Economics Bulletin

Volume 36, Issue 1

Contemporaneous Most-Favoured-Customer Pricing Policy vs. Price Discrimination in a Differentiated Product Duopoly Market.

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Abstract

In this paper a third degree price discrimination is analyzed in a differentiated product duopoly market. The main question is whether both firms should engage in price discrimination. An asymmetric equilibrium is derived in which one firm engages in price discrimination while the other firm sets a uniform price in both markets. This is done through the adoption of contemporaneous most favoured customer clause.

I am grateful to Prof. Krishnendu Ghosh Dastidar for helpful discussions. Thanks to Dr. Ragupathy V. and Dr. Upasak Das for helpful comments. I am indebted to two anonymous referees and associate editor for extremely helpful comments and suggestions. I bear the responsibilities of all the mistakes in the paper.

Citation: Amarjyoti Mahanta, (2016) "Contemporaneous Most-Favoured-Customer Pricing Policy vs. Price Discrimination in a Differentiated Product Duopoly Market.", *Economics Bulletin*, Volume 36, Issue 1, pages 75-83

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Submitted: August 24, 2015. **Published:** February 04, 2016.

1 Introduction

In this paper we attempt to find the optimal pricing policy for firms when operating in two separate duopoly markets. We find the optimal pricing policy through the adoption of contemporaneous most favoured customer clause (CMFCC). We study a two stage game where firms decide whether or not to adopt CMFCC in the first stage and in second stage, firms compete in prices. CMFCC acts as an insurance against price discrimination because by adopting CMFCC, a firm makes a commitment to the buyers. According to this commitment if it sells at a lesser price to some buyers (in one market) then the buyers who were charged a higher price (in the other market) will be refunded with the extra amount charged. If a firm adopts the policy of CMFCC, then it always sets a uniform price[1] and if a firm does not adopt CMFCC, then it can engage in price discrimination in both markets. Thus, the adoption of decision concerning CMFCC by firms in stage I endogenizes the decision of price discrimination.

In terms of the literature on most favoured customer pricing policy, Besanko and Lyon (1993) demonstrate that in a two stage game where firms can choose to adopt contemporaneous most favoured customer clause in the first stage, the equilibrium is achieved when either all or no firms choose to adopt CMFCC. Cooper (1986) shows that in a duopoly market there exists atleast one equilibrium where one firm chooses to adopt retroactive MFCC and the other firm does not. MFC clause can also lead to tacit collusion among firms. DeGraba (1987) shows that the adoption of the most favoured customer clause by a national firm can lead to a fall in prices across the industry. Aguirre (2000) argues that CMFCC acts in the advantage of the incumbent firm in an entry game.

The literature on price discrimination in monopoly market is quite rich and has a long tradition.[2] Varian (1989) provides an extensive survey of the results related to price discrimination in monopoly. There is also an extensive literature on price discrimination in oligopoly. Holmes (1989) shows that in a symmetric oligopoly market results are similar to that of a monopoly market and the uniform price lies between the discriminatory prices. Corts (1998) contended that the above results are true because of the symmetry assumption. Schulz (1999) demonstrates that the prices are lower for all consumers in third degree price discrimination under certain conditions. Stole (2007) is an excellent and exhaustive survey on price discrimination in imperfectively competitive markets. Galera and Zaratiegui (2005) show that the increase in aggregate output as a necessary condition for an increase in social welfare may not be true when the number of firms is greater than one and when the firms are heterogeneous i.e., their cost functions are not symmetric. Dastidar (2006) provides the sufficient condition for the output, profit and welfare to be higher (lower) in third degree price discrimination than uniform pricing in Cournot duopoly. Adachi and Matsushima (2014) show that when the products are differentiated symmetrically, price discrimination never leads to increase in social welfare. In the case of asymmetric differentiation and when the strong market is relatively less elastic, price discrimination may improve social welfare. Firms are always better-off by switching to price discrimination from uniform pricing. Asplund, Eriksson and Strand (2007), Stavins (2001) and Borzekowski, Thomadsen and Taragin (2009) provide the ev-

[1] Besanko and Lyon (1993) and Aguirre (2000) show that if a firm chooses to adopt the policy of CMFCC, it will always set uniform price.

