A Note on Law and Economics : Law against Retail Price Maintenance : Incentive of Retailer and Tax Evasion

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1. Introduction

A purpose of this note is to study the law against retail price maintenance. In general the law prohibits producer from determining even retail price in addition to wholesale price. In Miura (1997) the law against retail price maintenance has already been analyzed, and it has clearly been explained that under retail price maintenance the retail price becomes higher than the optimal retail price level. Then the law was already simply justified from an economic point in Miura (1997).

In this note, however, the following two additional aspects which has not been considered will be examined. The aspect with respect to an incentive of retailer for sales will be studied in the first place. And the aspect with respect to the tax evasion of producer [See Allingham and Sandmo (1972), Peacock and Show (1982), Kreutzer and Lee (1986), Watanabe (1986, 1987, 1988, 1989, 1996, 2001a, 2001b, 2003) for the tax evasion] will also be examined secondly. In section 2 of this note the first aspect will be analyzed and the second aspect will be studied in section 3. From the study of this note the following results will be derived; (a) under retail price maintenance if the incentive of retailer for sales is taken into consideration the retail price becomes higher than the ordinal retail price as analyzed in Miura (1997), (b) under retail price maintenance if the tax evasion of producer is taken into consideration the retail price becomes lower than the ordinal retail price as analyzed in Miura (1997). In the last section concluding remarks will be given.

2. Retail Price Maintenance and Incentive of Retailer for Sales

In this section the incentive of retailer for sales will be taken into consideration to analyze the retail price maintenance.

Demand function is assumed such that

$$p_R = a_0 \left(1 + \frac{p_R - p_W - c_R}{p_R} \right) - bx \quad , \tag{1}$$

where p_R is the retail price level, p_W is the wholesale price level, c_R is the sales cost of retailer, x is the level of production and $a > 0$, $b > 0$.

In equation (1) a special case where $p_R = p_W + c_R$ corresponds the case analyzed by Miura (1997).

The profit (π_M) of the producer is denoted by

$$\pi_M = \left(p_W - c_M \right) \frac{1}{b} \left\{ a_0 + a_0 \left(1 - \frac{p_W}{p_R} - \frac{c_R}{p_R} \right) - p_R \right\} \quad , \tag{2}$$

where c_M is the cost of production.

Maximizing (2) with respect to p_W and p_R yields the following first order conditions.

$$\frac{\partial \pi_M}{\partial p_W} = \frac{1}{b} \left\{ a_0 + a_0 \left(1 - \frac{p_W}{p_R} - \frac{c_R}{p_R} \right) - p_R \right\}$$
$$+ \left(p_W - c_M \right) \frac{1}{b} \left(\frac{-a_0}{p_R} \right) = 0 \quad , \tag{3}$$

$$\frac{\partial \pi_M}{\partial p_R} = \left(p_W - c_M \right) \frac{1}{b\,p_R^2} \left(a_0 p_W + a_0 c_R - p_R^2 \right) = 0 \quad . \tag{4}$$

Second order conditions are satisfied;

$$\frac{\partial^2 E\pi}{\partial p_W^2} = \frac{-2a_0}{b\,p_R} < 0 \quad , \tag{5}$$

$$D = \frac{\left(p_W - c_M \right) a_0^2}{b^2 p_R^4} \left(3p_W + 4c_R + c_M \right) > 0 \quad , \tag{6}$$

where $D = \begin{vmatrix} \dfrac{\partial^2 E\pi}{\partial p_W^2} & \dfrac{\partial^2 E\pi}{\partial p_W \partial p_R} \\[3mm] \dfrac{\partial^2 E\pi}{\partial p_R \partial p_W} & \dfrac{\partial^2 E\pi}{\partial p_R^2} \end{vmatrix}$

as $p_W > c_W$ is assumed.

From first order conditions (3) and (4) following (7) and (8) are derived

$$p_W^* = \frac{2}{9}\left\{ a_0 + \sqrt{a_0^2 + 3a_0(c_M + c_R)} \right\} + \frac{c_M - 2c_R}{3} \tag{7}$$

$$p_R^* = \frac{a_0 + \sqrt{a_0^2 + 3a_0(c_R + c_M)}}{3} . \tag{8}$$

On the other hand in the special case analyzed by Miura (1997) where $p_R = p_W + c_R$, the corresponding p_W^{**} and p_R^{**} are shown as

$$p_W^{**} = \frac{a_0 + c_M - c_R}{2} , \tag{9}$$

$$p_R^{**} = \frac{a_0 + c_M + c_R}{2} . \tag{10}$$

Therefore the following relation can be straightforwardly obtained;

$$p_R^{**} < p_R^* \tag{11}$$

Hence from the study of this section the following result can be obtained; under retail price maintenance if the incentive of retailer for sales is taken into consideration, the retail price becomes higher than the ordinal retail price as analyzed in Miura (1997). In the next section the aspect concerning the tax evasion of producer will be studied.

