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Customer-friendly sales division, transfer pricing, and the direct channel in the divisionalized firm

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Abstract

In this note, we assess the usefulness of transfer pricing in the divisionalized firm, which is composed of the headquarters and customer-friendly sales division. In particular, based on recent management practice, we assume the existence of a direct channel to provide the products to the consumer. From our analysis, we find that while the divisionalized firm always opens a direct channel to reach the consumer, the customer-friendly sales division does not improve the profit without the transfer pricing. In particular, we obtain that the manipulation of transfer price yields that the total profit does not depend on the level of emphasis of the customer by the sales division. In other words, the headquarters coordinates the supplied quantity using the transfer pricing under the direct channel. This result indicates the importance of internal transfer pricing to manage the divisionalized firm in a recent situation.

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1 Introduction

In practice, one can find many examples of the divisionalized firm. For example, McDonald's Corporation divides divisions to provide food for customers. Additionally, General Electric Company is a typical firm that uses the transfer price to manage divisional behavior. In a large company, it is difficult to control the divisional decisions because managers cannot observe the divisional actions directly. Therefore, transfer pricing becomes one of the useful devices to coordinate the divisional behavior indirectly.

In particular, in divisionalized firms, sales divisions play an important role because they can enhance the revenue through the sales promoting action directly. In the divisionalized firm, the sales division sometimes has a different preference from the headquarters in practice. For example, sales divisions frequently emphasize customer value to improve the revenue in the shop. This is because sales divisions directly contact with customers, and therefore, they seek to provide good responses to consumers in shops. However, one can infer that the behavior of the sales division may not yield a beneficial outcome to the total profit of firms because when the sales divisions emphasize the customer value, they may conduct excessive supply to provide cheap products to the customer. Hence, transfer pricing may become a useful device to manage divisional actions. In other words, we consider the effect of transfer pricing on the customer-friendly sales division.

Additionally, recent IT development allows companies to reach customers through a direct channel (e.g., online store). In this situation, large divisionalized firms can also supply products through the direct channel with the exception of a sales division (physical stores). For example, General Electric Company enables us to purchase its products through the direct online store. In another example, Apple Inc. supplies products through the e-commerce (direct channel) and Apple Store (physical store). However, only a few papers examine this case to discuss the optimal transfer pricing decision. Therefore, we examine the case in which the headquarters opens a direct channel to the retail market in the divisionalized firm.

In a previous economic analysis of transfer pricing with the integrated dual-channel supply chain, Hamamura (2022) investigates the optimal cost accounting system under the cost-based transfer price with the existence of a direct channel. However, other studies mainly analyze the non-integrated supply chain which cannot use the transfer price to manage the division (e.g., Chiang *et al*., 2003; Matsui and Tsunoda, 2022), or other studies do not assume the existence of a direct channel which is opened by the headquarters with the exception of Hamamura (2022), while we can observe many cases of this situation. In particular, Hamamura (2022) assumes the binary choice of transfer prices and does not suppose the customer-friendly sales division. Therefore, our study conducts a new analysis of transfer pricing with a direct channel. Additionally, Hamamura (2020) analyzes the effect of a customer-oriented sales division without a direct channel, assuming the cost-reducing investment by the manufacturing division. In this study, we explore the effect of transfer pricing under the existence of the direct channel without the cost-reducing investment. Lastly, several supply chain studies investigate the customer-friendly retailer under a non-integrated supply chain (Fernández-Ruiz, 2021; Modak *et al*., 2014). Therefore, our analysis provides new managerial insights based on an economic analysis.

Assuming the divisionalized firm has a customer-friendly sales division, we consider the optimal channel decision at first. After that, we explore the effect of transfer pricing on the total profit, consumer surplus, and social welfare. Our economic analysis may provide the effectiveness of transfer pricing to manage divisional behavior.

2 Model Setup

Based on Hamamura (2022), we propose a model that describes transfer pricing in divisionalized firms with a customer-friendly sales division. Assume the divisionalized firm has the headquarters (H) and sales division (S). The headquarters makes products by marginal costs, c. In this study, we normalize $c = 0$ for simplicity. We suppose the following profit functions for each player:

$$\pi_S = (p_S - t)q_S, \tag{1}$$

$$\Pi = \pi_S + (t - c)q_S + (p_H - c)q_H, \tag{2}$$

where p_i denotes the market price of division i $(= H,\ S)$, t is the transfer price, and q_i represents the quantity of division i. When the firm does not open a direct channel, $\Pi = \pi_S + (t - c)q_S$.

As we mentioned in the Introduction, we consider a customer-friendly sales division in this study, and therefore, this study assumes the following payoff function of the manager in the sales division based on previous economic analysis (e.g., Kopel, 2015).

$$V_S = \pi_S + \gamma CS, \tag{3}$$

where $\gamma \in (0,\ 1)$ denotes the emphasis level of consumer surplus (CS) by the sales division. While the manager of the sales division maximizes V_S, the headquarters maximizes Π when they choose the decision variables.

