Innovation and Technology Adoption in Health Care Markets

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Motivation

- New technology is a driving force behind growth in health care spending
- How do we value new technologies?
  - “Cost-Effectiveness” used around the world
- How is this value divided between patients and producers?
- Current vs future patients, not patients vs industry
- Implications of adopting new technologies based on “cost-effectiveness” analysis

Cost-Effectiveness Globally

- European Union
  - "Fourth hurdle" –Prior to 1993, few countries had agencies responsible for economic assessments of new medical products
  - Now, majority do (Drummond, 1991; OECD, 2001; Cookson et al., 2003)
    - Used for reimbursement decisions, price negotiations, and formulary inclusions
- United Kingdom
  - NICE advises NHS who spends about 90% of all care
  - Threshold for adopting new technologies by NICE appears to be ~ $60,000 per QALY (Raftery et al., 2001)
- Australia
  - First country to require pharmacoeconomic assessments of all new drugs submitted for national coverage
  - By 2001, only 2 of 26 new submissions were accepted whose cost per QALY exceeded $57,000 (Bethan et al., 2001)
- "Comparative-effectiveness" movement in the US

Cost-Effectiveness and Dividing the Gains from Innovation – *I-Pods*

- Initial price ~ $200
- Some individuals *willing to pay* more than price
  - Average WTP among consumers > $200, say $ 600
  - Suppose cost of production is $100
- Avg. Consumer gain = $400
- Avg. Producer gain = Profit = $100
- Social Gain (Consumer + Producer) = $500
- CEA
  - More cost-effective if price closer to cost
- Key Tradeoff: No I-pod vs an initially more expensive one - not expensive vs cheap

