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An Exploration into Royalty Stacking and Price Posting

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Intellectual Property Rights

Standard Essential Patents

Digital India

Innovation enables growth but it is also a national imperative for India in a knowledge-driven global economy. Given young India's young population, the size of its markets and the nature of its problems, India has great potential of being at the forefront of new technologies.

Two requirements for transforming India into a knowledge-based society are growth in human capital and the establishment of an innovation ecosystem. Neither will be possible without strategic government interventions in formulating laws and policies and, in developing the right institutions to create and nurture technological discoveries.

However, even these initiatives will come to nought if the intellectual assets generated by the human capital is not managed appropriately. Value generated from intellectual assets should not only be maximized, it must also be distributed widely among the Indian population.

This series focuses on the role played by intellectual property laws, competition policy and other institutions in defining the innovation ecosystem.

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An Exploration into Royalty Stacking and Price Posting

Brief

Royalty stacking has been quoted as a problem in the recent past and competition authorities have tried to come up with solutions to control increasing royalty rates. The paper examines efficacy of a situation where patent producers quotes or posts prices for their patented ideas rather than charging royalty rates. The finding is as follows: given some cost of production, charging royalty rates never yield an outcome which is worse than posting prices. In other words, royalty rates charged by patent holders yield an outcome where surplus to consumers, revenue to patent holders and revenue to manufacturer are no less than when prices are posted by the patent holders. Royalty rates can be charged in two ways, on final price of the product or on net price (price minus material cost) of the product. If the royalty rates are charged on final price, the surplus and revenue is equal to the outcome if prices are posted. If the royalty rates are charged on net price, the surplus and revenue is strictly greater than if prices are posted in presence of non-zero cost of production. Since only redistribution of producer surplus happens and quantity produced does not decrease, the issue does not affect competition in any way. The idea of posting prices in order to curb the issue of royalty stacking is hence flawed.

Royalty stacking refers to the stacking of claims of different licensors when several patents are used by the manufacturer in the production of complex products. The Competition Commission of India (CCI) in one of its prima-facie order observed that “The usefulness of complex products and services often depends on the interoperability of components and products of different firms..... [F]rom the perspective of the firm making the product, all the different claims for royalties must be added or “stacked” together to determine the total burden of royalty to be borne by the manufacturer. Stacked together it raises the cost and burden to consumers.” It is held that, if instead, patent holders ‘post’ a price for each of their patents (rather than charge royalty rates on the final product price), consumers may be better off.

The argument of royalty stacking has received considerable attention among competition authorities, courts and economists. Economists have characterised royalty stacking as a situation where each patent holder charges royalty rates independent of each other raising the cumulative costs of royalty. However, there are no empirical studies that provide any measure, or evidence, of how royalty stacking leads to excessive cost and, hence, price to consumers.

In this paper, we explore the impact of the two alternatives cited in the beginning of this note. In particular, two scenarios are analysed: (a) Case I: when patent holders post prices and the manufacturer (user of patents) decides how much to produce and (b) Case II: when the manufacturer pays royalty rates on price of the downstream product. Case II can be analysed in two different ways: when the royalty is charged on the final price and when it is charged on the ‘net price’, i.e., price minus the cost of materials (or, the net profit per unit of the product).

Analytical Framework

Suppose a producer of handsets uses n patents. The patents are held by k distinct entities. Let the material cost of a handset be $c \geq 0$. The demand curve faced by the manufacturer¹ is given by $P(Q)$, where P is the price of the handset and Q is the total quantity sold. In addition to the demand price being inversely related to the quantity sold, we will assume that the marginal revenue falls with quantity (second order condition).²

Case I:

In stage 1, each patent entity quotes a price for its (set of) patent(s), $x_j, j = 1, 2, \dots, k$. In stage 2, the handset producer chooses the quantity to maximize profit.

¹ Manufacturer produces a differentiated product and, hence, faces a sloped demand curve.

² The second order condition requires $\frac{d^2}{dQ^2} [P(Q)Q] \equiv \frac{d}{dQ} \left[\frac{dP(Q)}{dQ} Q + P(Q) \right] < 0$. We also assume that $P(0) < \infty$, i.e., the demand curve has a finite intercept.

Profit of the producer, π , is given by

$$(1) \quad \pi = [P(Q) - c - \sum_{j=1}^k x_j]Q$$

If Q^* maximizes (1), then³

$$(2) \quad \left(\frac{dP(Q)}{dQ} \Big|_{Q^*} \right) Q^* + P(Q^*) = c + \sum_{j=1}^k x_j$$

The revenue earned by the patent holder j is given by

$$(3) \quad Y_j = x_j Q^*, \quad j = 1, 2, \dots, k$$

The consumers' surplus S is given by

$$(4) \quad S = \int_0^{Q^*} [P(Q) - P(Q^*)]dQ$$

Case II:

In this case, we ask the following question: Given $\{x_j\}_{j=1}^k$ from Case I, does there exist a set of royalty rates, $\{r_j\}_{j=1}^k$, charged on the handset price such that $r_j P(Q')Q' \geq x_j Q^*$ for all $j = 1, 2, \dots, k$, and $\pi(Q') \geq \pi(Q^*)$ where Q' is the amount chosen by the handset producer when it is faced with royalty rates?

