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ABSTRACT

We examine the incentives of a monopolistic search engine, funded by advertising, to provide reliable search results. We distinguish two types of search results: sponsored and organic (not-paid-for). Organic results are most important in searches for online content, while sponsored results are more important in product searches. By modeling the underlying markets for online content and offline products, we can identify the sources of distortions for each type of result, and their interaction. This explicit treatment proves crucial for understanding, not only spillovers across markets, but also fundamental policy issues, such as the welfare effects of integration. In particular, integration of the engine with a small fraction of content providers is welfare-enhancing when incentives to distort are stronger for sponsored than organic search, but welfare-reducing in the opposite case.

1. Introduction

Search engines are indispensable for finding relevant content and products from the massive array of options available on the web. Numerous observers, including competition authorities, have questioned whether consumers and society can entrust this service to a monopolistic search engine that is funded by advertising from product sellers.[1] To evaluate these concerns, it is important to identify the main sources of market failure in the markets that search engines intermediate.

This paper contributes to that task. We distinguish two types of search result, sponsored and organic (not-paid-for), and we model the separate underlying markets for online content and offline products.[2] Explicit treatment of both types of search and both types of result allows us to identify the sources of distortions (away from consumers' ideal matches) and proves crucial for analyzing spillovers across markets and fundamental policy issues, such as the welfare effects of integration. Indeed, one of the most important policy insights of this paper is that integration of the engine with a small fraction of content providers (henceforth, called publishers) is welfare-enhancing when incentives to distort sponsored search are stronger than those for distorting organic search, but welfare-reducing in the opposite case.

Before presenting our specific approach and contributions, we briefly sketch the engine's trade-offs in choosing search reliability for each type of result separately. The trade-off is simplest for sponsored search. A search engine is a platform that connects consumers and merchants. Consumers searching for offline products (e.g., apparel, electronics, holiday packages) can use the search engine's webpage to find links to relevant merchants' websites. The engine typically charges merchants for well-placed links, called sponsored search links or "search ads," but does not charge consumers. As with any two-sided platform that only

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[1] With market shares exceeding 90% in most European countries and a global average above 80%, Google arguably dominates online search in most of the world (State of Search, 2012). Sponsored search generated Google's profits initially, but with recent expansion into ad intermediation (AdSense and AdWords) and content provision (e.g., Google Finance, YouTube and Zagat), display advertising from owned and affiliated webs accounts for an increasing share of profits (see e.g., Delo (2012)).

[2] Website owners can buy (sponsor) well-positioned links to their websites in the sponsored, but not the organic, results.

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charges one side, it is motivated to favor that side's interest. Thus, an ad-funded engine might encourage consumers to visit the merchants most willing to pay for sponsored ads, even when not ideal for consumers. The need to attract consumers to search online provides a countervailing reputational incentive against excessive product search distortion.

A general search engine is also a platform that connects consumers and publishers. When consumers search for online content (e.g., news, entertainment, encyclopedias), most of the relevant results are organic (publishers have limited interest in sponsoring). But the engine may still have incentives to distort. Publishers provide content on websites with "display ads" that link consumers to merchants. So publishers are customers of the search engine in the content market, but also competing intermediaries in the product market. This gives the engine an incentive to distort content search to reduce display ad-effectiveness. Again, reputational concerns temper the distortion incentive.

Formally, our model consists of a dominant search engine, denoted by *G*, that interacts with a set of consumers, publishers and merchants. At its core, the search engine is a platform that intermediates two distinct but interacting markets: its search results match consumers with publishers in the content market and with merchants in the product market where publishers' display ads also match consumers with merchants. The engine's key instruments are the reliability of its organic and sponsored results. To make the analysis tractable, we assume that consumers use its organic results for online content search and its sponsored results for offline product search. This assumption is extreme but approximates the empirical evidence.

The model highlights three key aspects of the mechanism that generates organic search distortions. First, participating consumers use the same engine for both content and product searches. So the engine can attract users of its sponsored search results by building a reputation for reliable organic results. Indeed without such a participation spillover, the engine would not provide any organic results at all. Second, when a consumer buys a product via a display ad while searching for content, the consumer has less need to engage in product search. So the engine earns less from selling sponsored search ads. That is, display ads are substitutes for search ads.[3] Third, *G* can make display ads less effective by diverting content-searching consumers. We consider two different mechanisms: (i) *G* can send consumers to less relevant publishers, frustrating contextual targeting (i.e., based on correlation between content and product taste) and inducing briefer visits and less time for ad display[4]; (ii) *G* can redirect consumers to publishers that are intrinsically less ad-effective or choose to be less ad-intensive (e.g., Wikipedia and the BBC have no ads). Thus *G* may distort organic search to steal business from publishers.