In this study, the firm faces the quantity decision in the product market, and we assume the following linear demand function.

$$p_i = a - q_i - dq_j, \quad i,\ j = H,\ S,\ i \neq j, \tag{4}$$

where a is positive constant grater than c, and d represents the degree of the channel substitution. For simplicity, we identify $a = 1$. Additionally, we suppose consumer surplus as $CS = (q_H^2 + 2dq_Hq_S + q_S^2)/2$, and social welfare is computed as $SW = CS + \Pi$. When the divisionalized firm does not open a direct channel, the demand function is $p_S = a - q_S$, and the consumer surplus is $CS = q_S^2/2$.

Lastly, in this study, we consider the following timeline of events. In Stage 1, the headquarters decides whether the divisionalized firm opens a direct channel or not. In Stage 2, the headquarters decides the level of internal transfer price. In Stage 3, if the firm opens a direct channel, the headquarters and sales division decide the quantity. On the other hand, in Stage 3, if the firm does not open the direct channel, the sales division decides the quantity in the final product market. We identify the sub-game perfect Nash equilibrium using the backward induction.

3 Results

To identify the effect of transfer pricing and a customer-friendly sales division in this study, we consider the following three cases: (i) the firm transfers the product based on marginal cost under the existence of a direct channel (benchmark case), (ii) the firm does not open a direct channel, and (iii) the firm opens a direct channel.

3.1 Benchmark case

First, we consider the case in which the firm transfers the product based on marginal cost under the existence of a direct channel as a benchmark case to specify the effect of transfer pricing. In Stage 3, the headquarters and sales division maximize Π and V_S, respectively. From the first-order condition (FOC), we obtain the following best response functions.

$$q_S = \frac{1 - t - d(1-\gamma)q_H}{2-\gamma}, \quad q_H = \frac{1 - 2dq_S}{2}, \tag{5}$$

Substituting $t = c$, we can consider the optimal quantities in this stage under the benchmark case. Additionally, we can confirm that the second-order condition (SOC) is satisfied for all d and γ. From this analysis, we identify the optimal quantities in this stage as follows.

$$q_S^B = \frac{2 - (1-\gamma)d}{4 - 2\gamma - (1-\gamma)d^2}, \quad q_H^B = \frac{2 - \gamma - d}{4 - 2\gamma - (1-\gamma)d^2}, \tag{6}$$

where superscript B represents the outcomes in the benchmark case. Using this outcome, we obtain the following outcomes in this case.

$$\begin{aligned} p_S^B &= \frac{2 - d - (2-d^2)\gamma}{4 - 2\gamma - (1-\gamma)d^2}, \quad p_H^B = \frac{2 - \gamma - d}{4 - 2\gamma - (1-\gamma)d^2}, \\ \Pi^B &= \frac{\gamma^2 + (1-\gamma)(8 - \gamma d^3) + (2+\gamma)d^2 - 2\left(4 - 3\gamma + \gamma^2\right)d}{\left[4 - 2\gamma - (1-\gamma)d^2\right]^2}, \\ CS^B &= \frac{(1+d)\left[8(1-d) - (4-\gamma)\gamma + 2(1-\gamma)d^2 + (6-\gamma)\gamma d\right]}{2\left[4 - 2\gamma - (1-\gamma)d^2\right]^2}, \quad SW^B = CS^B + \Pi^B. \end{aligned} \tag{7}$$

All outcomes are positive under $0 < \gamma < (2-d)/(2-d^2)$. We use this outcome to consider the effect of transfer pricing.

3.2 Non-direct channel

Next, to analyze whether the firm opens a direct channel or not, we examine the case in which the firm does not open a direct channel. In Stage 3, the sales division sets the following quantity based on the FOC.

$$q_S = \frac{1-t}{2-\gamma}. \tag{8}$$

We can confirm that this outcome satisfies the SOC.

Next, using the previous outcome, we consider the transfer price decision by the headquarters in Stage 2. In this case, we obtain

$$t = \frac{\gamma}{2} > 0. \tag{9}$$

One can confirm that when the manager of the sales division emphasizes consumer surplus, we obtain $t > c$ without a direct channel. In other words, using the transfer price, the headquarters

controls the decision-making of the managers to prevent excessive supply by the customer-friendly manager in the sales division because the level of the transfer price increases as γ increases.