(a) Royalty is a proportion of the end-price

Consider the royalty rates $r_j = \frac{x_j}{c + \sum_{j=1}^k x_j}$ giving us $\sum_{j=1}^k r_j = \frac{\sum_{j=1}^k x_j}{c + \sum_{j=1}^k x_j}$. The producer now maximizes

$$(5) \quad \pi = [1 - \sum_{j=1}^k r_j]P(Q)Q - cQ$$

For ease of notation, we write $X \equiv \sum_{j=1}^k x_j$ and $R \equiv \sum_{j=1}^k r_j$, giving us $R = \frac{X}{c+X}$. We can then write (5) as $\pi = P(Q)Q \left[\frac{c}{c+X} \right] - cQ$. A necessary condition for its maximization is

³ Throughout we will assume that an interior solution exists, i.e., there exists a finite and positive value of Q where profit is maximized. Clearly, for the producer to produce at all, there must exist a positive quantity $Q = q$ such that $P(q) > c + \sum_{j=1}^k x_j$. If this assumption is violated, then there is no production and, hence, no revenue to patent holders.

$$\Leftrightarrow \pi = \left[\left(\frac{dP(Q)}{dQ} \Big|_{Q'} \right) Q' + P(Q') \right] \frac{c}{c+X} - c = 0$$

$$\Leftrightarrow \left[\left(\frac{dP(Q)}{dQ} \Big|_{Q'} \right) Q' + P(Q') \right] = c + X$$

From (2), this is solved when $Q = Q' = Q^*$. Since $P(Q') = P(Q^*)$, the consumer surpluses in Cases I and IIa are the same. The thing that is different is the distribution of the producer surplus between the producer and the patent holders. The producer surplus in Case II(a), given $Q' = Q^*$, is

$$[P(Q^*)Q^* - cQ^*] \left[1 - \frac{X}{c+X} \right] \leq P(Q^*)Q^* - (c+X)Q^*$$

The above inequality follows from the fact $P(Q^*) > c + X$. This also implies that the patent holders get more under this case compared to what they were getting in Case I.

(b) Royalty is a proportion of the end-price, net of material cost

The producer now maximizes

$$(6) \quad \pi = [1 - \sum_{j=1}^k r_j][P(Q) - c]Q$$

The necessary condition for an interior solution to the maximization of the producer's profit is

$$(7) \quad \left(\frac{dP(Q)}{dQ} \Big|_{Q''} \right) Q'' + P(Q'') = c$$

where Q'' maximizes (6)

The revenue earned by patent holder j is given by

$$(8) \quad R_j = r_j P(Q'') Q'', \quad j = 1, 2, \dots, k$$

The consumer's surplus S is given by

$$(9) \quad S = \int_0^{Q''} [P(Q) - P(Q'')] dQ$$



Given the second order condition, it is immediate that $Q'' > Q^* = Q'$ from equations (2) and (7); alternatively, $P(Q'') < P(Q^*) = P(Q')$. Hence, the consumer surplus in II(b) will always be the largest

$$\int_0^{Q''} [P(Q) - P(Q'')]dQ > \int_0^{Q^*} [P(Q) - P(Q^*)]dQ = \int_0^{Q'} [P(Q) - P(Q')]dQ$$

Case Analysis

Cases I and II(a) show that posting a patent price and charging royalty rates on the end-price equivalent in terms of end-price and consumer surplus; however, charging royalty on the end-price, instead of posting prices on their patents, gives more surplus to the patent holder vis-à-vis the manufacturer. Simply put, the CCI, by insisting on price-posting is acting as a mediator to the distribution of surplus between the patent holder(s) and the manufacturer.

In Case II we show how the optimal quantity that maximises producers and consumer surplus increases when royalty is a proportion of the end price ($Q' \geq Q^*$). The best situation is when royalty rate is on net price (price minus the material cost) and, if at all, the CCI should implement that. However, this requires the CCI and the patent holder(s) must have information on the manufacturer's material cost of production which is proprietary to the manufacturer. As a result, such a policy is difficult to implement (enforce). Price, on the other hand, is observable to all and, hence, royalty rates can be based on that. Also, for much of the manufacturing activity we are talking about here, the material cost is a very small part of the price, i.e., c as a proportion of $P(Q)$ is very small.

Conclusion

In this brief, we argue that if royalty stacking is an issue at all, posting a price instead of a royalty rate on the end-price does not address it at all. Also note that since patent holders earn only if their patents are used, if patent prices stack up in such a way that production becomes unprofitable, the patent holders get zero revenue. So, it is not in their collective interest to prevent production (see footnote 3). The possibility of royalty stacking as the reason for insisting on posting prices for patents is a flawed decision.

About the institute

India Development Foundation (IDF) is a private, non-profit, research foundation set up as a Trust in 2003. Guided by the principles of equality and non-discrimination, IDF works on a variety of issues with a view to inform policymakers. One of its focus areas is to develop awareness about how markets work, why they are desirable and how to develop them. IDF aims to help policymakers transform emerging economies into market-based societies.

An important dimension of policy analysis is the linking of law and economics. At IDF a separate centre called the Ambedkar Centre for Law and Economics was created in memory of the man who intellectually and effectively combined the two aspects of policy making. These policy briefs are from the Ambedkar Centre for Law and Economics.

About the project

This project is on Intellectual Property Rights, Standard Essential Patents and Digital India. It is increasingly clear that several questions and doubts, raised in various fora of the government, regulatory bodies and the public, indicate misconceptions on intellectual property and the associated rights. It is important to not only clarify misconceptions but to provide a reasoned perspective and encourage a vibrant debate among the major players on this important subject.

Research undertaken in this project use economic reasoning to focus on how markets in the area of high technology work. Short Policy Briefs that address these issues are planned for public consultation and to be distributed to the relevant ministries and departments of the government regulatory bodies and trade bodies.

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