Our microfounded model allows us to study how organic and sponsored search distortions interact. We show that they are substitute instruments for *G*, owing to two mutually reinforcing effects. First, since display and search ads offer substitute channels for product-searching consumers, distorting one search type raises consumer sensitivity to the other. Second, participation spillovers imply that increased reliability of one search type relaxes *G*'s reputational concern when choosing the other.

We also predict how technological change and market characteristics affect equilibrium distortions. Technological innovations improving the effectiveness and targeting of display ads induce *G* to offer less reliable organic search results, potentially reducing consumer welfare, despite the positive direct effect of more effective display ads. Lower engine-use costs lead *G* to reduce the reliability of search results, worsening consumer access to offline products. Conversely, improvements in an alternative (non-strategic) search engine induce *G* to improve search reliability. As for market spillovers, when content search becomes more important for consumers, the engine unambiguously reduces sponsored search reliability, worsening consumer access to products. But in the converse direction, increasing the importance of product search has ambiguous effects on organic search reliability and access to content.[5]

Our second set of results address the question of how integration affects these distortions and welfare, and incentives to integrate. Integration may take place via direct publisher acquisition or via publishers paying a *G*-owned ad intermediary to serve their display ads. In either case, *G* internalizes a share of the publisher's display ad rents. This has vertical and horizontal effects. The vertical effect is always beneficial to consumers: *G* values participation more and therefore tends to raise both sponsored and organic search reliability.

The horizontal effects are more subtle. Partial integration removes *G*'s incentives to engage in stealing business from publishers that become affiliates, but exacerbates *G*'s business-stealing incentives from independent publishers. *G* can now divert all distorted organic traffic to its affiliates, thereby increasing its display, as well as its search ad revenues. The fact that a small number of affiliates allows *G* to capture a sizable amount of diverted traffic generates a clear effect in our baseline model: when it is optimal for *G* to distort organic search, integrating a small number of publishers causes a discrete drop in consumer and total welfare. However, when instead *G* finds it optimal to distort sponsored search and not organic search, this effect is absent and the vertical internalization effect raises search reliability and welfare.

In sum, the welfare consequence of *G*'s integration of a small number of publishers depends critically on the relative incentives for distorting the two types of search. In addition, our derivation warns against using the pre-merger size of a given publisher to assess the risks of integration with *G*: *G* can divert traffic from non-affiliates to turn the publisher into a market leader.

The consequences of increasing the extent of integration from a non-zero level are much simpler. The detrimental horizontal effect falls with the number of non-affiliates (from which to steal business), leaving only the positive horizontal and vertical effects. So expanding integration raises search reliability and also welfare, independent of the relative distortion incentives.

Integration also affects publishers: the joint rents of *G* and affiliates always rise,[6] but independent publishers' rents may fall. Integration tends to decrease the traffic that *G* directs to independent publishers, reducing their display ad rents. This might have potentially serious consequences for content quality in the long run.

Variation in publishers' display ad-effectiveness generates close parallels to our two sets of results. Under separation, *G* would then divert traffic from more to less ad-effective publishers, whereas with integration, *G* would divert from non-affiliated to affiliated and ad-effective publishers. So integration would lead to organic distortions that create a more ad-intensive experience for consumers.

The paper is organized as follows. We review the relevant literature in the next section. Section 3 presents the baseline model and characterizes the social optimum. Section 4 examines the equilibrium of the game with independent publishers. We study the effects of integration in Section 5 and Section 6 contains a few concluding remarks. The proofs are gathered in Appendix A.

[3] Search ads are better targeted to product queries but display and search ads are increasingly close substitutes for merchants owing to intensive online content consumption and targeting innovations, e.g., contextual targeting and "cookies."

[4] Further empirical testing is needed, but this match effect (which requires no publisher asymmetry) is consistent with Google AdSense's advice to publishers and eye-tracking studies such as Wang and Day (2007) and Lorigo et al. (2008). Ellman and Germano (2009) and Wilbur (2008) discuss broader links between content and ad effectiveness.

[5] These spillovers are asymmetric because organic reliability affects product access (via display ads) whereas sponsored reliability does not affect content access.

[6] We abstract from intra-organizational transaction costs. Such costs and regulatory concerns would limit the extent of consolidation but modeling them and predicting industry structure lie beyond the scope of this paper. Since non-affiliates may benefit from integration between *G* and other publishers, the process of bargaining over integration can become a war of attrition. The equilibria of such merger games typically involving reaching some agreement (integration) with probability one, but with delay.