Lastly, we specify the outcomes in this case based on the prior outcomes.

$$q_S^{ND} = \frac{1}{2}, \quad p_S^{ND} = \frac{1}{2}, \quad \Pi^{ND} = \frac{1}{4}, \quad CS^{ND} = \frac{1}{8}, \quad SW^{ND} = \frac{3}{8}. \tag{10}$$

Interestingly, with the exception of the transfer price, γ does not appear in the outcome because the headquarters can achieve to control the decision-making of the sales division using the transfer price. We compare this outcome with the case in which the firm opens the direct channel. Hamamura (2020) also analyzes the optimal transfer prices in the case of an integrated supply chain without a direct channel. However, Hamamura (2020) considers the cost-reducting investment of the manufacturing division and does not examine the effect of a direct channel.

3.3 Direct channel

We can apply Eq. (5) to explore this case. In other words, in the 3rd Stage, both players set the quantities as Eq. (5), and we obtain

$$q_S = \frac{2(1-t) - (1-\gamma)d}{2\left[2 - \gamma - (1-\gamma)d^2\right]}, \quad q_H = \frac{2 - \gamma - 2d(1-t)}{2\left[2 - \gamma - (1-\gamma)d^2\right]}. \tag{11}$$

Next, using the above outcome, we obtain the optimal transfer price in the 2nd Stage.

$$t^D = \frac{(1+d)\gamma + d}{2(1+d)} > 0, \tag{12}$$

where superscript D signifies that case in which the firm opens a direct channel. This outcome also indicates that t^D increases as γ increases. One can confirm that when the sales division does not emphasize consumer surplus, we obtain $t^D > 0$ because the transfer price is applied to coordinate the product market competition in the final product market. While Hamamura (2022) also demonstrates this result based on cost-based transfer prices, our result indicates that, without the criterion, the transfer price exceeds the marginal cost in the integrated dual-channel supply chain.

Using the above outcome, we obtain the optimal outcomes in this case and summarize the following results.

Result 1. *With a direct channel, when the manager of the sales division emphasizes consumer surplus in the divisionalized firm, we obtain the following outcomes.*

$$t^D = \frac{(1+d)\gamma + d}{2(1+d)}, \quad q_S^D = q_H^D = \frac{1}{2(1+d)}, \quad p_S^D = p_H^D = \frac{1}{2},$$
$$\Pi^D = \frac{1}{2(1+d)}, \quad CS^D = \frac{1}{4(1+d)}, \quad SW^D = \frac{3}{4(1+d)}.$$

Result 1 suggests that similar to the previous case, the effect of customer-friendly division does not have a direct impact on the outcomes, with the exception of the transfer price in this case. Transfer pricing is not only used to coordinate the competition but also it is applied to manage the excessive supply by the division manager. Hamamura (2022) cannot confirm this effect because Hamamura (2022) considers the discrete variable as a transfer price.

3.4 Comparison

Based on the previous three cases, we confirm the optimal channel decision and the effect of transfer pricing. First, we examine the difference in transfer pricing between a direct channel and a non-direct channel.

$$t^D - t^{ND} = \frac{d}{2(1+d)} > 0.$$

This result represents that the existence of a direct channel enhances the level of transfer price. We summarize this outcome as the following proposition.

Proposition 1. *The existence of a direct channel enhances the level of transfer price in the divisionalized firm.*

In particular, the degree of channel substitution plays an important role to consider the difference in transfer pricing between the two cases. If $d \to 0$, there are no differences between transfer prices. In other words, under the monopoly market, because the firm enjoys the monopolist strategy in the final product market, the divisionalized firm removes the double-marginalization in the indirect channel.

Next, we analyze the optimal channel strategy of the divisionalized firm.

$$\Pi^D - \Pi^{ND} = \frac{1-d}{4(1+d)} > 0.$$

This outcome implies that the firm can improve its profit by opening a direct channel. Summarizing this outcome, we conduct the following proposition.

Proposition 2. *The divisionalized firm always opens direct channels under the existence of the customer-friendly sales division.*

It is optimal to open a direct channel for the divisionalized firm. Therefore, given this outcome, we consider the effect of transfer pricing in our model. In other words, we consider the effect of transfer pricing in the divisionalized firm, given a direct channel.

Our main purpose of this study is to identify the effect of transfer pricing and the existence of a customer-friendly sales division. In a previous analysis, one can notice that the existence of the customer-friendly sales division does not have an impact on the decision-making of the channel selection with the transfer pricing. However, if the firm cannot decide any transfer prices in the transaction, it may have a different effect on the profit because the firm cannot coordinate the decision-making of the sales division using transfer prices. Therefore, we use the benchmark case to explore the effect of transfer pricing under the existence of the customer-friendly sales division. In other words, we consider $\Pi^D - \Pi^B$ and obtain the following outcome.

$$\Pi^D - \Pi^B = \frac{2(1-d^3)\gamma^2 + \left(1-\gamma^2\right)d^4 + 4(1-d)d^2 + 2(2-d)\gamma d + 2\gamma^2 d}{2(1+d)\left[4-2\gamma-(1-\gamma)d^2\right]^2} > 0.$$

From this outcome, we obtain the following proposition.

