

**Strategic Selection of Direct Selling and Private Brand
in Retail Market under Retailer Stackelberg**

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Abstract

A three-stage three-person non-cooperative game of retailer Stackelberg is designed to model two manufacturers' and one common retailer's channel arrangement for product distribution. In the first stage, each manufacturer, besides selling its product the retailer (the dealing channel), has to decide whether to sell it through a direct selling channel. The retailer, besides selling manufacturers' products, has to decide whether to also sell its private brand product through a private brand channel. Each manufacturer and the retailer then have to determine their retail margins of all channels' products; finally, the two manufacturers compete on wholesale price for the dealing channel's product. Results show direct selling and private brand are dominant strategies for manufacturers and the retailer, respectively. Consumer surplus and social welfare are highest in the equilibrium because diversification of products and stores increases consumers' willingness to pay.

Keywords: multiple channel structure, direct selling, private brand, product differentiation, store differentiation

JEL classification: C72, D43, L11, M31

1. Introduction

Private brand has become an important contributor to the retail channel. Major retailers, for example, Sears, President's Choice and Wal-Mart in America and Marks and Spencer, Tesco and Carrefour in Europe, have developed a large number of private brands in a wide range of categories in their retail markets (Whileman and Jary 1997; Collins-Dodd and Lindley 2003). Retailers have the incentive to develop their private brands because of consumers' low loyalty to the brand name, high substitutability between products, and high purchasing frequency. Product reputation and no advertising cost of a retailer's private brand products benefit itself in the market. Moreover, high substitutability between products hurts manufacturers but benefits the retailer. Accordingly, introduction of a private brand is likely to increase a retailer's profits in a product category if the cross-price sensitivity between manufacturers' brands and the private brand is high (Raju, Sethuraman, and Dhar 1995). More importantly, retailers view private brand products as an opportunity to build store image and differentiate their stores from those of competitors (Private Label Manufacturers' Association (PLMA) 1999).

Manufacturers like Levis, Sony and Avon, adopt a direct selling channel besides a dealing channel to successfully compete against other retailers' private brands. Ross, Dalsace and Anderson (2005) derived the sales volume at which the direct sales force's costs equal the outsourced sales force's cost, and concluded that for sales volume above that quantity, firms should use a direct sales force. Crittenden and Crittenden (2004) interviewed eight direct selling firms of product categories which included arts & crafts, cosmetics, cutlery, kitchenware, jewelry, vitamins, and healthcare. Results indicated direct sales are becoming common phenomena in order to keep sales strong. In addition, it is imperative that firms select the right individuals, develop appropriate skills, and provide high perceived value.

Different channel leaderships of Manufacturer-Stackelberg (MS), Retailer-Stackelberg

(RS) and Vertical Nash (VS) models have been compared and extensively analyzed from the perspective of multiple manufacturers and a common retailer (Moorthy 1988; Choi 1991; Trivedi 1998). In a subsequent paper, Choi (1996) extended his analysis to include price competition between duopoly common retailers. Not only product differentiation but also store differentiations between retailers are captured in the model he used to examine the equilibria between different channel structures. Moreover, Choi incorporated retail margin (instead of retail price) into the retailer's decision to guarantee a certain mark-up when acting as the dealing channel for manufacturers' products. His study findings showed that while product differentiation increases a manufacturer's profit, it hurts a retailer's profit. Store differentiation, on the other hand, is beneficial to retailers while harmful to manufacturers. Krisnan and Soni (1997) pointed out that retailers nowadays are often much larger than many manufacturers, have more power to decide how products are distributed and at what price, and therefore the issue of how retailer uses its power to decide the retail margin and price to guarantee its profit is of increasing research interest.

Multiple channels' development has become a very important strategy for both manufacturers' and retailers' distribution of products in a competitive market. To-date, however, there has been a limited number of studies focusing on both the retailer's and manufacturer's perspective. In the sales channel literature, most studies focus on the manufacturer's perspective since manufacturers can influence their retailers' decisions through various pricing strategies and incentives, including whether to integrate or decentralize retail activities (Moorthy, 1988; McGuire and Staelin 1983), making a specific agreement, such as quantity discounts (Jeuland and Shugan 1988), achieving cooperation for maximum joint profit, and analyzing channel efficiency and stability.

Since most of the existing literature focuses on the strategic interactions within a single channel, in this paper, the RS model is employed to examine channel structure for two

manufacturers and a common retailer presented with a choice of dealing channel, direct selling channel, and private brand channel. Products are assumed to have linear demands with vertical strategic substitutability which considers the effects of both product differentiation and store differentiation. This paper is organized as follows. Next section presents the basic model and the structure of our analysis. In sections 3 and 4, we derived the subgame perfect equilibrium solutions under different subgames multiple-channel structures. Section 5 reviews our results and then compared with those reported in the extant literature. Finally, areas for future research are suggested. All figures and tables are appendix in the end.

