus the southwest corner of Figure 4 represents a market that is homogenous both in terms of location and the willingness to pay of consumers. The northeast corner represents a market that is heterogenous in terms of service valuations and which has high locational differentiation between the retailers (because of high t).

[8]Note that θ_H is the harmonic mean. The denominator on the right is *not* the mean of the θs.

Figure 4 Coordinated Channel Equilibria



Note that the reason the picture is developed for a given level of θ_a *is because the per-unit travel costs* $t\theta_i$ *mixes the locational and the willingness to pay parameters.* Allowing θ_a to be constant produces independence between the locational differentiation and the willingness to pay heterogeneity dimensions.

The condition $t > \theta_H/2$ implies that the manufacturer desires retailers to behave in a similar fashion in markets where the locational differentiation between the retailers is substantial and the diversity in the willingness to pay of consumers is relatively small. An example is a homogenous residential suburb with a thin network of retailers. The intuition for this is as follows. When retailers match price and service they are on an equal footing in both the consumer segments. While this protects their market share in both segments, the disadvantage is that the intensity of competition will be high. However, with strong locational differentiation, retailers can better withstand this competition and enjoy the benefits of increased market share. Given this, inducing the retailers to be similar is advantageous for the manufacturer not only because more consumers will likely be served, but also because the benefit of inducing retail differentiation is small with little diversity in the willingness to pay.

3.2. Symmetric Contracting, Existing Results

I will now discuss the specific contractual forms which the symmetric contract Ω_s can (or cannot) take. The existing literature (Winter 1993) has pointed out that a standard spot contract consisting of the simple wholesale price will not achieve the first-best coordinated outcome. A direct implication of this is that the well-known pricing mechanism, the two-part tariff (consisting of a wholesale price and a fixed fee), will also not be optimal. While setting the wholesale price to marginal cost (and using the fixed franchise fee to extract all retail profit) eliminates double marginalization, the cross effects in price and service will still be present.

A point not highlighted by the literature but which can be shown in the present model is that even a fully nonlinear price contract such as the quantity discount will not be sufficient to coordinate retail price-service competition.[9] It is well known from Jeuland and Shugan (1983) and Moorthy (1987) that a quantity discount mechanism can coordinate the decisions of a retailer who does not face competition. However, quantity discounts are inadequate in markets with retail competition in price and service factors. To understand why, note that a quantity discount schedule can be seen to be equivalent to a scheme where the manufacturer charges a high price w^1 for the first q^1 units and then a lower price $w^2 < w^1$ for every incremental unit above q^1. This type of scheme is called a block tier scheme, and it is observed in many industries (Shepard 1993 discusses its incidence in gasoline retailing). The quantity discount scheme eliminates the double marginalization effect because for any quantity $q^2 > q^1$ the manufacturer can set w^2 at marginal cost for all units sold above q^1. Thereafter, q^1 and w^1 can be adjusted suitably to extract all the retail profits. However, the cross effects in service and price still remain, and therefore the channel is not fully coordinated.

Some practices that have been identified in the literature and that coordinate price service competition are exclusive territory distribution and retail price restraints (see Winter 1993 for these results). It can be shown that these practices are also sufficient to coordinate the channel in the symmetric outcome of Proposition 2. If the manufacturer enforces an exclusive territory arrangement, then the retailers will not be able to sell to customers outside of their assigned territory. Exclusive territories remove the cross-elasticity effects in price and service between the retailers and give each retailer the full rights to the customers in a territory, thereby promoting coordination. A retail price restraint helps the manufacturer to fix the retail price at the correct level. Then by suitably adjusting the wholesale price the manufacturer can also ensure that optimal level of service is provided.

3.3. Retail Differentiation and Channel Coordination

I now identify the conditions under which coordination will require the manufacturer to use contracts that induce retail differentiation.

PROPOSITION 3. *a. For $t < \theta_H/2$, the coordinated equilibrium is asymmetric across the two retailers.*[10]

b. In this equilibrium, a menu of contracts $\Omega_a = [\Omega_1,\Omega_2]$ where each Ω_k $(k = 1,2)$ consists of a retail price restraint, a wholesale price and a fixed fee is sufficient to coordinate the channel.

Offering contracts that are uniform across the two retailers is not always the optimum policy for the manufacturer. In Figure 4, the region between A-A′ and B-B′ represents markets where coordination involves retail differentiation. When the locational differences between the two retailers is relatively small but the diversity in the willingness to pay is substantial (i.e., $t < \theta_H/2$), the manufacturer finds it optimal to cause retail differentiation. This allows the manufacturer to better cater to the diversity in the consumer market. Moreover, small locational differentiation implies that retailers would indulge in cut-throat competition and dissipate the overall channel profits if they were undifferentiated. The manufacturer, therefore, coaxes the retailers to differentiate so that a low price and low service is offered at one outlet and a higher level for both is offered at the other.

