An Economic Theory Masterclass

Part XI: Implicit Markets

Lones Smith

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Implicit Markets

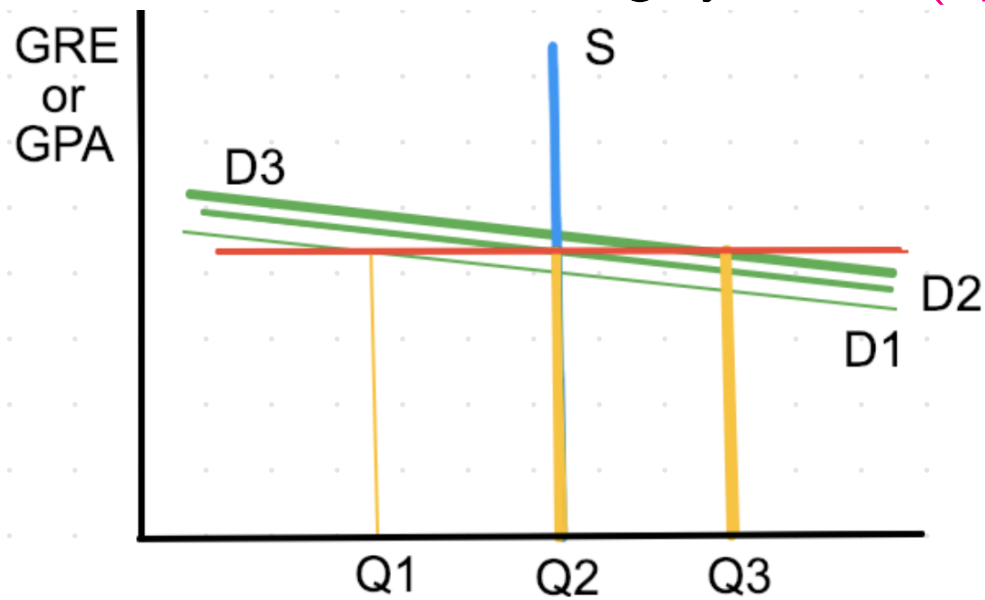
- *Economics explains almost all variation in behavior by changing prices or supplies*
  - Changing tastes is not a great explanation in economics
- In an implicit market, something other than an explicit monetary price clears market
- Research Query: Frequent flyer points are a currency of value to consumers, that is traded by airlines and rental firms,

Exam Optimization: Time is the Constraint

- My very first Gary Becker HW: "You're in an exam. You have two many questions to answer in the time allowed. Characterize which questions you answer, and how much time you allocate."
- Me:

College Admissions as an Implicit Market (joint work)

- *Stockout chance is often the price.* College admissions!
  - For college admissions, the admission bar is an intuitive price
  - The price formally offers a lower "price" to better students.
  - This price is not in tradable utility $\Rightarrow \nexists$ welfare theorem
- Chade, Lewis, and Smith (2014), "Student Portfolios and the College Admissions Problem" model this with two colleges
- Empirical fact: Without waitlisting, acceptance bar mistakes can lead to massive changes in acceptance rates.
  - 2017: UC-Irvine unadmitted 499 students
- Conjectured demand curves are highly elastic (open problem!)



Genoese Rollover Lotteries: Powerball and Megamillions

- *Expected loss is the price in gambling markets.*
- A *classic lottery* has a unique winner with a fixed prize.
- In a Genoese lottery, people pick their own numbers: If no one wins, the prize rolls over; if many win, the prize is shared.
- Buy ticket for $p = \$2$
- Pick five numbers from 1 to 69 and one number from 1 to 26
- Guess all 6 numbers correctly (1 in 292,201,338) $\Rightarrow$ jackpot
- If nobody wins jackpot in draw $n-1$, it gets rolled over to draw n

$$J_n = J_{n-1} + (1-\tau)pQ_n$$

  where τ is the tax rate and Q_n is tickets sold (twice weekly)
- When ties happen, the jackpot is shared equally

Demand and Supply for Lottery Tickets (joint work)