2. The Model

We consider a channel structure with two manufacturers M_1 and M_2 and one common retailer R . Each manufacturer produces a differentiated product at marginal cost c_1 and c_2 , respectively. Besides selling through the retailer (dealing channel), each manufacturer decides whether or not to sell directly (through a direct selling channel). Besides selling manufacturers' products, the common retailer decides whether or not to sell its private brand product (through a private brand channel) at marginal production cost c_r . Introducing some notations, let $i, j = 1, 2, i \neq j$ index the two manufacturers and r indexes the retailer. Let q_i^r, p_i^r and m_i^r , respectively, denote the quantity demanded, retail price and retail margin of product $i, i = 1, 2$, under the dealing channel. Let q_i, p_i and m_i , respectively, denote the quantity demanded, retail price and retail margin of product $i, i = 1, 2$, under the direct selling channel. Let q_r, p_r and m_r , respectively, denote the quantity demanded, retail price and margin of retailer R 's product under its private brand. In keeping with Choi (1991) and

Choi (1996), products are assumed to have linear demands with vertical strategic substitutability which consider the effects of both product differentiation and store differentiation. We extend the demand function as follows:

$$\begin{aligned}
 q_i^r &= 1 - p_i^r + \alpha(p_j^r - p_i^r) + \alpha(p_r - p_i^r) + \beta(p_i - p_i^r) + \alpha\beta(p_j - p_i^r), \quad i, j = 1, 2, \quad i \neq j \\
 q_i &= 1 - p_i + \beta(p_i^r - p_i) + \alpha\beta(p_j^r - p_i) + \alpha\beta(p_j - p_i) + \alpha\beta(p_r - p_i), \quad i, j = 1, 2, \quad i \neq j \\
 q_r &= 1 - p_r + \alpha(p_i^r - p_r) + \alpha(p_j^r - p_r) + \alpha\beta(p_i - p_r) + \alpha\beta(p_j - p_r), \quad i, j = 1, 2, \quad i \neq j
 \end{aligned}$$

where α and β represent product substitutability and store substitutability, respectively.

We require the parameters to satisfy $0 \leq \alpha \leq 1$ and $0 \leq \beta \leq 1$. A smaller value of α implies more product differentiation (i.e., less product substitutability), and the price difference between the three products (within a store) has less impact on the demands. Likewise, a smaller value of β implies more store differentiation (less store substitutability), and the price difference of the same product between the channels has less impact on the demands. A smaller value of $\alpha\beta$ implies less cross effect, and the price difference between the different products sold in the different channels has less impact on the demands.¹

The retail price of a product is determined by the sum of its production cost/wholesale price (w_i) and its retailer margin:

$$p_i^r = w_i + m_i^r \quad i = 1, 2$$

$$p_i = c_i + m_i \quad i = 1, 2$$

$$p_r = c_r + m_r$$

The product demands therefore depend not only on all manufacturers' wholesale prices and costs, but also on the retailer's margins.

¹Traditional linear demand functions $q_i = a - bp_i + \theta p_j$ have a major disadvantage when used in equilibrium problems: they imply that as products are more differentiated, equilibrium prices and its profit decrease. Choi's (1996) demand functions $q_i = a - bp_i + \theta(p_j - p_i)$ provide intuitively more appealing results with respect to product differentiation.

Each member in the channel structure maximizes its total profit by selecting an optimal value of the decision variable. The optimal solution for a profit maximization problem depends on the channel's institutional arrangement and the channel power between manufacturers and the retailer. In the current model, the channel power is RS, namely, the retailer chooses its price margin before manufacturers choose their wholesale prices.

We now design a three-stage three-person non-cooperative game as shown in Figure 1. In the first stage, each member selects its sales channel structure; in other words, each manufacturer besides selling through the retailer (the dealing channel) has to decide whether or not to sell its product through a direct selling channel, and the retailer, besides selling manufacturers' products, has to decide whether or not to sell its private brand product through a private brand channel. Then, both manufacturers and the retailer compete on retail margin. In the last stage, each manufacturer competes on wholesale price for the dealing channel's product. There are eight subgames in our model and their channel structures are categorized into the following six types: the dealing channel (SG1), dealing channel with the retailer's private brand channel (SG2), dealing channel with one direct selling channel (SG3), dealing channel with one direct selling channel and the retailer's private brand channel (SG4), dealing channel with two direct selling channels (SG5), and dealing channel with two direct selling channels and the retailer's private brand channel (SG6). We present subgame perfection equilibrium values derived by backward induction in the next two sections.

3. Equilibrium Analysis

We now discuss the competition within each subgame derived by backward induction. Because the model involves the parameters of product differentiation α and store differentiation β , the resulting formulas in some subgames are lengthy and tedious. Thus, Mathematica software is adopted to compute the equilibria of subgames. Its 3-dimensional

figures are utilized to derive the optimal channel strategy of manufacturers and the retailer, and to proceed the comparative-static analysis. In this section, we analyze the subgame of the dealing channel with two direct selling channels and the retailer's private brand channel (SG6). Due to the limitation of the length of the paper, the derivations of the equilibria of all other subgames are omitted in the main text.² We assume, without loss of generality, all production costs c_i and c_r are zero (see McGuire and Staelin 1986).

In this channel arrangement (SG6), manufacturers sell their products through the retailer as well as sell directly, and the retailer sells manufacturers' products as well as sells its private brand product. Manufacturers' and the retailer's profits are respectively

$$\pi_i = m_i q_i + w_i q_i^r, i = 1, 2 \quad (1)$$

$$\pi_r = \sum_{i=1}^2 m_i^r q_i^r + m_r q_r \quad (2)$$

Note that wholesale price equals to the manufacturers' margin with zero production costs. Under the assumption RS, the retailer is the leader and two manufacturers are the followers, and the leader takes the followers' reaction functions of wholesale prices into account for its own retail margin decisions. In the third stage, manufacturer chooses its wholesale price conditional on the retail margin. Manufacturer's reaction function can be derived from the following first-order conditions:

$$\begin{aligned} \frac{\partial \pi_i}{\partial w_i} &= 1 + 2\beta m_i + \alpha \beta m_j - (1 + 2\alpha + \beta + \alpha \beta) m_i^r + \alpha m_j^r + \alpha m_r \\ &\quad - 2(1 + 2\alpha + \beta + \alpha \beta) w_1 + \alpha w_2 = 0, i = 1, 2 \end{aligned} \quad (3)$$

and the second-order conditions are easy to verified:

$$\frac{\partial^2 \pi_i}{\partial (w_i)^2} = -2 - 4\alpha - 2\beta - 2\alpha\beta < 0, i = 1, 2$$

² The derivations of the equilibria of all other subgames are available upon the request on the authors.

