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Informative advertising by heterogeneous firms

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Abstract

This paper introduces a model to analyze the role of the cost of information dissemination in large markets where firms have varying degrees of intrinsic efficiency reflected in their marginal costs. Firms enter a market and discover how efficient they are. Those firms with high enough efficiency stay, others exit. Remaining firms then compete to attract consumers by disseminating information about their existence and their prices using a common advertising technology. The properties of the model's equilibrium are analyzed. The model is then used to study the effect of the cost of information dissemination on the competitiveness of the market and key industry aggregates, such as price distribution and the distribution of firm value.
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1. Introduction

This paper develops and analyzes a model of informative advertising by firms with varying degrees of efficiency which are reflected in their respective marginal costs. There are two major goals of this undertaking. The first one is to highlight the role of firm heterogeneity in markets where informative advertising is prominent. By explicitly recognizing the differences in intrinsic efficiency across firms, the paper investigates a critical aspect of the market provision of information that has not received much attention so far: the pecuniary externality imposed by more efficient firms on less efficient ones under competitive information dissemination. The nature of this "negative" externality depends on how efficiency is distributed across firms and the type of the advertising technology. The analysis emphasizes the effect of the interaction between firm heterogeneity and advertising technology on equilibrium distributions of price, firm value, and the amount of advertising.

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The second goal is to use the model to study the effects of an exogenous reduction in the cost of information dissemination in a market with many different types of firms. The role of consumer information has attracted renewed attention with the diffusion of e-commerce. Media revolutions over the course of history, such as newspaper, radio, television and most recently the Internet, have given way to easier and cheaper information dissemination.[1] Firms now have access to more efficient technologies to reach and inform consumers. Because a firm's success depends critically on how effectively it spreads information about itself, improvements in information technologies have had profound effects on competition among firms. Recent research on the economics of the Internet has focused mostly on the implications of reduced search costs for consumers.[2] However, firms' increasingly intense efforts to reach consumers by releasing information through online advertising have received less attention, despite the fact that Internet advertising is a major tool of competition for Internet-based firms and search engines. Major search engines, such as Yahoo! and Google, have been competing for advertising revenues by introducing new ways of making consumers click on on-line ads.[3] Using the model, the effect of continuing improvements in advertising technologies on industry structure is analyzed.

The model is stylized to study the interaction between firm heterogeneity and the cost of information. A large competitive market is considered, where firms differ only with respect to their marginal costs.[4] Firms enter the market as long as it is profitable to do so. After entry, each firm learns its intrinsic efficiency: a more "efficient" firm has a lower marginal cost compared to a less efficient firm.[5] Those entrants that are not efficient enough exit. Remaining firms offer a homogeneous good for sale and compete by choosing prices, but need to make themselves known to consumers before any sales can be made. Firms are endowed with a common "information technology", also referred to as "advertising technology", that enables them to spread information about their existence and their attributes. Information dissemination is equivalent to informative advertising: only the information about the existence, location, and price of a firm is conveyed, and there is no persuasive, goodwill, or signaling content of an ad. For simplicity, consumers are assumed to be passive information filters. They do not engage in search and make their purchases based on the information they receive randomly.[6]

The model sketched above contains certain special elements that facilitate the analysis of the role of information in markets with heterogeneous firms. First, the focus is on a large economy with many firms and many consumers where it is critical for firms to make themselves known to consumers. Continuing improvements in information dissemination technologies affect many large sectors of the economy, making it appropriate to adopt a large market framework. An individual firm is by assumption "small" with respect to the rest of the industry, and it takes the industry aggregates as given. This assumption comes at the expense of ignoring a single firm's actions on the rest of the industry, but allows for a simpler analysis. Second, the model explicitly considers firm entry and exit and the endogenous determination of industry size, albeit in a one-shot setting. The differences in entry rates and threshold efficiency levels for survival across economies with different costs of information dissemination are investigated. Finally, specific attention is paid to the role of information technology. A general advertising technology that generates decreasing returns to advertising outlays is considered.[7] Comparative statics exercises are performed with respect to the advertising technology to analyze how a reduction in information cost affects the distributions of key variables, such as price and firm value.

The model is closely related to the static models of informative advertising in homogeneous-good industries. In particular, the model draws upon the work of Butters (1977), who introduced an early version of these

[1] See Chandler and Cortada (2000) for an excellent discussion of the information's role in shaping firm and industry structure in the US.

[2] See, e.g., Brown and Goolsbee (2000).

[3] Research by eMarketer predicts that online advertising market will grow to $25 billion in 2010 from its current level of $15.9 billion (see Guth, 2006).

[4] Like Stegeman (1991), we use the term "competitive" to emphasize that each firm is small with respect to the industry and has no influence on industry aggregates by itself. However, a firm can set its own price and influence its demand, taking as given the aggregate distribution of prices in the market. Thus, the way we use the term "competitive" is different from the general textbook definition of a competitive industry.

[5] As described later, all firms have the same fixed cost of operating in the industry. Thus, a more efficient firm is also the one with a lower average total cost, net of advertising cost.

[6] Consumer search and advertising are jointly investigated by Robert and Stahl (1993) in a framework with identical consumers.

[7] However, no attempt is made to replicate the specific nature of returns to advertising in a particular advertising medium.

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