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Issues in on-line advertising and competition policy: a two-sided market perspective.

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Introduction

On-line advertising accounted for $26.04 Billions of the total US advertising pie in 2010, with annual growth rates in the double digits. In the past few years the Internet has continued to grow in significance when compared to other ad-supported media. In 2010, Internet advertising surpassed advertising revenues in newspapers. Advertising in general and on-line advertising in particular involves a large diversity of actors. The main actors on the supply side of the market are search engines and portals (for example Google, Yahoo), on-line news outlets (for example cnn.com, nyt.com), user generated content sites (YouTube, blogs), social networks (Facebook, Google+) and E-commerce outlets (EBay, Amazon).[1] What makes on-line advertising attractive is the wide range of new products and services offered. Sponsored search ads allow to tie advertising messages to specific keyword searches. Sponsors can thus be matched to consumers who showed an interest in particular products / topics. Behavioral targeting and re-targeting techniques allow to use information collected on an individual's browsing behavior, such as the pages he has visited or the searches he has made to select which advertisements to display to that individual. Performance-based pricing allows charging as a function of the outcome of the campaign. Cost per thousand impressions (CPM), cost per click-through (CPT) or cost per sale (CPS) are only some of the schemes employed by on-line outlets (often called "platforms" in what follows) to attract advertisers.

Despite the wealth of innovation, the economics of "on-line" advertising is not fundamentally different than its "off-line" counterpart. On-line outlets (or platforms) create (or buy) content which is used to

attract "eyeballs." The eyeballs are then used to attract advertisers. This is precisely what traditional media, such as newspapers or TV broadcasters have been doing all-along. For example newspapers bundle news and advertising. Consumers pay (or not) for the content and typically choose their favorite outlet via price and quality considerations. Advertisers pay for the attention of consumers.

The advertising markets raise several issues for the conduct of competition policy that are related to the unconventional nature of the market and its functioning.

A first basic set of questions is about the optimal pricing choices and business models in these markets. TV networks such as ABC and NBC thrived until recently delivering free over-the-air content. This "cross-subsidization" model has advertising as the sole source of revenues. At the other end of the spectrum, several cable channels have little or no advertising with subscribers paying the service. Finally newspapers, at least in their initial incarnations, frequently adopted a mixed model, revenue being generated on both sides of the market. Readers purchase copies while advertisers purchase space. It is not hard to find new instances of these "old" business models on the Internet. For example search engines and social networking sites are free to users and costly to advertisers. Other examples readily come to mind.

A first set of insights comes from a thriving research area in Industrial Organization on the general features of what have been called "two-sided platforms" or "two-sided markets." Notable contributions include Caillaud and Jullien (2003), Rochet and Tirole (2003, 2006), Armstrong (2006) and Weyl (2010). These articles study the incentives of privately owned platforms, such as exchanges, that enable interactions between two (or more) different sets of users such as buyers and sellers. Search engines, news outlets and social network websites are all instances of two-sided (or multi-sided) platforms. Their distinctive feature is the presence of externalities between different user types. That is, the value that users place on the platform depends on who else is using the platform. The success of these platforms depends crucially on their ability to account for these externalities when determining their pricing and investment strategies.

Although theories of platform competition are not specific to the Internet, they shed light on most of the basic trade-offs faced by Internet platforms and will be used here to set the stage. These theories contrast market outcomes with efficient (i.e. welfare-maximizing) outcomes under various market configurations and governance structures. Accordingly in what follows we first discuss competition policy issues specific to two-sided intermediation that are relevant for advertising markets in general. We then turn to those aspects inherent to the on-line world that we believe can potentially lead to new intuitions or deserve specific treatment.

Part one: the economics of media platforms

A simple framework

To fix ideas consider the simplest abstract model of a monopoly platform. This framework does not apply to the above examples where competition is the rule. However a theory of monopoly is essential to be able to talk about competition policy related issues such as market definition and the assessment of market power. Think about a news outlet with some predetermined content that deals with a large number of readers and advertisers. All advertisers' willingness to pay to access the platform (that is to buy ad-space) increases with circulation (that is the number of readers). On the contrary, all readers' willingness to pay for the newspaper decreases with the number of advertisers. Because the emphasis here is on the *quantity* of agents on different sides of the market it is convenient to think of the platform as setting quantities rather than prices. Let $P_R(n_R, n_A)$ and $P_A(n_A, n_R)$ be the inverse demand function of readers and advertisers respectively. That is the maximum price that the platform can ask readers and advertisers respectively if it wishes to sell n_R copies and n_A ads. Clearly P_R and P_A decrease with n_A, P_R decreases with n_R and P_A increases with n_R. The outlet then chooses its sales so as to maximize its profit as stated below (arguments omitted):