So manufacturers might have to go beyond simply

[9]The formal analysis of quantity discounts and their inability to coordinate price-service competition is available from the author.

[10]There is a lower bound for t. For $t < \theta_p/4$ where $\theta_p = (\theta_H + \theta_1(1 - \lambda))$, the coordinated profit is nonconcave.

nullifying the double marginalization and the cross effects to using the contract to manage retail differentiation. How can the manufacturer induce such a differentiated outcome using channel contracts? Proposition 3 shows that this can be done by offering the retailers a menu of contracts. A menu that will work is one in which each option consists of a retail price restraint linked to an associated wholesale price and franchise fee. Retailers self-select from the menu and then endogenously differentiate in price and service. The contract forces retail differentiation by ensuring that the profits earned by a retailer is always greater if she chooses the option from the menu that was not chosen by the other retailer. Note that there is a difference between the "menus" discussed here and those associated with adverse selection problems that arise when the retailers differ on some characteristic which is not observable to the manufacturer (e.g., retail cost characteristics). Here the retailers are ex-ante identical in their cost characteristics and they face symmetric demand in the sense that at equal price and service levels the retailers will get the same demand. Despite this the contract menu induces them to differentiate.

An arrangement used by Ford Motors and called a *rainbow schedule* is the institutional equivalent of the type of menu described in Proposition 3b. Ford offered dealers different levels of wholesale price assistance linked to different retail price point commitments. Retailers could choose any combination from the schedule. Ford then periodically monitored the retail prices to determine whether the dealer should continue to get the assistance or not. The company was brought to court by some of its dealers protesting against this arrangement (*Capital Ford Truck Sales and William M. Anderson v. Ford Motor Company, 1992*). The court, however, ruled in favor of Ford Motors and stated that because Ford offered the dealers the full freedom to choose any option from the schedule, the dealers could not claim antitrust injury. This highlights a critical advantage of menu-based contracts. Because these contracts do not force retailers into accepting different terms of trade, they can provide manufacturers protection from litigation under the Robinson-Patman Act, which prevents manufacturers from offering different terms of trade to retailers unless justified by cost differences.

Another menu that will work is a quantity forcing menu consisting of quantity quotas linked to particular wholesale prices and fixed fees. Gasoline refiners have used quantity forcing menus consisting of volume quotas that are linked to the pre-specified annual franchise fees (Shepard 1993). Retailers have the freedom to pay any level of the up-front franchise fees from the menu at the year beginning, and this entitles them to a corresponding annual volume quota. Note that this quantity forcing arrangement, which has a flavor of "force," is nevertheless compatible with a voluntary self-selection "menu" because retailers have full freedom to choose any option from the menu. But once a particular option is chosen, the retailer is offered only the corresponding quantity.

3.4. Whether to Promote Price or Service Competition

I now turn to the next issue of the paper: conflict over the nature of retail competition itself. When would a manufacturer find the retailers to be biased excessively towards price competition at the cost of service provision and when would the opposite be true? To address this, I focus on the symmetric configuration of the model (the point can also be made for the asymmetric configuration). Recall that the discussion till now focused on the competitive regime in which the high-type consumers were always the ones that were fully served. However, it is also possible that the low-types (and not the high-types) are always fully served in equilibrium. It turns out that the incidence of these two distinct regimes are directly linked to whether the retailers are biased excessively towards price or service competition. Proposition 4 investigates this issue.

PROPOSITION 4. *Under retail competition and in the symmetric outcome of Proposition* 2,

a. In the range,

$$V > \text{Max}\left\{V^H;\ V^{\max} = \frac{t(2t - \theta_1)}{2(1 - \lambda)}\right\} \quad \text{where } V^H \text{ is defined by (6),} \tag{7}$$

the high-type segment is always fully served in equilibrium. In this case, the manufacturer desires to promote price competition among the retailers and a maximum price restraint (a price ceiling) is optimal.

b. In the range,

$$V^L < V < V^{\min} = \frac{t(2t - \theta_2)}{2\lambda}$$
$$\text{where } V^L \text{ is defined by (6),} \qquad (8)$$

the low-type segment is always fully served in equilibrium. In this case, the manufacturer desires to reduce price competition among the retailers and a minimum price restraint (a price floor) is optimal.

This proposition deals with channel conflict over the nature of retail competition. In other words, a manufacturer might find competition among unrestrained retailers to be biased excessively either towards price competition at the cost of service provision or vice-versa. The proposition identifies the types of manufacturers who are likely to stimulate more price as opposed to more service competition among their retailers.