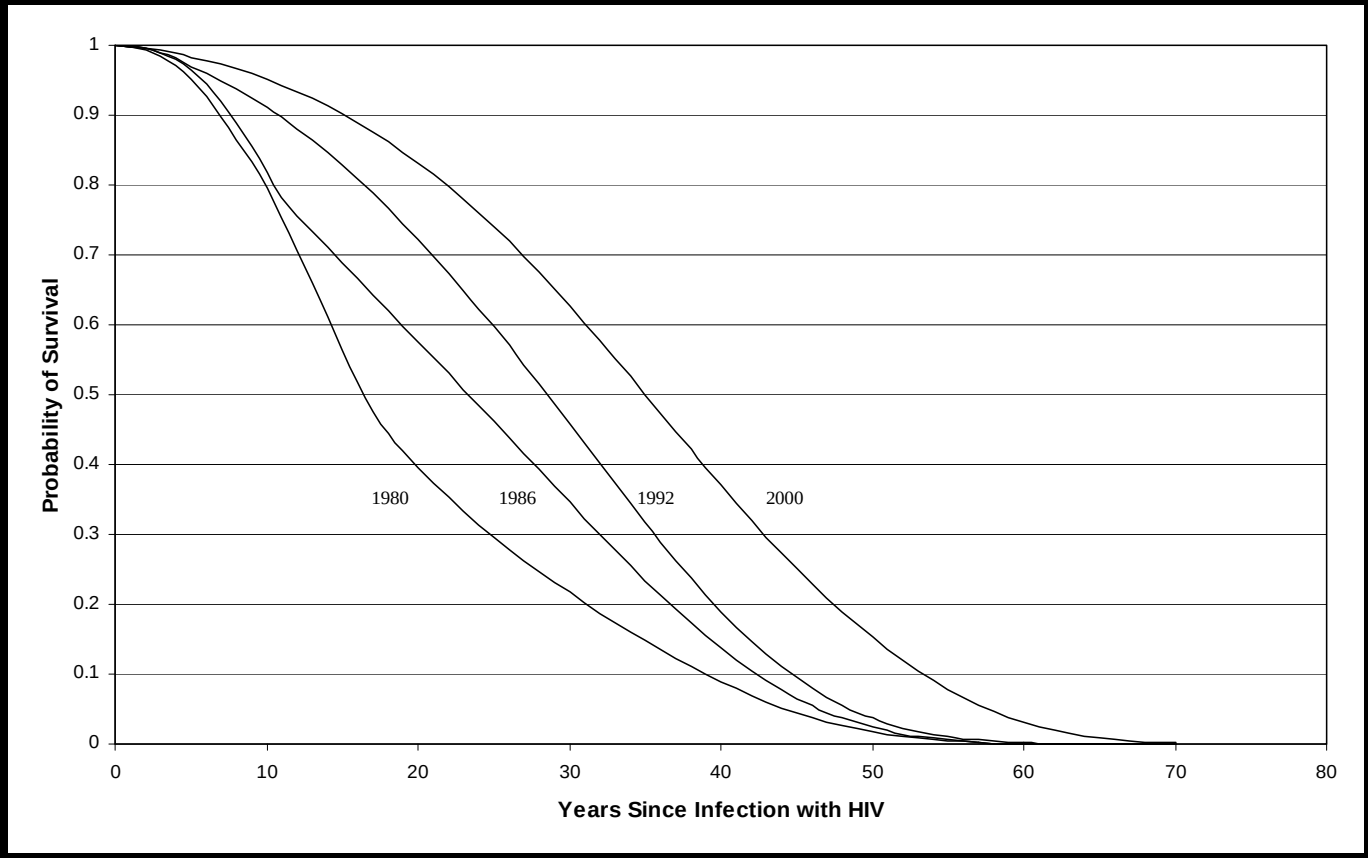
Division of Gains Matters

- *Short Run*: Large value going to consumers is usually optimal because it reflects competitive pricing
- *Long Run:* To undertake significant R&D for medical products, innovators need to be motivated by profits
  - Evidence on R&D and Profits
    - Large and rich diseases generate more R&D
    - R&D respond to profits directly (e.g. Orphan Act in US)
  - Rationale for patent system
  - Static vs dynamic efficiency
  - Pro-patents is often anti-CEA

Cost-Effectiveness and Innovation

- Highly cost-effective technologies are those whose value largely accrues to consumers
- Adoption based on CE may lower innovation if only the most CE technologies are adopted
- *Key Issue*: Do innovators already possess sufficient incentives for innovation?
  - Case study of HIV/AIDS
  - Generalizing results to other new technologies

Dividing the Gains in HIV/AIDS



Dividing the Gains in HIV/AIDS – Overview

- Need to monetize the estimated gains in survival
  - The concept and estimation of “value of a life”
  - Value of a life-year exceeds income – leisure!
  - 1.5 million infected to date x 5 year increase in life expectancy across all cohorts $100K → $750 billion already!
  - Incorporating future cohorts → above $1 trillion
- Need to estimate profits to innovators
- Assess how gains of new technology accrue to patients versus innovators

