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Inducing search by periodic advertising

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ABSTRACT

A person engaged in search may be uncertain whether the good or job he seeks is still available. Some people may therefore search when the job or good is unavailable; others may stop searching too early. A seller or employer who wants individuals to search should therefore periodically announce that the position or good is still available. The profit-maximizing strategy, however, differs from the socially-optimal one. Online advertising, which allows immediate updating of information by the seller or employer, also alleviates the problem of excessive search. But the seller may have insufficient incentive to adopt online announcements.

1. Introduction

A person is often uncertain whether the object of his search is still available. For example, a consumer may be unaware whether a house he had seen a week ago was sold; a renter may be unsure whether an apartment is still vacant; a person reading a classified advertisement for a car may believe it has already been sold; a person seeking employment may fear that by the time he applies for a job it has already been filled.

For concreteness we shall speak of the last example, a job search. The problem has been recognized in practice. Cawley (2006) writes that "The American Economic Association Ad Hoc Committee on the Job Market was concerned that candidates occasionally go unhired and job positions unfilled because they do not match during the primary job market. Once the primary market clears, it is difficult for unmatched agents to determine who remains unmatched on the other side of the market. Furthermore, while labor demanders can post another advertisement in Job Openings for Economists, it is difficult for labor suppliers to signal their continuing availability."

Our paper explores behavior when searchers are imperfectly informed. We avoid assuming that applicants continue arriving until the job is filled, or the good is sold, stopping immediately once it is. Instead, we allow a person to apply for a job after it is filled, and we allow some potential job-seekers to refrain from incurring the cost of applying for a job in the belief that it has already been filled. For example, a person may believe that a vacancy announced 6 months ago is almost certainly filled, so that applying for it now would be wasteful. Hence, an employer cannot merely choose from a stream of applicants; he must also ensure that applicants appear. The employer must therefore periodically re-announce the vacancy. The announcement is observed by all potential applicants, so we need not worry about different persons having different information. Put differently, we explore the participation constraint in a model of search.

The firm (the employer) might overcome the problem by advertising when a position is filled. The firm would then advertise only twice – when the position is first

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available, and when it is filled. Alternatively, if advertising is online, the employer may continually update announcements, and a job seeker can check whether the job is still available before he applies for it. Online advertising can thus overcome the problem we identify below, which would have been especially prevalent when job-seekers relied on classified advertisements in newspapers. Our analysis can then be viewed as demonstrating a benefit of online advertising, and perhaps justifying governmental subsidies for access to the Internet. That is, posting job announcements on the Internet, as on monster.com, lets the firm immediately inform job-seekers when a job is filled. That is an advantage of online posting; determining its magnitude requires the analysis below.

We accordingly consider a firm which periodically announces openings. Also note that what is important for our purposes is not that people who applied for the position learn when it is filled, but that *potential* applicants, who must decide whether to incur the cost of applying, are so informed.

To return to periodic advertising, note that informing potential job-seekers of a vacancy is costly, and that the profit-maximizing employer will consider these costs in determining its optimal hiring strategy. We shall confirm the intuitive notion that the higher are these costs, the more quickly the employer attempts to fill the position, and the lower its hiring standards. Analogously, a homeowner may sell a house more quickly, or post a lower price, the higher are the advertising costs. Of greater interest, we show that the employer incompletely internalizes the search costs of job-seekers, so that too many people are induced to incur the cost of search. Our comparisons will consider social optimization when the behavior of employers, but not job-seekers, is controlled, and when the behavior of both employers and job-seekers is controlled.

Our analysis thus extends the conventional analysis of job search, which mostly considers search by workers, but ignores firms' policies. The standard search model (see, for example, Lippman and McCall, 1976; Albright, 1977; Karlin, 1962) supposes that a steady stream of job-seekers arrives at the employer's premises, that it determines each applicant's productivity, and then hires the first one whose productivity exceeds some critical level.

The classic model is highly instructive, in spite of, or perhaps because of, its strong assumptions.[1] Assaf and Levikson (1991) do consider advertising intensity, the effects of advertising on arrivals, and how the arrivals decline over time in its absence. But unlike us, they view advertising as occurring continuously rather than at intervals set by a firm. Thus, these authors do not examine the length of a cycle, the hiring standards the firm uses within a cycle, or the differences between socially-optimal and profit-maximizing policies. Similarly, Feigin and Landsberger (1981) consider the decisions of job-seekers, but not those of employers. In the literature on auctions, which effectively involves a seller search for buyers with high valuations of the good, Samuelson (1985) and McAfee and McMillan (1987) consider potential buyers who incur a cost of participating; but the models do not allow multiple auctions, and thus neglect the need for advertising the continued availability of a product.

Studies in marketing consider two concepts related to ours – "copy wearout" and "pulsing." Copy wearout is the decay in advertising effectiveness over time, which is independent of the amount of advertising (see Naik et al., 1998). Most of the literature on wearout refers to television advertising (see, for example, Scott and Solomon, 1998), which focuses on increasing the desire for a good rather than on informing consumers or job-seekers of the availability of a good or a job. In our model, wearout occurs because the longer the time since a job-seeker last saw a vacancy announced, the lower his confidence that the job is still available. Pulsing refers to an advertising strategy in which advertisements are run more intensely in some periods than in others. One rationale for pulsing is that advertising shows diminishing returns over time (Park and Hahn, 1991; Dube et al., 2005). An interpretation of our results is that the longer an advertisement has been shown, the less effective it may become. We show that in our context pulsing maximizes profits, and we also determine the profit-maximizing pattern of pulsing.

The effects of advertising when consumers search for the lowest price are studied by Robert and Stahl (1993). They find that in equilibrium a firm may sometimes advertise a high price, and at a different time advertise a low price. Acemoglu and Shimer (2000) use a model that resembles that of Robert and Stahl (1993) to examine workers who incur a cost of searching for a job. They find that in equilibrium different firms may use different technologies and offer different wages. Awareness advertising, which informs consumers of the existence of a good (or, for our purposes, of the existence of a job), is studied by Doraszelski and Markovich (2007), who also find that firms facing the same costs and demands may nevertheless behave differently. These papers, unlike ours, consider equilibrium results rather than the behavior of a single firm, but they neglect expectations of whether the good or job is available.

2. Assumptions

2.1. The firm

At time $t = 0$ the firm announces a job opening; applicants then start arriving. Advertising an opening costs the firm c. This cost can be interpreted as the price of an attention-grabbing advertisement in a newspaper, the cost of other publicity designed to attract job-seekers, or perhaps the cost of reminding employment agencies to send the firm applicants.

We assume that the firm chooses not to advertise that a vacancy is filled: indeed, if the firm anticipates no hiring in the future, and so gains nothing from building a reputation for announcing the end of a vacancy, then at the time the vacancy is filled the firm gains nothing from announcing it. In other words, we look at a subgame-perfect solution.

[1] Morgan and Manning (1985) demonstrate that sequential search may be dominated by search with a fixed sample. We follow most of the literature in assuming, however, that applicants arrive sequentially and will not wait for a decision, so that search with a fixed sample is infeasible.