$$\max_{n_A, n_R \geq 0} P_A * n_A + P_R * n_R.$$

Alternatively one could think of the platform as setting prices and restate the problem as follows. Let $n_A(P_A, n_R)$ and $n_R(P_R, n_A)$ denote the number of advertisers and readers whose willingness to pay exceeds P_A and P_B respectively. n_A decreases with P_A and increases with n_R. n_R decreases with P_R and n_A. Once again the outlet chooses the prices that solve (arguments omitted):

$$\max_{P_A, P_R \geq 0} P_A * n_A + P_R * n_R.$$

This way of posing the problem highlights an important coordination issue in these markets. What each agent gets when using the platform depends on how many other agents are using the platform as well. So all agents need hold a conjecture of what the other agents will do in order to form a valuation of the platform's services. This means that for each pair of prices P_A and P_R there could be multiple levels of equilibrium participation. Coordination issues are important but will not be the focus of this article. In what follows we sidestep this issue by assuming that the platform is always capable to coordinate users. Formally the assumption is that for each relevant pair of prices P_A and P_R, there are unique levels of participation n_A and n_R consistent with those prices. The term consistent means that all users at these participation levels obtain more utility by participating than by not participating. (See Caillaud and Jullien (2003) for more on this).

Starting from any set of prices consider the impact of decreasing one price to one group of users, say readers. A first direct and familiar consequence is that demand on that side, that is the number of readers, goes up. But a second effect is that attracting additional readers creates value for advertisers whose demand will also increase as a result. It follows that the amount of money that the platform is willing to give up to get an extra reader on board is lower than the physical marginal cost of serving a user, because of the two-sided externalities. The (robust) intuition that prices are equal to marginal cost plus a markup is still valid once we plug in the right notion of cost, that is the "opportunity cost." Here:

Price = (physical cost – value created on the other side)+markup,

where the markup is a standard monopoly markup. Hence prices tend to be smaller than in a one-sided market.

Applying this logic to competition leads new results. Indeed a key insight when accounting for two-sidedness is the different role played by competitive pressure in these markets. Typically competition will not affect the two sides of the market with the same intensity. For example most of the competition for advertisers takes place through competition for the attention of consumers in the price and quality dimension. The reason being that being the sole supplier of a given individual's attention allows extracting a monopoly rent on the advertising side of the market

A simple extension of the above model can be used to shed light on the issue of competition. Think about two platforms courting the same two sets of end-users. Platforms simultaneously post all their prices. End-users observe prices and choose one platform. (Later on we consider the case in which end-users are allowed to choose more than one or none). Suppose that all users have idiosyncratic tastes over the platforms. For given participation levels (i.e. given their conjecture about what the other users will do at the posted prices) the differential value of choosing one platform over the other is heterogeneous within the population of users and continuously distributed on the real line. So some users would strictly prefer platform 1 to platform 2, others will prefer platform 2 to platform 1 and those with a differential value exactly equal to zero will be indifferent. Starting from any set of prices consider again the impact of decreasing one price to one group of users, say readers. The previous discussion is still valid but a new effect is at work. When competing by stealing readers the platform reduces the attractiveness of its competitor. As a result, a price reduction for readers attracts more advertisers than in the monopoly case. Taking this into account, a platform will choose prices according to:

Price = (physical cost – value created on the other side – value destroyed at the competitor)+markup

Competition tends to reduce the markup (as in most markets). In addition the two-sided externality reduces further the prices. A first consequence of the downward pressure brought about by lower opportunity costs is skewed pricing. That is: the margin over physical cost may be very different for the two sides, even negative on one side. In particular the service can be free on one side. For our purpose the main point is that price skewness needs not reflect strong market power and is intensified by competition. These "low" or below physical cost prices are not anti-competitive per-se. Negative prices are not an indicator of predatory practices as competition may intensify cross subsidies.

In general the effect of competitive pressure on two-sided businesses depends on a number of key factors such as:

- Price instruments available / tarification:
    - How many prices? (membership fees, usage fees on all or on a subset of the sides).
    - Which kind of prices? (Participation contingent prices / usage (for example "per click") contingent prices?
- Services:
    - Is the service bundled with other goods or services
    - Is it two-sided or multi-sided?
    - Are the platforms selling complementary products?
- Consumer behavior
    - Do they rely on one or several outlets?
    - How do they perceive advertising (ad-lovers or advert to ads)?
    - Do they have switching costs?

