Economic Value of Google

Hal Varian
Chief Economist
Google

Google

Value of Google

- What I'm not going to do
  - Counterfactual estimate of world without Google
  - Alternative histories are like playing tennis with the net down
- What I am going to do
  - Attempt to quantify value of Google advertising and search in the US
    - Ads: value provided to advertisers, publishers, charities
    - Search: time saved by users
  - Inherently back-of-envelope

Google

Value of Google to advertisers

- Easy to determine how much advertisers pay, but need a model to estimate the value they get
- Standard model: profit maximization
  - v = value of a click
  - x = number of clicks
  - $c(x)$ = cost of clicks
- Goal of advertiser
  - Maximize $vx - c(x)$
  - Can include impression value, lifetime value, etc.

Google

What are alternative?

- Suppose advertiser is getting x clicks now and spending $c(x)$
- It could reduce its bid, get fewer clicks, $\hat{x}$, and spend less $c(\hat{x})$
- If it is profit maximizing $vx - c(x) \geq v\hat{x} - c(\hat{x})$
- Therefore *value per click must be greater than the incremental cost per click*

$$v \geq \frac{c(x) - c(\hat{x})}{x - \hat{x}}$$

Google

Intuition

- I could cut my bid and move down
  - Save some money
  - Lose some clicks
- If I don't want to move down, then the clicks I would lose must have a higher value than the money I would save
- (Similar inequality for raising bid and moving up)

But how do you know how many clicks you would get at new bid?

- If you are an advertiser you can experiment
- Or you can use Bid Simulator

Google

How does Bid Simulator work?

- If you decrease your bid, you move down in the rankings
- We can estimate how many clicks you get with same ad quality at the lower position
- We see how much you have to pay based on auction rules
- Get a pretty good estimate of “click-cost curve”

Rest of argument

- Get a lower bound on value from change in costs over change in clicks, v
- Plug into profit formula to get lower bound on profit at current operating position: $vx - c(x)$
- Calculate value/cost ratio $v\,x / c(x)$
  - value/cost ~ 2
  - ROI: (value – cost)/cost ~ 100%
- How can it be so large?

Go back to auction

- If auction is oversold (more bidders than slots) then competition for slots is intense and price is pushed up close to value
- If auction is undersold (more slots than bidders) then competition is much diminished
  - Last advertiser pays reserve price
  - Other advertisers pay just enough to beat the buy below them
  - Prices are a huge bargain

Google

In practice

- Only about 1/3 of pages have ads
- Average number of ads on those pages is around 4
- So for most pages, competition is not intense
- Virtually all advertisers would like to get more clicks at the same CPC they are paying now
- Constraint is the number of searches on their keyword

Google

Search clicks

- What value does Google provide to its advertisers?
  - Net value of clicks ~ cost of clicks
  - Organic clicks are about 5 times as large as ad clicks
  - Organic clicks may be worth a bit less in terms of conversion value
- Bottom line
  - Google advertisers get back about 7 times what they spend in value of ad clicks + organic clicks

Google

Other contributions to value

- Publishers get AdSense revenue share of 67% of the ad revenue
- Non-profits get value of search services provided to them
- Bottom line
  - Total value in US to advertisers + publishers + nonprofits = $54 billion

Google

Value of search to users

- How much is search worth to users?
- How much would you pay to give it up?
- See “A Day Without a Search Engine” by Yan Chen et al at Univ of Michigan
  - Hire students to answer questions using 1) Google, 2) Library
  - Compare quality of answers and time to answer
  - Bottom line: search engine has same or better quality answers, saves about 15 minutes per search (once you are in library)

Google

Answerable questions from queries

Answerable

[where in world is swine flu] → Is there a map where I can see where swine flu has been diagnosed?

[washington state scholarships] → What scholarships are offered in the state of Washington?

[statistical analysis] → What are common methods for performing statistical analysis on a dataset?

