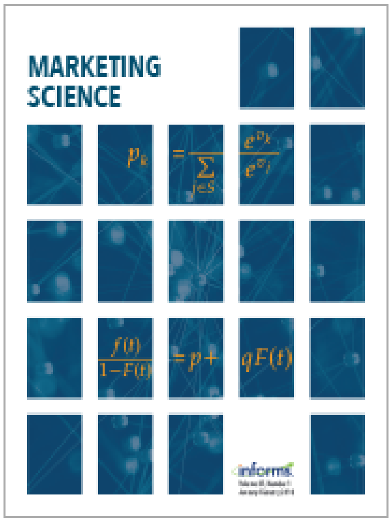

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Channel Coordination in the Presence of a Dominant Retailer

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The retail trade today is increasingly dominated by large, centrally managed "power retailers." In this paper, we develop a channel model in the presence of a dominant retailer to examine how a manufacturer can best coordinate such a channel.

We show that such a channel can be coordinated to the benefit of the manufacturer through either quantity discounts or a menu of two-part tariffs. Both pricing mechanisms allow the manufacturer to charge different effective prices and extract different surpluses from the two different types of retailers, even though they both have the appearance of being "fair." However, quantity discounts and two-part tariffs are not equally efficient from the manufacturer's perspective as a channel coordination mechanism. Therefore, the manufacturer must judiciously select its channel coordination mechanism.

Our analysis also sheds light on the role of "street money" in channel coordination. We show that such a practice can arise from a manufacturer's effort to mete out minimum incentives to engage the dominant retailer in channel coordination. From this perspective, we derive testable implications with regard to the practice of street money.

Key words: distribution channels; channel power; channel coordination
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1. Introduction

The retailing industry today is increasingly dominated by large, centrally managed "power retailers," such as chain supermarkets, mass merchandizers, wholesale clubs, and category killers (Schiller and Zellner 1992, Kahn and McAlister 1997, Useem 2003). In this paper, we draw from the well-known *dominant-firm* model in economics (Samuelson and Nordhaus 1989, Shepherd 1997, Riordan 1998) and develop a channel model with the presence of a dominant retailer and a passive fringe of identical retailers to examine how a manufacturer can achieve channel coordination profitably in this channel environment.

Our channel model with a dominant retailer captures three characteristics salient in some of today's retailing markets. First, due to their ability to offer consumers the unprecedented opportunity for one-stop shopping and their ability to offer manufacturers effective promotional services, often unmatched by independents or mom-and-pop stores, power retailers are dominant players, commanding a large market share in nearly every retail market (Epstein 1994, Zerrillo and Iacobucci 1995, Wahl 1992).[1] Second, they are frequently the largest distributors for manufacturers. Sales through Walmart, for instance, account for 17% of the P&G's total sales in 2002, 39% of Tandy's, and a double-digit percentage for many other large manufacturers (Useem 2003). Third, power retailers are frequently the price leaders (Stone 1995, Weinstein 2000). As a pricing consultant characterized it, "it used to be that shelf prices [at independents and convenience stores] were set by buying (illegally) a copy of the price book from the store manager of a famous national chain, and adding two cents (improperly) to each item.... Over time, that famous national chain changed, the facts changed, and so did their policies and strategy.... Shelf prices are now set by buying the price book from the store manager of the same store of the same national chain, but instead of adding two cents, they now subtracted two cents" (Partch 1991).

Previous studies, such as those of McGuire and Staelin (1983), Coughlan (1985), and Coughlan and Wernerfelt (1989), examine the manufacturers' choice

[1] In the grocery industry, for instance, chain supermarkets account for only 16% of the total number of stores in US in 1999, while independent supermarkets and small stores with sales below \$2 million account for nearly 40%. However, in terms of sales, chain supermarkets account for 61.8% of the total while independents and small stores account for about 27%. See *Progressive Grocer Annual Report* (2000).

of channel structure but do not address the issues of channel coordination directly. Jeuland and Shugan (1983, 1988) study how quantity discounts can coordinate a dyadic channel where both price and nonprice decision variables are involved. Moorthy (1987) shows that a two-part tariff can be used to motivate the retailer to set the channel-profit maximizing price in a dyadic channel. This is also the case, as Lal (1990) shows in the context of franchising, even if the retailer provides the value-added service.[2] We build on these studies by extending their analysis to a different channel structure with new insights. We show that optimal channel coordination entails a judicious choice on the part of a manufacturer between quantity discounts à la Jeuland and Shugan (1983) and a menu of two-part tariffs.

