



ELSEVIER

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jeboWelfare-optimal patent royalties when imitation is costly[☆]Fernando J. Leiva Bertran^{a,*}, John L. Turner^b^a Department of Economics, Arizona State University, Main Campus, PO BOX 873806, Tempe, AZ 85287-3806, United States^b Department of Economics, University of Georgia, Brooks Hall 5th Floor, Athens, GA 30602-6254, United States

ARTICLE INFO

Article history:

Received 2 August 2016

Received in revised form 11 February 2017

Accepted 17 March 2017

Available online 30 March 2017

JEL classification:

K2

L1

O3

Keywords:

Damages

Entry

Invention

Patents

Prize system

Royalties

ABSTRACT

We identify welfare-optimal patent royalties in a model of costly imitation, entry and imperfect competition. When the social planner may impose a compulsory license, optimal royalties either blockade imitation, facilitating unregulated monopoly, or yield an aggregate-zero-profit *efficient* duopoly. When duopoly is optimal, the optimal per-unit royalty pins the equilibrium price at the aggregate average cost and the optimal fixed royalty shifts surplus so the patentee and imitator break even. Efficient duopoly yields higher welfare than monopoly for sufficiently low invention cost, and may also yield higher welfare than a prize system. Interestingly, royalty payments may be negative. Because of this, efficient duopoly may not be feasible if the planner must instead direct the courts to use such royalties.

© 2017 Elsevier B.V. All rights reserved.

1. Introduction

Competition between inventors and imitators is often imperfect, characterized by a small number of competitors, equilibrium price markups and potentially wasteful duplication of fixed costs. There are two primary reasons. First, imitation is typically less costly than invention, but not free. In their survey of firms from the chemical, drug, electronics and machinery industries, Mansfield et al. (1981, pp. 909–913) find that imitation costs and time are on average about two-thirds of invention costs and time. In about half of cases, imitation costs are between 40% and 90%. Second, inventors often seek patents, which allow their owners to raise imitation costs through licenses or damages.¹

Given costly imitation and patents, the welfare realized from a given invention is often determined by whether imitators earn enough profit to enter and how imitators are required to compensate inventors. In particular, if there is an imitator paying royalties to the inventor, then the royalties may both reallocate surplus and affect the level of output. This alters the standard problem of the efficient way to design a patent reward of a given size (e.g. Gilbert and Shapiro, 1990; Klemperer, 1990; Gallini, 1992). Specifically, when it is optimal to have imitation occur, the *total* reward of the inventor and imitator

[☆] We thank Hector Chade, Matt Mitchell and multiple anonymous referees for helpful comments.

* Corresponding author.

E-mail addresses: fernando.leivaibertran@asu.edu (F.J. Leiva Bertran), jlturner@uga.edu (J.L. Turner).

¹ We will think of damages that blockade imitation as being equivalent to an injunction.

forms the key constraint, and the planner's problem is how to use royalties to efficiently reallocate surplus, given this total reward.

In this paper, we examine the implications of this issue in a single-period model of endogenous invention, imitation, and imperfect (Cournot) competition where marginal production costs are constant, the imitation cost is positive and proportional to the invention cost, and two-part royalties are paid. We study three main questions. First, assuming a monopolist may not be regulated, what are the welfare-maximizing, feasible levels of entry and output? Second, what royalties would a planner choose for a compulsory license to achieve those levels of entry and output? Third, what are the implications of these optimal royalties for a setting where royalties are imposed by courts after patentees choose to sue for infringement?

We produce several useful benchmark results. To start, we show that welfare-optimal royalties either blockade imitation in the sense of [Bain \(1956\)](#), facilitating unregulated monopoly, or encourage one imitator and achieve an aggregate-zero-profit *efficient* duopoly.² In the latter case, a two-part royalty implements the optimal pattern of output. We then show that duopoly with this two-part royalty yields higher welfare than monopoly if and only if the invention cost is sufficiently low. This threshold invention cost decreases with the ratio of imitation to invention costs (the *imitation cost ratio*), so that efficient duopoly is more likely to be optimal when the imitation cost ratio is lower.