Consider the regime in which the high willingness to pay segment is always fully served. This regime is represented by the condition in (7) (shown as X-X′ in Figure 3) which represents hi-ticket products because of relatively high values of V. Given that consumers who have higher willingness to pay for service are also the ones who have higher costs of traveling, a retailer who competes for the high-type consumers faces a benefit as well as an associated cost. The benefit is that these consumers are more profitable because of their higher willingness to pay for services. But these consumers are also the ones who have greater time/travel costs, and this reduces the price they are willing to pay. Thus retailers would find competing for the high type consumers more attractive if a sufficiently high level of service can be provided to counterbalance the higher travel costs of these consumers. All else being equal, retailers will be willing to invest in higher dollar value of services for products with a larger V. Thus for relatively high-ticket items, retailers are biased towards competing for the high-type consumers, and these consumers will always be served by one or the other retailer.

Another way to understand this is to note that the consumer surplus in (1) can be expressed as $\Phi_{ij} = V + \theta_i(S_j - td_{ij}) - P_j$. The high-type segment will be the one that is always fully served if these consumers get more surplus than the low-type consumers at every location. For this we need $(S_j - t/2) > 0$. The condition $V > V^{max}$ (i.e., above X-X′ in Figure 3) ensures that this happens. Under this condition, the optimal service level will be high enough to ensure that $(S_j - t/2)$ is positive. In addition $V > V^H$ is required so that the marginal high-type consumer who is in the middle of the market gets a positive surplus in equilibrium. In contrast, for relatively low-ticket products [$V^L < V < V^{\min}$] the competitive regime is of the opposite type in which the low type consumers are always served.[11] This happens between Y-Y′ and Z-Z′ in Figure 3.

Why is a maximum price restraint is required when (7) holds (i.e., for high-ticket products and market areas with a large proportion of low-type consumers (high $(1 - \lambda)$)? In these situations the consumers who are likely to be ignored by the retailers are the inconveniently located low-type consumers. Because these consumers are more price sensitive (in the sense that they value a unit decrease in price more in terms of service units) the manufacturer desires to enhance retail price competition. *Setting an appropriate maximum price restraint helps the manufacturer to do so and thereby redirect each retailer's attention to the low-type consumers who would otherwise have bought a substitute product.*

The fact that manufacturers of high-ticket items like automobiles advertise their maximum suggested retail price is consistent with the above result. Advertising a suggested retail price is an institutional equivalent of a maximum price restraint. A suggested retail price (sticker price) provides consumers with a reference point in their bargaining with car dealers. Suitably setting and advertising such a price helps manufacturers to influence the final retail price. The proposition also suggests that this practice is most likely to benefit manufacturers in lower income neighborhoods.

[11]Note that in the range between X-X′ and Y-Y′ (i.e., $V^{\min} < V < V^{\max}$), neither type of competitive regime exists. Consider the competitive regime in which the high-type segment is always fully served. The coordinated manufacturer, in this case, will ensure that the marginal low-type consumer gets zero surplus. Otherwise, the manufacturer could have raised price and earned more profit. Consider when V starts going below $V^{\max}$. The low-type consumer will now get more surplus than the high-type consumer at every location. However, this contradicts the fact that the coordinated manufacturer should be able to leave zero surplus with the marginal low-type consumer. Analogous arguments can be made for when V starts increasing beyond $V^{\min}$. Therefore, for $V^{\min} < V < V^{\max}$ a competitive regime does not exist.

In contrast, Proposition 4b suggests that for low-ticket products, manufacturers desire to reduce price competition and persuade the retailers to offer higher levels of service (see the condition (8)). This is because the competitive regime will now be of the type in which all the low type consumers are served while some of the high type consumers are likely to be ignored. Retailers are now biased towards too much price competition. Using a price floor reduces this competition and thereby helps to manage the channel. Indeed, in both the Ippolito (1988) and the Overstreet (1983) studies, price floors were frequently used for small ticket products such as chocolate, clothing, liquor and other grocery and drugstore items.

