International Journal of Industrial Organization 29 (2011) 678–689

Contents lists available at ScienceDirect

International Journal of Industrial Organization

journal homepage: www.elsevier.com/locate/ijio

# Is targeted advertising always beneficial?[☆]

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ARTICLE INFO

*Article history:*
Received 9 December 2009
Received in revised form 16 September 2010
Accepted 8 March 2011
Available online 13 March 2011

*JEL classification:*
D83
L13
M37

*Keywords:*
Targeted and random advertising
Advertising cost
Spatial differentiation

ABSTRACT

In this paper, we study a simple model in which two horizontally differentiated firms compete in prices and targeted advertising on an initially uninformed market. First, the Nash equilibrium is fully characterized. We prove that when the advertising cost is low, firms target only their "natural markets", while they cross-advertise when this cost is high. Second, the outcome at equilibrium is compared with random advertising. Surprisingly, we prove that firms' equilibrium profits may be lower with targeted advertising relative to random advertising, while firms are given more options with targeted advertising.

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## 1. Introduction

When a firm launches a new product, it uses *informative advertising* to generate demand for the product and to make potential customers aware of the existence of the new product, its attributes and its price. For a long period firms had been unable to discriminate their advertising expenditures between the different groups of consumers, either because of lack of information on consumers' habits or because they had no means to reach some of them without reaching the others. Hence they had been using *random (mass) advertising* such as newspapers advertisements or general television channels which allow them to reach randomly different types of consumers. However in doing so, the firm may spend its money in sending messages to a lot of people who will probably never buy the product even when they are well informed about it.

Nowadays, on the one hand, there is a large proliferation of specialized media oriented to specific segments of the market such as magazines, private TV channels focused on sport, health, food, cars…. On the other hand, the outstanding growth of internet social networking such as Facebook, MySpace and LinkIn, enables firms to obtain better information on consumers' preferences. It has thus become possible for firms *to target* their markets focusing on the most interesting consumers and avoid wasteful mass advertising.

The aim of this paper is twofold. First, to what extent will a firm choose to target its "natural consumers"? Second, is targeted advertising always beneficial to firms relative to random advertising?

Following the proliferation of Internet websites, there has been a spectacular development of interactive targeted advertising which has taken two main forms. First, the *contextual advertising* systems (such as Google AdSense), by scanning the text of websites for keywords, display advertisements to the user based on what he/she is currently viewing.[1] If for instance, he/she is viewing a website dedicated to sports using such a system, he/she may see advertisements for companies which sell sports articles such as Adidas. If he/she is booking a flight ticket to Toronto, he/she will see advertisements for car rentals or hotels in Toronto. Second, the *behavioral targeting* systems, such as DoubleClick, Predicta BT, AdLink among others, select advertisements by using the information which can be collected on individuals' web-browsing behavior such as the searches they have made or the pages they have visited.[2] Providers of onsite behavioral targeting use for instance purchase history together with

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[☆] We are grateful to Imed Bouassida for his availability and the interview he has granted us. We would like to thank Nizar Souiden for helpful discussion. We thank two anonymous referees for very helpful comments and suggestions which have allowed us to improve significantly this paper.

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[1] On contextual advertising see for instance Kenny and Marshall (2000).

[2] On behavioral targeting see Yan et al. (2009).

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doi:10.1016/j.ijindorg.2011.03.002

other data in order to further individualize advertisements. Media planners are able by collecting information on different sites, to build up a likely demographic make-up of internet users and to "sell" audiences (for instance a certain number of teenagers, of women between 35 and 50, of men above 40…) rather than sites.

Thanks to all these new developments, it has become possible for firms to really choose between mass advertising through general media and targeted advertising by focusing on the most interesting consumers.

A first output of this paper is precisely to show that the relevant distinction to be made is between the "natural customers" of a firm, i.e. the consumers who, when fully informed buy the firm's product, and the others who, in the same circumstances buy the competitors' products. In equilibrium, though allowed to fully differentiate their advertising intensities, firms always select "two-step" advertising functions, and advertise more intensively towards their natural customers.

There are numerous real-world examples of such practices, which follow from media planners distinction between primary and secondary (advertising) targets. For instance, Land Rover is using the Nokia Ad Platform to inform a specific target (customers with a high income and of a certain age group) of the existence of the Land Rover LR3 model. These customers are offered banner ads on carrier grade media inviting them to visit the LR3 website.[3] Of course Land Rover also informs less targeted customers via commercials or billboards. Supermarkets are another traditional example of geo-targeted advertising: they mainly inform customers in areas around their stores both via outside advertising (billboards) and mailing, in addition to more general advertising in radio or TV channels.

