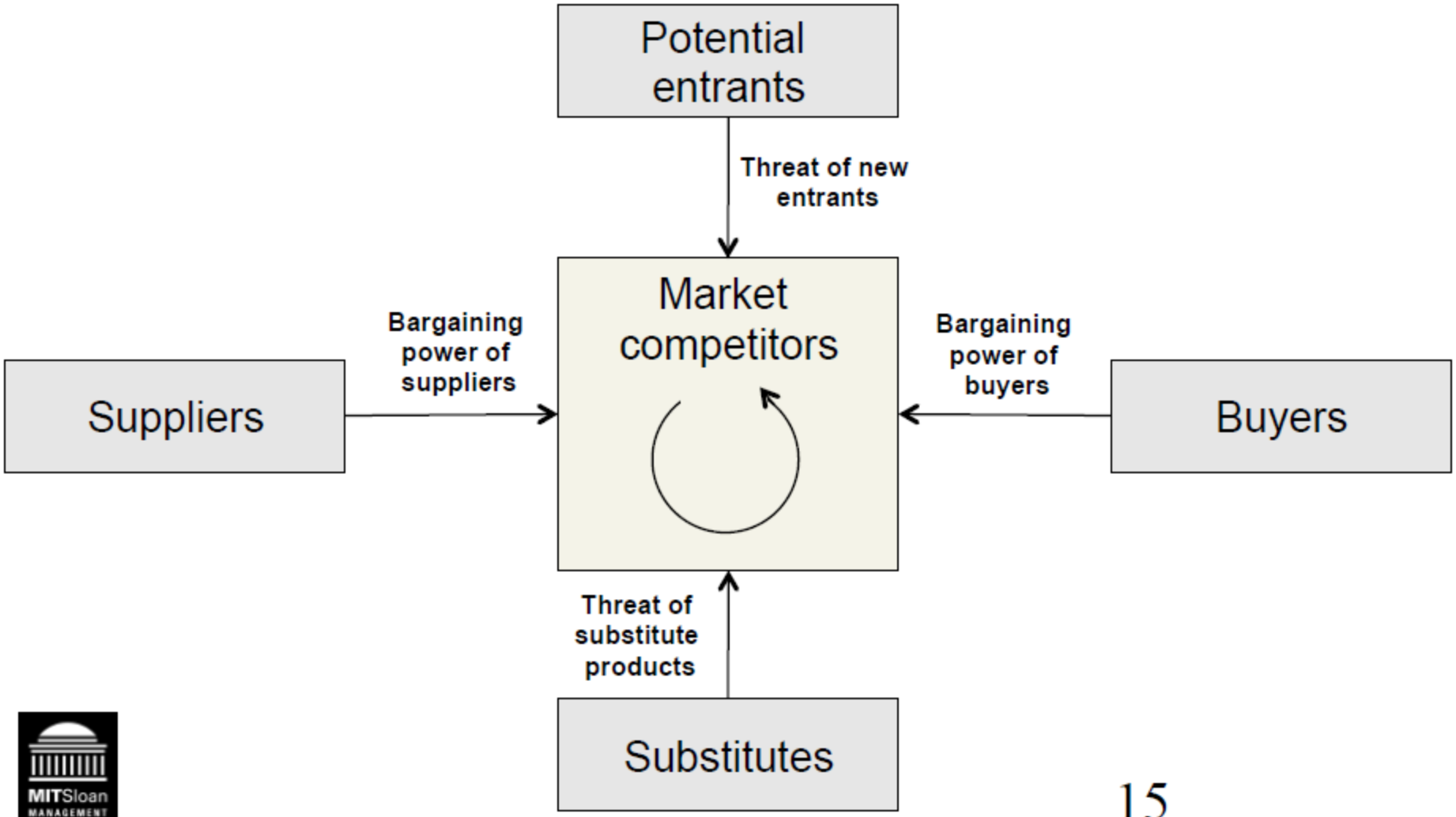
Lecture 9
Network Economics I:
Network externalities

15.011/0111 Economic Analysis for Business Decisions
Oz Shy

Porter's 5 forces: One systematic way to evaluate competitive threats (that make an industry "unattractive")



