Digital Monopolies: Privacy Protection or Price Regulation?

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Introduction

Larger markets are better, all else equal, because they can execute the same trades as smaller, standalone markets, and sometimes execute more or more valuable trades.

- The full force of these increasing returns are evident in the rise of gigantic data-driven matchmakers
- We refer to these as **digital monopolies (DMs)**
- Like natural monopolies, DMs call for antitrust scrutiny and possibly regulation

Digital Monopolies and Policy Intervention

- DMs have recently received intense scrutiny from competition authorities, with calls for action ranging from consumer *privacy protection* to the dissolution of these firms
- Contrasting views:
  - distopian future (or present)
  - 'Golden Age of Music, Movies, Books, and Television" (Waldfogel 2017)
- *Privacy protection* sometimes portrayed as if it were a goal in and of itself
- But, of course, that's *not* how we usually think about regulation and intervention
  - *consumer surplus* (CS) or *social surplus* (SS) objective

Key Distinction

Does the DM use data to improve

- *matching* only

  or

- *matching* **and** *pricing*?

Key Results

- Fundamentally different implications for *consumer surplus (CS)* and *social surplus (SS)*:
  - *matching* **only**:
    - *CS* and *SS* both increase as privacy *vanishes*
    - consumers and society agree – no privacy
  - *matching* **and** *pricing*:
    - *CS* is maximized at interior level of privacy protection, while *SS* is maximal without *any* privacy protection
    - consumers want some, but not complete, privacy
    - society prefers no privacy

- *Disclaimer*: throughout, consider only
  - *private values* environments
    - whoever likes *AKB48 (Arashi)* is likely to enjoy being referred to *Nogizaka46 (TOKIO)*
  - no fraud or criminal behaviour

Privacy Protection or Price Regulation

- We show that *price regulation* outperforms privacy protection with respect to *CS*
  - allow personal data to be used for matching, but restrict use of personal data for pricing
- Everything *looking* new in the digital age does not imply we have to do away with all old-school economics
- In the digital age, may be able to implement price regulation by inspecting algorithms

Outline

- Model overview
- Results
- Policy Implications
- Investment
- Related Literature
- Conclusion