We shall not address all these points but only the issue of end-user behavior which is crucial to assess the role of competition. The assumption that consumers and advertisers only choose one platform (in jargon "single-home") is a main driver of the results above. Indeed a key element that affects the analysis of competition with advertising is the extent to which one or the other category of users of the service relies on only one outlet (single-home) or several outlets ("multi-home"). We will address the issue of consumers' behavior when discussing multiple impressions, we focus here on advertisers. Whether advertisers view outlets as competing media between which they must choose or as different channels with different audiences on which they can diversify their campaign may change drastically the nature of competition. The first case corresponds to the situation described above and arises for instance when advertisers have limited resources to invest and diversification is too costly. The second case corresponds more to large and well funded advertising campaigns on outlets with different audiences. In this case, advertisers will consider each outlet separately and their decision to invest in one outlet will depend on its audience only and not on the other outlets. This situation is often referred to as a "competitive bottleneck" in the two-sided market jargon. This is the canonical model adopted by many influent articles on media competition, such as the work of Anderson and Coate (2005) for instance. In this situation, competition shifts entirely on the consumer side. Platforms do not compete directly to attract advertisers but only through consumers. Indeed once an outlet has succeeded to attract some "eyeballs", it becomes the sole mean of access to these consumers for advertisers and it can sell this access at monopoly price. Outlets thus receive high revenue per consumer from advertisers but this profit is to a large extent passed-on to consumers as outlets compete intensely to attract them. Price skewness becomes maximal with low prices on the consumer side. Although platforms enjoy some form of market power on one side of the market, this is disciplined by competition on the other side of the market. This is one of the main reasons for which one cannot analyze the advertising side without considering competition on the consumer side.

Welfare economics of two sided markets

A first basic challenge faced by anti-trust authorities and courts is to adopt a welfare concept to measure industry performance. In most one-sided businesses, practices that foster competition typically increase total surplus. In two-sided businesses, consumer surplus is the sum of the surplus of agents on different sides. The same practices could lead to redistributive effects among end-users. Some anti-competitive practices or agreements that benefit a set of end-users could be overlooked.

Consider for instance the consumer surplus as it is inferred from the demand addressed to the firm in standard economic activities. In general when the clients of the firms are also firms that produce and sell goods, the same criterion extends provided that these clients are active in a competitive market (as competition leads them to pass-on efficiency gains to final consumers). But this logic is difficult to apply to advertising as it impacts consumption only indirectly, which is often overlooked.

In general how to weight the surplus of different agents is subtle and, as we shall see, even subtler when considering the surplus that derives from advertising. Economists have long had conflicting views on advertising (see Bagwell (2007) for a survey of the literature). The *persuasive* view holds that advertising "shapes" consumer tastes fostering brand loyalty and spurious product differentiation. (Chamberlin (1933), Robinson (1933), Kaldor (1950)). This approach suggests that advertising can have serious anti-competitive effects and shouldn't be encouraged. The *informative* view holds that advertising is a market response to a shortage of information on determinants of consumer choices such as prices, quality and even mere existence of products and services (Stigler (1961)). As such advertising could have pro-competitive effects removing frictions that foster market power. A third view holds that advertising can be *complementary* to consumption (Becker and Murphy (1993)). For instance network goods need coordination of a sufficiently large base of consumers to deliver any value. Advertising is complementary to the extent that it helps individuals coordinate. "Signaling goods" (e.g. conspicuous consumption) are also examples of goods whose value increases with advertising. Under this view advertising should also be encouraged, as advertisers typically fail to internalize the full extent of consumer surplus.

Advertising can also be a wasteful activity. Waste comes in from two sources. Strategic complementarities in advertising choices might trap competing firms into *excessive* advertising. If a campaign needs to outplay a rival's campaign to be successful then the firms' incentives to pour resources into advertising can go up even though the individual firm and industry profits go down. Then firms and consumers would be better off without advertising altogether. Furthermore advertising consumes attention of individuals which is a scarce resource, increasingly so in the digital world. The lack of a separate market for attention in which consumers register their willingness to pay can lead to inefficient depletion. Advertisers do not internalize consumers' welfare when crafting their campaigns. The option of consumer "exit" which usually works as a disciplining device of last resort is typically unfeasible and "ad avoidance" is a costly activity. Already in 1901, Fogg-Meade (pp.231-232) pointed out that advertising is "a subtle, persistent, unavoidable presence that creeps into the reader's inner consciousness."

Finally advertising supports the creation of quality content through competition for eyeballs and more generally reduces the entry cost of new content as platforms may be willing to subsidize creation in order to foster their position in the advertising market.

Overall we see even a simple criterion as the consumer surplus may be delicate to assess in practical cases, in particular mergers, as it requires to take a stance on the type of advertising considered and its social value.

Market definition and the assessment of market power.