To the extent that asymmetry is introduced at the retail level, Ingene and Parry (1995a) is closely related to our study.[3] However, our research differs from theirs in that our channel structure incorporates price leader and follower behavior seen in some markets, while theirs does not; we seek to characterize the most profitable way for a manufacturer to achieve the integrated channel profit or channel coordination, while theirs derives a pricing mechanism that would maximize a manufacturer's own profit, or channel profit, but not both. In addition, our model incorporates retail services to shed light on the frequently observed phenomenon of "street money" in the context of distribution channels—a lump sum, discretionary payment from a manufacturer to a retailer for demand stimulating services such as feature advertisement. Our analysis suggests that street money helps to coordinate a dominant retailer channel profitably. As such, we derive some testable implications as to how a manufacturer may spend street money.

Our study also complements Iyer (1998) and Ingene and Parry (2000). The former examines a channel with two symmetric retailers engaging in price and nonprice competition and concludes that neither quantity discounts nor a menu of two-part tariffs are sufficient to coordinate such a channel. The latter examines a two-retailer channel competing on price only and concludes that it is not always optimal to use either quantity discounts or a menu of two-part tariffs to coordinate such a channel. In contrast, we show that in the presence of a dominant retailer, it is always optimal for a manufacturer to coordinate the channel, so long as it chooses the right mechanism.

In the rest of the paper, we first set up our model and discuss coordination problems therein. We then show how quantity discounts plus a lump sum payment or a menu of two-part tariffs can be used by a manufacturer to coordinate the channel profitably. Finally, we compare these two coordination mechanisms to develop more managerial insights, and we conclude with suggestions for future research.

2. Dominant Retailer and Channel Conflict

Our channel consists of a manufacturer selling through a dominant retailer and a competitive fringe. Specifically, we assume that the dominant retailer has market power and faces a downward-sloping demand curve given by

$$Q_d = \gamma(\alpha - \beta p + s), \tag{2.1}$$

where $\gamma \leq 1$ is the fraction of the market demand accounted for by the dominant retailer and s is the demand-stimulating service that only the dominant retailer provides to the manufacturer's product that goes beyond what the competitive fringe can provide. For instance, the dominant retailer can run feature advertisement or information seminars to promote the manufacturer's product. The cost of providing such service is f, which could be the opportunity cost of feature ad space.

We assume that the dominant retailer is the price leader in the market and behaves as a monopolist in setting its price p and in deciding whether to provide the demand-stimulating service s given its demand. Once the dominant retailer sets its price, all retailers in the competitive fringe take this price as the market price. Our analysis will not be qualitatively altered if the competitive fringe simply adds a fixed markup or deducts a fixed dollar amount off the leader's price. This is generally consistent with the industry practice described earlier where small retailers use the pricing book of a large retailer. At that price, the demand facing the competitive fringe as a whole is given by

$$Q_c = (1 - \gamma)(\alpha - \beta p + s), \tag{2.2}$$

which is, we assume, shared equally by the N fringe retailers.[4] The total market demand is then simply

$$Q_m = \alpha - \beta p + s. \tag{2.3}$$

[2] More recently, Gerstner and Hess (1995) examine the channel coordination role of pull promotions in the same channel context and Weng (1995) examines that of quantity discounts from an operations management perspective. Srivastava et al. (2000) as well as Kadiyali et al. (2000) empirically investigate pricing issues within a channel. Issues related to advertising in a distribution channel are discussed in Shaffer and Zettelmeyer (2004).

[3] In a separate article, Ingene and Parry (1995b) extend the analysis to the case of a manufacturer dealing with many independent retailers and controlling channel breadth.

[4] Our analysis is not qualitatively altered if we allow retailers in the competitive fringe to be of unequal size.

Note that our specification of the demand function (2.2) implicitly assumes that a fringe retailer benefits from the demand-stimulating service provided by the dominant retailer. While this assumption greatly facilitates our analysis, it does not drive our main conclusions.[5]

2.1. The Integrated Channel

Channel profit is maximized if the manufacturer integrates forward and sets the market price (p), and service (s) directly. Assuming a zero marginal cost,[6] the manufacturer solves the following optimization problem

$$\max_{p,\,\lambda\{0,1\}} (\alpha - \beta p + \lambda s)p - \lambda f. \tag{2.4}$$

Assuming $f \le \gamma s(2\alpha + s)/(4\beta)$, which ensures that the manufacturer can induce such service even when the channel is not integrated, we have the optimal channel profit and price as

$$\begin{aligned} &\lambda^* = 1, \quad \Pi^*(s, f) = \frac{(\alpha + s)^2}{4\beta} - f, \\ &p^* = \frac{\alpha + s}{2\beta}, \quad \text{and} \quad Q_m^* = \frac{\alpha + s}{2}. \end{aligned} \tag{2.5}$$