[2] In this paper, we only survey the papers on price discrimination in oligopoly.

idence for firms involving in price discrimination in Swedish newspaper industry, airline industry and mailing list market, respectively.[3]

One of the interesting results of our paper concerns the subgame perfect Nash equilibrium of the two stage game, where one firm employs third degree price discrimination (does not adopt CMFCC) and the other firm sets a uniform price (adopts CMFCC) in both markets. This is in sharp contrast to the result of Beasanko and Lyon (1993), but the market conditions in our paper are different.[4] In a different setting involving the choice of price policy in spatial competition model with a given location, Thisse and Vives (1988) show that it is optimal to choose discriminatory price policy for all firms. Firms are worst off if they choose an uniform pricing policy.

The paper is organized as follows: we explain the model in section two, in section three we derive the equilibrium in stage II and in section four we derive the equilibrium in stage I, and section five presents the concluding remarks.

2 Model

We consider two separate markets and represent them by j, $j = 1, 2$. There are two firms, we represent them as $i, i = A, B$. Both the firms A and B sell in both the markets. The firms produce differentiated product and the demand function of firm A in market j is $q_j^A = A_j - b_j p_j^A + c_j p_j^B$, $A_j > b_j > c_j > 0, j = 1, 2$. The demand function of firm B in market j is $q_j^B = A_j - b_j p_j^B + c_j p_j^B$, $j = 1, 2$. Here q_j^i denotes the output of firm i in market j; p_j^i denotes the price of the product of firm i in market j. For simplicity we assume that cost of production is zero for both the firms.

In stage I, firms A and B decide whether or not to adopt the policy of CMFCC. In this stage, a firm has to choose from two strategies: adopt CMFCC and not adopt CMFCC. In stage II, there is a price competition between these firms. In stage II, the strategy of a firm is to choose a price in each of the two markets, that is, firm i chooses p_j^i in market j.

In stage I, the game has four scenarios: 1) firm A does not adopt CMFCC (discriminates price) and firm B adopts CMFCC (commits to uniform price), 2) firm A adopts CMFCC (commits to uniform price) and firm B does not adopt CMFCC (discriminates price), 3) both firms A and B do not adopt CMFCC (discriminate price) and 4) both firms adopt CMFCC (commit uniform price).

The pay-off of the firms are given by the profit of the firms in each market. The profit of firm i in market j is given as $\pi_j^i(p_j^i, p_j^{-i}) = p_j^i(A_j - b_j p_j^i + c_j p_j^{-i}), j = 1, 2, i = A, B$. If firm i adopts CMFCC, leading to uniform price in both the markets, we denote its price as $p_1^i = p_2^i = p^i, i = A, B$.

[3] We cite only few papers on the evidence of price discrimination.

[4] In a set-up similar to our paper, Lin, Huang and Liu (2013) show a symmetric equilibrium where all firms engage in price discrimination.

3 Equilibrium in Stage II

We find the subgame perfect equilibrium of the game through backward induction. First we compute the optimal strategies of firms in stage II for all the four different scenarios and then compute the optimal strategies in stage I.

3.1 Firm A does not adopt CMFCC and firm B adopts CMFCC

We assume that firm A does not adopt CMFCC (discriminate price)and firm B adopts CMFCC (commits uniform price). The profit of firm B in market 1 and 2 when it commits uniform prices and firm A does price discrimination, is given as: $\pi_1^B(p_1^A, p^B)+\pi_2^B(p_2^A, p^B) = p^B(A_1 - b_1p^B + c_1p_1^A) + p^B(A_2 - b_2p^B + c_2p_2^A)$. Firm B sets a price p^B to maximize its profit and the first order condition from the maximization yields:

$$\frac{A_1 + A_2 + c_1p_1^A + c_2p_2^A}{2(b_1 + b_2)} = p^B \tag{1}$$

Firm A chooses to discriminate price in stage I, the profit of firm A in market 1 when firm B adopts CMFCC is, $\pi_1^A(p_1^A, p^B) = p_1^A(A_1 - b_1p_1^A + c_1p^B)$. Firm A sets a price p_1^A to maximize its profit, the first order condition gives us:

$$\frac{A_1 + c_1p^B}{2b_1} = p_1^A \tag{2}$$

The profit of firm A in market 2 when firm B adopts CMFCC is: $\pi_2^A(p_2^A, p^B) = p_2^A(A_2 - b_2p_2^A + c_2p^B)$. Firm A sets a price p_2^A to maximize its profit, the first order condition gives us:

$$\frac{A_2 + c_2p^B}{2b_2} = p_2^A \tag{3}$$

Solving the equations (1), (2), (3), we get the equilibrium price:

$$\begin{aligned}
p^B &= \frac{2b_1b_2A_1 + 2b_1b_2A_2 + A_1b_2c_1 + A_2b_1c_2}{4b_1b_2(b_1 + b_2) - b_1c_2^2 - b_2c_1^2}, \\
p_1^A &= \frac{4A_1b_2(b_1 + b_2) - A_1c_2^2 + 2b_2c_1(A_1 + A_2) + c_1c_2A_2}{8b_1b_2(b_1 + b_2) - 2b_1c_2^2 - 2b_2c_1^2}, \\
p_2^A &= \frac{4A_2b_1(b_1 + b_2) - A_2c_1^2 + 2b_1c_2(A_1 + A_2) + c_1c_2A_1}{8b_1b_2(b_1 + b_2) - 2b_1c_2^2 - 2b_2c_1^2}.
\end{aligned}$$

After substituting the values of p^B, p_1^A, p_2^A in the profit functions, the profit of firm B in market 1 and 2 is,

$$\pi_1^B(p_1^A, p^B) + \pi_2^B(p_2^A, p^B) = \left(\frac{2b_1b_2(A_1 + A_2) + A_1b_2c_1 + A_2b_1c_2}{4b_1b_2(b_1 + b_2) - b_1c_2^2 - b_2c_1^2}\right)^2 (b_1 + b_2).$$

The profit of firm A in market 1 and 2 is,

$$\pi_1^A(p_1^A,p^B)+\pi_2^A(p_2^A,p^B)=b_1\left(\frac{4A_1b_2(b_1+b_2)-A_1c_2^2+2b_2c_1(A_1+A_2)+c_1c_2A_2}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2+$$
$$b_2\left(\frac{4A_2b_1(b_1+b_2)-A_2c_1^2+2b_1c_2(A_1+A_2)+c_1c_2A_1}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2.$$

If firm A adopts CMFCC and firm B does not adopt CMFCC, the profits of firm A will be same as that of firm B's in scenario (1) and profit of firm B will be same as the profit of firm A in scenario (1)and this is due to the fact that the firms are symmetric.

3.2 Firm A and Firm B both do not adopt CMFCC.

Suppose firms A and B both do not adopt CMFCC and consequently, both the firms do price discrimination. The profit of firm A in market 1 is, $\pi_1^A(p_1^A,p_1^B)=p_1^A(A_1-b_1p_1^A+c_1p_1^B)$. Firm A sets p_1^A to maximize its profit and the first order condition gives us:

$$\frac{A_1+c_1p_1^B}{2b_1}=p_1^A \tag{4}$$

The profit of firm B in market 1 is :$\pi_1^B(p_1^A,p_1^B)=p_1^B(A_1-b_1p_1^B+c_1p_1^B)$. Firm B sets p_1^B to maximize its profits and the first order condition is:

$$\frac{A_1+c_1p_1^A}{2b_1}=p_1^B \tag{5}$$

Solving the equations (4) and (5), we get the values of $p_1^A=\frac{A_1}{2b_1-c_1}$ and $p_1^B=\frac{A_1}{2b_1-c_1}$. Substituting these p_1^A and p_1^B into the profit function, we get the profit functions of firm A and firm B as[5] $\pi_1^A()=(\frac{A_1}{2b_1-c_1})^2$ and $\pi_1^B()=(\frac{A_1}{2b_1-c_1})^2$ respectively. Following the same procedure, we get the profits of firm A and firm B in market 2 as $\pi_2^A()=(\frac{A_2}{2b_2-c_2})^2$ and $\pi_2^B()=(\frac{A_2}{2b_2-c_2})^2$, respectively.

