Data-Driven Services, Online Advertisement, and Privacy

Keith Waehrer, E.CA Expert Forum

1 October 2018

Business model of data-driven online services

1 October 2018

Services that collect data from users and sell targeted advertising

- These services attract users (consumers) by offering a service or content
  - Consumers are often not charged for the use of the service
- Use of these services generate data about the individual users
- The data can also be used to make the service more attractive
  - E.g., to improve the service either generally or through a customized offering
- These services can monetize user data in a number of ways
  - Sell targeted ads on service
  - Track users sufficiently to serve targeted ads on other services
  - Sell data to 3rd parties

Pricing of data-driven online services tends to be influenced by their two-sided nature

- Unconstrained profit-maximizing prices in these kinds of two-sided environments can be zero or negative
  - Facebook offers their service to consumers for free, monetizing consumer use of the service by selling advertising

- Zero is a special price
  - No transaction costs or consumer opportunism associated with negative prices

- Thus, mergers or other conduct that would tend to change the unconstrained profit maximizing price will not affect these zero prices in the same way
  - That is, no price effects on the consumer side

Two-sided market past enforcement failures?

- Did the agency miss something by focusing on the side where with the potential for price effects?

- Consolidation in US newspapers ~20 years ago
  – Price effects on the consumer side were not expected, as cover price was not believed to be a competitive instrument
  – DOJ looked primarily on the advertiser side for price effects; did not look at effects on the consumer side

- Radio station consolidation by Clear Channel ~20 years ago
  – Zero price on the consumer side, so no price effects on the consumer side
  – DOJ again focused on the advertiser side for price effects

- More recently, Zillow/Trulia merger of US online real estate listing cites
  – Free to consumers, so no price effects on the consumer side
  – DOJ focused on the advertiser side, finding that real estate agents had other good options for advertising to house buyers and sellers

Even where there is a zero price to consumers, services compete to attract consumers

- Without price as a competitive tool, free services use other features to attract consumers

- Newspapers attract reads with quality reporting and other content

- Radio stations attract listeners by offering quality programs and reducing advertising interruptions

- Data-driven online services attract users by improving the quality of the content and user experience
  - For free data-driven online services, the relevant competitive instrument is the quality of the service

Challenges of analyzing competitive effects when quality is the competitive instrument

- Theoretical results on the effect of competition on quality are ambiguous

- Quality can be subjective; consumers might disagree on what constitutes a welfare-improving quality change

- Measurement and quantification can be difficult given that there are generally many different dimensions to quality

- The goal here in part is to explain how one might overcome these difficulties when analyzing the loss of competition over quality (*including possible privacy*) on the consumer side

Models that generate ambiguous results are not applicable in this case

- The ambiguous relationship between competition and effects on quality arise when firms compete both on price and quality

- When pricing is constrained, it has been long understood that increasing competition would lead to higher levels of quality. (See White (1972))

- Thus, one of the often stated issues with analyzing competitive effects in quality is not an issue in cases where price is not a competitive instrument

Do changes in quality meant to attract users improve consumer welfare?

- Unlike a decrease in price, which unambiguously benefits consumers, changes in quality might increase welfare for some and a decrease for others

- Users attracted to a service as a result of a change in quality are unambiguously better off as a result of the quality change
  - The direction of effects on Infra-marginal users is uncertain; this effect is known as the Spence distortion
  - However, in most circumstances it is likely a good assumption that consumers are better off if a quality change increases the number or intensity of use of a service

The decrease in quality from a horizontal merger can be demonstrated with a simple model

- For services 1 and 2 let usage be denoted $d_1(t_1, t_2)$ and $d_2(t_2, t_1)$ where t_1 and t_2 are the levels of quality or privacy protection offered by the two services

- Let $m_1(t_1)$ and $m_2(t_2)$ denote the variable profits of the services as a function of the offered quality

- The profit of the merged firm is
$$m_1(t_1)d_1(t_1, t_2) + m_2(t_2)d_2(t_2, t_1)$$