Not answerable

[Tv s hows on internet]

[Technet]

[TEACHER DAY MYSPACE COMMENTS]

Google

Details

- 2515 searches, yields 1420 (= 56%) that are “answerable using library”
- After duplicate elimination, end up with 356 searches
- Classified into Factual, Source, Web, Other
- 105 Factual and 251 Source converted to questions
- Library: reference room or library stacks; can consult reference librarian two times
- Rate answers using 3 raters and take average

Google

Summary

- 99% answered in web treatment, 90% in library treatment
- Web searches averaged 7 minutes, library searches averaged 22 minutes
- Top library sources: electronic card catalog (72%), ready reference (13%), telephone directory (9%)
- Quality of answers is about the same
- Students prefer web search

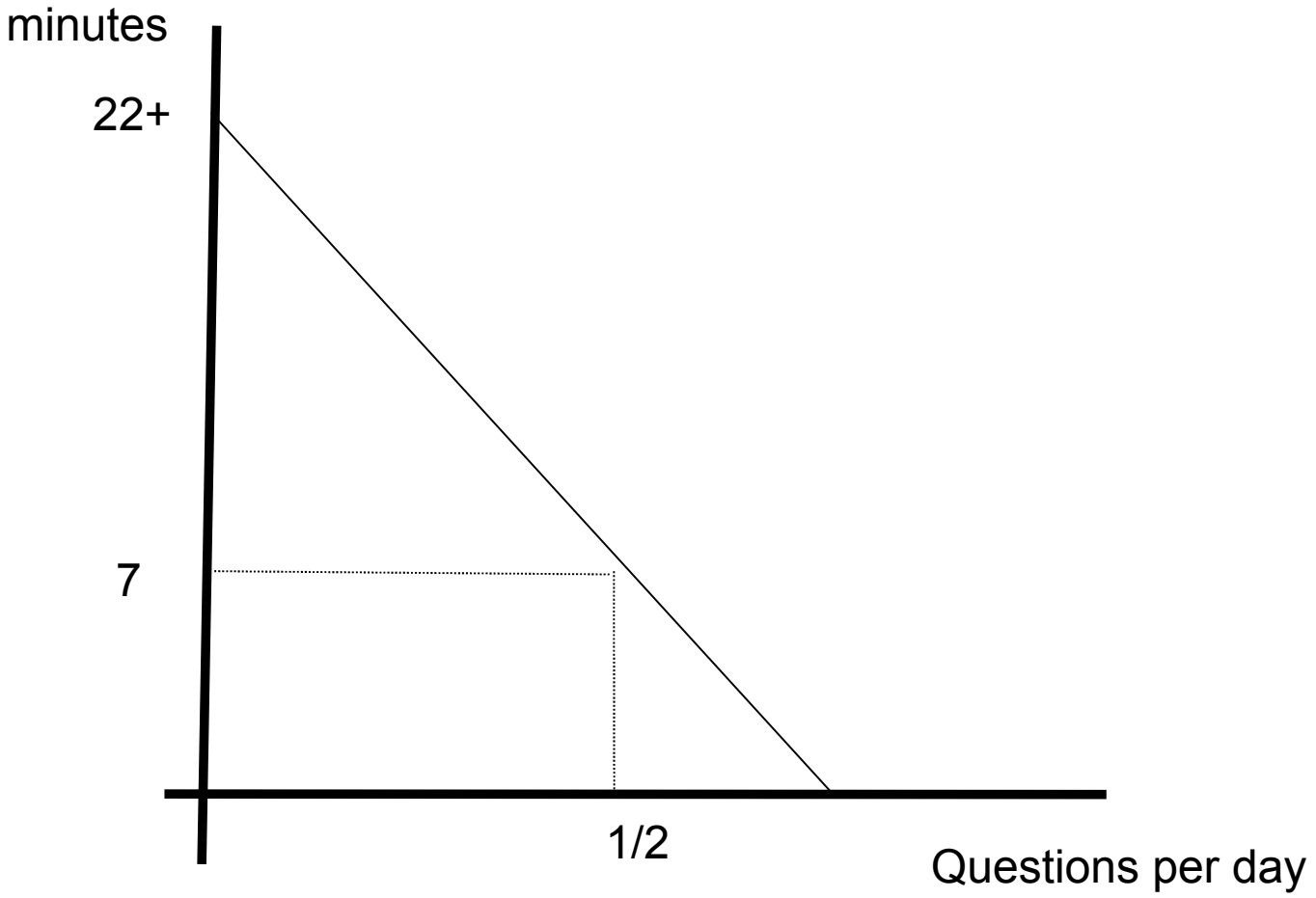
Google

Back of the envelope calculation

- Summary
  - Time using library treatment = 22 + travel
  - Time using web = 7
  - Questions per day now = 1 per capita
  - Answerable questions per day = ½ per capita
  - Questions per day then = close to zero
- Problem
  - When getting answers was expensive we asked few questions
  - Now that getting answers is cheap we ask a lot of questions