Solving (3) for the conditional Nash equilibrium values w_i s as a function of all retail margins, $w_i(m_1, m_2, m_1^r, m_2^r, m_r)$.

The retailer incorporates $w_i(m_1, m_2, m_1^r, m_2^r, m_r)$ into its retail profit to determine optimal margins. Substituting it into (1) and (2), manufacturers' and the retailer's profits are

$$\pi_i = m_i \times q_i(m_1, m_2, m_1^r, m_2^r, m_r) + w_i(m_1, m_2, m_1^r, m_2^r, m_r) \times q_i^r(m_1, m_2, m_1^r, m_2^r, m_r),$$

$$i = 1, 2 \quad \pi_r = \sum_{i=1}^2 \left[m_i^r \times q_i^r(m_1, m_2, m_1^r, m_2^r, m_r) \right] + m_r \times q_r(m_1, m_2, m_1^r, m_2^r, m_r)$$

The first order conditions of retail margins in the second stage are as follows:

$$\frac{\partial \pi_r}{\partial (m_i^r)} = 0, \quad \frac{\partial \pi_i}{\partial (m_i)} = 0, \quad \frac{\partial \pi_r}{\partial (m_r)} = 0, \quad i = 1, 2, \quad (4)$$

It can be easily verified that the second-order Hessian matrix

$$\frac{\partial^2 \pi_i}{\partial m_i^2} = -2 - 4\alpha\beta + \frac{2\alpha^2(1+\alpha)\beta^2(2+\beta)(\alpha^2+4(1+\beta)+4\alpha(2+\beta))}{(2+3\alpha+2\beta+2\alpha\beta)^2(2+5\alpha+2\beta+2\alpha\beta)^2} + 2\alpha\beta \left(-1 - \frac{2\alpha(1+\alpha)\beta(2+\beta)}{\alpha^2-4(1+\beta+\alpha(2+\beta))^2} \right)$$

$$- 2 \frac{\beta(4(1+\beta)+4\alpha(2+\beta)^2+\alpha^2(15+15\beta+4\beta^2))}{4(1+\beta)^2+8\alpha(2+3\beta+\beta^2)+\alpha^2(15+16\beta+4\beta^2)} < 0, \quad i = 1, 2,$$

$$\frac{\partial^2 \pi_r}{\partial (m_i^r)^2} = - \frac{2(2(1+\beta)^3+6\alpha(1+\beta)^2(2+\beta)+\alpha^3(14+23\beta+12\beta^2+2\beta^3))+\alpha^2(23+47\beta+30\beta+6\beta^3)}{(2+3\alpha+2\beta+2\alpha\beta)(2+5\alpha+2\beta+2\alpha\beta)} < 0,$$

$$i = 1, 2,$$

$$\frac{\partial^2 \pi_r}{\partial (m_r)^2} = - \frac{(2(2(1+\beta))+2\alpha^2(2+5\beta+2\beta^2)+\alpha(7+10\beta+4\beta^2))}{(2+3\alpha+2\beta+2\alpha\beta)} < 0,$$

$$\begin{vmatrix} \frac{\partial^2 \pi_r}{\partial (m_1^r)^2} & \frac{\partial^2 \pi_r}{\partial m_1^r \partial m_2^r} \\ \frac{\partial^2 \pi_r}{\partial m_2^r \partial m_1^r} & \frac{\partial^2 \pi_r}{\partial (m_2^r)^2} \end{vmatrix} = \frac{4(1+\alpha)(1+\beta)(1+\beta+\alpha(2+\beta))^2(1+\beta+\alpha(3+\beta))}{(2+3\alpha+2\beta+2\alpha\beta)(2+5\alpha+2\beta+2\alpha\beta)} > 0,$$

$$\begin{vmatrix} \frac{\partial^2 \pi_r}{\partial (m_2^r)^2} & \frac{\partial^2 \pi_r}{\partial m_2^r \partial m_r} \\ \frac{\partial^2 \pi_r}{\partial m_r \partial m_2^r} & \frac{\partial^2 \pi_r}{\partial (m_r)^2} \end{vmatrix} = \begin{vmatrix} \frac{\partial^2 \pi_r}{\partial (m_1^r)^2} & \frac{\partial^2 \pi_r}{\partial m_1^r \partial m_r} \\ \frac{\partial^2 \pi_r}{\partial m_r \partial m_1^r} & \frac{\partial^2 \pi_r}{\partial (m_r)^2} \end{vmatrix} =$$

$$\frac{\left\{ \begin{aligned} &4(2(1+\beta)^2+2\alpha(1+\beta)^2(8+7\beta+2\beta^2))+\alpha^2(44+125\beta+135\beta^2+66\beta^3+12\beta^4) \\ &+\alpha^3(46+143\beta+160\beta^2+74\beta^3+12\beta^4)+\alpha^4(2+\beta)^2(3+12\beta+4\beta^2) \end{aligned} \right\}}{(2+3\alpha+2\beta+2\alpha\beta)(2+5\alpha+2\beta+2\alpha\beta)} > 0,$$