3.5. An Extension: Upstream Competition and Brand Loyalty

Up until now I analyzed the case of a single manufacturer dealing with *intrabrand* competition among its retailers but with no competition from other manufacturers. How will the introduction of competition at the manufacturer level affect the coordination of price and nonprice competition. *In particular, the interesting question is whether the manufacturers would deliberately not coordinate retailer actions in the face of competition from other manufacturers.* A general analysis of this problem should accommodate not only *intrabrand* competition between the retailers of a particular manufacturer but also *interbrand* competition between retailers of competing manufacturers. A model that will capture this is one with two manufacturers each selling through two retailers resulting in a market in which all the four retailers compete. The formal analysis of such a model is beyond the scope of this paper. However, because I have already examined the case of a single manufacturer with intrabrand competition (but no interbrand competition), a good understanding for the general problem can be had from examining the other extreme: the case of interbrand competition between the manufacturers but no intrabrand competition at the retail level. This channel structure, of course, is the standard channel duopoly structure of McGuire and Staelin (1983) and Moorthy (1988b) involving upstream competition between manufacturers who sell through exclusive retailers. Therefore, such an analysis will also have the additional benefit of providing a basis for understanding retail price-service differentiation in the context of a channel duopoly. A formal model to facilitate this analysis is described below.

The base model of §2 is modified to incorporate interbrand competition between manufacturers (manufacturers are also indexed by $j = 1,2$ because they sell through exclusive retailers). With upstream competition, the extent of a manufacturer's brand loyalty affects channel relationships. Brand loyalty is incorporated into the base model as follows: Assume that the market is comprised of two brand loyal segments (one for each manufacturer) and a brand-switching segment. Let each brand loyal segment form a proportion b of the total market. The proportion of the brand switching segment therefore is $(1 - 2b)$. As in the base model, consumers are uniformly distributed on the line.

Manufacturer Brand Loyal Segments. If consumers in manufacturer j's loyal segment buy in the category they *always* buy j's brand. This assumption captures the notion of brand loyalty. Whether these consumers buy or not depends upon whether they get a positive surplus according to the surplus function in the base model. Each manufacturer's loyal segment further consists of consumers who have high or low willingness to pay for retail service. Consistent with the base model, λb of the brand loyal consumers have high willingness to pay while the remaining $(1 - \lambda)b$ brand loyal consumers have a lower willingness to pay for service.

Brand Switching Segment. This segment is also further split into $(1 - 2b)\lambda$ consumers who have high willingness to pay for service and the remaining $(1 - 2b)(1 - \lambda)$ consumers who have low willingness to pay. These consumers are willing to switch across the brands and may therefore consider shopping between the two retailers. Their surplus function is also as defined in the base model. The focus of the analysis is on the relevant situation where the two manufacturer-retailer dyads compete with each other for all the switching consumers.

To Coordinate or Not. A manufacturer's coordination task now involves coordinating its retailer in the face of competition from the other manufacturer-retailer dyad. Consistent with the literature on channel

duopolies the noncoordinated structure is defined as one in which the manufacturer uses just a simple wholesale price (decentralization), while full coordination is analogous to the case when the manufacturer has full control over the retail decisions and the wholesale price is set at the marginal cost of production (vertical integration).

Will the manufacturer *always* desire coordination in the face of upstream competition? The analysis shows that unlike in the channel with a single manufacturer and pure intrabrand competition, this is not always the case. Sometimes the manufacturers might voluntarily prefer not to coordinate the channel and to sell to the retailer using just a simple wholesale price. Only when brand loyalty is strong enough and in the range

$$r_1 \equiv \{(1/2 - (9t/4\theta_H)) < b < (1/2 - (45t/28\theta_H))\}$$

do both manufacturers adopt coordinated strategies in equilibrium. A coordinated strategy allows the manufacturer to extract retail profits but the disadvantage is that for a given service level the retail price is lower. This is because the double marginalization effect that increases retail prices no longer exists in a coordinated channel. Manufacturers are therefore subjected to more intense price competition. But with strong brand loyalty, the reduction in retail prices is not very significant, and this makes the coordinated strategy more attractive.[12]

However, both manufacturers voluntarily decide not to coordinate retailer actions when brand loyalty is weaker and in the range

$$r_2 \equiv \{(1/2 - (27t/10\theta_H)) < b < (1/2 - (9t/4\theta_H))\}$$

The advantage of the resulting higher retail prices, in this case, more than offsets the disadvantage from not being able to extract all the retail profits. In addition, at the downstream level, the retailers also respond by adopting differentiated price and service strategies, and this further softens the intensity of competition in the channel.

It is well known since McGuire and Staelin (1983) that in a channel with pure price competition and linear demand functions, vertical integration (or coordination) is desired by manufacturers when their products are sufficiently differentiated (i.e., strong brand loyalty). Decentralization is optimal in markets with less product differentiation.[13] This present analysis provides a basis for understanding retail price-service differentiation in the context of a channel duopoly. Retail differentiation is likely in markets with weak brand loyalty.