The simple model introduced above is useful for thinking about market definition issues in multi-sided businesses. Suppose for instance that the task at hand is to define the relevant market for advertising using a standard tool: the SSNIP test. The exercise consists in identifying the smallest market such that fully coordinated sellers (a hypothetical monopoly) in this market would find it profitable to increase the price

above the current level in a non-transitory way, say by 5%. The key question in the case of advertising is how we treat the two-sides and the fact that prices on both sides are inter-related.

Suppose we were to adopt a "naïve" approach neglecting the indirect externalities between readers and advertisers. This means, for instance, evaluating the impact of a price increase on advertisers keeping fixed both the quantity and the price on the readers' side of the market. The *estimated* impact on profits of an increase of the price of advertising is (approximately) equal to:

$$\Delta P_A * n_A - \Delta n_A * P_A^{'}$$

where $P_A^{'}$ denotes the new, higher price. However, the story is not over. Suppose that some consumers are sensitive to advertising, because of the lower amount of ads, more or fewer consumers would purchase the newspaper at the same price. Changing circulation implies additional revenues equal to $\Delta n_R * P_R$. So the *actual* impact comprises the additional change in revenues on the readers' side of the market. From this reasoning we can conclude that this "naïve" incarnation of the SSNIP test on the market for advertising would lead to a systematic over-estimation of market size if consumers dislike advertising (under-estimation if they like advertising). How big the discrepancy would be between *actual* and *estimated* impact depends on the strength of the cross-network externalities. The higher the elasticity of the readers' demand to the advertisers' quantity, the higher the mismatch.

Consider now a more "sophisticated" version of the test that takes in to account the *overall* change in revenues resulting from a price increase on the price of advertising: $\Delta P_A * n_A - \Delta n_A * P_A^{'} + \Delta n_R * P_R$. Since the price change affects the willingness to pay on the readers' side the (coordinated) platforms could consider changing[2] the readers' price as well to further boost profits. Clearly the platforms cannot do worse when using a second instrument. So the overall effect of an increase in the advertisers' price

would be under-estimated. Thus estimated market size would be systematically larger than the market size obtained by considering the full pricing possibilities offered to the platforms on both sides. By how much in turn depends on how sensitive is both own-side demand and cross-side demand to a change in P_R.

Note that not even the *sign* of the estimation bias is pinned down by the structure of the problem. For example, if we were to conduct the "naïve" version of the test on the readers' side of the market (that is increase P_R) then we would end up under-estimating the size of the relevant market. The reason being that advertisers *like* readers and so would react to fewer readers by cutting back on participation. So what looks as a profitable price increase at a first pass could potentially end up *reducing* profits helping identifying too narrow relevant markets.

This exercise captures the difficulties that arise in defining markets that are two-sided due to the presence of cross-group externalities. In principle the two sides should be evaluated jointly as a single market.

A second observation is that there is no inverse relationship between market power and markups. Reducing prices on one side can be profitable if the resulting revenue losses are more than compensated by gains on different sides. Redefining the notion of a "small but significant non-transitory increase in prices" in these markets is a complex task that requires imposing more structure on the problem than the mere existence of well-defined demand schedules.

A final observation when considering the consumer side, either on its own or because it affects the advertising side, is that the current notion of SSNIP test is inconsistent with markets where the service is free, as it is often the case for on-line services but also for radio stations, free newspapers or over-the-air TV stations. There it is necessary to rely on direct or indirect measures of product substitutability. Notice that a free service doesn't mean there is no competition but that competition relies on non-price dimensions, in particular choice of content and other quality dimensions. Adequate tests should be developed for these markets.

Part two: Internet platforms

The past decade has brought a wealth of new platform businesses that took advantage of new technologies that lowered a range of costs (see Levin (2011) on the economics of the Internet). The possibility of tailoring (or customizing) content at the individual user level at no additional cost opened up a wide range of brand new businesses. Search engines, social networking websites, on-line news outlets, e-commerce websites, portals and news aggregators are amongst the most successful of these platforms. Most of these markets are "multi-sided" in the sense that they coordinate more than two sets of users. For example search engines involve mostly two groups of active users, searchers and advertisers, but also content producers, and e-commerce websites involve buyers, sellers and advertisers. Understanding the complexities of markets with multi-sided externalities that come in a wide array of forms is a first challenge to academics and practitioners.

The lower costs of monitoring "interactions" or transactions brought innovation in payments and pricing mechanisms as well. As a result entirely new markets emerged. Search engines charge on a query-by-query basis running real-time (generalized) second price auctions to sell the ad space on the right hand side of the results' page. Itunes and its kin App-store have no membership fees but rather charge for a single piece of content. Ebay is able to monitor and tax transactions between otherwise anonymous buyers and sellers.

New market institutions emerged to cope with various market frictions. Feedback systems allow users to solve the old markets-for-lemons problem in a decentralized way. Collecting user information opened up new possibilities in improving the match between members of opposite sides of the market. At the same time it raised privacy concerns.

