The Welfare Effects of Third-Degree Price Discrimination in Intermediate Good Markets

Michael L. Katz

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Two fundamental differences between final and intermediate good markets:

1) The buyers’ demands for the product market are interdependent - Downstream firm’s demand for an input is a function both of the price it pays for the input and of the prices that the buyer’s product market rivals.

2) Buyer’s ability of (vertical) integration

=> Because of above two reasons, the analysis of third-price discrimination market can not be applied to intermediate-goods market
Analytical Framework

- Homogenous final good → perfect substitute
- One unit of input produces one unit of output

**Upstream Firm**
- Initially, the output is produced by the single incumbent upstream producer
- Marginal cost is constant, $c$

**Downstream Firm:** *There are two types of sellers in each region*
1) One store in each market is a branch of a chain that sells the final good in the market
2) A local store that operates solely in *that* market

- Downstream firms are Cournot competitors
Definition

- \( P(\cdot) \): the inverse demand function in that market

- \( x_1[m_1, m_2], x_2[m_1, m_2] \) are the equilibrium output of firm 1 and firm 2, respectively, and \( m_i \) indicates the marginal input cost of firm \( i \)

- \( X \) is the total output in a single market:
  \[
  \Rightarrow X[m_1, m_2] = x_1[m_1, m_2] + x_2[m_1, m_2]
  \]

- Firm \( i \)'s profit in a single market
  \[
  \pi_i[m_i, m_j] = x_i[m_i, m_j] \{ P[X(m_i, m_j)] \}
  \]

  \[
  \frac{\partial X}{\partial m_i} < 0, \quad \frac{\partial \pi_i[m_i, m_j]}{\partial m_i} < 0, \quad \frac{\partial \pi_i[m_i, m_j]}{\partial m_j} \geq 0
  \]

- \( w_i \) is price that upstream producer charges firm \( i \)
  \[
  \Rightarrow \text{if firm } i \text{ purchases the input from the upstream producer}
  \]
Cost of producing input by final good firm

\[ F + vy, \text{ where } F \text{ is positive and fixed cost that must be sunk for production to take place, and } v \text{ is positive constant with } V \geq C \]

\[ \Rightarrow \text{For the integration by firm } i, \ m_i = v, \quad \pi[v, m_j] - \frac{F}{k_i}, \text{ where } k_i \text{ is number of downstream markets in which firm } i \text{ is present} \]

Additional Assumption

- Local store does not have option of integration because it’s not profitable.
- Even though chain produces intermediate good, it can’t sell to local store.
The Integration Decision

The chain’s integration decision based on expected profits with and without integration is given by:

\[ \left\{ \pi^e [w_1, w_2] - \frac{F}{K} \right\} - \pi [w_1, w_2] \geq 0 \quad (1) \]

**Definition:** \( I[w_2] \) is the value of \( w_1 \) such that this price pair satisfies (1) with equal profits.

Note: \( I[w_2] \) (or integration frontier) can have either upward or downward slope depending on whether changes in \( w_1 \) and \( w_2 \) raise or lower the left-hand side of equation (1).

\[ \Rightarrow \text{For example: suppose } w_1 \text{ is the input price the chain pays. Then, } w_1 \text{ will reduce the chain’s integration incentive but increase in } w_2 \text{ raises it.} \]
The Upstream Supplier’s Choice of Prices

It will choose \( w_1 \) and \( w_2 \), taking the chain’s integration rule into consider-

\[ \max_{w_1, w_2} U^m [w_1, w_2] \]

\[ \equiv (w_1 - c)x[w_1, w_2] + (w_2 - c)x[w_1, w_2] \]

subject to

\[ \pi[w_1, w_2] \geq \pi^e[w_1, w_2] - \frac{F}{K} \]
**Welfare Analysis**

*Two types of welfare effects*

1) Total amount of the intermediate good or final good

2) Production efficiency

**Case I: integration in both regimes**

If upstream finds it optimal to induce integration both with and without price discrimination, then two outcomes are the identical.

⇒ In this case, the welfare levels are the same in both price regimes

**Case II: integration in neither regime**

If not profitable for chain to integrate under either pricing regime

- input prices under price discrimination are higher than those under no price discrimination

\[
\left( \frac{w_1 + w_2}{2} \right) > w_{NPD}
\]

⇒ lower total number of input and final good
⇒ lower consumer surplus
Case III: integration in one regime

- Both welfare effects (number of output and production efficiency) are affected.
- Price discrimination will lower the output and consumer surplus, but the effect might be overweighed by the savings from the avoidance of integration costs.
  \[ \Rightarrow \] Uncertain about which price regime will give more welfare.