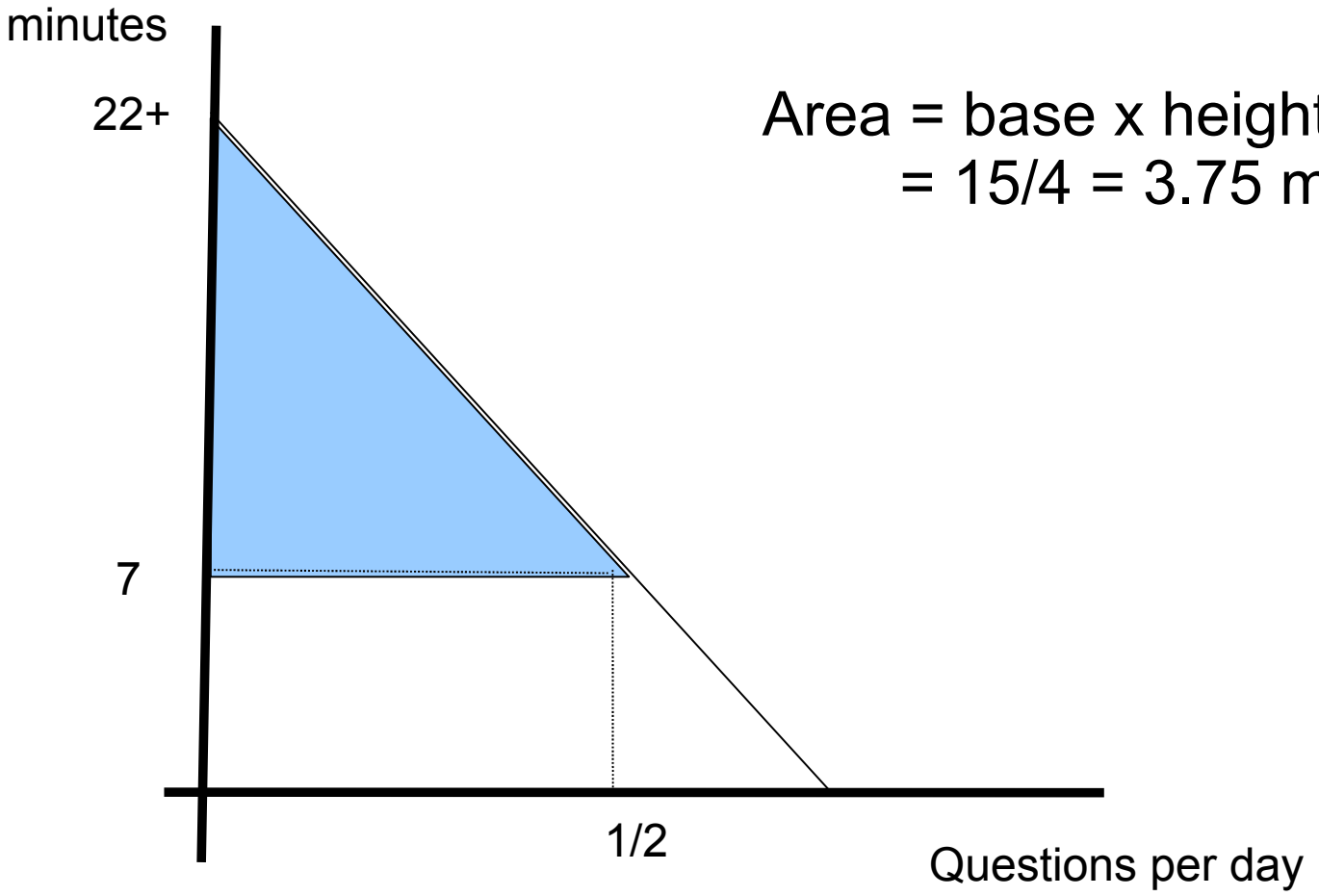
Google

Demand curve for questions



Google

Consumer surplus



Area = base x height/2
= 15/4 = 3.75 minutes

Google

Convert to dollars

- Per person
  - Average hourly earnings = $22
  - Save 3.75 minutes per day = $1.37/day
  - 365 days in a year = $500
- How many users?
  - 130M people employed
  - 130M x 500 = $65B
  - 300M population
  - 300M x 500 = $150B