Model overview

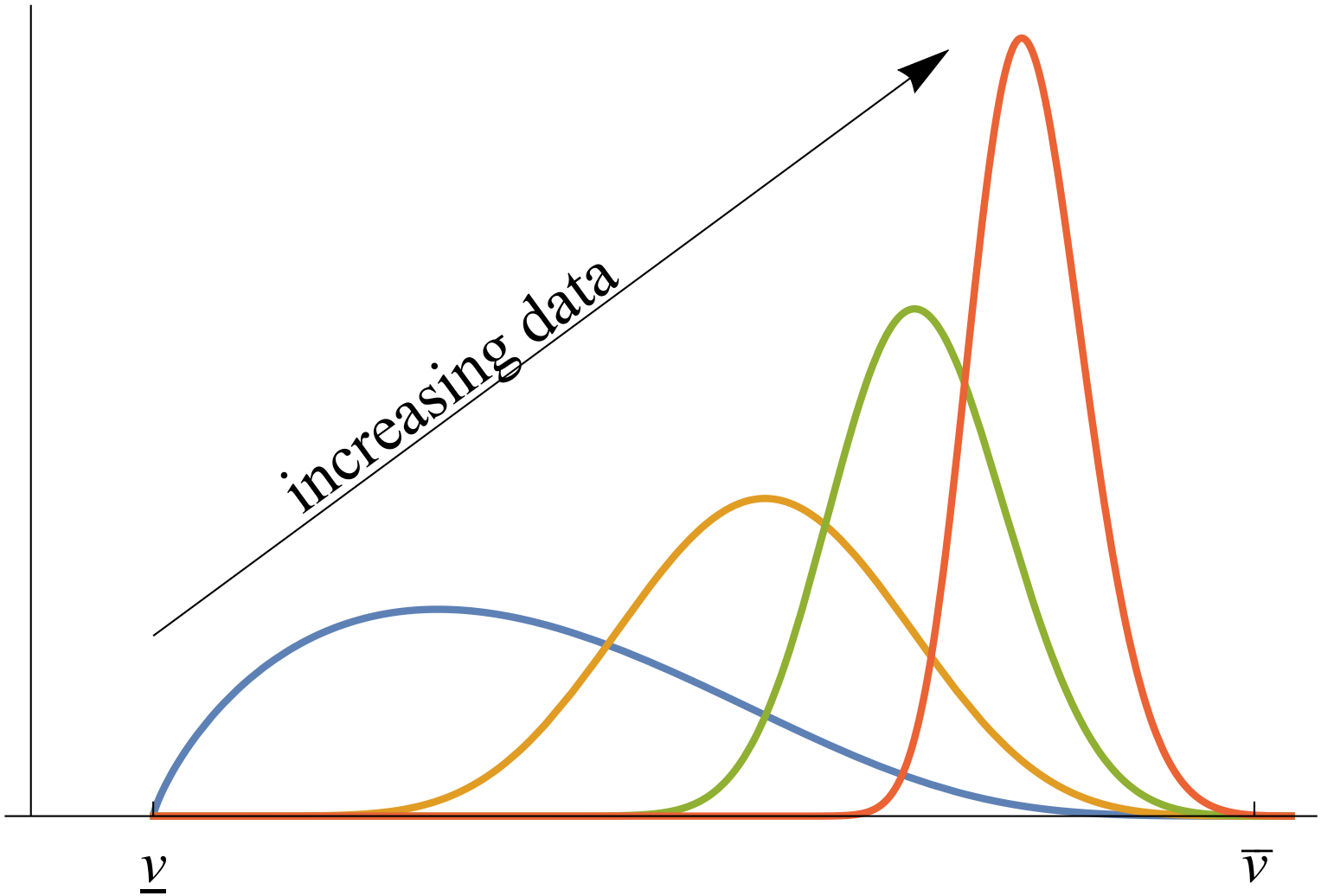
Model overview

- 1 consumer and 1 DM
- Both risk neutral
- DM is a seller: cost c to provide one unit of a good/service
- Consumer is a buyer: value v for one unit of a good/service
- c is common knowledge
- v is the consumer's private information (max value $\overline{v}$)

Data collection

- Distribution of the consumer's value depends on data
  - Assume an underlying distribution F on $[\underline{v}, \overline{v}]$
  - Given level of data n, consumer's value is drawn from F^n
- Increases in data correspond to higher match values and lower consumer privacy
    - DM offers what it estimates to be the highest-value product for the consumer given its data

Effects of increasing data



As data increases, better and more precise value distributions

Competitive effects

- Consider effects of increased data (reduced privacy) on:
  - DM's profit-maximizing price
  - DM's expected profit
  - consumer surplus
  - social surplus

Results

Effect of data on DM's optimal price

- If data are used only for matching (and not pricing), then consumers, the digital monopoly, and society all prefer maximum data
- Focus now on the interesting case, where the digital monopoly uses data for matching and pricing

Theorem 1

The DM's optimal price increases in the amount of data and goes to $\overline{v}$ as the amount of data increases.

- A reduction in privacy increases match quality *and* causes the DM to charge ever increasing prices to the consumer

Implications for consumer surplus

- Consumer surplus approaches zero when there is no data and when there is infinite data, so:

Corollary 1

Consumer surplus is maximized at an interior level of data.