2.2. Independent Retailers

We assume that the manufacturer moves first in this channel, making a take-it-or-leave-it offer of its wholesale price (w) to all retailers. At any given wholesale price (w), the dominant retailer decides what price to charge and whether to provide any demand stimulating service. If such service is provided, the retailer's optimal price is determined by

$$\max_{p} \gamma(\alpha - \beta p + s)(p - w) - f, \tag{2.6}$$

which yields the optimal profits and price as

$$\begin{aligned} &\tilde{p}(w, s, f) = \frac{\alpha + s + \beta w}{2\beta}, \quad \text{and} \\ &\tilde{\pi}_d(w, s, f) = \frac{\gamma(\alpha + s - \beta w)^2}{4\beta} - f. \end{aligned} \tag{2.7}$$

Because retail service cannot be monitored perfectly and hence is not contractable, the dominant retailer will provide such service only if $\tilde{\pi}_d(w, s, f) \ge \tilde{\pi}_d(w, 0, 0)$, or $w \le w_s$, where

$$w_s = \frac{\gamma s(2\alpha + s) - 4\beta f}{2\beta\gamma s}. \tag{2.8}$$

Anticipating the decision by the dominant retailer, the manufacturer decides whether to induce service or not. By comparing the maximum profits that the manufacturer can obtain from inducing or not inducing the dominant retailer's service, we can characterize the equilibrium of this decentralized channel. The results are summarized in Table 1.[7]

The decentralized channel does not achieve the maximum channel profit for two reasons.[8] First, due to the classic double marginization problem resurfaced in this channel with a dominant retailer, the retail price is too high to achieve the channel maximum ($\tilde{p} > p^*$ for all $f \le \gamma s(2\alpha + s)/(4\beta)$). Second, the incentive facing the dominant retailer for service provision is also distorted, partly by double marginalization and partly by a smaller demand facing the dominant retailer. Consequently, it might choose not to render any service even when doing so will increase the channel profits (see the last column of Table 1).

3. Quantity Discount and Channel Coordination

To achieve a coordinated channel, the manufacturer does not need to integrate forward and depart from its core competence. It can do so through pricing mechanisms.[9] In that case, the manufacturer must find a pricing mechanism that can simultaneously achieve three objectives: first, to motivate the dominant retailer to set the retail price and to provide the desired service to maximize the channel profit; second, to maximize the manufacturer's own profit while securing the dominant retailer's cooperation; and third, to take as much profit away from the competitive fringe as possible. A quantity discount schedule à la Jeuland and Shugan (1983) is one such pricing mechanism.

3.1. Optimal Quantity Discount Schedule

Let $t(q, f)$ be the unit price charged by the manufacturer when the order quantity from a retailer is q and

[5] An alternative specification is to have $Q_d = \gamma(\alpha - \beta p) + s$ and $Q_c = (1 - \gamma)(\alpha - \beta p)$ to eliminate the service externality and to let a retailer's market share to vary with s. Our analysis shows that this alternative model does not qualitatively alter our basic conclusions. The details of our analysis are available upon request from the authors and are posted at www.marketingscience.org. We thank an anonymous reviewer for suggesting this model.

[6] Assuming nonzero, but constant production costs does not affect our substantive conclusions and hence are set equal to zero for simplicity.

[7] To facilitate the equilibrium analysis, we assume $\gamma \ge (\alpha + s)/(\alpha + s + Ns)$ and $\alpha \ge 7s$. These conditions essentially imply that the effect of service is not very large relative to the base level of demand.

[8] Note that we have $\Pi^* > \tilde{\Pi}$ for all $f \le \gamma s(2\alpha + s)/(4\beta)$.

[9] Potentially, a firm can also achieve the same objective through varying its product offering. See Bergen et al. (1996).