Valuing the Gains in HIV/AIDS Survival – Details

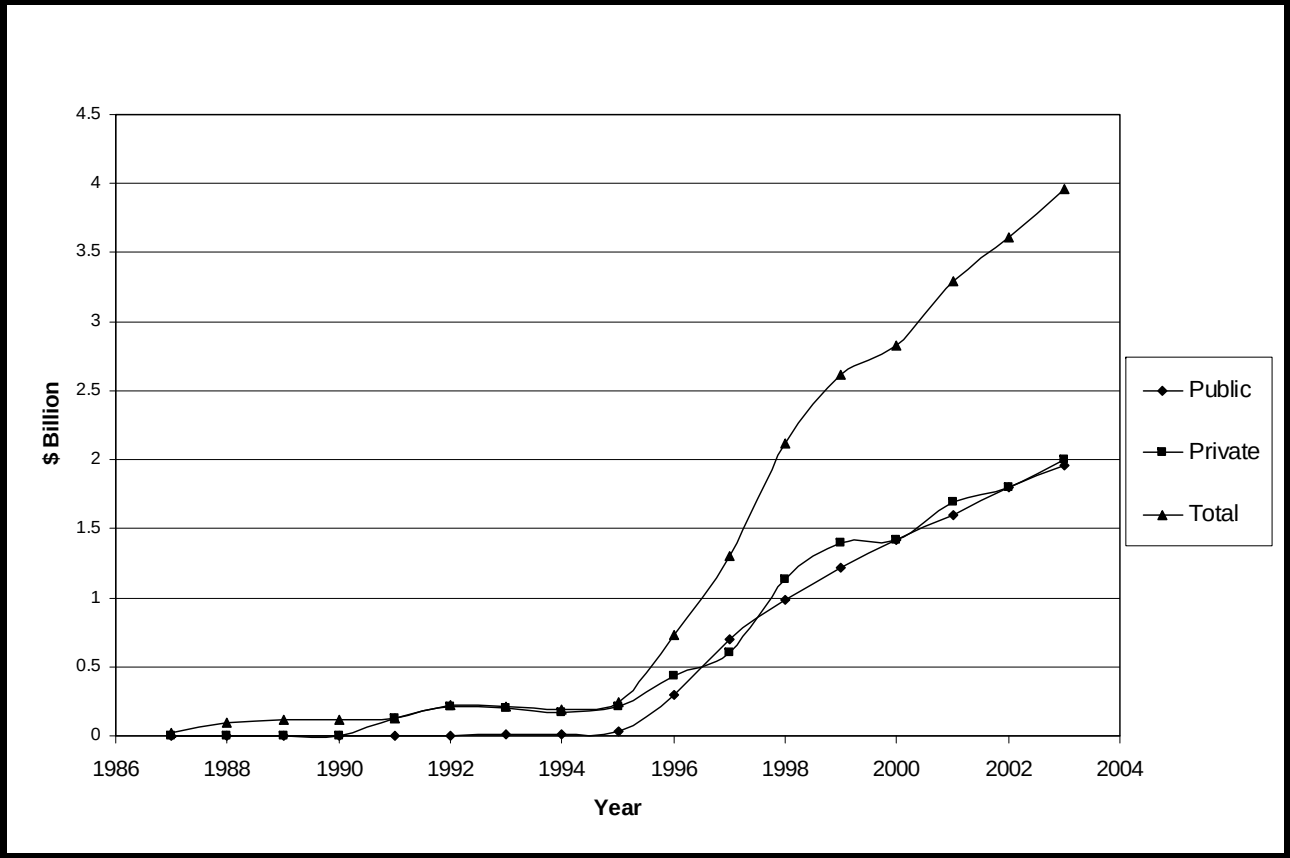
		Value of Survival Gains ($)	
Year of HIV Infection	HIV Incidence	Individual ($)	Aggregate ($ Billion)
1980	20,000	17,655	0.35
1984	160,000	116,156	18.59
1988	80,000	250,284	20.02
1992	40,000	383,328	15.33
1996	40,000	696,951	27.88
2000	40,000	740,515	29.62
Total Discounted Value (Year 2000 $ Billion)			398

All figures are discounted to 1980 and are in year 2000 dollars.