- Consumers want some privacy, but not complete privacy

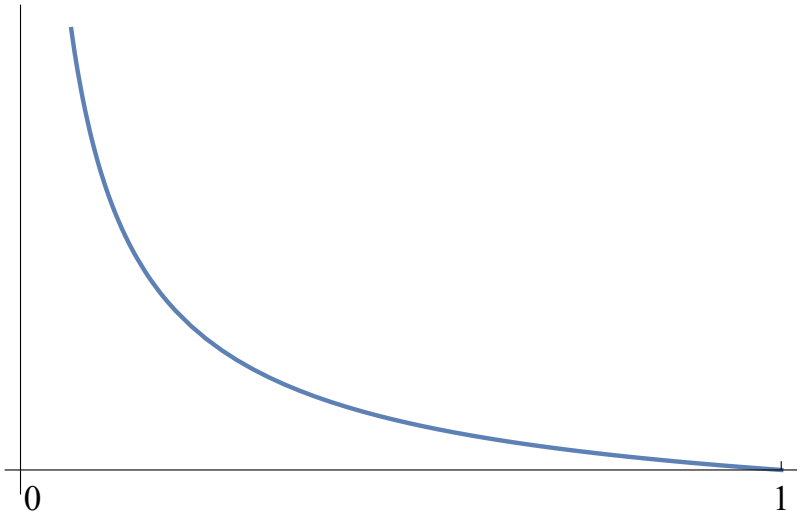
Policy Implications

Policy Implications

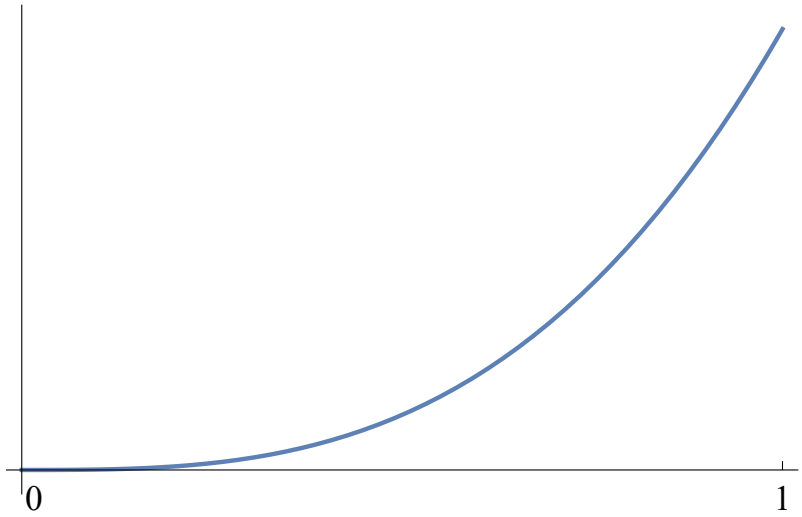
- Low levels of data: increases in data increase both consumer surplus and social surplus
- High levels of data: DM has an incentive to increase data collection; but the consumer wants to decrease data collection
- For high levels of data, a social surplus (and DM) perspective is in conflict with consumers' interests

Illustration

(a) Distribution of values: Low level of data



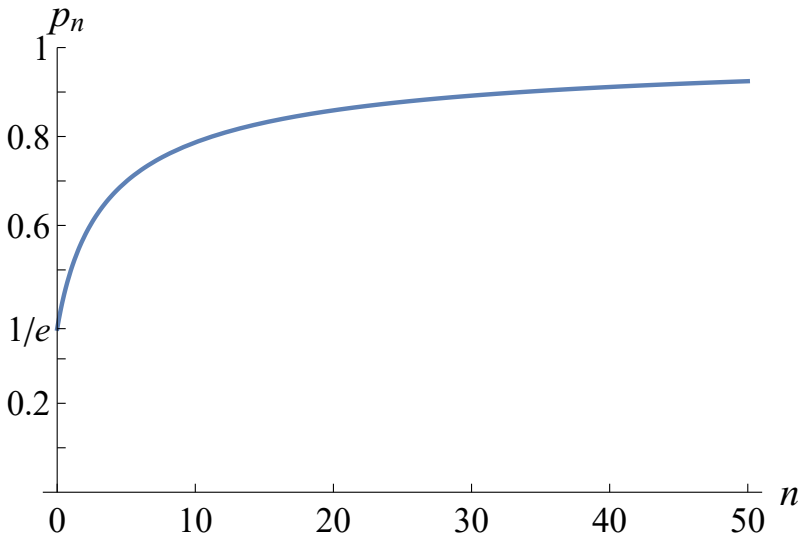
(b) Distribution of values: High level of data



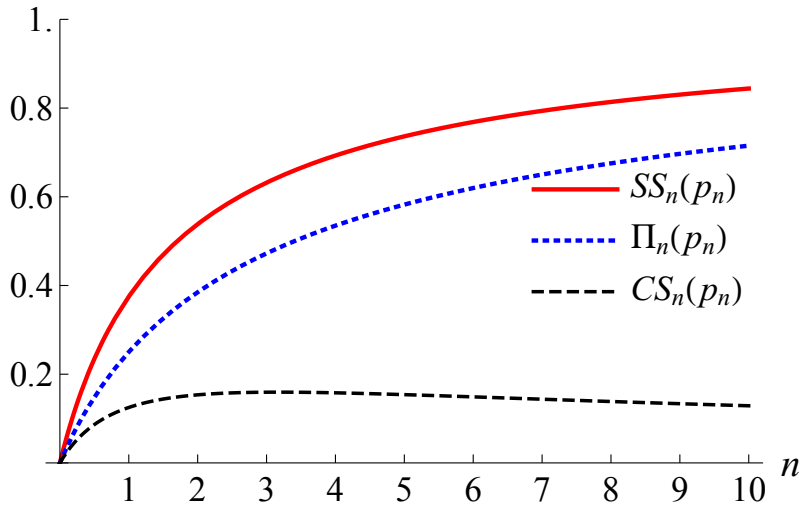
Assumes $F_n(v) = v^n$ and $c = 0$

Illustration

(c) Digital monopoly's price



(d) Consumer, producer, and social surplus



Assumes $F_n(v) = v^n$ and $c = 0$, which implies that $p_n = \left(\frac{1}{n+1}\right)^{\frac{1}{n}}$

