

Economics of Networks

Network Effects: Part 1

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Agenda

Externalities

Network effects and markets

- Tipping Points
- Competition and Lock-in
- Labor markets

Suggested Reading: EK Chapter 17

What is an Externality?

A consequence of economic activity that is not reflected in market prices

- Typically spillover effects on third parties

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Absence of pricing is key: Rival goods \neq externalities

- If I buy a can of coke, you cannot drink it
- If I paid what it costs to replace the can, there is no externality

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What about positive externalities?

- Vaccines
- Education
- Research

Problems with Externalities

Supply and Demand

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Policy responses:

- Taxes and subsidies (“internalize” the externality)
- Direct regulation
- Selling/auctioning pollution rights (allow secondary market)

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Good policy needs to anticipate how people respond

- Think about congestion pricing plans

Network Effects

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Artificial network effects

- Referral programs

Markets for Network Goods

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If mass $q \in [0, 1]$ purchase the product, type v values it at qv

- Network effect: more valuable if more people buy
- At price p , net benefit $qv - p$

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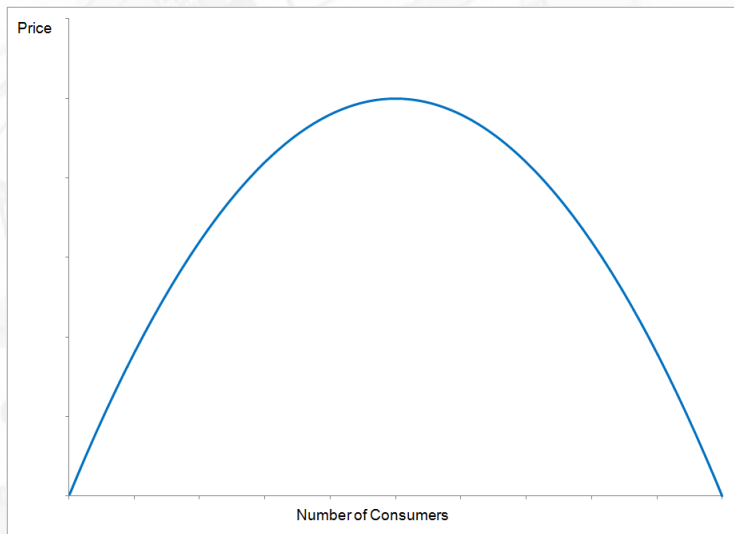
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In equilibrium: $1 - q = \frac{p}{q}$

Equilibrium Demand



A Funny Demand Curve

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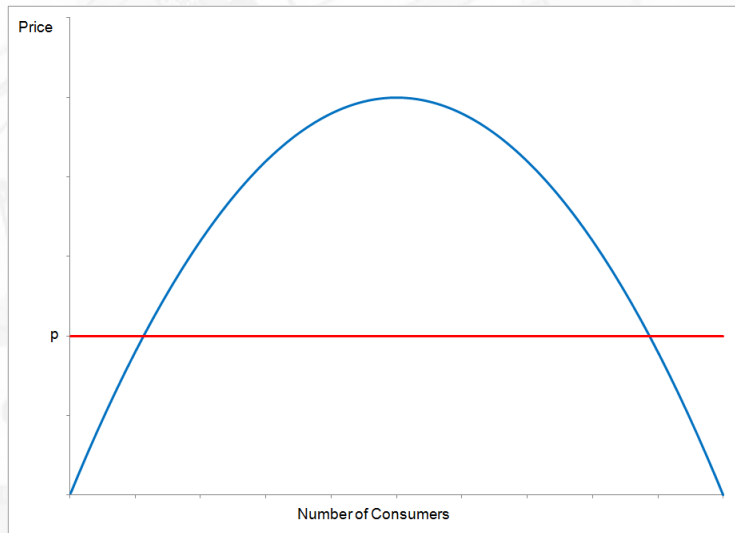
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Implication: multiple equilibria