Table 1 Equilibrium for Decentralized Channel

	Service $\left(0 \le f \le \frac{\alpha\gamma s}{4\beta}\right)$	Service $\left(\frac{\alpha\gamma s}{4\beta} < f \le \frac{\gamma s(\alpha+\sqrt{s(2\alpha+s)})}{4\beta}\right)$	No service $\left(\frac{\gamma s(\alpha+\sqrt{s(2\alpha+s)})}{4\beta} < f \le \frac{\gamma s(2\alpha+s)}{4\beta}\right)$
$\tilde{p}$	$\frac{3(\alpha+s)}{4\beta}$	$\frac{4\alpha\gamma s+3\gamma s^2-4\beta f}{4\beta\gamma s}$	$\frac{3\alpha}{4\beta}$
$\tilde{w}$	$\frac{\alpha+s}{2\beta}$	$\frac{\gamma s(2\alpha+s)-4\beta f}{2\beta\gamma s}$	$\frac{\alpha}{2\beta}$
$\tilde{\pi}_m$	$\frac{(\alpha+s)^2}{8\beta}$	$\frac{(4\beta f+\gamma s^2)\{\gamma s(2\alpha+s)-4\beta f\}}{8\beta(\gamma s)^2}$	$\frac{\alpha^2}{8\beta}$
$\tilde{\pi}_d$	$\frac{\gamma(\alpha+s)^2}{16\beta}-f$	$\frac{(\gamma s^2-4\beta f)^2}{16\beta\gamma s^2}$	$\frac{\alpha^2\gamma}{16\beta}$
$\tilde{\pi}_c$	$\frac{(1-\gamma)(\alpha+s)^2}{16\beta}$	$\frac{(1-\gamma)(\gamma s^2+4\beta f)^2}{16\beta(\gamma s)^2}$	$\frac{(1-\gamma)\alpha^2}{16\beta}$
$\tilde{\Pi}$	$\frac{3(\alpha+s)^2}{16\beta}-f$	$\frac{\gamma^2 s^3(4\alpha+3s)+8\beta f\{\gamma s(2\alpha+s-2\gamma s)-2\beta f\}}{16\beta(\gamma s)^2}$	$\frac{3\alpha^2}{16\beta}$

the cost of service provision is f. Facing such a pricing schedule, the dominant retailer solves the following optimization problem:

$$\max_p Q_d(p)\{p-t(Q_d(p),f)\}-f. \tag{3.1}$$

The manufacturer needs to find a pricing schedule $t(q,f)$ whereby the retailer's profitability is aligned with the manufacturer's. They are aligned if the retailer's optimization problem (3.1) is transformed into the following instead:

$$\max_p k_1 Q_m(p)p-k_2 f. \tag{3.2}$$

In the above equation, $0<k_1<1$ is the fraction of the total channel profit, excluding service cost, that the dominant retailer can capture. The parameter k_2, where $0\le k_2\le 1$, is the fraction of service cost that the dominant retailer cannot recover.[10] The following proposition makes it clear that such a transformation is feasible and unique.

Proposition 1. *A manufacturer can coordinate the channel with a dominant retailer by offering a quantity discount schedule with the unit price given by*

$$t(q,f)=\frac{\gamma-k_1}{\gamma}\left(\frac{\alpha+s}{\beta}-\frac{q}{\gamma\beta}\right)-\frac{(1-k_2)f}{q}.$$

Proposition 1 can be verified by substituting $t(q,f)$ into Equation (3.1) to obtain Equation (3.2). We can take the quantity discount schedule à la Jeuland and Shugan (1983) one step further by determining k_1 and k_2. By noting that the manufacturer's discount schedule must ensure that the retailers in the competitive fringe are not priced out of the market and that the manufacturer uses minimum incentives to induce the dominant retailer to service its product, we have (see Appendix A)

$$k_1^*=\frac{N\gamma+\gamma-1}{2N\gamma+\gamma-1}\gamma,\quad\text{and}$$

$$k_2^*=\begin{cases}1 & \text{if } 0\le f\le k_1^*\dfrac{s(2\alpha+s)}{4\beta}\\ k_1^*\dfrac{s(2\alpha+s)}{4\beta f} & \text{if } k_1^*\dfrac{s(2\alpha+s)}{4\beta}<f\le\dfrac{\gamma s(2\alpha+s)}{4\beta}.\end{cases} \tag{3.3}$$

The optimal quantity discount schedule that coordinates the channel is given by

$$t^*(q,f)=\frac{\gamma-k_1^*}{\gamma}\left[\frac{\alpha+s}{\beta}-\frac{q}{\gamma\beta}\right]-\frac{(1-k_2^*)f}{q}. \tag{3.4}$$

Note that $k_1^*>0$ is strictly less than γ so that $t^*(q,f)$ is indeed a quantity discount schedule. Under this schedule, a dominant retailer purchasing a quantity of q and providing the merchandizing service s will pay a unit price of $t^*(q,f)$. This means that when buying from the manufacturer a quantity of q, the dominant retailer pays a unit price of

$$\frac{\gamma-k_1^*}{\gamma}\left(\frac{\alpha+s}{\beta}-\frac{q}{\gamma\beta}\right)$$

and receives a lump sum compensation of $(1-k_2^*)f$ for the service provision, making a profit of $k_1^*(\alpha+s)^2/(4\beta)-k_2^*f$. The competitive fringe retailer will simply pay a unit price depending on their order quantity according to $t^*(q,f)$ when f is set equal to zero[11]

[10] Note that k_1 and k_2 are similar but not identical to those in Jeuland and Shugan (1983).