Calculating the Gain to Producers

- Gain to producers = profit

Spending on HIV/AIDS Drugs



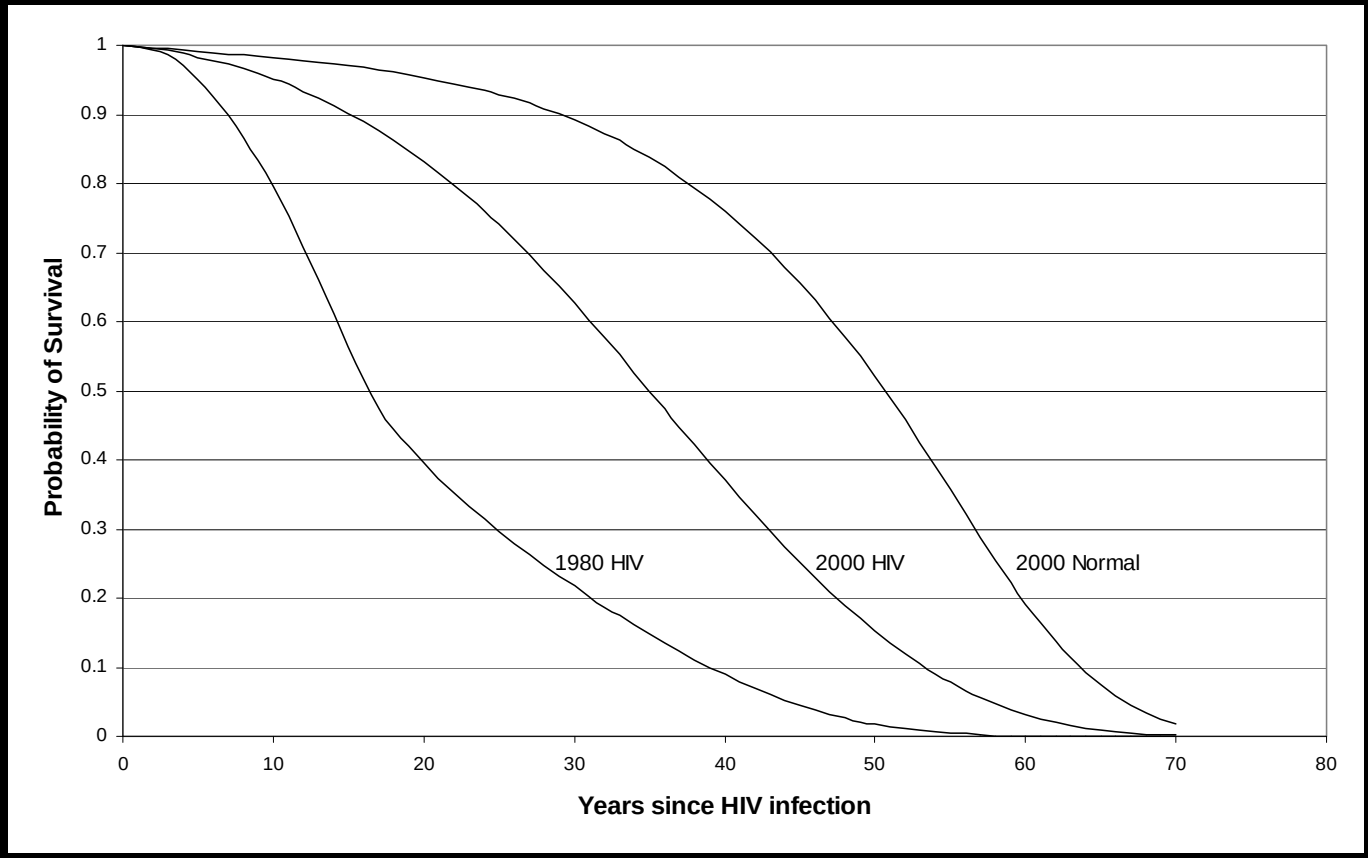
Calculating the Gain to Producers

- Gain to producers = profit
- Estimating profits from HIV/AIDS drugs
  - Use estimates of production costs from generic prices to calculate sales mark-up
  - Estimated lifetime sales ~ $74 billion
  - Estimated lifetime profits ~ $63 billion

Putting It Together

- Aggregate value of improvements in HIV/AIDS survival – $1.4 trillion
- Profits – $63 billion
- About 5% of social value arising from HIV drugs is captured by innovators