What happens when the extent of brand loyalty is even weaker and in the range

$$r_3 \equiv \{(1/2 - (27t/8\theta_H)) < b < (1/2 - (27t/10\theta_H))\}?$$

Now the channel equilibrium has two characteristics. First, a mixed channel results. While one manufacturer fully coordinates the actions of his retailer, the other adopts a noncoordinated strategy. Second, at the retail level there is price-service differentiation with the noncoordinated retailer adopting the higher service position. Intuitively, the retailer in the noncoordinated dyad faces the disadvantage that its price will be higher than that chosen by the coordinated dyad. Adopting a high-end service position helps the noncoordinated retailer to support the higher price. This in turn strengthens the incentives for the manufacturer to use a noncoordinated strategy.

McGuire and Staelin (1983) find that, in general, the mixed structure is not an equilibrium in channels with pure price competition. The lower price charged by the integrated manufacturer induces the other manufacturer to avoid a noncoordinated strategy. Only under some restrictive behavioral assumptions do they find the mixed structure to be an equilibrium.[14] McGuire and Staelin (1986) provides a cost-based rationale for a mixed structure. They find that a mixed structure can arise if the integrated channel has significantly higher

[12]A retail price restraint, for example, will allow the manufacturer to coordinate the actions of its retailer.

[13]Bonnano and Vickers (1988) and Coughlan and Wernerfelt (1989) indicate a caveat to this result by showing that if a franchise fee is possible then vertical integration (coordination) will never be an equilibrium, since now the disadvantage of the manufacturer not being able to extract all the residual retail profits under decentralization vanishes.

[14]For instance, the mixed structure occurs for high product substitutability conditions if each manufacturer takes into account only the decisions of its retailer but ignores that of the competing retailer. However, it is not clear why under full information about retail prices, a rational manufacturer would choose such a strategy of ignoring the competitor's retail prices. Moorthy (1988b) provides some demand-side conditions for a mixed structure to be an equilibrium in channels with pure price competition.

costs of retailing. *The analysis here provides a strategic rationale for a mixed channel structure that relies upon retail differentiation in price and non-price factors. The ability of the retailers to adopt price-service differentiation provides the manufacturers with the extra flexibility needed to sustain a coordinated/non-coordinated channel strategy.*

After having analyzed the extreme cases, one can now consider what would happen in the more general case with both intrabrand competition between retailers of the same manufacturer and upstream (interbrand) competition between different manufacturers. First, suppose the market has very strong brand loyalty. From our analysis of the extreme case of interbrand competition (with exclusive retailers) we know that coordinating the channel is more likely to be profitable for the manufacturers. But a market with weaker brand loyalty presents greater difficulties for manufacturers facing both upstream and intrabrand competition. Under weak brand loyalty, a noncoordinated strategy should help a manufacturer to reduce upstream competition. But this strategy also has the drawback that the manufacturer would be unable to manage the intrabrand competition between his retailers. This reduces the attractiveness of a noncoordinated strategy. The reduction in profit will be especially high if the cross-effects in price/service on demand between the manufacturer's dealers are significant (i.e., dealers of same brand compete intensely). Thus the requirements of simultaneously managing upstream competition and intrabrand competition might not be compatible when both these types of competition are intense. Overall, this general issue of coordinating both intrabrand and interbrand competition is worth further investigation.

4. Managerial Implications and Legal Considerations

This paper deals with price and non-price contractual restrictions. While implementing the contracts identified here, managers have to consider the legal problems that could arise. Though retail price restraints are deemed per se illegal under the Sherman Act, a number of recent developments have left this per se status only nominally intact. The economic criteria that are now used to determine the legal status of price restraints are two-fold. First, price restrictions must reduce retail price competition if they are to be illegal. This means that antitrust law would more likely be enforced for price restrictions in the form of minimum price rather than for maximum price restrictions. In fact, in Atlantic Richfield Co. vs. USA Petroleum Co. (1990) the Supreme Court ruled that maximum price restraints are legal as long as they are not predatory.[15] Second, the courts in enforcing the illegality rule look for evidence of "horizontal conspiracy" among either a group of retailers or between a manufacturer and a group of retailers. Therefore, price restrictions which are a result of collusive actions are illegal, while the courts allow price restrictions if it is obvious that the need for such restrictions arises out of a unilateral policy by the manufacturer to decide how its product should be marketed. Thus, while deploying price restrictions, managers must ensure the availability of any information or action that shows the absence of collusive motives.