[11] As stated earlier, we assume that the competitive fringe does not provide s and therefore does not incur the cost of f.

and makes a zero profit. We can show that for all $f \le \gamma s(2\alpha+s)/(4\beta)$, the manufacturer is strictly better off when this quantity discount schedule is used to coordinate the channel than when it is not. Note that this quantity discount schedule favors the dominant firm not only with a lower unit price as in Shugan and Jeuland (1983), but also with a potential service subsidy because a competitive fringe does not provide the same level of service by assumption.

3.2. Phenomenon of Street Money

"Street money" is the lump-sum cash payment that a manufacturer offers to a retailer for servicing its product, and it is frequently offered only to certain major players in a market in order to motivate their service provision (Weinstein et al. 1990). The past literature has attributed the rise of street money—slotting fees in specific—mainly to the scarcity of shelf space and facilitating practices (Chu 1992, Shaffer 1991). Our analysis suggests that a different motivation is possible as summarized in the following proposition.

Proposition 2. (a) *Street money from the manufacturer to the dominant retailer can arise as part of a manufacturer's effort to coordinate a dominant retailer channel.* (b) *For the purpose of coordinating the channel, the manufacturer offers more street money as service cost increases (larger f) and as consumers become more price sensitive (higher β). It offers less street money when the dominant retailer is more dominant (larger γ), when the number of retailers in the competitive fringe is larger (larger N), or when the retail service is more effective (larger s).*

The channel coordination role of street money can be seen from the fact that whenever the dominant retailer is sufficiently motivated to provide the desired service without any prodding from the manufacturer (when $0 < f \le k_1^* s(2\alpha+s)/(4\beta)$), the manufacturer's lump-sum payment for the service is zero even though the manufacturer is also a beneficiary of the service (Equations (A.1) and (3.4)). However, as service cost increases the manufacturer starts to offer service subsidies to motivate the retailer's cooperation. As a testable implication, this channel coordination perspective on street money suggests that a manufacturer may not mete out street money to all dominant retailers. Street money will be dispensed only to those retailers whose cost of service is sufficiently high. Anecdotal evidence seems to suggest that this is indeed the case, as chain supermarkets seem to collect a lion's share of street money from food and beverage product categories.

The phenomenon of street money is unique to our dominant retailer channel with asymmetrical capability of service provision. In a dyadic channel as studied by Jeuland and Shugan (1983), street money is not required for channel coordination, although a side payment not related to the cost of providing service is possible. Neither is it required to coordinate a competitive channel according to Ingene and Parry (1995a, 2000).

4. Two-Part Tariffs and Channel Coordination

In practice, a manufacturer frequently uses a menu of two-part tariffs to implement quantity discounts (Oren et al. 1982). When devising such a menu, the manufacturer offers a set of price schedules, each of which consists of a fixed fee component $F_i \ge 0$ and a unit price component $w_i \ge 0$, where i indexes the price schedule. Because there are only two types of retailers in this channel, the manufacturer needs to set up only two such schedules, (F_d, w_d) intended for the dominant retailer and (F_c, w_c) for the competitive fringe. As we show in Appendix B, the manufacturer's optimal strategy is to set $w_d = 0$ to align the interests of the dominant retailer and the manufacturer in the retail price and service provision, and set rest of its tariffs such that all surplus is taken away from the competitive fringe, leaving the dominant retailer indifferent choosing either price schedule. We have

$$F_c = \begin{cases} 0 & \text{if } 0 \le f \le \dfrac{\alpha\gamma s}{4\beta} \\ \dfrac{(1-\gamma)(\alpha+s)(4\beta f-\alpha\gamma s)}{4\beta N\gamma s} & \text{if } \dfrac{\alpha\gamma s}{4\beta} < f \le \dfrac{\gamma s(2\alpha+s)}{4\beta} \end{cases},$$

$$F_d = \begin{cases} \dfrac{3\gamma(\alpha+s)^2}{16\beta} & \text{if } 0 \le f \le \dfrac{\alpha\gamma s}{4\beta} \\ \bar{F}_d & \text{if } \dfrac{\alpha\gamma s}{4\beta} < f \le \dfrac{\gamma s(2\alpha+s)}{4\beta} \end{cases},$$

$$w_c = \begin{cases} p^* & \text{if } 0 \le f \le \dfrac{\alpha\gamma s}{4\beta} \\ w_s & \text{if } \dfrac{\alpha\gamma s}{4\beta} < f \le \dfrac{\gamma s(2\alpha+s)}{4\beta} \end{cases},$$