Lower search frictions significantly changed consumer habits. Internet users have easy access to multiple competing platforms. For example most on-line newsreaders often get their news from multiple-sources. Buyers can compare prices across a wide variety of stores. Sellers can cross-list on multiple platforms. As

we have argued above it makes a significant difference to outcomes whether groups single-home or multi-home.

Issues for competition on the ads

Is Internet advertising on the same markets as newspapers advertising or bill-boards and storefront signage? On-line markets reach less people (so far) but allow for better targeting. It is not clear whether the capacity to target advertising enhances (and hence complements) existing off-line campaigns or acts as a substitute for them. On the theory side, the prevalent view is that firms substitute between on-line and off-line advertising (for example Athey and Gans (2010) and Bergemann and Bonatti (2011)). On the empirical side there is preliminary evidence that off-line and on-line ads are negatively related. Goldfarb and Tucker (2010a) study this issue through a randomized trial in the context of advertising on alcoholic beverages. They show that the effectiveness of a ban on alcohol advertising (measured as the likelihood that a given individual purchases alcoholic beverages conditional on exposure type) is significantly reduced when consumers are exposed to on-line ads. Goldfarb and Tucker (2010b) exploit exogenous variation in the ability of lawyers to solicit customers via traditional media such as direct mail or "ambulance chasing" behavior. They find that advertising prices per click for search engine advertising are 5-7% higher when lawyers cannot use traditional channels. Both pieces of evidence suggest that on-line advertising substitutes for off-line ads. In general the key issue is the extent of multi-homing between on-line and off-line behavior. These results suggest that advertisers use both on-line and off-line resources and that these markets cannot be thought as operating independently. But the extent of substitution/complementarities is still not quantified. Faced to lack of conclusive evidence, on the public policy side the ongoing view is that these channels are neither complements nor substitutes. The Federal Trade Commission did not consider off-line markets in its assessment of the Google-Doubleclick merger. The European Commission explicitly asserted that for antitrust purposes "on-line advertising is a distinct market from off-line advertising."[3] The French Autorité de la Concurrence took the same position in an opinion expressed in 2010.[4]

The exercise of market power in on-line markets takes different, not immediately apparent, static and dynamic forms. A good example of a static distortion is the use of reserve prices in sponsored search auctions (keyword advertising). Search engines often tweak the rules that assign advertisers to particular keyword searches in order to boost profits. This activity, by some dubbed "market" or "auction design" typically leads to higher revenues at the expense of lower advertising surplus. For instance reserve prices (typically employed by all auctioneers) boost revenues by rationing out of the market advertisers that would have otherwise participated. The employment of these "shadow" access prices is the reason why many of Google's searches contain few or no ads. (If advertising were costless then it could do no harm to an advertiser to associate its name even to un-related searches). A good example of a distortion that results from dynamic considerations is given by display-ad auctions. Many ad-networks, such as DoubleClick allow advertisers to target specific users across websites belonging to the same network. A typical arrangement could condense as follows: "impress the same user at most x times at a unit-price no higher than z per impression over the course of y days." In practice display ads (also called banner ads), are auctioned off in real time (thus sequentially) to advertisers who instruct robots to bid on their behalf. A simple strategy is a triple (x,y,z). The fact that users show up on the network multiple times over the relevant advertising period y incentivizes advertisers to "shade" their bids. ("Bid shading" describes the practice of a bidder placing an offer that is below what he thinks a good is worth). Suppose that advertisers choosing high price bids (z) also choose a large number of impressions (x). As higher advertiser types reach their target level z their robots dropout of the market for this particular user. So subsequent auctions will have fewer participants with lower bids. The expectation of lower future prices is what induces bid shading. The ad-network could increase revenues by cutting back on the number of ads. The lower the expected number of future auctions the higher the bid for the current. So even in the absence of static distortions (e.g. no reserve prices), there could well be dynamic ones.

As mentioned, Internet fosters multi-homing by consumers (by some called "switching behavior") via lower switching costs, leading to multi-homing on both sides of the market. This has two main

implications. First in the traditional context of competitive bottleneck, there is little or no competition for advertisers. If outlets are gatekeepers of their customers' attention then they can always insist on charging the monopoly price for accessing that attention. On the contrary multi-homing by consumers introduces substitutability between platforms: as the fraction of readers who can be reached through multiple outlets goes up the "old" Cournot logic kicks in. Individual ad-supply choices affect (common) market prices. These strategic externalities induce lower equilibrium prices. (see Ambrus, Calvano and Reisinger (2011) and Anderson Foros and Kind (2011)).

