Available online at www.sciencedirect.com
SCIENCE DIRECT®
International Journal of Industrial Organization
24 (2006) 995–1011
International Journal of Industrial Organization
www.elsevier.com/locate/econbase

Bounding the relative profitability of price discrimination

David A. Malueg [a], Christopher M. Snyder [b,*]

[a] *Department of Economics and the A. B. Freeman School of Business, Tulane University, 206 Tilton Hall, New Orleans, LA 70118, United States*
[b] *Department of Economics, Dartmouth College, 301 Rockefeller Hall, Hanover, NH 03755, United States*

Received 16 December 2004; received in revised form 3 November 2005; accepted 14 November 2005
Available online 24 February 2006

Abstract

We derive bounds on the ratio of a monopolist's profit from third-degree price discrimination to that from uniform pricing. If the monopolist serves N independent markets, demand is continuous, and the cost function is superadditive, then the profit ratio is bounded by N. A linear-demand example is provided coming arbitrarily close to this bound. We provide examples showing the profit ratio can be unboundedly large when marginal cost is decreasing, demand is discontinuous, or fixed cost is positive. If the monopolist has access to certain demand-rationing strategies under uniform pricing, we can bound the profit ratio even for discontinuous demand functions and multiproduct cost functions.

JEL classification: D42; L12; L41

Keywords: Third-degree price discrimination; Uniform pricing; Profit bounds

1. Introduction

How valuable is the ability to price discriminate? This question is central, for example, to the debate on parallel imports and international exhaustion of intellectual property rights. If allowing parallel imports eliminates price discrimination across countries, even consumers who benefit from a lower price may ultimately lose through a reduction in firms' ex ante investment

* Corresponding author.
E-mail addresses: dmalueg@tulane.edu (D.A. Malueg), Christopher.M.Snyder@dartmouth.edu (C.M. Snyder).

0167-7187/$ - see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.ijindorg.2005.11.006

incentives.[1] The size of this incentive effect depends on the relative profitability of price discrimination.

Recently, the issue of parallel imports has received particular attention in the international market for pharmaceuticals (see Danzon and Towse, 2003). In order to preserve low prices in poor countries, the European Union recently tightened restrictions on the re-importation on malaria, tuberculosis, and HIV/AIDS drugs from poor countries, enhancing pharmaceutical manufacturers' ability to engage in price discrimination across rich and poor countries. Recent U.S. policy moved in the opposite direction: by relaxing restrictions on the re-importation of pharmaceuticals from Canada, the United States reduced pharmaceutical manufacturers' ability to engage in price discrimination across the two countries. These policies were motivated by a desire to reduce prices in certain markets with little regard to what Danzon and Towse (2003) note may be potentially significant effects on firm's incentives to undertake pharmaceutical research and development.[2] Our results on the relative profitability of price discrimination will provide bounds on the effect of such policies on firms' ex ante incentives to discover and develop pharmaceuticals as a function of the number of markets (countries) involved.

To date, the economics literature has been silent on the profitability of price discrimination, focusing instead on the effect of price discrimination on static social welfare (defined as consumer surplus plus producer surplus). We address this gap in the literature by examining the effect of third-degree price discrimination on a monopolist's profit. Typically it is of little interest to ask *whether* third-degree price discrimination increases a monopolist's profit—because all price vectors feasible under uniform pricing are also feasible under discrimination, the monopolist's profit under price discrimination is weakly higher than under uniform pricing.[3] In this paper we ask *how much* price discrimination can increase a monopolist's profit.

We show that if a monopolist faces N independent markets, demand is continuous, and the cost function is superadditive (related to diseconomies of scale), then the profit ratio is bounded by N. In cases where under price discrimination some markets are not served or are charged equal prices, we provide the tight bound that is strictly less than N. If the preceding conditions on demand and cost do not hold, the ratio of profit under third-degree price discrimination to profit under uniform pricing can be arbitrarily large, as we demonstrate in a series of examples.

Our results relate to the public policy question of the effect of parallel importation of drugs and other goods on firms' ex ante investment incentives, as mentioned above. Our results have other practical implications for firm strategy and public policy. Firms' incentives to facilitate third-degree price discrimination by developing technologies to separate consumers into different markets and prevent arbitrage among them depend on the profitability of price discrimination. For example, Odlyzko (2004) notes the increasing complexity of price discrimination schemes in transportation, citing among other examples the evolution of canal tolls from simple uniform fees per boat for early canals in England to fees which varied not only

[1] Rey (2003) and Valletti and Szymanski (2004), for example, model the effect of parallel imports on manufacturers' investments in quality.

[2] For the development of new drugs, research is essential—and it does not come cheap. The average research and development expenditure on a new drug is an estimated $400 million out-of-pocket, capitalized to $800 million (2000 U.S. dollars) by the time of government approval (DiMasi et al., 2003).

[3] In departures from a static model with passive final-good consumers—the model studied in this paper—uniform pricing may be more profitable than price discrimination. For example, a durable-good monopolist may benefit if it can commit to a constant price over time (Coase, 1972). For another example, an upstream firm that sells inputs to competing downstream firms using secret contracts may benefit from establishing a reputation for offering uniform contracts (McAfee and Schwartz, 1994).