For the markets discussed in the paper it is possible that both a price restraint and a nonprice restraint such as exclusive territories or quantity forcing might be theoretically sufficient for coordination. One consideration that helps companies to choose between them is a well-known inconsistency in the legal treatment of price vs. nonprice contracts. While price restraints are deemed strictly illegal, the courts have given nonprice restraints (with analogous effects) a greater degree of latitude (Posner 1977, 1981). Because of this, firms have used nonprice based arrangements that mimic the effects of price restraints. The case of Eastern Scientific Co. vs. Wild Heerberg Instruments, Inc. is an interesting example.[16] The manufacturer (Eastern Scientific) established exclusive territories and permitted sales between territories if they occurred at a *suggested maximum list price*. By creating the threat of sales from dealers of other territories, the manufacturer effectively limited the maximum price a dealer could charge up to the suggested list price. The manufacturer thus controlled the retail price without explicitly imposing a

[15]Atlantic Richfield Co. vs. USA Petroleum Co., 495 U.S. 328, 110 S. Ct. 1884 (1990).

[16]Eastern Scientific Co. vs. Wild Heerberg Instruments, Inc., 572 F.2nd 883 (1st Cir), cert. denied, 439 U.W. 833 (1978).

price restraint and this arrangement was upheld by the court. Another example of implementing a price floor without "forcing" the retailer is the practice adopted by Nintendo and Sony in the video game market. Nintendo specifies a minimum advertised price (MAP) which is tied to the offer of co-operative advertising contributions from the company. Retailers get the co-op contribution in return for adherence to the MAP.

The implementation of the menu-based contracts of Proposition 3 is also an interesting issue. One alternative is to design the menu and allow the retailers to freely choose from this menu. In this case, retailers would ascertain over a period of time that it is in their interest not to choose the same option from the menu. The disadvantage of this method is that retailers may take some time to "learn" that being similar to the other retailer does not pay. However, this approach has the advantage that it is less likely to run afoul of antitrust law. The alternative method is to design the menu and induce the retailers to voluntarily choose the "correct" option by tying it to some promotional incentive (as in the Nintendo case).

5. Summary and Testable Implications

Price and nonprice competition among retailers is present in most distribution channels. This paper examines how manufacturers should manage these channels through a framework that highlights the role of two critical types of consumer heterogeneity: locational differences (as in the models of horizontal differentiation) and differences in the willingness to pay for retail services (as in the models of vertical differentiation). The main results and some testable implications of the paper are summarized in Table 1.

Though differentiation in price and nonprice service factors among retailers is pervasive, the literature on distribution channels has focused on the use of uniform contracts to coordinate retail price-service competition. The paper shows that manufacturers in heterogeneous markets must not only ensure that retailer interests are properly aligned, but they also might have to use the contract to induce retail differentiation. This is achieved through menu-based contracts as in the theory of mechanism design. Retail differentiation is required when the locational differences between the retailers is small compared to the heterogeneity in the willingness to pay of consumers. Indeed, this decision of whether to induce symmetry or differentiation in retail markets is a question that practitioners often grapple with. Marketing managers often have to choose between using a single as opposed to a mix of several types of retail channels. This choice is typically accepted as a matter of (exogenous) corporate policy. The point emphasized here is that the retailing mix can be endogenous to the channel contracts offered by the manufacturer.

The paper highlights another aspect of channel coordination that is important. In markets with price and service competition there can be channel conflict over the nature of retail competition itself: A manufacturer might find the retailers to be excessively biased either towards price competition at the cost of service provision or vice-versa. The paper identifies when manufacturers are likely to stimulate price as opposed to service competition among their retailers and provides an endogenous rationale for the use of price ceilings versus price floors.

When upstream competition is also considered, there is a suggestion that full coordination of the channel is not always the optimal strategy for a manufacturer. It is optimal only in markets with strong brand loyalty. Formal analysis of price and non-price competition in a channel duopoly (with interbrand but no intrabrand competition) shows that retail price-service differentiation is likely in markets with weak brand loyalty. The analysis also provides a rationale for the existence of mixed channels. Retail differentiation complements and supports a mixed channel strategy in markets with very weak brand loyalty. An implication of this is that the incidence of mixed channels should be greater in industries with lower concentration ratios.

An important extension of this paper will be a formal analysis of the general problem of a channel with both intrabrand brand and upstream competition. The extension to markets like grocery or hardware where competing retailers sell products of multiple manufacturers is also important. A particularly interesting issue will be to examine the conditions under which