and

$$\begin{vmatrix} \frac{\partial^2 \pi_r}{\partial(m_1^r)^2} & \frac{\partial^2 \pi_r}{\partial m_1^r \partial m_2^r} & \frac{\partial^2 \pi_r}{\partial m_1^r \partial m_r} \\ \frac{\partial^2 \pi_r}{\partial m_2^r \partial m_1^r} & \frac{\partial^2 \pi_r}{\partial(m_2^r)^2} & \frac{\partial^2 \pi_r}{\partial m_2^r \partial m_r} \\ \frac{\partial^2 \pi_r}{\partial m_r \partial m_1^r} & \frac{\partial^2 \pi_r}{\partial m_r \partial m_2^r} & \frac{\partial^2 \pi_r}{\partial(m_r)^2} \end{vmatrix} = \frac{8(1+\beta+\alpha(2+\beta))^2((1+\beta)^2+\alpha^2(1+\beta)^2(9+4\beta))+2\alpha^3\beta(6+5\beta+\beta^2)+2\alpha(3+6\beta+4\beta^2+\beta^3)}{(2+3\alpha+2\beta+2\alpha\beta)(2+5\alpha+2\beta+2\alpha\beta)} < 0$$

is negative-definite, implying the solution to (4) is a Nash equilibrium between two manufacturers and the retailer. The resulting margins as functions of α and β are $m_i(\alpha, \beta)$, $m_i^r(\alpha, \beta)$ and $m_r(\alpha, \beta)$. Substitute them back into $w_i(m_1, m_2, m_1^r, m_2^r, m_r)$ to obtain wholesale price $w_i(\alpha, \beta)$. Retail prices $p_i(\alpha, \beta)$, $p_i^r(\alpha, \beta)$, $p_r(\alpha, \beta)$, quantity demanded $q_i(\alpha, \beta)$, $q_i^r(\alpha, \beta)$, $q_r(\alpha, \beta)$ and manufacturers' profits $\pi_i(\alpha, \beta)$ and the retailer's profit $\pi_r(\alpha, \beta)$ can be derived in turn. The equilibrium values are plotted in 3-dimensional figures where horizontal axes are α and β (see Table 1).

Finally, we derive consumer surplus and social welfare in SG6. Social welfare is the sum of consumer surplus and all the members' profits. Apply Cramer's rule to transfer demand functions into inverse demand functions $p_i^r(q_i^r; q_j^r, q_i, q_j, q_r)$, $p_i(q_i; q_i^r, q_j^r, q_j, q_r)$ and $p_r(q_r; q_i^r, q_j^r, q_i, q_j)$. Their values are also plotted in Table 1 by the following formula:

$$\begin{aligned}
CS(\alpha, \beta) = & \sum_{\substack{i=1 \\ i \neq j}}^2 \left[\int_0^{q_i^{r*}} p_i^r(q_i^r; q_j^{r*}, q_1^*, q_2^*, q_r^*) dq_i^r - p_i^r(q_i^{r*}; q_j^{r*}, q_1^*, q_2^*, q_r^*) q_i^{r*} \right] \\
& + \sum_{\substack{i=1 \\ i \neq j}}^2 \left[\int_0^{q_i^*} p_i(q_i; q_1^*, q_2^*, q_j^*, q_r^*) dq_i - p_i(q_i^*; q_1^*, q_2^*, q_j^*, q_r^*) q_i^* \right] \\
& + \int_0^{q_r^*} p_r(q_r; q_1^*, q_2^*, q_1^*, q_2^*) dq_r - p_r(q_r^*; q_1^*, q_2^*, q_1^*, q_2^*) q_r^*
\end{aligned}$$

and

$$SW(\alpha, \beta) = CS(\alpha, \beta) + \pi_1(\alpha, \beta) + \pi_2(\alpha, \beta) + \pi_r(\alpha, \beta)$$

4. The Results

In this section, we derive the subgame perfect equilibrium of the game by comparing Mathematica 3-dimensional figures of the resulting profits in each subgame. Then, we examine the static comparisons in terms of α and β in the equilibrium, and discuss their implications from the viewpoints of consumer surplus and social welfare.

4.1 Subgame Perfect Equilibrium

We examine the dominant strategy of manufacturers and the retailer in the decision of channel selection by comparing manufacturers' equilibrium profits. In Table 2(a), it can be easily verified that, no matter whether or not M_2 sells its product directly and no matter whether or not R sells its private brand, selling its product directly besides through the dealing channel is a dominant strategy for M_1 . Similarly, it is a dominant strategy for M_2 to sell its product directly. In Table 2(b), by comparing the retailer's equilibrium profits, it can be also verified that, no matter whether or not M_1 and M_2 sell their products directly, selling its private brand product as well as selling manufacturers' products is a dominant strategy for R . Accordingly, the subgame SG6 whereby both manufacturers sell their products directly as well as through the retailer, and the retailer sells its private brand product as well as

manufacturers' products, is the subgame perfect equilibrium of the game. Moreover, it is beneficial to a manufacturer to sell its product directly, since its profit increases with the number of sales channels. It is also beneficial to the retailer to sell its private brand. Hence, channel members could gain more profits through additional sales channels, even though there exists keen competition in the retailing market.

Next, we examine the welfare implications of the different channel structures. As can be seen from Table 3, consumer surplus and social welfare are highest under SG6. Hence, a multiple channel structure contributes to product and store diversification which, in turn, promotes consumer surplus and social welfare.

4.2 Comparisons of Equilibrium Margin, Retail Price and Quantity Demanded

In the subgame perfect equilibrium, both manufacturers sell their products directly as well as through the retailer and the retailer sells its private brand as well as both manufacturers' products. Let's now compare the rankings of margin, retail price, and quantity demanded of products for the dealing channel, direct selling channel, and private brand channel. Consistent with previous literature results, the lowest retail prices are offered by the channel with the least number of intermediaries exploiting their own profits (Kotler 1991). Product sales through a zero-level channel (direct selling channel and/or private brand channel) avoid exploitation by a one-level channel (dealing channel). Also, the retailer has the incentives to find an original equipment manufacturer (OEM) to produce private brand products at a low cost. Hence, the ranking of product margin is private brand, direct selling and dealing channel. The ranking of product retail price is dealing channel, private brand and direct selling. Finally, the product in the dealing channel has the lowest quantity demanded (see Figure 5).