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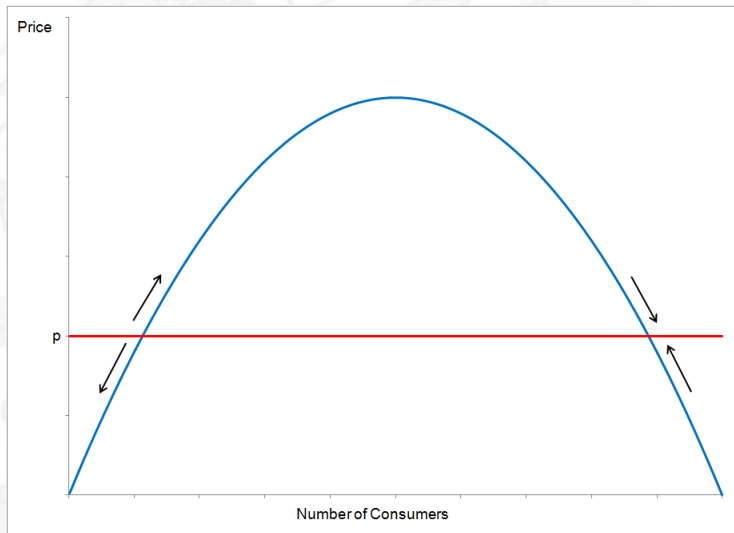
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Let's think about myopic best response dynamics

- Consumers buy in each of many periods
- Observe how many bought last period
- Which equilibria are **stable**?

A Dynamic Adjustment Process



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High equilibrium and non-adoption are stable

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Pure network goods face barriers to adoption

- Cold-start problem
- Examples?

A Simple Market with Competition

Two products, A and B , compete for adoption

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When customer t arrives, $N_A(t)$ chose A and $N_B(t)$ chose B

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Type of customer t is random

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Which product do they choose?

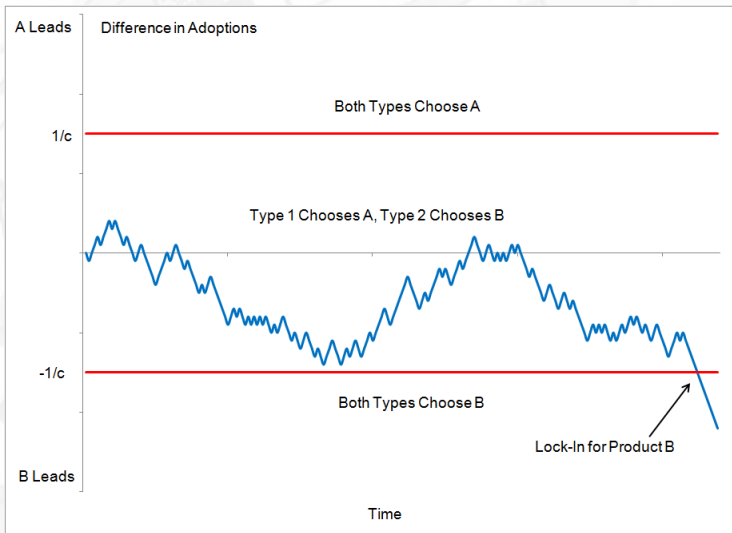
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Which product do they choose?

What does the next customer do?

Lock-In



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Historical examples:

- The QWERTY keyboard
- Microsoft Windows
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Network effects can lead to “winner-take-all” markets

- Best technology doesn't always win

Network Effects in the Labor Market

Old idea in economics: geographic concentration of firms related to geographic concentration of skills

- Why would we have a geographic concentration of skills?

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Consider a two-period model with a large population of workers and firms

- Assume one worker per firm

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With probability $q \in [0, 1)$, each worker and firm separate after period 1

- Separated firms and workers rematch at random for period 2

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Consider an extension with two regions in different equilibria

- A new entrant that wants to use the new technology will choose the region with more adopters

Network Effects in Residential Choices

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Consider academic peer effects: children's education is affected by their classmates

- Parents who care about education may move for a more desirable peer group

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Utility of agent i is $U_i = w_i - c_i - r_i$

- Wage w_i
- Cost of education c_i
- Cost of rent in chosen neighborhood r_i

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Cost of education depends on fraction x of high-skill agents in one's neighborhood

- Cost $c_H(x)$ to become high skill, cost $c_L(x)$ to become low skill
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Since agents are ex ante identical, we have the equilibrium condition

$$U_i(L) = U_i(H)$$

Agents are indifferent between becoming high-skill or low-skill

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Assume the labor market is city-wide, perfectly competitive, and exhibits constant returns to scale

- If ratio of high to low skill workers H/L is high, then ratio of wage rates w_H/w_L will be low
- Ensures equilibrium will include a mixture of types

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Assume there are two neighborhoods in the city of equal size

- Individuals compete in the housing market to locate in one neighborhood or another

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Key observation: only segregated equilibrium is stable under myopic best response dynamics

- Starting from an integrated equilibrium, what happens if we move a fraction ϵ of high-skill agents from neighborhood 1 to neighborhood 2?

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Next time: local network effects