- Risk neutral quasi-linear story: People buy lottery tickets if

$$\text{thrill from gambling} + \text{expected winnings} > p$$

- ticket "price" is expected loss $\lambda = p -$ (expected winnings)
- *inverse demand* $\Lambda(Q)$ is the thrill of Q'th ticket sold
- Inverse supply curves $L(Q)$ of losses for Q tickets sold
  - Classic lotto for a fixed jackpot J: $L(Q) = p - J/Q$
  - In a Genoese lottery, people pick their own numbers
  - Assume secondary prizes w, win chance α, and tax τ.
  - Lemma: The inverse supply curve is:

$$L(Q|J) = p - w - [J/Q + p(1-\tau)][1 - e^{-\alpha Q}].$$

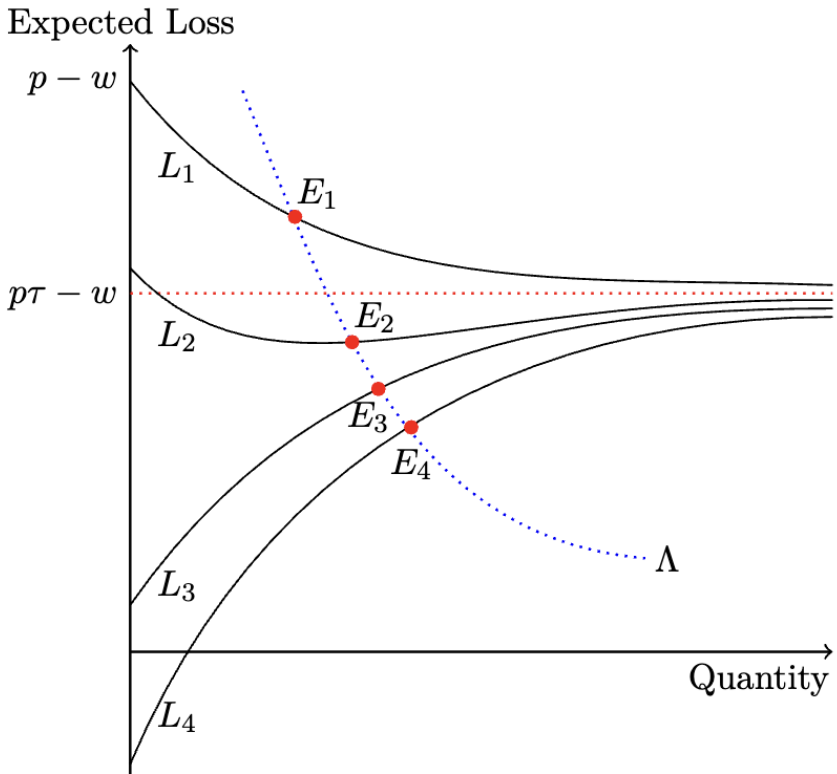
    - Proof: Expected winnings per ticket equal w plus the expected per-ticket jackpot winnings, namely $J + p(1-\tau)Q$ times the chance $1 - e^{-\alpha Q}$ that the jackpot is won this draw
  - Higher jackpots J (eg. rollovers) shift the supply curve down
  - When J rises, do so many more buy tix that losses hold fixed?

Lottery Equilibrium

- A *lottery equilibrium* for jackpot J is an *equilibrium quantity* $\mathcal{Q}(J)$ where inverse supply equals inverse demand $\Lambda(Q)$:

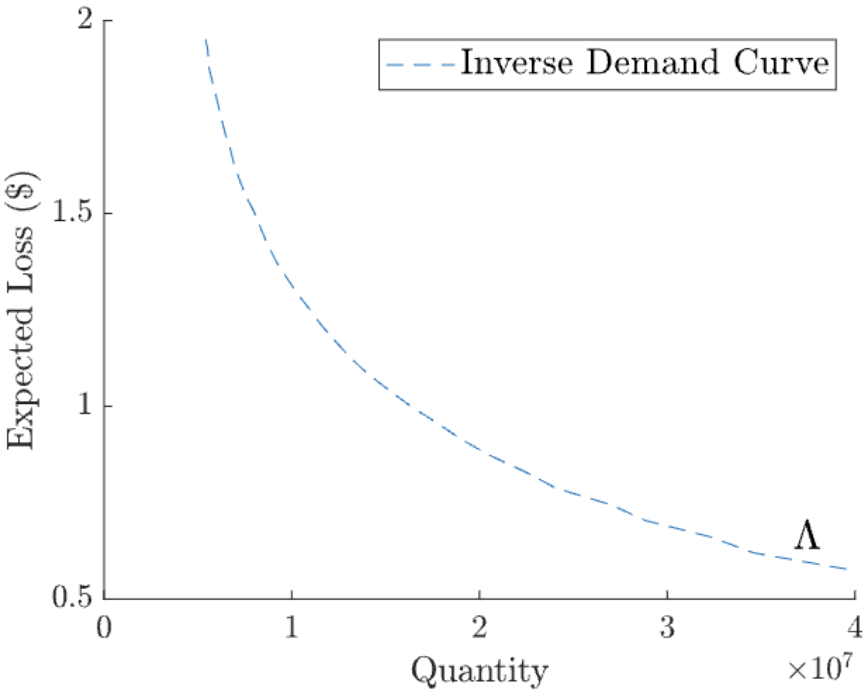
$$L(\mathcal{Q}(J)|J) \equiv \Lambda(\mathcal{Q}(J))$$

- Rational expectations equilibrium: buyers must anticipate Q
- Rollovers shift the supply curve down, identifying demand
- New ticket buyers have a lower lotto thrill (winnings rise)
- inverse supply curves $L_i = L(\cdot|J_i)$ for $J_1 < J_2 < J_3 < J_4$