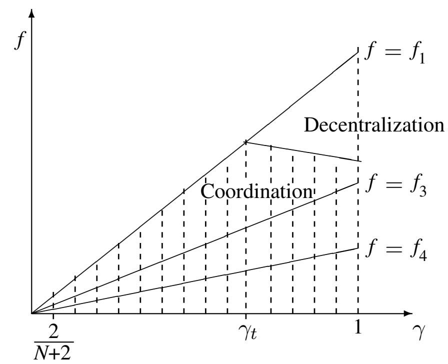
$$\pi_m = \begin{cases} \dfrac{(4-\gamma)(\alpha+s)^2}{16\beta} & \text{if } 0 \le f \le \dfrac{\alpha\gamma s}{4\beta} \\ \bar{\pi}_m & \text{if } \dfrac{\alpha\gamma s}{4\beta} < f \le \dfrac{\gamma s(2\alpha+s)}{4\beta} \end{cases},$$

where $\bar{F}_d$ and $\bar{\pi}_m$ are defined in Appendix B and p^* and w_s are, respectively, given by Equations (2.5) and (2.8). Some straightforward analysis of this menu yields the following proposition.

Proposition 3. *A menu of two-part tariffs can coordinate a dominant retailer channel, whereby a retailer choosing to pay a low fixed fee pays a higher wholesale price and vice versa. However, channel coordination with a menu of two-part tariffs is not always profitable for the manufacturer.*

The negative correlation between the wholesale price and the fixed fee is essential for the manufacturer to be able to separate the two types of retailers in

Figure 1 **Menu of Two-Part Tariffs and Channel Coordination**



Note. Parameter definitions are given in Table 2. Shaded region is where coordination is more profitable.

the market and to achieve channel coordination profitably. This feature of the pricing scheme is in sharp contrast to the quantity discount schedule discussed in the previous section where the dominant retailer pays a lower unit price and gets paid a lump sum, while a fringe retailer pays a higher unit price without being paid a lump sum. This is necessitated by the fact that the manufacturer must motivate a retailer to choose the intended tariffs. More specifically, the manufacturer must leave a potentially sizable surplus to the dominant retailer. As a result, the manufacturer is *not* always better off using a menu of two-part tariffs to coordinate the channel than not coordinating the channel at all. Figure 1 shows that when the dominant retailer is very dominant, and the service cost is high, the manufacturer is worse off using a menu of two-part tariffs to coordinate the channel.

With a menu of two-part tariffs, street money resurfaces when service cost is high. As shown by Equation (B.7) in Appendix B, when $f > \alpha\gamma s/(4\beta)$, the manufacturer compensates the dominant retailer for providing retail service. This payment from the manufacturer to the dominant retailer once again demonstrates the channel coordination role of street money—such a payment does not have to occur even when the service cost is not zero. When such a payment does occur, it covers only part of the cost when the dominant retailer has a small market share, *but it exceeds the cost when the dominant retailer has a sufficiently high market share*. This variation in the service fees reflects the manufacturer's effort to mete out the minimum incentive to induce channel coordination.

Table 2 **Parameter Definitions**

Parameter	Definition	Parameter	Definition
f_1	$\frac{\gamma s(2\alpha+s)}{4\beta}$	f_2	$\frac{\alpha\gamma s}{2\beta}$
f_3	$\frac{\gamma s(\alpha+\sqrt{s(2\alpha+s)})}{4\beta}$	f_4	$\frac{\alpha\gamma s}{4\beta}$
f_5	$k_1^*\frac{s(2\alpha+s)}{4\beta}$	γ_b	$\frac{\alpha+s}{\alpha+s+Ns}$
γ_t	$1-\frac{N\alpha^2}{2(1+N)(\alpha+s)^2}$		

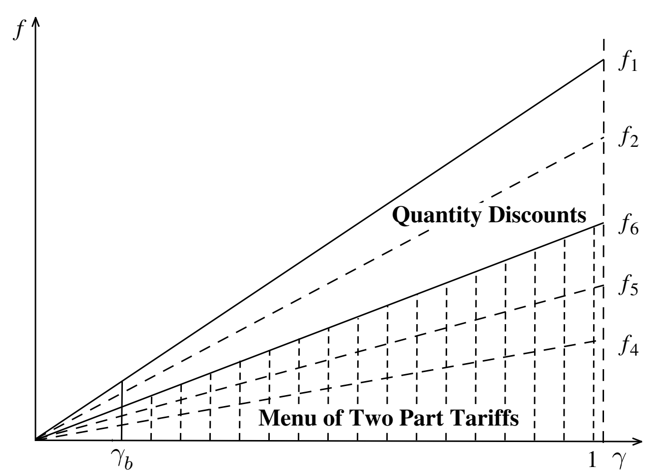
5. Winners and Losers of Channel Coordination

In our model, channel profits always increase due to coordination. However, not all channel members will benefit from this increase. In general, regardless of which pricing scheme is used to coordinate the channel, the competitive fringe is always worse off with coordination than without. The dominant retailer may become better or worse off, relative to an uncoordinated channel, when the manufacturer coordinates the channel with either quantity discounts or a menu of two-part tariffs. Consumers, however, always benefit from a lower price in a coordinated channel, and so does society as whole because the channel profit also increases when the channel is coordinated. Finally, the manufacturer is better off with coordination, so long as it judiciously chooses its coordination mechanism. The following proposition makes it more precise.