Finally, we can examine, by Table 1, the impact of product differentiation and store

differentiation on the equilibrium outcome. When products are less differentiated, the margins in direct selling and private brand channels decrease and the wholesale prices in dealing channel decrease. Retail prices (quantity demanded) in all channels decrease (increase). This, in turn, decreases manufacturers' profits but increases the retailer's profit. On the other hand, when stores are less differentiated, margins and retail prices (quantity demanded) in all channels decrease (increase). Thus, the retailer's profit decreases.

5. Conclusion and Discussion

Retailers nowadays have become more powerful than most manufacturers as a result of larger retail chains. Their increasing influence on the market is a growing research interest. Most of the literature discusses optimal channel strategy and equilibrium of channel structures from the viewpoint of firm's profit with only one parameter of product differentiation (Jeuland and Shugan 1983; Moorthy 1988). We have expanded the literature and examined both consumer surplus and social welfare in multiple channels with two parameters of product differentiation and store differentiation. The main contribution of this paper is its exploration of manufacturers' and a retailers' selection of channel structure from dealing, direct selling or private brand channel, and the resulting pricing strategy. In an attempt to extend the literature in this area, we have developed a three-stage three-person non-cooperative game that incorporates competition between two manufacturers and one common retailer whose products are assumed to have vertical strategic substitutability. The effects of both product differentiation and store differentiation on equilibrium outcome are considered. Equilibrium solutions are derived from the setting up of a Retailer Stackelberg model.

The two manufacturers besides selling their products through the retailer (dealing channel) had to decide whether or not to sell directly (through a direct selling channel) where

the retailer besides selling the manufacturers' products had to decide whether or not to sell its private brand product through a private brand channel. Then, both manufacturers and the retailer competed on retail price margins. Finally, each manufacturer competes on wholesale price for the dealing channel's product. The results obtained in the above section can be summarized by the following set of propositions:

***Proposition 1.** In the subgame perfect equilibrium of the game, both manufacturers sell their products directly as well as through the retailer, and the retailer sells its private brand as well as manufacturers' products. Consumer surplus and social welfare are highest under this multiple channel structure.*

An increase in sales channels promotes its total demand, but this evokes fierce competition between products and stores, and incurs a considerable amount of operational and managerial costs (ignored in the current model). In the equilibrium, the former force dominates the latter one. Thus, manufacturers are beneficial to sell their products directly as well as through the existing dealing channel, and the retailer is beneficial to sell its private brand product as well as manufacturers' products. In other words, channel members gain more profits through additional channels, even though there exists fierce price competition in the market. Results obtained from this study in relation to Proposition 1 are supported by Raju et al. (1995), Trivedi (1998) and Ross et al. (2005). Retailers in a competitive market prefer to carry a private brand products line rather than play a leadership role in a dealing channel and manufacturers expect to find a direct selling channel lucrative. Global retail giants like Tesco, Carrefour, Sears and Wal-Mart have developed a large number of categories with their private brands in their retail markets (Whileman and Jary 1997; Collins-Dodd and Lindley 2003). The diversification of products and stores increases consumers' willingness to pay and thus, promotes consumer surplus and welfare. These results fit those reported in

Trivedi (1998) that consumers benefit the most from a direct selling channel with the greatest demand and lowest prices.

Proposition 2. *The ranking of channel structure for product retail margins is private brand, followed by direct selling and then dealing channel. The ranking of channel structure for products retail prices is dealing channel, followed by private brand and then direct selling channel.*

Product sales through zero-level channels, such as direct selling channel and/or private brand channel, avoid exploitation by middlemen (Kotler 1991). Moreover, the retailer can produce private brand products at a low cost through OEM. Though products are sold through zero-level channels with higher margins, their prices may be lower than in one-level channels because of lower production costs. Hence, ranking of products retail margin is private brand, direct selling and dealing channel.

Next, ranking of products retail price is, accordingly, dealing channel, private brand and direct selling. Whileman and Jary (1997) observed many retailers' own private brands are priced lower their manufacturers' cleaning, disposable, food, do-it-yourself products, and health and beauty aids. A manufacturer usually does not sell its product directly at a price lower than in a dealing channel, since it does not want to discourage the incentive of the retailer to sell its product and there exists a considerable amount of costs in setting up, operating and managing a direct selling channel. However, both facts are not considered in the model. Hence, the result that the retail price through direct selling channel is the lowest among three channels conflicts what we observe in the reality.

Proposition 3. *When products are less differentiated, margins in direct selling and private brand channels decrease and wholesale prices in the dealing channel decrease. Retail prices (quantities demanded) in all channels decrease (increase). This, in turn, decreases*

manufacturers' profits. On the other hand, when stores are less differentiated, margins and retail prices (quantities demanded) in all channels decrease (increase). Thus, the retailer's profit decreases.

When the substitutability of products increases, increase in product competition forces manufacturers to decrease the margins in the direct selling channel and the retailer to decrease the margin in its private brand channel in order to attract consumers of substitute products. Manufacturers are forced to reduce the wholesales prices in the dealing channel. Thus, retail prices in all channels decrease and quantity demand increase. In the end, manufacturers' profits decrease. When the substitutability between stores increases, increase in store competition forces all manufacturers and the retailer to decrease their margins. Accordingly, all retail prices decrease and the corresponding quantities demanded increase. Finally, fierce competition makes the retailer worse off and its profit decreases as reported in Choi (1996).