The second implication is somewhat subtler. At large advertising campaigns can be thought as stochastic processes. With some probability some of the ads will end up hitting already informed consumers and hence get wasted together with the attention of that particular consumer. Internet platforms react to this problem by introducing tracking technologies that increase allocative efficiency. Although far from being perfect, these technologies reduce within outlet waste. As switching behavior increases more attention gets wasted as there is no *across* outlet tracking. To give a sense of how big the problem is Athey, Calvano and Gans (2011) provide evidence (based on 30 large recent cross-outlet internet campaigns) that more than two thirds of the ads are wasted, hitting the same receivers more than 10 times. This fact alone can account for the decline of advertising revenues experienced by newspapers as readership migrates on-line. Ad-networks seeking to build a case for mergers often argue that the merged entity could reduce these inefficiencies by improving tracking through superior information. Athey, Calvano and Gans (2011) show that this need not be the case as profits are not monotonic in consumer switching. Advertisers with a high opportunity cost of missing consumers, the argument goes, increase their demand of ads as a result of switching to make sure they reach their target. Finally the ability of the merged entity to price-discriminate between different types of advertisers by charging different prices to multiple-outlet and single-outlet campaigns respectively is shown to introduce further allocative distortions.

Illustration with a simple model

As an illustration of the issues raised by multi-homing, we develop a very simple model that captures some basic insights of the literature. Consider two outlets 1 and 2 that propose contents to consumers and advertising space. To simplify matters, assume that the audience of each outlet is fixed and independent of the advertising policy. A representative consumer may decide to visit one or both outlets. With probability X_i $(i = 1,2)$ the representative consumer visits only outlet *i*, while with probability *X* he visits both outlets. For consistency, $X_1 + X_2 + X$ is smaller or equal to 1. For each advertiser there is a single consumer who is a potential target. A representative advertiser may buy at most one impression on outlet *i* at price P_i. The outlet then targets the consumer, which results in a probability Q_i that the consumer impressed is the advertiser's target. Q_i thus corresponds to the quality of targeting. If the consumer impressed is not the target the value for the advertiser is zero. If the consumer is the target the value of a first impression is *1*, while the value of a second impression is *1-A* (this occurs if the advertiser buys ads to both outlets and the targeted consumer sees both ads). Thus the value of 2 impressions is *2-A,* less than the double of the value of one impression. The parameter *A* can take values between *0* and *1* (*A = 1* means that a second impression is useless for the advertiser). Proposing an advertising slot costs *C*.

In this simple model, everything is exogenous except that each outlet chooses the price P_i of its advertising slot. To start the analysis, consider the case where the advertiser must choose only one outlet (single-homing). The expected revenue of the advertiser when choosing outlet *i* is $Q_i(X_i + X) - P_i$. Assume that outlet 2 is more attractive so that $Q_2(X_2 + X)$ is larger than $Q_1(X_1 + X)$. This could be because it is more efficient at targeting or because it has a larger audience and hence a better chance to be visited by the target. It is then straighforward to see that outlet 1 chooses the price ($P_1 = C$) and outlet 2 sells the ad at price $P_2 = C + Q_2(X_2 + X) - Q_1(X_1 + X)$.

The question is now how does the result change when the advertiser can buy a slot on both outlets. If the advertiser already has a slot on outlet 2, the value of an additional slot on 1 is the difference between the value with two slots and the value with one slot: an extra slot on outlet 1 generates an additional chance of

reaching the target $Q_1(X_1 + X)$ but with probability Q_1Q_2X, this consumer receives two impressions in which case the value is reduced by a factor *A* (this requires the consumer to visit both outlets and each outlet to succeed in targeting him). Thus the value of the extra slot is $V_1 = Q_1(X_1 + X) - Q_1Q_2XA$. When $V_1 < C$, single-homing by the advertiser prevails. But when $V_1 > C$, it is not sustainable. Indeed the advertiser would be willing to pay the cost of the slot of the second outlet. Suppose that $V_1 < C$. In the equilibrium that emerges, the advertiser buys a slot on both outlets (multi-homing). This implies that an outlet cannot charge a price larger than the incremental value of adding a second slot. Indeed given that he buys the slot on one outlet, the advertiser is only willing to pay V_1 for outlet 1 and, according to the same reasoning, $V_2 = Q_2(X_2 + X) - Q_1Q_2XA$ for outlet 2. In equilibrium outlet 1 sets a price V_1 and outlet 2 sets a price V_2.

Single-homing is more likely when outlet 2 is very efficient ($Q_2$is large) and the value of a second impression is small (*A* is large). Comparing the profits, we obtain that each outlet obtains a larger profit with multi-homing when it is an equilibrium ($V_1 > C$). This is immediate for 1 as it does not sell with single-homing. For outlet 2, it is due to the fact that it faces a less intense price-competition from 1 under multi- homing. Indeed when $V_1 > C$, it can be shown that both prices are higher under multi-homing.[5] Under single-homing, outlet 2 must compete with the very low price of the less efficient outlet, while under multi-homing it faces no competition.