Royalties that yield efficient duopolies depend upon invention costs and the imitation cost ratio in intuitive ways. The optimal per-unit royalty is strictly increasing in the invention cost and the imitation cost ratio, while the optimal fixed royalty is strictly decreasing in the invention cost and the imitation cost ratio. Per-unit royalties act like a tax or subsidy on the imitator, shifting output down or up. When invention costs are high, higher per-unit royalties reduce output and raise the aggregate variable profit to a level high enough to cover the total invention plus imitation costs. Fixed royalties shift surplus so that each firm earns enough variable profit to cover its own fixed costs. When the invention cost and/or the imitation cost ratio is higher, the imitator's variable profit is lower, so the fixed royalty likewise needs to be lower.

The potential welfare benefits of optimal royalties may be quite significant. For example, we show that welfare with optimal royalties may exceed welfare under a *prize* system, where the inventor is compensated for the value of its invention and the technology is put in the public domain and may be imitated royalty-free.³ We assume that under a prize system, the imitation cost ratio is lower than in our baseline model but competition remains imperfect. We show that optimal royalties yield higher welfare for sufficiently low invention costs. Intuitively, imitation is socially excessive under a prize system, and costs from extra imitation outweigh the direct reduction in imitation costs when the invention cost is sufficiently low.

Efficient duopoly royalties differ markedly from royalty damages assigned by courts in practice. Most notably, for a sufficiently low invention cost, the efficient per-unit royalty is negative. For a sufficiently high invention cost, the efficient fixed royalty is negative. Only for an intermediate invention cost is it possible for both the efficient per-unit and the efficient fixed royalty to be positive.

These results suggest that current court practice may sharply limit the possibility of using royalties to increase welfare. Generally, courts treat patent infringement as a tort and base damages on compensation for the injury caused by infringement, not on invention and imitation costs. Patent infringers are considered “tortfeasors” and courts in England and the US have consistently sought to identify damages equal to the value of property taken ([Lipscomb, 1989](#), pp. 5–27).⁴ And royalties with negative components are virtually unheard of.⁵

The legal process itself may be partially responsible for constraints on negative royalty components. With court-imposed royalties, the patentee must willingly sue for royalty payments to be realized. Because of this, a credibility constraint emerges—the total royalty payment must be non-negative. We show that the total royalty payment with efficient duopoly royalties is negative for a sufficiently high invention cost. Hence, the credibility constraint may bind. In particular, if such cases coincide with cases where welfare is higher under efficient duopoly than under monopoly (which require a sufficiently *low* invention cost), then optimal imitation and output are impossible to achieve with court-imposed royalties even if courts can choose negative royalty components. We discuss how asymmetric information might worsen the credibility problem, and how firm behavior might respond in cases where courts are unable to set optimal royalties.

Generally, reward-theory approaches to optimal patent policy (e.g. [Nordhaus, 1969](#); [Gilbert and Shapiro, 1990](#); [Klemperer, 1990](#)) and optimal compulsory licensing ([Tandon, 1982](#)) ignore the possibility that imitators enter and compete imperfectly in the shadow of royalties. In an important followup to these papers, [Gallini \(1992\)](#) analyzes possible effects of costly imitation. Her paper restricts attention to imitation as *inventing around*, where it does not lead to infringement and the payment of output-distorting damages. Our paper captures the complementary case, where imitation always leads to infringement. Papers directly considering how patent royalties and other damages influence competition (e.g. [Schankerman and Scotchmer, 2001](#); [Anton and Yao, 2007](#); [Choi, 2009](#); [Henry and Turner, 2010](#); [Krasteva, 2014](#)) do not consider how the cost of entry by

² In a spatial model with a single potential entrant, [Waterson \(1990\)](#) also notes that monopoly may be optimal.

³ In practice, prize systems have gained relatively little traction as a means of promoting innovation. However, there are important exceptions ([Kremer, 1998](#)). See also [Scotchmer \(2004, Chapters 1 and 2\)](#).

⁴ The one notable exception to this is that the various patent laws have permitted damages to be increased in cases where infringers' conduct is deemed egregious—under current US law, damages may be trebled if infringement is found to be “willful.”

⁵ [Cooley \(1993\)](#) analyzes damages from 152 cases over 1982–92. Positive fixed and/or royalty damages were paid in 71 of these cases and lost profits were paid in the other cases.

Download English Version:

<https://daneshyari.com/en/article/5034577>

Download Persian Version:

<https://daneshyari.com/article/5034577>

[Daneshyari.com](https://daneshyari.com)