Our theoretical framework can be extended in several directions. First, our model is limited to the channel structure of two manufacturers and one common retailer, where current retail markets are dominated by large retail chains such as Carrefour and Wal-Mart (Raju et al. 1995). Further research should incorporate multiple powerful retailers in the retail market in the model, although it will become more complex to analyze such a channel structure. Second, some logical strategies, such as advertising and slotting allowance, have not been included in this study and always exist in the real world (Shaffer 1991). Finally, managerial and sales costs are assumed to be zero and other demand factors such as product qualities are ignored for the sake of tractable analyses. The more reasonable (nonlinear) cost/demand functions should be considered in future research (Choi and Coughlan 2006; Moorthy 1988; Choi 1991).

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Appendix

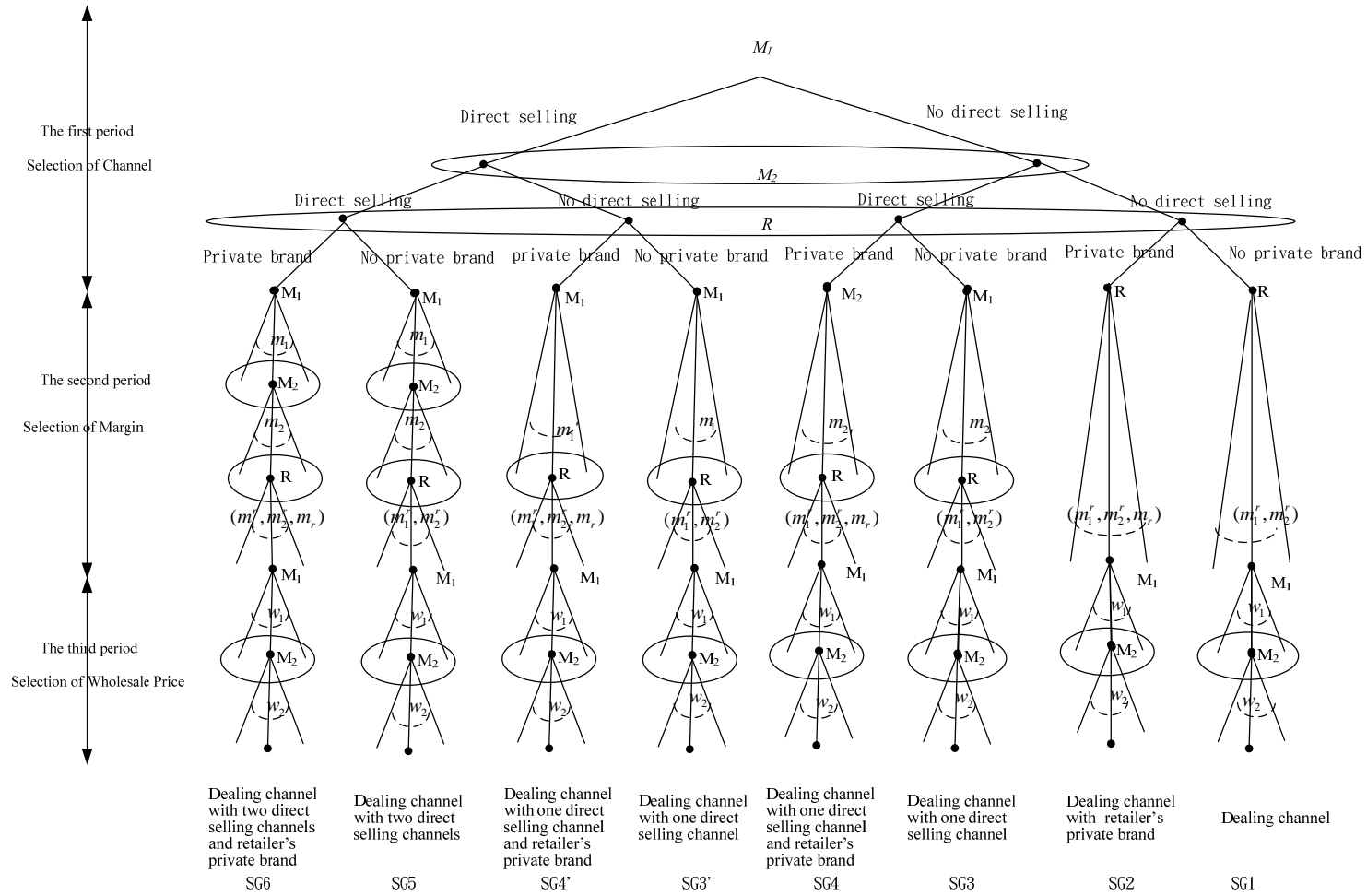


Figure 1. The Game Tree

Table 1. Equilibrium Values in Dealing Channel with Two Direct Selling Channels and Retailer's Private Brand Channel (SG6)