Due to lower prices, when $V_1 > C$, the advertiser would obtain a larger profit under single-homing than multi-homing. Thus surprisingly the advertiser does not benefit from the possibility to use both outlets, due to low intensity of competition that offsets the potential benefits of using multiple channels to reach the consumers.

Let us now look at the effect of entry in this context. For this purpose assume that outlet 1 is the sole outlet until some date where outlet 2 enters. Assume that $V_1 > C$. Before entry, outlet 1 is a monopoly and obtains profits $Q_1(X_1 + X)$ by selling the slot (we assume here that entry does not affect the audience of

outlet 1). The total industry profit after entry is $V_1 + V_2 - 2C$. Entry may then raise or reduce industry profit (depending on *A* and *C*). There are two effects at work here. On the one hand, entry creates new value that is shared between the entrant and the advertiser. On the other hand entry reduces the value of the first outlet which depresses profits. This result is similar to one obtained in Athey, Calvano and Gans (2011).

The model sheds also some light on investment. Consider investment in targeting, the return of increasing Q_i under multi-homing is $(X_i + X - Q_j XA)$ where Q_j is the quality of the other outlet. First investments in targeting are strategic substitutes (the more the competitor invests, the less the outlet invests). Second a shift toward more multi-homing by consumers (increasing *X* at constant audience $X_i + X$) reduces the gains from investment, hence multi-impressions are detrimental to investment. The same conclusion could be derived for investment in content (that raises audience).

Issues for competition on the consumers side

The importance of advertising for the consumer side in on-line is obvious given that it is a key driver of platform competition for consumers and a key ingredient for most free on-line services. The importance of advertising raises some new issues for the consumer side.

As pointed by Crampes, Haritchabalet and Jullien (2009), advertising changes the nature of competition for consumers by affecting the nature of returns to scale. Depending on the technology and the type if advertising, it may be the source of increasing returns to scale (when one more consumer helps increasing the advertising revenues per consumer) or decreasing returns to scale. Decreasing returns may arise if marginal consumers are less attractive for advertisers than infra-marginal consumers. On Internet, it is often alleged that, by exploiting information from a large customer base, larger outlets have superior possibilities in targeting leading to increasing returns. Increasing returns to scale would then imply a larger concentration, some level of barriers to entry and more concerns about anti-competitive practices.

Moreover, in network industries a standard concern for anti-trust authorities is that dominant platforms enjoy a competitive advantage because consumers are coordinated or "locked in" to the platform. This translates into higher barriers to entry, as entrants will have to win the reluctance of several sides to switch platform in the absence of the other side. A critique to this argument is that "divide and conquer strategies" in which one side is lured through subsidies (negative prices) that ensure participation for all levels of participation of the other sides can be profitably employed to penetrate the market (see Jullien (2011)). However in on-line advertising markets, for instance search engines, the lack of prices on the consumer side make these strategies unfeasible and thus bring back concerns of foreclosure due to coordination. The emergence of gatekeepers such as Google's search engines raise concern of foreclosure through prominence, obfuscation and search diversion. For example Microsoft repeatedly complained that Google drastically increased the rate for its ads. In September 2007 the cost for placing a "Windows live" ad next to search results for the keyword "Hotmail" (Microsoft's own email outlet) allegedly increased from 10 cents to $5 per click. The Federal Trade Commission as of September 2011 is probing this and other increases.[6] A broader issue of course is whether a gatekeeper could favor its own businesses. This could be done in several ways. First, by applying dissimilar conditions to equivalent transactions depending on whether the gatekeeper has a subsidiary in the same market as the advertiser in question. Second, by tweaking on a search engine the "organic" or "unsponsored" search results to obfuscate rivals (see Tarantino (2011)). "Unfair" (whatever that means) ranking of search results could put a firm out of business in a world in which being on page 2 of a search query is pretty much like not existing.[7] Finally another practice (search diversion) has the gatekeeper favoring some advertisers against the best interest of consumers (see Hagiu and Jullien (2011a)). A basic fact about sponsored search is that the websites with a higher willingness to pay to reach a consumer are not always the websites that the consumers are looking for when entering their queries. Whenever this mismatch occurs the engine will have an incentive to "tweak" the results to favor the higher willingness to pay advertisers. A key question is whether competition between platforms is strong enough to discipline them. Consumers, the argument goes, would quickly find another recipient of their queries if they were to find out that results were not packed

to suit their needs. The answer seems to rely on the extent of multi-homing in the market, the discipline being effective only if enough consumers single-home (see Hagiu and Jullien 2011b).