Table 1

Market Conditions	Equilibrium	Optimal Contracts	Testable Implications
	Single Manufacturer and Competing Retailers		
$0 < t < \theta_P/4$	Coordinated profit is nonconcave		
$\theta_P/4 < t < \theta_H/2$	Asymmetric equilibrium with retail differentiation	Menu-Based Contracts	Variation in the contract terms offered to different retailers more likely in markets with high retail density and substantial income variations
$t > \theta_H/2$	Symmetric equilibrium with undifferentiated retail market	Uniform Contracts to all retailers. Retail price restraints or exclusive territories optimal but two-part tariffs and quantity discounts not optimal	Likely in markets with less income variations (eg. a homogenous residential suburb) and more locational advantages for the retailers. Price ceilings more likely for high-ticket items.
	Upstream Competition, Extreme Case with Exclusive Retailers		
$b < [1/2 - 27t/8\theta_H]$	No pure strategy channel equilibrium		
$[1/2 - 27t/8\theta_H] < b < [1/2 - 27t/10\theta_H]$	Mixed channel equilibrium with retail differentiation		Incidence of mixed channels should be highest in industries with lowest concentration ratios
$[1/2 - 27t/10\theta_H] < b < [1/2 - 9t/4\theta_H]$	Manufacturers decide not to coordinate and retailers differentiate		Retail differentiation is more likely in markets with weak brand loyalty
$[1/2 - 9t/4\theta_H] < b < [1/2 - 45/28\theta_H]$	Manufacturers choose to coordinate	Price restraints optimal	

manufacturers choose exclusive versus common retailers. In sum, the study of channel relationships with price and nonprice competition is a fruitful area for further research.[17]

Appendix

Proof of Proposition 2

Consider the optimization program represented by (5) subject to the constraints in (2) and (3) for the competitive case where the incentive compatibility constraints for the high types and the individual rationality constraints for the low types are binding.[18] These binding constraints are used to derive the demands x_j and y_j, which are as follows:

$$x_j = \frac{1}{t\theta_1}[V + \theta_1 S_j - P_j],$$

$$y_j = \frac{1}{2} + \frac{S_j - S_{3-j}}{2t} - \frac{P_j - P_{3-j}}{2t\theta_2}. \quad \text{(A1)}$$

Substituting these demands into (5) and solving the first-order conditions w.r.t prices give:

$$P_1(S_1, S_2) = \frac{V}{2} + \frac{t\theta_1\lambda}{4(1-\lambda)} + \frac{\theta_1(S_1 + S_2)}{4} + \frac{\theta_H(S_1 - S_2)}{4},$$

$$P_2(S_1, S_2) = \frac{V}{2} + \frac{t\theta_1\lambda}{4(1-\lambda)} + \frac{\theta_1(S_1 + S_2)}{4} - \frac{\theta_H(S_1 - S_2)}{4}. \quad \text{(A2)}$$

[17]This paper is based upon Chapter 3 of my dissertation at the University of Toronto. I am grateful to Frank Mathewson, Jack Mintz, Andy Mitchell, Chakravarthi Narasimhan, Kannan Srinivasan, Ambar Rao, and to Ralph Winter. I also thank the Editor (Rick Staelin) and the review team. Rakesh Niraj provided excellent research assistance. Any errors are my own.

[18]It can be proved a competitive regime in which the binding constraints are both the incentive compatibility constraints (for the high and the low type segments) does not exist. In other words, the optimum cannot be such that the marginal consumers from both segments simultaneously get positive surplus. If this were the case, the coordinated manufacturer could always structure the contract to increase the retail price or reduce the service level at both the retail outlets without reducing demand, and thereby increase the coordinated profit.

Substitute P_1 and P_2 back into the objective function to get the profit function in service. Denote this reduced form profit function by $\Pi_v(S_1, S_2)$. The first-order conditions in service can be evaluated for the service levels as:

$$R_j(S_{3-j}) = S_j = \frac{1}{[4t - \theta_P]}$$

$$[(\theta_1(1 - \lambda) - \theta_H) S_{3-j} + 2(1 - \lambda)V + t\lambda\theta_1]$$

$$\text{where} \quad \theta_P = \theta_H + \theta_1(1 - \lambda). \tag{A3}$$

The second-order conditions ($\partial^2\Pi_v(S_1, S_2)/\partial S_j^2 < 0$) imply that $t > \theta_p/4$. Consider now the range $t > \theta_H/2$. Some algebra will indicate that $\theta_H/2 > \theta_p/4$, and therefore the SOCs are satisfied for $t > \theta_H/2$ and the reduced-form profit functions are strictly concave in S_j in this range. In addition, the limit as $S_1 \to S_1'$ of $\Pi_v(S_1, S_2)$ approaches $\Pi_v(S_1', S_2)$ and this assures that the profit function is continuous. Therefore, solving the equations in (A3) gives the unique symmetric optimum (σ_s). The symmetric service and price levels can be evaluated to be:

$$S_{\text{sym}} = \frac{2(1 - \lambda)V + t\lambda\theta_1}{4t - 2\theta_1(1 - \lambda)}, \tag{A4}$$

$$P_{\text{sym}} = \frac{V}{2} + \frac{t\theta_1\lambda}{4(1 - \lambda)} + \frac{\theta_1 S_{\text{sym}}}{2},$$

$$\text{where} \quad S_{\text{sym}} \text{ is given by (A4).} \tag{A5}$$

This proves Proposition 2.