MITSloan MANAGEMENT

15

Network externalities

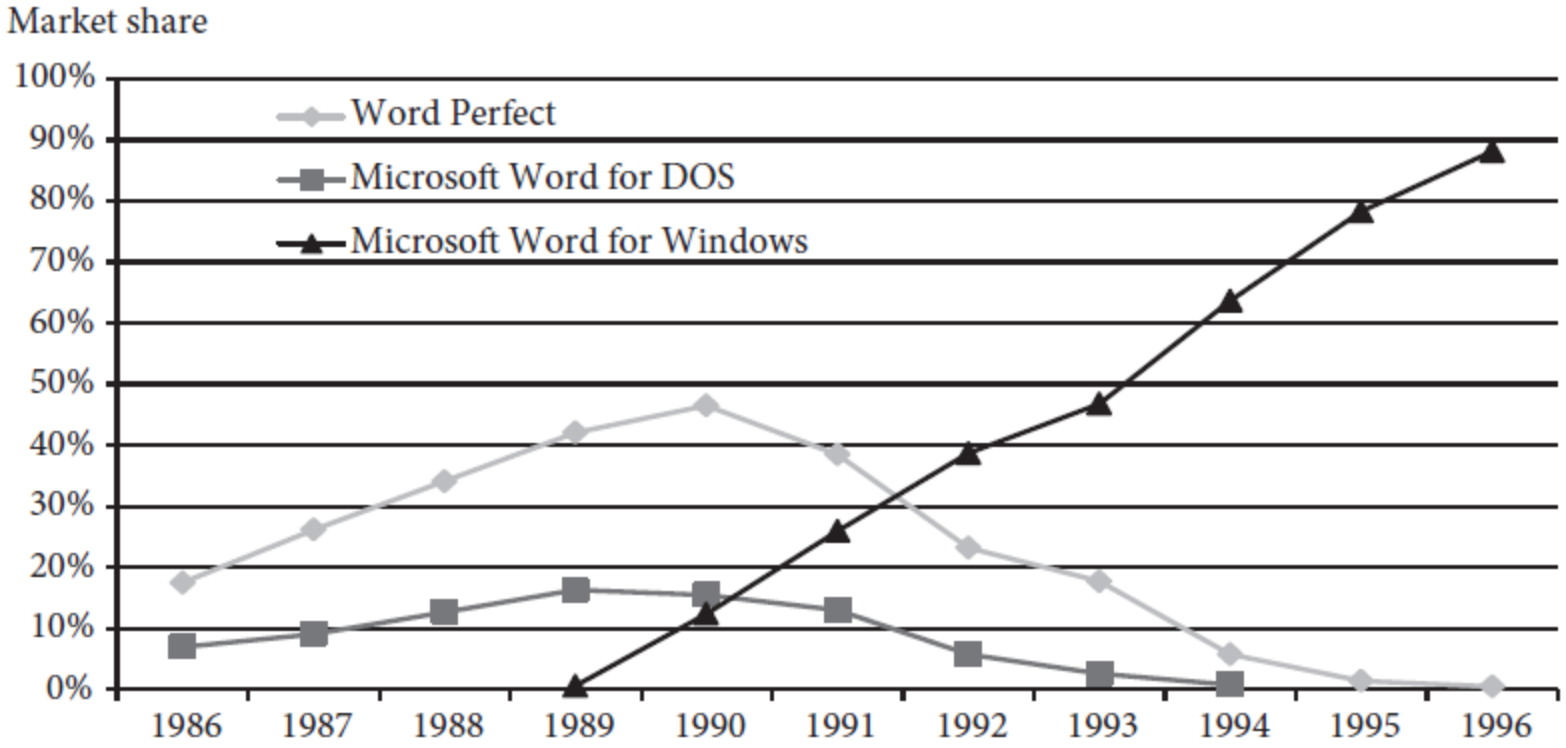
Definition: Consumer preferences are said to exhibit positive (negative) network externalities or network effects or adoption externalities if consumers utility is enhanced (reduced) when more consumers use the same or a compatible brand.

Examples of positive network effects: Telephone, social networks, e-mail, fashion, driving side (left or right), languages, manners, currency ($ or ¥), payment instruments,

Examples of negative network effects: Vanity behavior: buyers seek to isolate themselves from the “rest-of-us,” join exclusive clubs, shop at fancy stores, “limited” editions,

Network externalities: Word processors (users exchange files)