A further challenge is that the forensics for detecting abuses practiced by on-line businesses has little or nothing to do with its off-line counterpart. Detecting or proving the existence of malicious "tweaks" in the algorithms that determine the outcome of position auctions or search results is a very complex task.

Issues for competition at the meta-platform level (News aggregators)

News aggregators recently stirred debate on the practice "scraping" information on multiple outlets and making it available through one portal. Other examples include meta-search engines such as price comparison services (Kelkoo, Kayak) and social network Aggregators which allow managing multiple social profiles from the same interface (the (now defunct) Google Buzz service was the most prominent attempt). By reducing outlet loyalty, aggregators somewhat raise the extent of multi-homing which may be viewed as a progress as consumers have more flexibility but also alters competition between outlets.

Moreover, these "meta-platforms" take away part of the consumers' traffic that would have otherwise visited the target site. The counterpart is that they intercept and drive more traffic to the same sites, since *action* (i.e. reading a full story or purchase a product) requires a click through a link on the aggregator to the supplier of the content. While the aggregators clearly bring value to consumers, they may raise concerns if they become bottlenecks. Aggregators claim that the option of "opting out" from the crawler list, that is the option of not being featured on the aggregator, per se is sufficient to clear the floor from allegations of anti-competitive behavior and violation of intellectual property rights. However the platforms whose content is used by aggregators often claim that they are "trapped" and that they keep on participating because opting out is not a viable alternative. This issue can be related to several topics within the general area of research on collective action problem**s** and coordination failure **(**Dixit (2007) talks in particular about traps). Content producers may face some form of "prisoner's dilemma" in the sense that collectively they would be better off without the aggregator, but if all others join they have no

other choice than to do so or perish. Once coordination on the aggregator occurs, the option of "opting-out" has no value. The issue in analyzing such a situation would then be that the aggregator raises the value for consumers in the short run, but may reduce the supply and quality of content in the long run.

Conclusion

Internet takes an increasing importance in competition policy, due to its impact on the economy and the emergence of global players. Advertising is an essential part of many business models on-line. As we illustrated, advertising on-line raises several issues. Two-sidedness must be accounted for as some practices that seem abusive from one side's perspective may benefit final consumers. Other issues are more specific to advertising, such as the proper welfare criterion for policy makers. Among these is the fact that many on-line markets involve actors with very diverse business models, for instance with the coexistence of free and pay services and various mixes of complementary services and bundles. Understanding competition in this complex context requires developing a wider notion of platform than two-sided market.

A final remark is that the line between consumer protection and competition policy becomes tenuous in on-line markets. Obfuscation and search diversion by information bottlenecks are examples of practices that could be addressed from both perspectives. Privacy is another major such issue. Digital interactions have drastically raised the ability of websites to collect, store and treat data on individuals, compared to traditional "brick and mortar." The use of this information raises ethical issues, but also economic issues related to discrimination and exploitation. In particular increasing concentration may raise concerns for the individuals' control over the use of private data. Evaluating privacy issues and if necessary potential remedies could be done at the merger control stage, which would introduce a dimension different from traditional competition policy considerations such as price level or market foreclosure.

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[1]Source: Internet Advertising Revenue Report (2011). (Industry Survey Conducted by Price Waterhouse Coopers and sponsored the Interactive Advertising Bureau (IAB)).

[2] Since "ongoing" prices are not assumed to be optimal, decreasing could also lead to increased profits as discussed at the end of the paragraph.

[3] See Article 61, reference case No COMP/M.5727 - MICROSOFT/ YAHOO! SEARCH BUSINESS, REGULATION (EC) No 139/2004 MERGER PROCEDURE. Available at: http://ec.europa.eu/competition/mergers/cases/decisions/M5727_20100218_20310_261202_EN.pdf

[4] See Avis du 14 décembre 2010 sur le fonctionnement concurrentiel de la publicité en ligne (10-A-29). Available at: http://www.autoritedelaconcurrence.fr/user/avisdec.php?numero=10-A-29

[5] $V_1 > P_1$ since $P_1 = C$ and $V_2 > P_2$ because $V_2 - P_2 = V_1 - P_1$.

[6] http://www.businessweek.com/news/2011-09-21/google-ad-rate-for-microsoft-said-to-be-investigated-by-u-s-.html

[7] Jeremy Stoppelman of Yelp (an on-line search and review of local businesses on-line) and Jeff Katz CEO of Nextag Inc. (a price-comparison site) testified along these lines on September 21st 2011 in front of the Members of the Senate Judiciary Subcommittee on Antitrust, Competition Policy and Consumer Rights that discussed issues related to Google's Market Power.