3.3 Firm A and Firm B both adopt CMFCC

Suppose firms A and B both adopt CMFCC, then both the firms set uniform price in market 1 and 2. The profit of firm A in market 1 and 2 is, $\pi_1^A(p^A,p^B)+\pi_2^A(p^A,p^B)=p_1(A_1-b_1p^A+c_1p^B)+p^B(A_2-b_2p^A+c_2p^B)$. Firm A sets p^A to maximize its profit, the first order condition is given as:

$$\frac{A_1+A_2+p_2(c_1+c_2)}{2(b_1+b_2)}=p^A \tag{6}$$

The profit of firm B in markets 1 and 2 is: $\pi_1^B(p^A,p^B)+\pi_2^B(p^A,p^B)=p^B(A_1-b_1p^B+c_1p^A)+p^B(A_2-b_2p^B+c_2p^A)$. Firm B sets p^B to maximize its profit, the first order

[5] $\pi_j^i()$ are functions and the arguments have been dropped for notational convenience.

condition is given as:

$$\frac{A_1 + A_2 + p_1(c_1 + c_2)}{2(b_1 + b_2)} = p^B \tag{7}$$

Solving the equations (6) and (7), we get the values of $p^A = \frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2}$ and $p^B = \frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2}$. Thus, the total profits of firm A and B are $\pi_1^A() + \pi_2^A() = (\frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2})^2(b_1 + b_2)$ and $\pi_1^B() + \pi_2^B() = (\frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2})^2(b_1 + b_2)$ respectively.

4 Equilibrium in stage I

Now we find the optimal strategy of firms in stage I. To do so we compare the profits of firms in different scenarios. To facilitate the comparison we place some restrictions on the parameters $A_1, b_1, c_1, A_2, b_2, c_2$. We consider two types of restrictions:

- Case 1: $A_1 = A_2 = A,\ b_1 < b_2,\ c_1 = c_2 = c,\ b_1 > c.$
- Case 2: $A_1 > A_2,\ b_1 = b_2 = b,\ c_1 = c_2 = c,\ b > c.$

In order to make the notations compact we introduce, $\alpha_1 = 2b_1 + c_1,\ \gamma_1 = 2b_1 - c_1,$ $\alpha_2 = 2b_2 + c_2,\ \gamma_2 = 2b_2 - c_2,\ \theta = \sqrt{b_1 + b_2}.$

First, we consider the scenario in which firm A does not adopt CMFCC, that is discriminates price. To find the optimal strategy of firm B in such situation we compare the profits of firm B from adopting and not adopting CMFCC. In other words, we compare the profits of firm B in scenario (1) and scenario (3). We get the following results.

Lemma 4.1. *Given case 1, if firm A does not adopt CMFCC then, it is optimal for firm B to adopt CMFCC, if* $(\theta^2 - 1) > 0$ *and* $(2b_2\alpha_1\gamma_1\theta - b_1\alpha_2\gamma_2) > 0$.

Proof. If we have $(\frac{2b_1b_2(A_1+A_2)+A_1b_2c_1+A_2b_1c_2}{4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2})^2(b_1 + b_2) > (\frac{A_1}{2b_1-c_1})^2 + (\frac{A_2}{2b_2-c_2})^2$, then it is optimal for firm B to adopt CMFCC, when firm A does not adopt CMFCC. After simplification and placing the restrictions described in case 1 in the above inequality we get:

$$A^2[b_2^2\alpha_1^2\gamma_1^2\gamma_2^2(\theta^2 - 1) + 2b_1b_2\alpha_1\alpha_2\gamma_1^2\gamma_2^2\theta^2 + 2b_1b_2\alpha_1\alpha_2\gamma_1\gamma_2(\gamma_2^2\theta - \gamma_1^2) + b_1^2b_2^2\gamma_1^2\gamma_2^2(\theta^2 - 1) - b_1^2\alpha_2^2\gamma_2^4 - b_2^2\alpha_1^2\gamma_1^4] > 0. \tag{8}$$

We get, if $(\theta^2 - 1) > 0$, and $2b_2\alpha_1\gamma_1\theta - b_1\alpha_2\gamma_2 > 0$ then the inequality (8) is true. Thus, we get a sufficient condition for firm B to adopt CMFCC, when firm A does not adopt CMFCC in case 1. □

Lemma 4.2. *Given case 2, if firm A does not adopt CMFCC then, it is optimal for firm B to adopt CMFCC, if* $(\theta^2 - 1) > 0$.