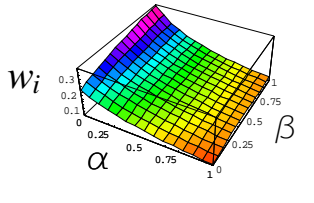
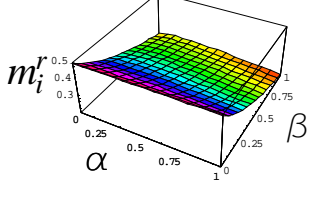
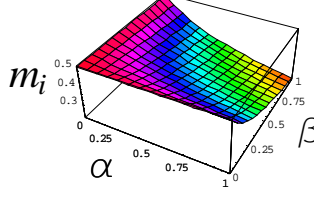
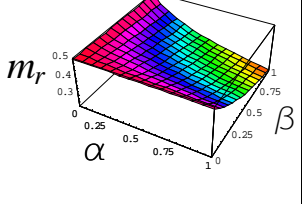
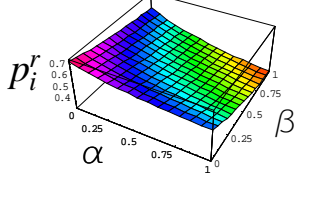
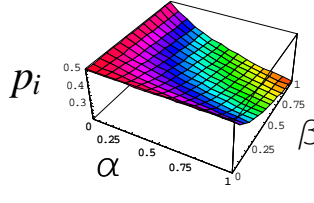
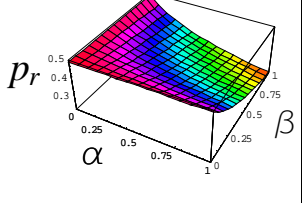
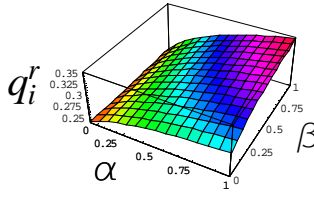
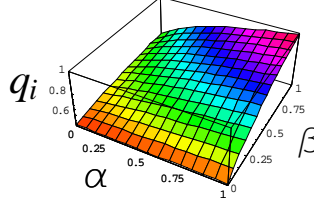
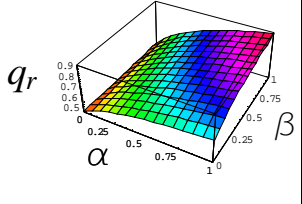
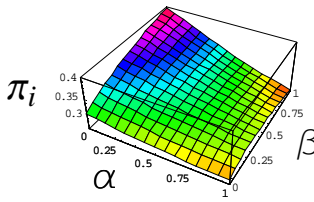
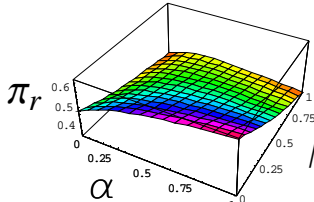
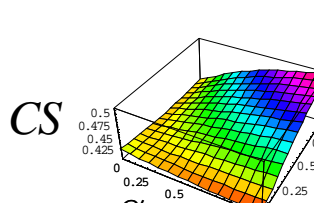
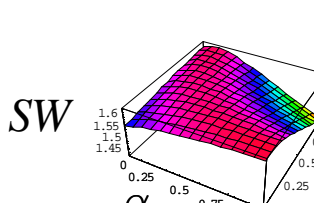
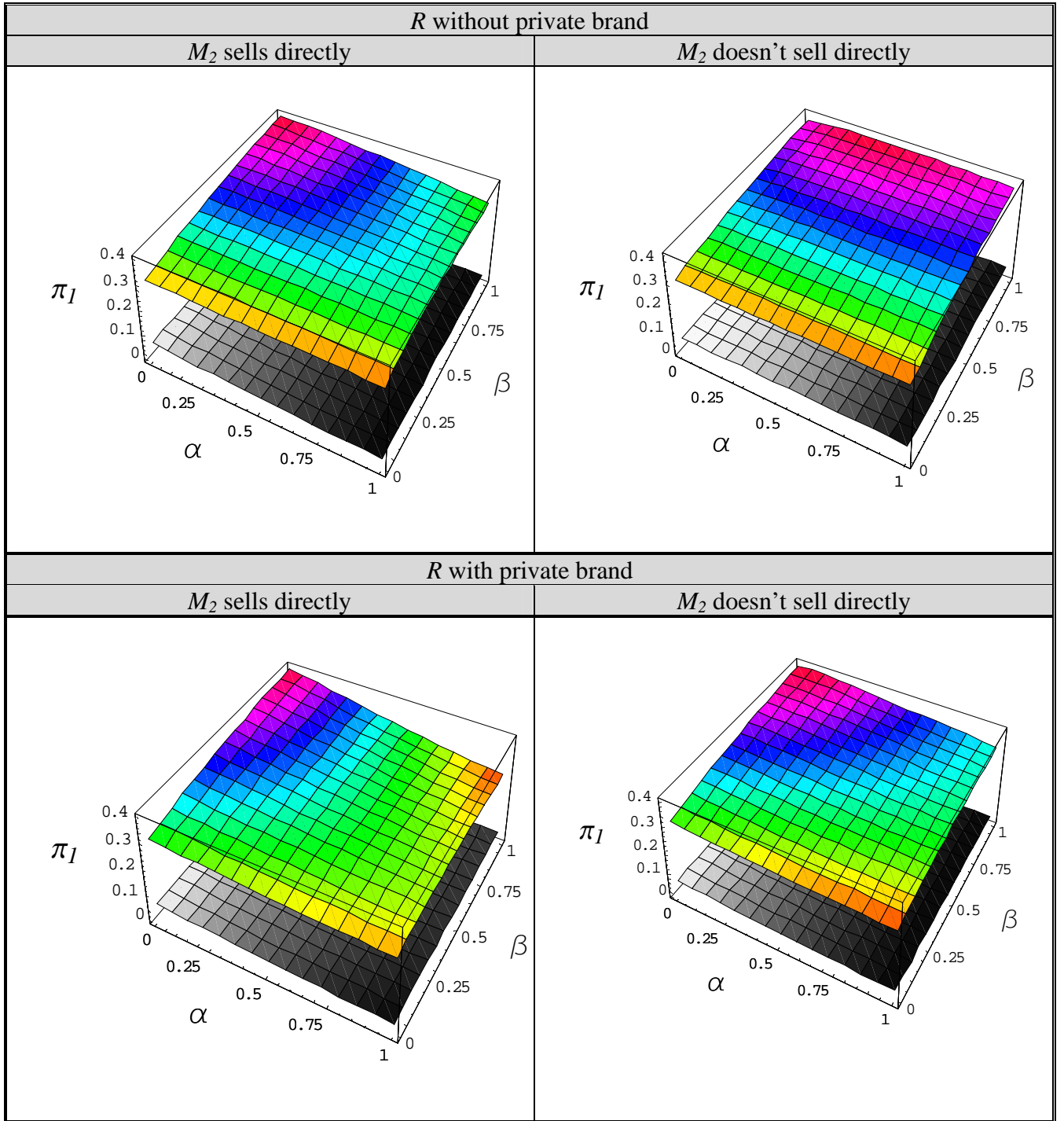
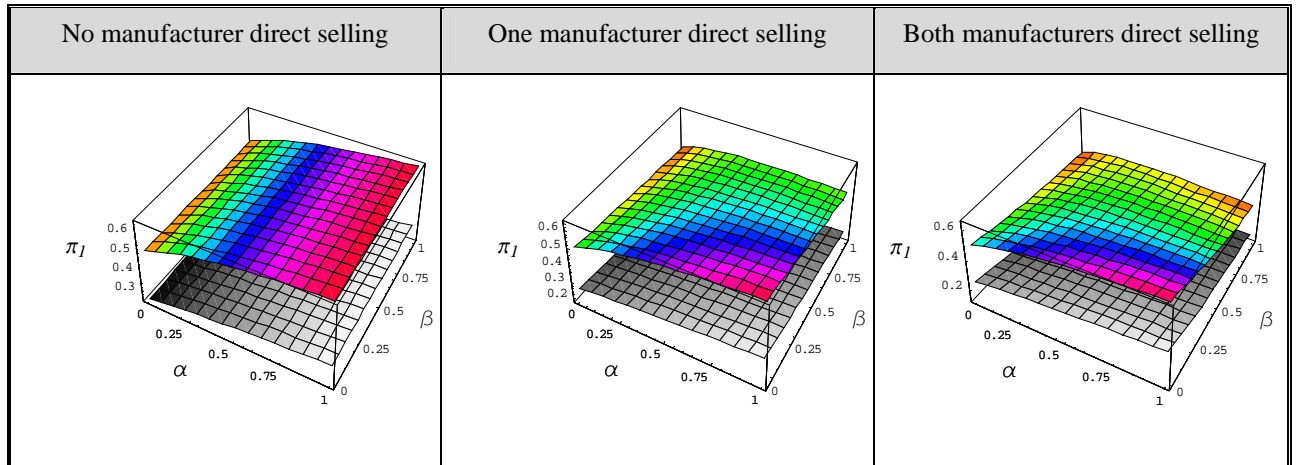
Wholesale price			
Margin			
Retail price			
Quantity demanded			
Manufacturer's and retailer's profit			
Consumer surplus and social welfare			