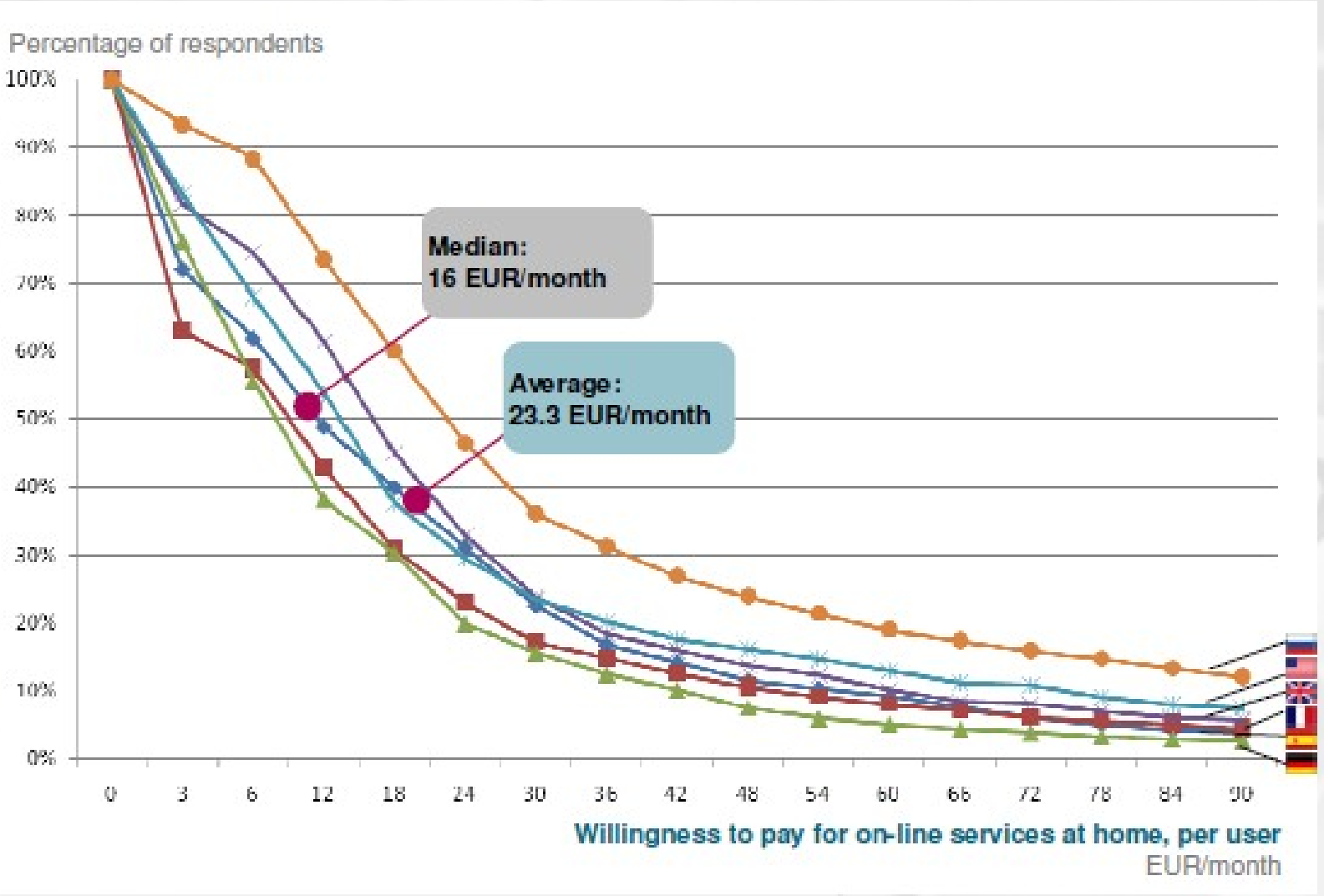
Other work

- Litan and Varian
  - Estimated contribution of Internet to productivity in US using survey responses
- Jacques Bughin IAB/McKinsey
  - Uses “contingent valuation” techniques to estimate value at home of ad-supported applications in Europe + US: $100 B
- Boston Consulting
  - Estimates contribution of internet industries to GDP in Europe

Google

On-line services usage value

Eur/month



SOURCE: IAB/McKinsey White Paper on Consumer Benefits of Online Advertising

Google

Summary

- Value to advertisers + publishers ~ $54B
- Value to users in time saved ~ $65B
- Value of ad-supported applications in US ~ $25B
- Leaves out
  - Cost of trips to library
  - Unanswerable searches
  - Value to non-employed
  - Value of better matched purchases
  - Entertainment value
  - Improved decisions
  - Etc, etc, etc.

Google