Proof. If we have $(\frac{2b_1b_2(A_1+A_2)+A_1b_2c_1+A_2b_1c_2}{4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2})^2(b_1+b_2) > (\frac{A_1}{2b_1-c_1})^2+(\frac{A_2}{2b_2-c_2})^2$, then it is optimal for firm B to adopt CMFCC, when firm A does not adopt CMFCC After simplification and with the restrictions of case 2 in the above inequality, we get:

$$A_1^2b^2\alpha^2\gamma^4(\theta^2-1)+2A_1A_2b^2\alpha^2\gamma^4\theta^2+2b^2\alpha^2\gamma^4(A_1^2\theta-A_2^2)+A_2^2b^4\gamma^4(\theta^2-1) \\ -A_1^2b^2\alpha^2\gamma^4-A_2^2b^2\alpha^2\gamma^4>0. \quad (9)$$

The inequality (9) is true, if $(\theta^2-1)>0$ is true. Thus, we get a sufficient condition for firm B to adopt CMFCC, when firm A does not adopt CMFCC in case 2. □

From lemma 4.1 and lemma 4.2, we get sufficient conditions under which it is optimal for firm B to adopt CMFCC, when firm A does not adopt CMFCC. This shows that both firms following the strategy of price discrimination is not an optimal strategy under the above conditions in cases 1 and 2.

Now suppose firm B adopts CMFCC, to find the optimal strategy of firm A, we compare the profits of firm A from not adopting CMFCC and by adopting CMFCC. Therefore, we compare the profits of firm A in scenario (2) and scenario (4). We get the following results.

Lemma 4.3. *Given case 1, If firm B adopts CMFCC then, it is optimal for firm A to not adopt CMFCC if and only if*

$$\frac{b_1}{b_2}>\frac{(2b_1b_2+2b_1^2-c^2)(2b_1\alpha_1\gamma_1+4b_1\alpha_2(b_1+b_2)+8b_1b_2\alpha_2+2b_1\alpha_1\gamma_2+4b_2\alpha_1\gamma_1)}{(2b_1b_2+2b_2^2-c^2)(4b_1\alpha_2\gamma_2+2b_2\alpha_2\gamma_2+6b_2\alpha_1\gamma_1-2c\alpha_2(b_2-b_1)+2b_2\alpha_1\gamma_2)}.$$

Proof. If we have

$$b_1\left(\frac{4A_1b_2(b_1+b_2)-A_1c_2^2+2b_2c_1(A_1+A_2)+c_1c_2A_2}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2+ \\ b_2\left(\frac{4A_2b_1(b_1+b_2)-A_2c_1^2+2b_1c_2(A_1+A_2)+c_1c_2A_1}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2 > \left(\frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2}\right)^2(b_1+b_2),$$

it is optimal for firm A to not adopt CMFCC, when firm B is adopting CMFCC. After simplification and with the restrictions as in case 1, we get,

$$b_1(2b_1b_2+2b_2^2-c^2)(4b_1\alpha_2\gamma_2+2b_2\alpha_2\gamma_2+6b_2\alpha_1\gamma_1-2c\alpha_2(b_2-b_1)+2b_2\alpha_1\gamma_2) \\ -b_2(2b_2b_1+2b_1^2-c^2)(2b_1\alpha_1\gamma_1+4b_1\alpha_2(b_1+b_2)+8b_1b_2\alpha_2+2b_1\alpha_1\gamma_2+4b_2\alpha_1\gamma_2) > 0. \quad (10)$$

The necessary and sufficient condition for the inequality (10) to be true is

$$\frac{b_1}{b_2}>\frac{(2b_1b_2+2b_1^2-c^2)(2b_1\alpha_1\gamma_1+4b_1\alpha_2(b_1+b_2)+8b_1b_2\alpha_2+2b_1\alpha_1\gamma_2+4b_2\alpha_1\gamma_1)}{(2b_1b_2+2b_2^2-c^2)(4b_1\alpha_2\gamma_2+2b_2\alpha_2\gamma_2+6b_2\alpha_1\gamma_1-2c\alpha_2(b_2-b_1)+2b_2\alpha_1\gamma_2)}.$$

Thus, we get the necessary and sufficient condition under which it is optimal for firm A to not adopt CMFCC, when firm B is adopting CMFCC.