3. Retail Price Maintenance and Tax Evasion of Producer

In this section the tax evasion of the producer will be taken into consideration to analyze the ordinal retail price maintenance, where $p_R = p_W + c_R$.

If the tax evasion is not detected the profit of the producer is denoted by

$$p_W x - c_M x - t \left\{ p_W x - (1+\delta) c_M x \right\} \ , \tag{12}$$

where t is tax rate and δ is the cost overstatement rate.

On the other hand if the tax evasion is detected the profit of the producer is denoted by

$$p_W x - c_M x - t \left\{ p_W x - (1+\delta) c_M x \right\} - F t \delta c_M x \ , \tag{13}$$

where F is the penalty rate of tax evasion.

Hence from (12) and (13) the expected profit is shown as

$$E \pi = \frac{1}{b} (a - p_W - c_R) \left\{ (1-t)(p_W - c_M) + t \delta c_M (1 - q(\delta) F) \right\} \ , \tag{14}$$

where $q(\delta)$ is the probability of detection.

Maximizing (14) with respect to p_W and δ yields

$$\frac{\partial E \pi}{\partial p_W} = \frac{1}{b} \left\{ -(1-t)(p_W - c_M) - t \delta c_M (1 - q(\delta) F) \right.$$
$$\left. + (a - p_W - c_R)(1-t) \right\} = 0 \ , \tag{15}$$

$$\frac{\partial E \pi}{\partial \delta} = \frac{1}{b} (a - p_W - c_R) t c_M (1 - 2 \delta F) = 0 \ . \tag{16}$$

Second order conditions are satisfied

$$\frac{\partial^2 E \pi}{\partial p_W^2} = -\frac{2}{b} (1-t) < 0 \ , \tag{17}$$

and

$$D = \begin{vmatrix} \dfrac{\partial^2 E \pi}{\partial p_W^2} & \dfrac{\partial^2 E \pi}{\partial p_W \partial \delta} \\[3mm] \dfrac{\partial^2 E \pi}{\partial \delta \partial p_W} & \dfrac{\partial^2 E \pi}{\partial \delta^2} \end{vmatrix} > 0 \ , \tag{18}$$

where $\dfrac{\partial^2 E\pi}{\partial p_W^2} < 0$ from (17), $\dfrac{\partial^2 E\pi}{\partial p_W \partial \delta} = 0$

and $\dfrac{\partial^2 E\pi}{\partial \delta^2} = -\dfrac{2}{b}(a_0 - p_W - c_R) t c_M F < 0$

as $a_0 > p_W + c_R$ can be assumed.

From first order conditions (15) and (16) the following (19), (20) and (21) are derived.

$$p_W^{***} = \frac{a_0 - c_R}{2} + \frac{1}{8(1-t)F}\{4(1-t)F - t\}c_M , \qquad (19)$$

then

$$p_R^{***} = \frac{a_0 + c_R}{2} + \frac{1}{8(1-t)F}\{4(1-t)F - t\}c_M , \qquad (20)$$

$$\delta^{***} = \frac{1}{2F} . \qquad (21)$$

Therefore from (9) and (19) the following relation (22) can be derived.

$$p_R^{**} - p_R^{***} = \frac{t c_M}{8(1-t)F} > 0 ,$$

then $\quad p_R^{**} > p_R^{***}$ \hfill (22)

Hence from the analysis of this section the following result is derived; if the tax evasion of producer is taken into consideration the retail price becomes lower than the ordinal retail price as analyzed in Miura (1997) under the retail price maintenance.

In addition to the above result the following policy- mix with respect to the tax rate and the penalty rate can also be derived straightforwardly by totally differentiating (20);

$$p_R^{***} \text{ decreases}$$

if the tax rate is raised while the penalty rate is raised such that

$$\frac{F}{t}\frac{dt}{dF} > \frac{1}{1-t} .$$

And from (21) the cost overstatement rate can also be reduced by the above policy-mix.

4. Concluding Remarks

In this note the law against retail price maintenance has been studied.

The law against retail price maintenance has already been analyzed In Miura (1997), and it has clearly been explained that under retail price maintenance the retail price becomes higher than the optimal retail price level. The purpose of this note is to take the incentive of retailer for sales and the tax evasion of producer into consideration.

From the study of this note the following main results have been derived; under retail price maintenance if the incentive of retailer for sales is taken into consideration, the retail price becomes higher than the ordinal retail price as analyzed in Miura (1997), and if the tax evasion of producer is taken into consideration the retail price becomes lower than the ordinal retail price as analyzed in Miura (1997) under the retail price maintenance.

The policy- mix with respect to the tax rate and the penalty rate can reduce not only the level of retail price but also the cost overstatement rate.

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