Additional Results

- In the limit as data increases, the DM captures all of social surplus

- Further, for "standard" underlying distributions, as data increases, the DM maximizes social surplus (and captures all of it)

  (probability that the consumer's value is above the DM's optimal price goes to one as data increases)

Price Regulation

- Because the benefits from big data accrue disproportionally, and in the limit uniquely, to the DM, one could consider price regulation
- Ramsey pricing: set price to maximize a weighted average of the DM's profit and social surplus
- Unfortunately, Ramsey pricing does not solve the problem because, as data increases, the Ramsey price converges to $\overline{v}$ for any weights
- Consumers still get nothing in the limit

Alternative to Ramsey Pricing

- Alternative: set the price $\tilde{p}$ so that consumer's share of social surplus is constant:

$$CS_n(\tilde{p}) = \alpha SS_n(\tilde{p})$$

  where $\alpha \in (0, 1)$ measures the consumer's "fair" share
- Given α, defines a unique price
- Price decreases in α and is bounded away from $\overline{v}$ for $\alpha > 0$

Investment

Incentives to invest

- Now, study the DM's incentives to invest
- Consider two forms of investment:
  - data analytics
  - product quality

Investments in data analytics

- DM's expected payoff is increasing in the level of investment in data and data analytics
- Regulation that imposes a sufficiently low price reduces the DM's marginal incentive to invest in data analytics relative to a DM that is free to choose its price
    - For sufficiently low prices, marginal benefit from more data is increasing in price

Investments in data analytics

- For "standard" distributions, *any* binding price regulation reduces the DM's incentive to invest in data

Proposition 1

- Price regulation reduces a DM's marginal incentive to invest in data analytics if the imposed price is sufficiently low;
- For some distributions and costs, any binding price regulation reduces the DM's marginal incentive to invest in data analytics.

Product quality investments

- A DM can also improve match values by directly improving the quality of the product it offers
  - streaming giant Netflix has become a vertically integrated firm that produces a considerable amount of content in-house (Koblin 2017)
  - arguably, Netflix has an advantage in content production because of its access to viewer data—tailor content to customers
  - one source of the *Golden Age* documented by Waldfogel (2017)

Product Quality Investments

- Assume that the distribution of the consumer's value is improves with investment in product quality (first-order stochastic dominance shift)

Product Quality Investments

How do marginal incentives for investment vary with the level of data and the price?

Proposition 2

DM's investments in product quality and data analytics are strategic complements if and only if the product price is sufficiently high.

- For sufficiently high-priced products, allowing a DM to have more information on consumers can induce the DM to invest in increased product quality
- Potential drawback of price regulation: may eliminate the strategic complementarity between investments in high product quality and data analytics

Related Literature

Related Literature

- Privacy protection: Shelanski 2013, Acquisti-Taylor-Wagman 2016, Jullien-Lefouili-Riordan 2018, Goldfarb-Tucker 2019
- Coase Theorem: absent transaction costs, giving consumers ownership of their data might benefit consumers
- Lesson that emerges from the mechanism design literature (transaction costs derive from private information) is *not* that agents on one side of the market (say, consumers) should be given all the property rights
  - Myerson-Satterthwaite 1983: with extreme ownership structures, efficient incentive compatible and individually rational trade is impossible without running a deficit
  - In contrast, efficient trade may be possible with shared ownership structures (Cramton-Gibbons-Klemperer 1987, Neeman 1999, Che 2006, Figueroa-Skreta 2012)
  - Cautionary tale against idea that extreme ownership is optimal

Conclusions

Conclusions (1/3)

- Like natural monopolies, DMs arise because of increasing returns to scale
- Without limits on the use of data for pricing, DMs may reduce consumer surplus
- Privacy protection:
  - reduces, and in the limit eliminates, market power of DMs
  - also reduces, and in the limit eliminates, the social surplus created by DMs

Conclusions (2/3)

- Regulators should aim at protecting consumers' information rents rather than their privacy
- Price regulation may be preferable to privacy regulation

- Implementation
  - restrict use of data for pricing (but not for matching)
  - more work to be done

- Concern: may reduce incentives for investment in data analytics and product quality

Conclusions (3/3)

- Data for matching versus data for matching **and** pricing
- Consumer privacy versus consumer surplus

Thank you!