Proposition 3. *Transfer pricing improves the total profit of an integrated supply chain with a direct channel.*

This result indicates the usefulness of transfer pricing. In practice, we can find several examples of this case. For example, General Electric Company sets the transfer price to manage the sales division and sells products through a direct e-commerce channel. Our outcome supports these practices. In particular, when the sales division emphasizes customer value, transfer pricing plays an important role in controlling the division's behavior. While Hamamura (2022) demonstrates that the divisionalized firm sets the cost-based transfer price above the marginal cost, our study shows that, without the assumption of the choice of a cost accounting system, the transfer price exceeds the marginal cost with a direct channel.

Next, we consider the effect of transfer pricing on consumer surplus. We get

$$CS^D - CS^B = -\frac{A_1}{4(1+d)\left[4-2\gamma-(1-\gamma)d^2\right]^2},$$

where $A_1 \equiv 2(1-\gamma)(1+d^3)\gamma + (1-\gamma^2)(2+d^3)d + 8(1-d^2)d + 2(1-d^4)\gamma + 2d(1+d^3) + 4(1-d)d + 2(d^3+\gamma d^2+2d+2)\gamma > 0$. This outcome implies that $CS^D > CS^B$. In other words, transfer pricing harms consumer surplus because the customer-friendly sales division cannot supply the excessive quantity in the product market by transfer pricing. We summarize this result as the following proposition.

Proposition 4. *In our model, transfer pricing lowers consumer surplus.*

Lastly, we focus on an additional welfare effect of transfer pricing. In other words, we shed light on social welfare. We obtain

$$SW^D - SW^B = \frac{A_2}{4(d+1)\left[4-2\gamma-(1-\gamma)d^2\right]^2},$$

where $A_2 \equiv 6\gamma(1-\gamma) + (1-\gamma)^2 d^4 + 2((2+\gamma)d^2 + \gamma d + 2d - 4)\gamma d + 12(1-d)d + 2(1-\gamma^2)d + 2(1-d)\gamma + 2(1-\gamma)d > 0$. This outcome shows that transfer pricing improves social welfare because the improvement of total profits dominates the reduction of consumer surplus. We conclude this outcome as the following proposition.

Proposition 5. *In our model, transfer pricing improves social welfare.*

We will discuss the result of our model in the next section.

4 Discussion and Conclusion

In this note, under the existence of the customer-friendly sales division, transfer pricing becomes beneficial for the divisionalized firm with a direct channel. In prior transfer pricing research, the effect of transfer pricing is mainly considered without a direct channel. However, we analyze the effect of transfer pricing, focusing on the divisionalized firm which has a direct channel to reach the consumer. The customer-friendly sales division supplies excessive quantities to the product market, and therefore, the firm needs to prevent the negative effect of customer-oriented management using any devices. In this study, we focus on internal management based on transfer pricing to consider optimal divisional management because prior studies or texts proved the usefulness of transfer

pricing to control the division. Considering the new case which is observed in many practices, we also demonstrate the effectiveness of transfer pricing in internal management. Our economic analysis supports the previous discussion about the transfer prices.

Additionally, from the perspective of welfare effects, while transfer pricing harms consumer surplus, social welfare is improved by internal management. In this study, while we assume the customer-friendly sales division, many firms emphasize customer value in their reports. For example, from its sustainable impact report, HP Development Company, HP defined customers as key stakeholders during the COVID-19 pandemic, highlighting social activities intended to improve customers' value (e.g., product take-back, repair, remanufacturing, remarketing, and materials recycling)[1]. Therefore, one can consider its case, and when the firm emphasizes the customer value, one may obtain the other results. Because only a few studies assume the divisionalized firm has a direct channel, our study will provide future research opportunities.

Based on our model, one can consider the following future studies in economic studies. First, while we assume the customer-friendly sales division, one can analyze the effect of the customer-friendly integrated firm. In other words, while this study only considers the effect of the division manager's social concern, the firm manager also focuses on the customer company-wide in the recent practice. Through the report, many companies revealed that they emphasize the other player's values based on sustainability and development goals, as we mentioned above. In this case, one may obtain the different effects of the transfer pricing on social performance. Second, as Matsui (2017) considered, it is interesting to consider the endogenous timing game based on our model. In particular, while the dual-channel supply chain study examines the endogenous decision timing of market prices, the integrated supply chain study with a direct channel does not consider this problem. In fact, while Hirao and Hamamura (2022) examines the optimal decision timing by non-integrated supply chain parties with the socially concerned manufacturer, previous studies do not explore the optimal decision timing under the integrated and dimensionalized supply chain with the socially concerned retailer. Therefore, our simple analysis may conduct other research opportunities in economic study.

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