Proof of Proposition 3a

Consider the range $\theta_p/4 < t < \theta_H/2$. From (A3), it can be verified that retailer j's monopoly level of service is greater than the smallest level of retailer j's service that is needed to shut out the other retailer. In other words, $R_j(S_{(3-j)} = 0) > R_{(3-j)}^{-1}(S_{(3-j)} = 0)$. Therefore, in addition to the symmetric optimum of Proposition 2, the points

$$[S_{1\text{asym}}, S_{2\text{asym}}] = [(2(1 - \lambda) V + t\lambda\theta_1)/(\theta_H - \theta_1(1 - \lambda), 0]$$

and

$$[0, (2(1 - \lambda) V + t\lambda\theta_1)/(\theta_H - \theta_1(1 - \lambda)]$$

are also possible optima. Tedious algebra can now show that when $\theta_p/4 < t < \theta_H/2$, $\Pi_v(P_{1\text{asym}}, P_{2\text{asym}}, S_{1\text{asym}}, S_{2\text{asym}}) > \Pi_v(P_{1\text{sym}}, P_{2\text{sym}}, S_{1\text{sym}}, S_{2\text{sym}})$. This proves Proposition 3a.

Note also that when $t < \theta_p/4$ the coordinated profit function is nonconcave. In this range, $\partial\Pi_v(S_j, S_{(3-j)})/\partial S_j > 0$ for all $S_{(3-j)}$. This means that $S_j^* \to \infty$. □

Proof of Proposition 4

The condition that ensures that it is the high-type segment (and not the low-type segment) that is fully served is that $S_j - t/2 > 0$ at the first-best optimum. Evaluating this leads to the condition $V > \{V^{\max} = t(2t - \theta_1)/2(1 - \lambda)\}$. From Proposition 1, $V > V^H$, is required to ensure retail competition. Thus $V > \text{Max}\{V^H, V^{\max}\}$ is the necessary and sufficient for the existence of the competitive regime in which the high-type segment is fully served. I will now show that a price ceiling is a sufficient to achieve the first-best for this case. The first-order conditions with respect to price can be written as (note that the SOCs are satisfied):

$$\frac{\partial\pi_{rl}(P_1, S_1; P_2, S_2)}{\partial P_1} = \left[\frac{\partial\Pi_v(P_1, S_1; P_2, S_2)}{\partial P_1}\right.$$

$$\left. - w\,\frac{\partial q_1(P_1, S_1; P_2, S_2)}{\partial P_1} - P_2\,\frac{\partial q_2(P_1, S_1; P_2, S_2)}{\partial P_1}\right] = 0. \tag{A6}$$

In the service stage, the retailer chooses S_1^* to satisfy $\partial\pi_{r1}[P_1(\cdot), S_1; P_2(\cdot), S_2]/\partial S_1 = 0$. This can be written as:

$$\frac{\partial\pi_{rl}(S_1, S_2)}{\partial S_1} = \left[\frac{\partial\Pi_v(S_1, S_2)}{\partial S_1} - w\,\frac{\partial q_1(S_1, S_2)}{\partial S_1}\right.$$

$$\left. - P_2(S_1, S_2)\,\frac{\partial q_2(S_1, S_2)}{\partial S_1} - q_2\,\frac{\partial P_2}{\partial S_1}\right] = 0. \tag{A7}$$

Similar conditions can be derived for retailer 2.

Suppose that the manufacturer uses a price restraint. Consider the vertically integrated optimum (P_{sym},S_{sym}) where S_{sym} is as shown in (A4) and P_{sym} is as in (A5). The manufacturer can set $w = w^*$ such that at the vertically integrated optimum (P_{sym}, S_{sym}), the sum of the last three terms in (A7) is zero. This elicits (P_{sym}, S_{sym}) provided that the price restraint at P_{sym} is binding. Use (A7) to evaluate w^* and then evaluate (A6) at (w^*, P_{sym}, S_{sym}). The first term is zero at (P_{sym}, S_{sym}) by definition. Substituting the values of the demand derivatives and after some algebra the last two terms in (A6) can be evaluated to be positive at (w^*, P_{sym}, S_{sym}). This implies that the price restraint is binding and in the form of a price ceiling $P_{\text{ceiling}} = P_{\text{sym}}$. It is trivial then to show that a fixed fee can be set to extract all retail profits. Proposition 4b can be proved in an analogous fashion by considering the other possible regime in which the low-type segment is not fully covered. □

Proofs not provided are available from the author.

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