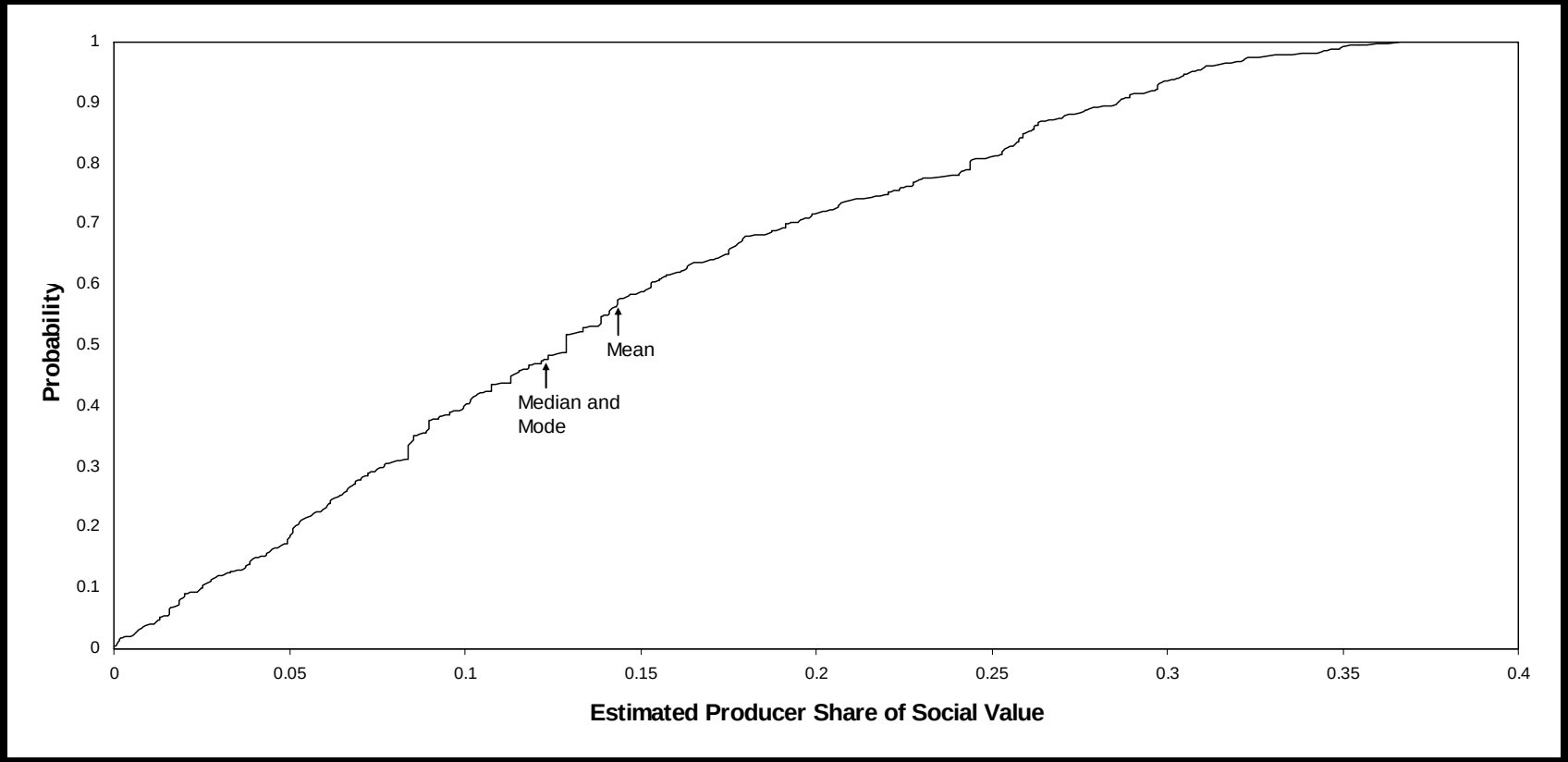
How Much Value is Left in a Cure? $1.5 trillion



Generalizing Results from HIV/AIDS

- Is appropriation in HIV/AIDS an anomaly?
- Link between how cost-effective a technology is and division of gains
  - More cost-effective technologies → more gains to consumers
  - Multitude of existing CE studies implicitly tell us how gains are divided!
    - Tufts CE registry – over 200 CE studies

Dividing the Gains from Medical Technologies



Concluding Remarks

- Dynamic vs static efficiency
  - Patents
  - Technology adoption based on CEA
- Main question raised by our study
  - Are innovators under-motivated?
    - E.g. HIV/AIDS – Is 5% too low?
- Broader research agenda
  - How can CE thresholds in place in several European countries (and implicitly argued for in the US) be used to strike the right balance?
    - Dynamic CE analysis