Table 2(a) Comparisons of M_1 's Profits with/without Direct Selling



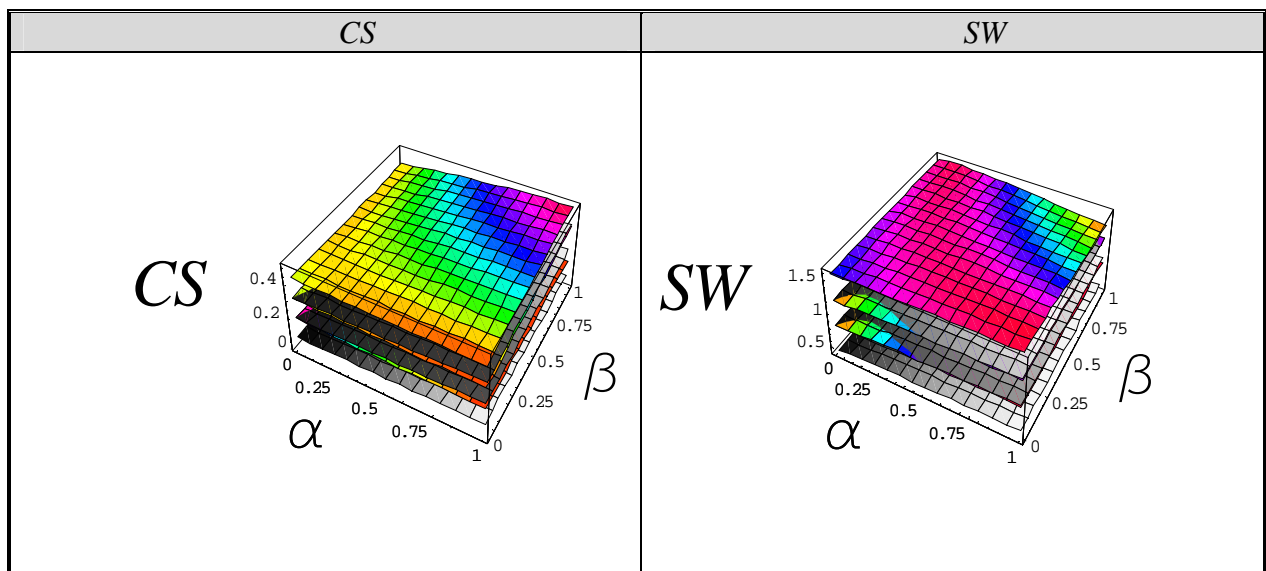
Note: The upper colored figure is M_1 's profit with direct selling and the black one is M_1 's profit without direct selling

Table 2(b) Comparisons of R's Profits with/without Private Brand



Note: The upper colored figure is the profit of R with private brand, the black one is the profit of R without private brand

Table 3 Comparisons of Consumer Surplus and Social Welfare



Note: The top colored figures are CS and SW of SG6, and the five lower ones are those of SG1-SG5.

Figure 5 Comparisons of Equilibrium Margin, Retail Price and Quantity Demanded