Proposition 4. *The manufacturer prefers quantity discounts to a menu of two-part tariffs as a channel coordination mechanism when the service cost is sufficiently high* ($f \geq f_6$). *However, it may prefer a menu of two-part tariffs at a given service cost when the dominant retailer is sufficiently dominant.*

It is straightforward to verify Proposition 4 by comparing the manufacturer's payoffs under quantity discounts and two-part tariffs. In Figure 2, we illustrate the results of this analysis.

Figure 2 **Optimal Channel Coordination Mechanism**



Note. Parameter definitions are in Table 2. The existence of f_6, where $f_5 < f_6 < f_2$, is shown in Appendix C. The shaded area is the region where a mean of two-part tariffs is preferred to quantity discounts.

Intuitively, when the service cost is high, the manufacturer must provide increasingly more incentives in the form of a lump-sum payment to the dominant retailer, not only to motivate the dominant retailer to provide service but also to neutralize the retailer's incentive to choose the unintended pricing schedule. This is why at a high service cost, the manufacturer over-compensates the dominant retailer. Because of the overcompensation, the manufacturer's profit drops precipitously with a higher service cost. This is not the case, however, when a quantity discount schedule is used. The manufacturer's profit under the optimal quantity discount schedule decreases with the cost as expected, but it decreases slowly to make the pricing scheme stand out as the manufacturer's choice when the service cost is high.

A menu of two-part tariffs might however, stand out as the manufacturer's coordination mechanism when the dominant retailer is sufficiently dominant. A more dominant retailer has a smaller incentive to choose the pricing schedule intended for the competitive fringe and, hence, allows the manufacturer to extract more surplus from the dominant retailer when it uses a menu of two-part tariffs. In other words, channel power, measured as the relative profitability of a channel member (Messinger and Narasimhan 1995), can shift to the manufacturer when the channel is coordinated with a menu of two-part tariffs. In contrast, when quantity discounts are used, power shifts from the manufacturer to the dominant retailer as the latter becomes more dominant.

6. Conclusions

In this paper, we have developed a parsimonious model of a channel with a dominant retailer to capture some of the salient characteristics in some of today's distribution channels: power retailers, independents, price leadership, and retail service. The focus of our analysis was primarily on how such a channel can be coordinated profitably by a manufacturer. Our analysis identifies the challenges and opportunities specific to coordinating such a channel and sheds some new light on channel coordination as a managerial imperative.

We show that a manufacturer is better off coordinating a dominant retailer channel through quantity discounts when the cost of retail services is high, and through a menu of two-part tariffs, when the cost is low, or when the dominant retailer is sufficiently dominant. We also show that channel coordination can motivate the provision of retail services by power retailers and the choice of coordination mechanisms may have a bearing on channel power. In this context, we show that the phenomenon of "street money" can arise from the manufacturer's effort to mete out minimum incentives to power retailers in order to coordinate a channel.

Our model is a first step in studying issues related to coordinating a channel populated by power retailers. Future research can, for instance, relax some of our assumptions such as a single dominant retailer and a fixed level of retail services. It can also empirically test some of our predictions regarding street money.

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Appendix A

To determine k_1, note that the unit price each competitive fringe will pay under the pricing schedule $t(q, f)$ will be

$$w_c^* = \frac{(\gamma - k_1)(2N\gamma + \gamma - 1)(\alpha + s)}{2\beta N\gamma^2}.$$

To achieve the coordinated outcome, the manufacturer must set its quantity discount schedule so that the competitive fringes are not priced out of the market. This means that we must have $w_c^* = p^*$, or

$$k_1 = k_1^* = \frac{N\gamma + \gamma - 1}{2N\gamma + \gamma - 1}\gamma, \tag{A.1}$$

as in Proposition 1.