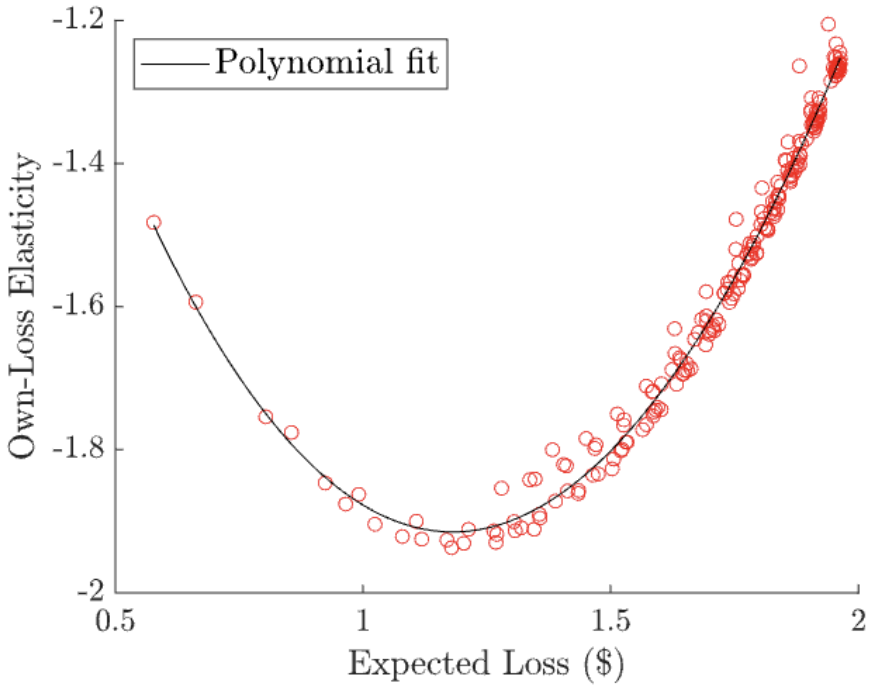


Inverse Demand Curve & Own-Loss Elasticity for Powerball

(a) Inverse Demand Curve

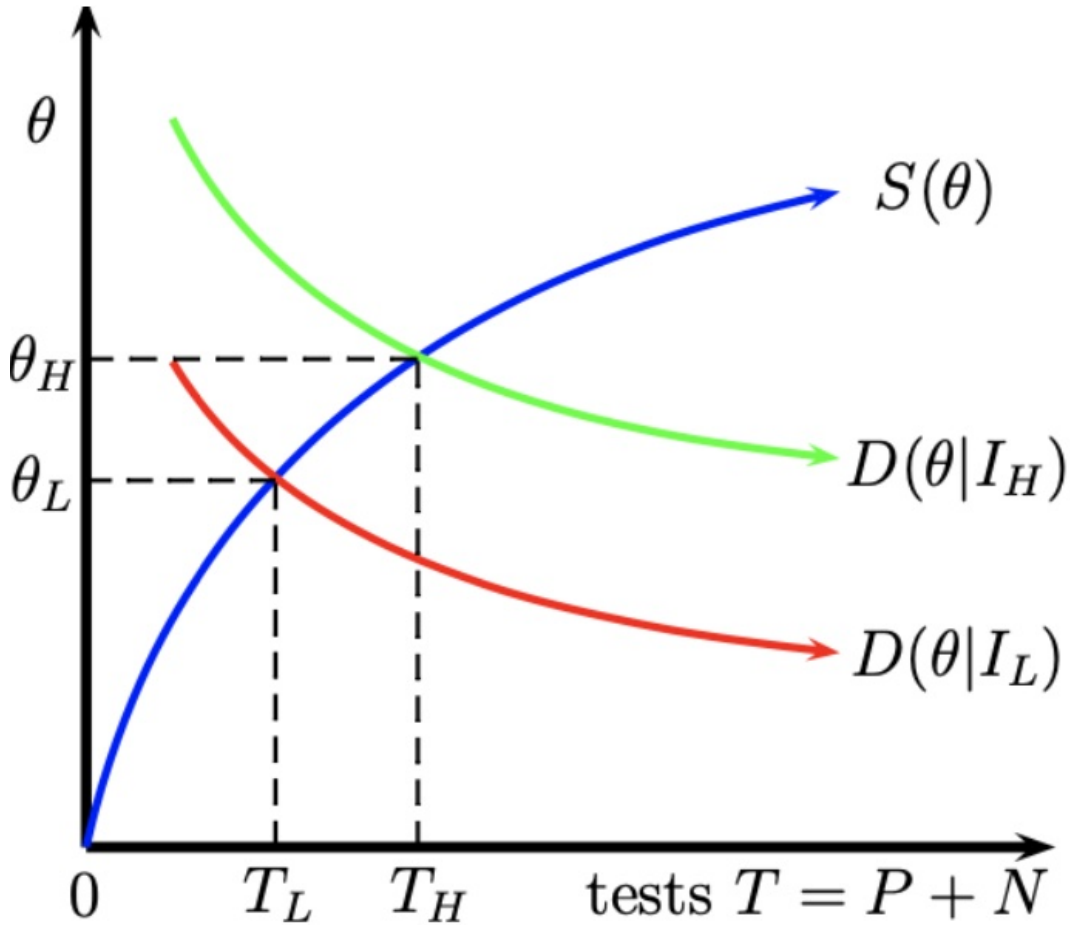


(b) Elasticities



The Testing Market and Hassle Cost (joint work)

- *Queuing hassle cost θ is the price to get tested for COVID*
- Demand rises in infection levels I (more have bad symptoms)
- Supply $S(\theta)$ is increased in response to more expected demand
- Corollary: Positivity (truly infected % of tested T) rises in I
- The question and solution (Prelim, 2022) is posted on canvas!



Other Implicit Prices:

- To guard against crime auto accidents, people incur a vigilance cost (distracted driving)
- To guard against crime, people incur a hassle cost & vigilance
- My implicit market for Malibu: Healthy dog food is cost of yummy food.

"You keep on learning and learning, and pretty soon you learn something no one has learned before"

- Richard Feynman

Have a Great Exam! Come Back & See Me!

(me & you ↑)