□

Lemma 4.4. *Given case 2, it is always optimal for firm A to not adopt CMFCC when firm B adopts CMFCC.*

Proof. If we have

$$b_1\left(\frac{4A_1b_2(b_1+b_2)-A_1c_2^2+2b_2c_1(A_1+A_2)+c_1c_2A_2}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2+$$
$$b_2\left(\frac{4A_2b_1(b_1+b_2)-A_2c_1^2+2b_1c_2(A_1+A_2)+c_1c_2A_1}{2(4b_1b_2(b_1+b_2)-b_1c_2^2-b_2c_1^2)}\right)^2 > (\frac{A_1+A_2}{2(b_1+b_2)-c_1-c_2})^2(b_1+b_2),$$

it is optimal for firm A to not adopt CMFCC, when firm B is adopting CMFCC. After simplification and with the restrictions of case 2 we get,
$2\alpha\gamma^2(A_1-A_2)[2A_1\alpha\gamma^2+4A_1b\alpha\gamma+2A_2c\alpha\gamma-4A_2b\alpha\gamma-2A_2\alpha\gamma^2-2A_1c\alpha\gamma]>0.$
$\implies 4\alpha^2\gamma^4(A_1-A_2)^2>0.$
This is always positive. Thus, it is always optimal for firm A to not adopt CMFCC, when firm B adopts CMFCC.

□

Lemma 4.3 gives the necessary and sufficient condition for firm A to not adopt CMFCC, when firm B adopts CMFCC in case 1. Lemma 4.4 shows that it is always optimal for firm A to not adopt CMFCC, when firm B adopts CMFCC. Thus, both firms adopting CMFCC is never an optimal strategy. We can see that both firms will never follow the strategy of setting a uniform price.
Now we show the conditions under which we get a pure strategy Nash equilibrium in stage I of the game. This pure strategy Nash equilibrium will also be the subgame perfect Nash equilibrium of the two stage game because we find the optimal strategy in stage I given the optimal strategy in stage II.

Proposition 4.5. *Given case 1, If* $(\theta^2-1)>0$ *and*

$$\frac{2\theta(4b_1^2-c^2)}{(4b_2^2-c^2)}>\frac{b_1}{b_2}>\frac{(2b_1b_2+2b_1^2-c^2)(2b_1\alpha_1\gamma_1+4b_1\alpha_2(b_1+b_2)+8b_1b_2\alpha_2+2b_1\alpha_1\gamma_2+4b_2\alpha_1\gamma_1)}{(2b_1b_2+2b_2^2-c^2)(4b_1\alpha_2\gamma_2+2b_2\alpha_2\gamma_2+6b_2\alpha_1\gamma_1-2c\alpha_2(b_2-b_1)+2b_2\alpha_1\gamma_2)}$$

then a pure strategy Nash equilibrium in stage I is when firm A does not adopt CMFCC and firm B adopts CMFCC.

Proof. Proof follows from Lemma 4.3 and Lemma 4.1.

□

The proposition 4.5 gives a pure strategy Nash equilibrium in stage I in case 1, which is also a subgame perfect Nash equilibrium of the two stage game. It is obvious that we get another pure strategy Nash equilibrium, where firm B does not adopt CMFCC and firm A adopts CMFCC for the same sufficient condition. This is because firms are symmetric in nature.

Proposition 4.6. *Given case 2, if* $(\theta^2-1)>0$ *then a pure strategy Nash equilibrium in stage I is when firm A does not adopt CMFCC and firm B adopts CMFCC.*

Proof. Proof follows from Lemma 4.2 and Lemma 4.4. □

Similarly, we get another pure strategy Nash equilibrium where firm B does price discrimination and firm A adopts CMFCC in stage I for the same sufficient condition.
One interpretation of this asymmetric equilibrium can be the following: if firm A does not adopt CMFCC, and hence discriminates price in the two markets, then there exists an optimal price charged by firm B which is a linear combination of the two prices charged by firm A. Firm B sets this linear combination of the two prices by committing to adopt CMFCC. In case 2, we get asymmetric equilibria when the demand functions in both the markets are sufficiently flat. That is, demand functions are sufficiently elastic in their own price. In case 1, demand functions being substantially flat is not a sufficient condition and we need additional restrictions. The additional restriction is the bounds on the ratio of the own price slopes of the demand function in the two markets.

5 Conclusion

We conclude that in a duopoly market with product differentiation and price competition, the optimal strategy is the following: one firm adopts CMFCC while the other firm engages in price discrimination under certain conditions. We derive the sufficient conditions for two types of parametric variation of the demand function. For case 2, the sufficient condition for the asymmetric equilibrium is a mild restriction on the demand function that it must be sufficiently elastic in own price. We also conclude that the firms are not always better-off if all of them engage in price discrimination simultaneously. It is also not optimal for all firms to simultaneously adopt CMFCC.

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