- The sign of the first-order condition of the profit function evaluated at premerger levels of quality (t_1^*, t_2^*) indicates whether there is an incentive to increase or decrease quality post-merger
$$m_2(t_2^*)\partial d_2(t_2^*, t_1^*)/\partial t_1$$

- This is negative if an increase in service 1's quality decreases usage of service 2 as one would expect if the services are competing in quality

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Measuring unilateral merger effects on the free side of a two-sided market

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Quantification of effects does not necessarily depend on being able to measure quality or privacy

- Effects can be quantified in a way similar to UPP

- One variation of UPP is the calculation of the cost efficiencies that eliminates the upward pricing pressure: compensate marginal cost reduction

- In this context we can similarly find the cost efficiency that eliminates the downward quality pressure (DQP)

- The post-merger profit function with incremental cost efficiency for service 1, Δ_1

$$[m_1(t_1) + \Delta_1]d_1(t_1, t_2) + m_2(t_2)d_2(t_2, t_1)$$

- The first-order condition of this with respect to t_1 evaluated at pre-merger levels of quality is equal zero if there is no incentive to change quality levels post-merger

$$\Delta_1 \frac{\partial d_1(t_1^*, t_2^*)}{\partial t_1} + m_2(t_2^*)\frac{\partial d_2(t_2^*, t_1^*)}{\partial t_1} = 0$$

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Downward Quality Pressure

- This first-order condition can be rearranged to an expression that looks very much like a UPP formula

$$\Delta_1 = m_2(t_2^*)D_{12}$$

where $D_{12} = -\dfrac{\partial d_2(t_2^*, t_1^*)}{\partial t_1} \Big/ \dfrac{\partial d_1(t_1^*, t_2^*)}{\partial t_1}$

- The critical efficiency as a proportion of service 1's margin would be

$$\Delta_1 / m_1(t_1^*) = D_{12} \, m_2(t_2^*) / m_1(t_1^*)$$

- Note that this is exactly the same formula you would get for a price effect except that the diversion here is from a change in quality rather than a change in price

- More details: http://waehrer.net/Merger%20effects%20in%20privacy%20protections.pdf

Is it really more difficult to estimate a diversion ratio for a quality change than a price change?

- Given the time, budget, and data for competition over prices, one could estimate a demand system econometrically
  - Need to measure quality in order to estimate a demand system for changes in quality

- However, we rarely have the time, budget, and data to do demand estimation

- In practice diversion ratios are derived in much cruder ways
  - Proportional to shares: $D_{12} = s_2/(1 - s_1)$, where s_i is service i's share
  - Data on customer churn or switching where the switching is not necessarily caused by price changes
  - Natural experiments involving discrete changes in product availability or price

- Seems reasonable that these methods could just as easily be used to derive a diversion ratio from a change in quality

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Exploitative abuse in the level of privacy

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Facebook

- Recent competition enforcement action in Germany
  - Facebook is dominant
  - Facebook's privacy protections violate German privacy regulation
  - The fact that as a dominant firm consumers cannot avoid the regulatory violation, the violation is regarded as an exploitative abuse of dominance

- In a competitive market, if all services similarly violate privacy regulations, consumers similarly cannot avoid the regulatory violation

- Are privacy protections a competitive instrument?

- If not, a perceived lack of privacy protections be an exploitative abuse of dominance

Is privacy really a competitive instrument for data-driven online services?

- Anecdotally firms that operate in competitive markets do not seem to be forced by competitive pressure to offer better privacy protections

- Barriers to competing on the basis of privacy protections:
  - Lack of transparency—consumers find it difficult to parse the details of user agreements
  - Implications of privacy policies not immediately evident from users' experience—implications of privacy protection can arise much later and in unanticipated ways
  - Behavioral economics issues?

- If privacy is not a competitive variable, we should not expect competition to solve privacy issues or competition policy to protect privacy
  - Other forms of regulation likely a better tool than competition policy

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