To determine k_2, we note that the manufacturer has every incentive, for the sake of maximizing its own profit, to let the retailer bear as much burden of service costs as it is consistent with providing sufficient motivation for the retailer to service its product. Under the quantity discount schedule in Proposition 1, the difference between the retailer's optimal profit when the service is provided and that when it is not is given by $k_1^* s(2\alpha + s)/(4\beta) - k_2 f$. This means that the k_2 that maximizes the manufacturer's profit and yet provides sufficient incentive for the retailer to service its product is given by

$$k_2^* = \begin{cases} 1 & \text{if } 0 \le f \le k_1^* \dfrac{s(2\alpha + s)}{4\beta} \\ k_1^* \dfrac{s(2\alpha + s)}{4\beta f} & \text{if } k_1^* \dfrac{s(2\alpha + s)}{4\beta} < f \le \dfrac{\gamma s(2\alpha + s)}{4\beta}. \end{cases} \tag{A.2}$$

Thus, the optimal pricing schedule that the manufacturer sets to coordinate the channel is given by

$$t^*(q, f) = \frac{\gamma - k_1^*}{\gamma}\left(\frac{\alpha + s}{\beta} - \frac{q}{\gamma\beta}\right) - \frac{(1 - k_2^*)f}{q}.$$

Appendix B

The key to coordinating this channel is to motivate the retailer to set its price at p^* as defined in Equation (2.5). From Equation (2.7), we can see that the manufacturer can do so only if it sets $w_d = 0$. Then, given $(F_d, 0)$ and (F_c, w_c), if the dominant retailer and the competitive fringe all choose the two-part tariffs intended for them, their profits are, respectively,

$$\pi_d = \gamma \frac{(\alpha+s)^2}{4\beta} - f - F_d, \qquad \pi_c = (1-\gamma)\frac{(\alpha+s)}{2N}(p^* - w_c) - F_c. \tag{B.1}$$

To motivate participation by all retailers, the manufacturer must choose its price schedules so that they all make nonnegative profit, or $\pi_d \geq 0$ and $\pi_c \geq 0$. These two inequalities imply $F_d \leq \gamma(\alpha+s)^2/(4\beta) - f$ and $F_c \leq [(1-\gamma)(\alpha+s)/(2N)] \cdot (p^* - w_c)$.

A competitive fringe firm will choose (F_c, w_c), instead of $(F_d, 0)$, if $F_d - F_c \geq [(1-\gamma)(\alpha+s)/(2N)]w_c$. The equivalent condition for the dominant retailer is, when $w_c \leq w_s$,

$$F_d - F_c \leq \frac{\gamma w_c[2(\alpha+s) - \beta w_c]}{4}.$$

We can show that the case $w_c > w_s$ is never optimal for the manufacturer. Thus, the manufacturer solves the following optimization problem:

$$\max_{(F_d, F_c, w_c)} F_d + \frac{(1-\gamma)(\alpha+s)}{2} w_c + NF_c, \tag{B.2}$$

$$F_d \leq \gamma \frac{(\alpha+s)^2}{4\beta} - f, \tag{B.3}$$

$$F_c \leq (1-\gamma)\frac{(\alpha+s)}{2N}(p^* - w_c), \tag{B.4}$$

$$F_d - F_c \geq (1-\gamma)\frac{(\alpha+s)}{2N} w_c, \tag{B.5}$$

$$F_d - F_c \leq \frac{\gamma w_c[2(\alpha+s) - \beta w_c]}{4}. \tag{B.6}$$

Solving this optimization problem, we have

$$F_d = \bar{F}_d = \frac{4\alpha^2(N\gamma+\gamma-1)+4\alpha s(2N\gamma+\gamma-1)+3N\gamma s^2}{16\beta N} - \frac{f\{2\beta f N + s[2\alpha(-1+\gamma)+s(N\gamma+2\gamma-2)]\}}{2N\gamma s^2}, \tag{B.7}$$

$$\pi_m = \bar{\pi}_m = \frac{4\alpha^2(N+\gamma-1)+4\alpha s(2N+\gamma-1)+N(4-\gamma)s^2}{16\beta N} - \frac{f\{2\beta f N + s[2\alpha(-1+\gamma)+(N\gamma+2\gamma-2)s]\}}{2N\gamma s^2}.$$

Appendix C

In this appendix, we show that a f_6 exists, where $f_5 < f_6 < f_2$, so that whenever $f > f_6$, the manufacturer prefers quantity discounts and whenever $f < f_6$ the manufacturer prefers a menu of two-part tariffs. Let $\Delta\pi_m(f) = \pi_m^q - \pi_m^t$, where π_m^q is the manufacturer's payoff when quantity discounts are used to coordinate the channel and π_m^t is the manufacturer's payoff when a menu of two-part tariffs are used. We can easily show that $\Delta\pi_m(f_5) < 0$ but $\Delta\pi_m(f_2) > 0$. Furthermore, we have $\partial\Delta\pi_m(f)/\partial f > 0$. Thus, there must exist a $f_6 \in (f_5, f_2)$ so that $\Delta\pi_m(f_6) = 0$. □

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