A second output of this paper is to show that, unlike a widely accepted opinion, targeted advertising by competing firms does not always increase equilibrium profits. The traditional view has been very clearly expressed for instance in Iyer et al. (2005) who conclude that "… the ability to target advertising provides benefits that are not lost when competitors respond by implementing targeting of their own. Because of reduced waste, targeted advertising can simultaneously make all firms better off". The present paper shows that this outcome is not warranted. In our setting, the transition from mass to targeted advertising may result in a reduction of profits for both firms. This is because targeted advertising may result in fiercer competition between firms and lower equilibrium prices. Under targeted advertising, a price cut allows the undercutting firm to attract more additional customers than under random advertising. However, in this case, the attraction of an additional actual customer requires extra advertising expenditures. For large enough advertising costs, the former effect dominates the latter, while this is the reverse for low advertising costs.

To derive rigorously these results and others, we develop a horizontal differentiation model *à la* Hotelling (1929) where consumers are uniformly distributed and the firms are located at the two extremities of a "linear city". As in Grossman and Shapiro (1984) or the simplified version of Tirole (1988), potential customers are not initially aware of the existence of the firms and each firm chooses simultaneously its price and its advertising strategy in order to inform consumers about its product. Our approach differs however from the previous ones as we assume that firms are able to perfectly target their consumers, by choosing a different advertising strategy for each type of consumers. We investigate the Nash Equilibrium in this case and compare the equilibrium outcome to the one obtained in the random advertising model of Tirole (1988).

### 1.1. Main results

First we show that even though each firm is able to target each type of consumers, it chooses at equilibrium to differentiate its advertising strategies only between its natural market (in which consumers, if fully informed, would buy from this firm) and the rival's natural market. This two-step advertising function is implementable in a very simple way, by advertising simultaneously in general audience media and in specialized ones focused on the firm's natural customers. Our second main finding concerns the market equilibrium. We show that for sufficiently low advertising cost, the market is perfectly segmented at equilibrium with each firm targeting only its natural consumers. In this case, the equilibrium prices are larger and firms achieve higher profits than those under random advertising. This market segmentation is an equilibrium outcome. It does not preclude price competition, since a firm can always increase its market share by cutting its price and simultaneously advertising to inform its potential new customers.

When the advertising cost is high enough, firms cross-advertise. Each firm differentiates its targeting strategy in order to reach a fraction of its natural consumers and a lower *but positive* fraction of the natural consumers of its rival. In the latter case, the equilibrium prices and profits are lower under targeted advertising than under random advertising.

### 1.2. Related literature

Informative advertising has been thoroughly studied. A major result in this context is due to Butters (1977) who studies price advertising in markets for homogeneous goods. An important contribution by Grossman and Shapiro (1984) extended the Butters' model and introduced product differentiation via a circle model to show how informative advertising affects price competition in an oligopoly market when products are horizontally differentiated and advertising is uniform throughout the market. Several papers adapted the Grossman and Shapiro's (1984) model to analyze different market configurations where consumers can buy only products on which they are informed, such as Celik (2007), Hamilton (2004), Bester and Petrakis (1995), etc.

Several authors have later developed models in order to formally establish the effect of targeted advertising on prices and competition. Most of this research has assumed that firms directly target different groups of consumers. However, none of these works on targeted advertising has assumed that a firm is allowed to target and reach a fraction of the rival's consumers, an assumption which makes the originality of our model.

Two different arguments have been put forward to explain the superiority of targeted advertising upon random (or mass) advertising:

1. The first and simplest one refers to cost savings. According to these studies, targeting allows to save on advertising expenditures towards consumers who will never be willing to buy the firm's product and to advertise more towards the others. For instance, Esteban et al. (2001) and Hernandez-Garcia (1997) argue, in a monopolist framework, that the overall level of advertising falls with targeting and show similarly to Iyer et al. (2005), that the use of targeted advertising increases the market price and leads to higher profits in comparison to random advertising. This conclusion is shared with Johnson (2009) in another setting.
2. The second argument is that targeting may reduce if not eliminate competition between firms producing differentiated goods since each firm will advertise at equilibrium only towards its consumers. In particular, Galeotti and Moraga-Gonzalez (2003) with a homogeneous product competition as well as Iyer et al. (2005) with horizontally differentiated products, find that there is only a Nash equilibrium in mixed strategies, i.e. that targeting can fragment the market only from time to time. Furthermore, Roy (2000) shows through a sequential targeted pricing-advertising game, that at equilibrium, the entire market is divided into mutually exclusive

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[3] Source: http://news.softpedia.com/news/Land-Rover-Attracts-Customers-Using-Mobile-Advertising-69127.shtml.

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