Licensing Cost and Competition in Licensing New Products

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Abstract

We consider two innovators of substitutional technologies. We analyze their strategies to auction off licenses to interested firms that can produce new products with the technology. When products using the two technologies are identical, we show that the innovators are likely to benefit from a higher licensing cost .

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1 Introduction

2 The Model

Consider two innovators of different technologies, say A and B. Both innovators are considering selling their licenses to interested firms that can make new products with the new technology. Products using either technology A or B are considered substitutes. For simplicity, we assume commodities produced by the two technologies are identical from consumers' perspective. The inverse demand function for this product is $p = a - q$ where q is the total amount of new products from either technology. Moreover, we assume the marginal cost of producing this new product with either technology A or B is a constant c. The interaction among the innovators and interested producers can be summarized by the following game.

In the first stage of the game, the two innovators sell licenses separately by means of auction to a set of potential buyers. Let k_1 and k_2 be the number of licensees determined independently by Innovator 1 and 2. In the second stage, $k = k_1 + k_2$ producers will use the new technology to produce and compete a la Cournot.

In the last stage of the game, each firm h, $h = 1...k$, will produce an identical amount $q_h = \frac{a-c}{k+1}$ and make an operating profit equal to $\pi_h = (\frac{a-c}{k+1})^2$.

Assume an infinite amount of potential firms so that every firm will bid with their operating profit π_h. In the first stage, Innovator i, $i = 1, 2$, will try to maximize his licensing revenue as

$$R_i(k_i) = k_i[(\frac{a-c}{k+1})^2 - \alpha] \tag{1}$$

, where α is the licensing cost.

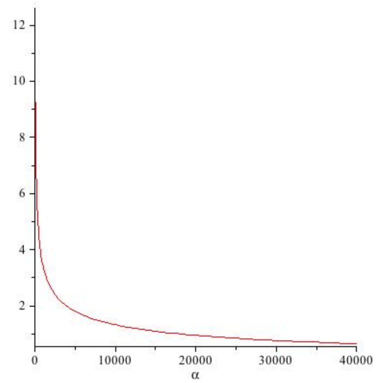
The equilibrium k_i can be found by solving the following first-order conditions

$$\begin{cases} (\frac{a-c}{k+1})^2(1 - \frac{2k_1}{k+1}) = \alpha \\ (\frac{a-c}{k+2})^2(1 - \frac{2k_1}{k+1}) = \alpha \end{cases} \tag{2}$$

Consider the symmetric equilibrium where $k_i = k^*$, $i = 1, 2$. By (2),

$$k^* = \frac{1}{2}[\frac{(a-c)^{2/3}}{\alpha^{1/3}} - 1].$$

The following graph shows how k^* changes along with α.



By substituting k^* into (1), after rearrangement, the innovator's revenue from licensing is

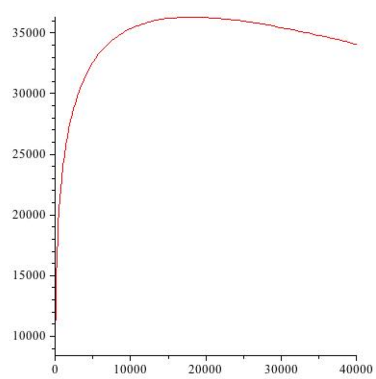
$$R_i(k^*) = \frac{1}{2\alpha^{1/3}}[(a-c)^{2/3} - \alpha^{1/3}][(a-c)^{2/3}\alpha^{2/3} - \alpha] \tag{3}$$

By taking derivative of $R_i(k^*)$ with respect to α

$$\frac{dR_i(k^*)}{d\alpha} = \frac{1}{6}[3 - 4(a-c)^{2/3}\alpha^{-1/3} + (a-c)^{4/3}\alpha^{-2/3}] \tag{4}$$

, which is positive when $(a-c)^{2/3}\alpha^{-1/3} < 1$ or when $(a-c)^{2/3}\alpha^{-1/3} > 3$. In words, the licensing revenue will be increasing in α when $0 < \alpha < (a-c)^2/27$

The following figure demonstrates how the innovator's licensing revenue will change with a higher licensing cost.



Though a higher licensing cost induces a smaller set of licensees, it also creates a looser competition in the product market, and a higher operating profits for these licensees. Thus the innovator can collect more in the auction.