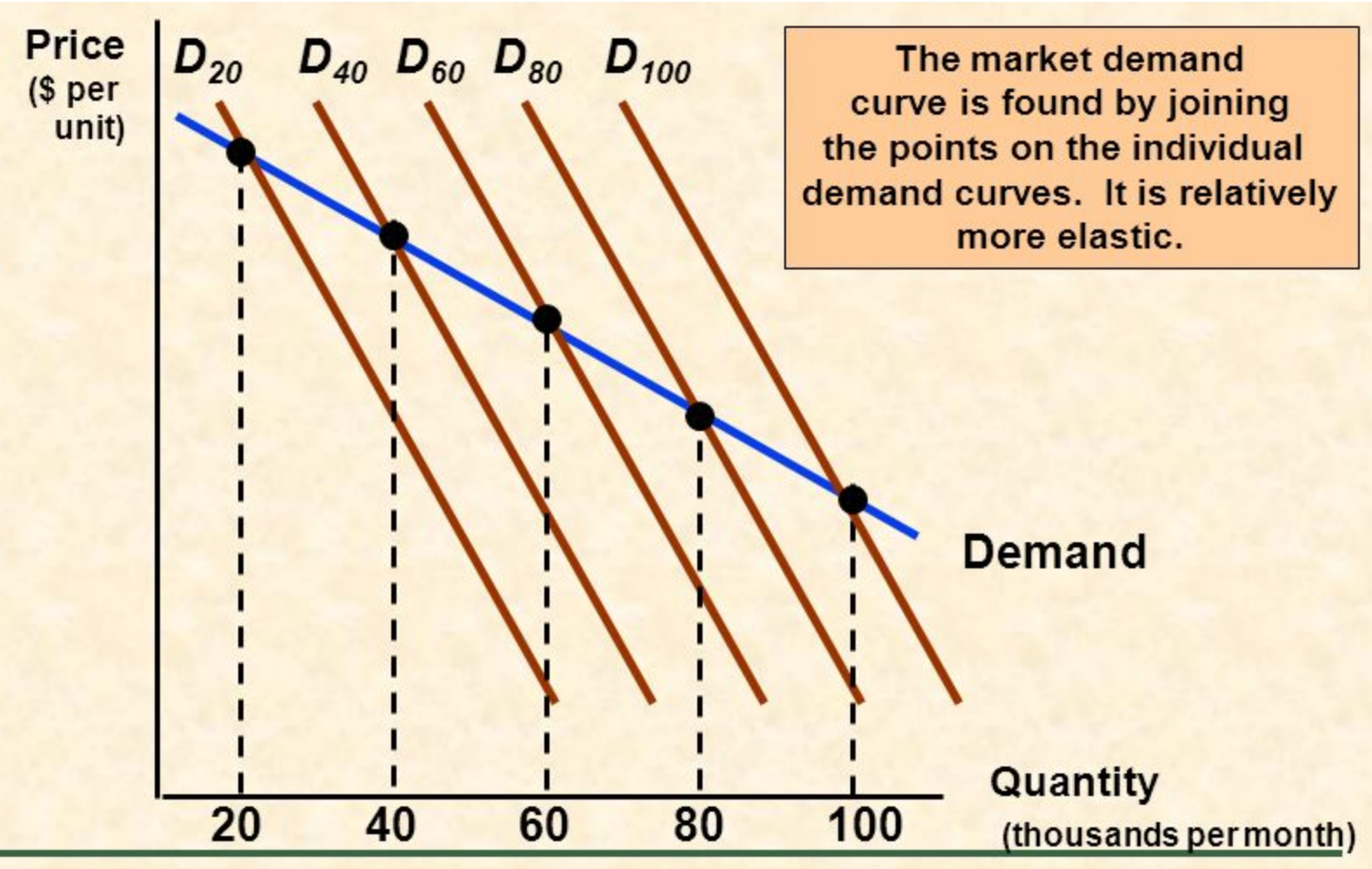
Compatibility with the MS-Windows OS can explain the rise and fall of word processors



"Word for Windows" (used until this very day) wiped out "Word Perfect" (dominant player during the DOS era) because WP was not Windows-compatible in the early 1990s

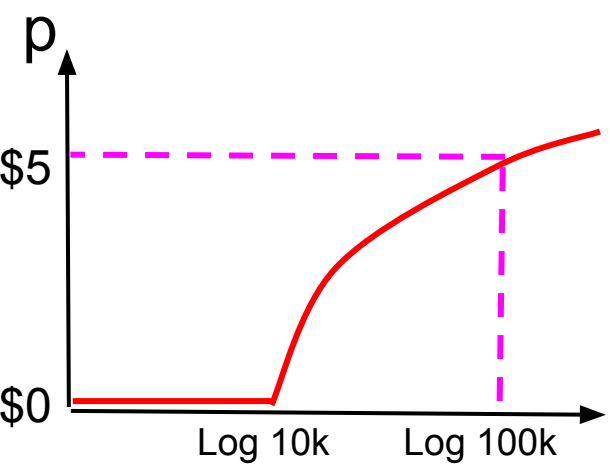
Network externalities: Effects on demand

Note: Bears some similarity to income effects for normal goods)



Network externalities: Demand may be upward sloping

N = # Users (subscribers)	0	10k	100k	1,000k	10,000k
Maximum willingness to pay(subscription fee per period)	$0	$0	$5	$20	$30



N = 10k =10,000 is often called the critical mass at p=$0 (minimum number of users needed to generate a strictly-positive demand)

N=100k is the critical mass at p=$5

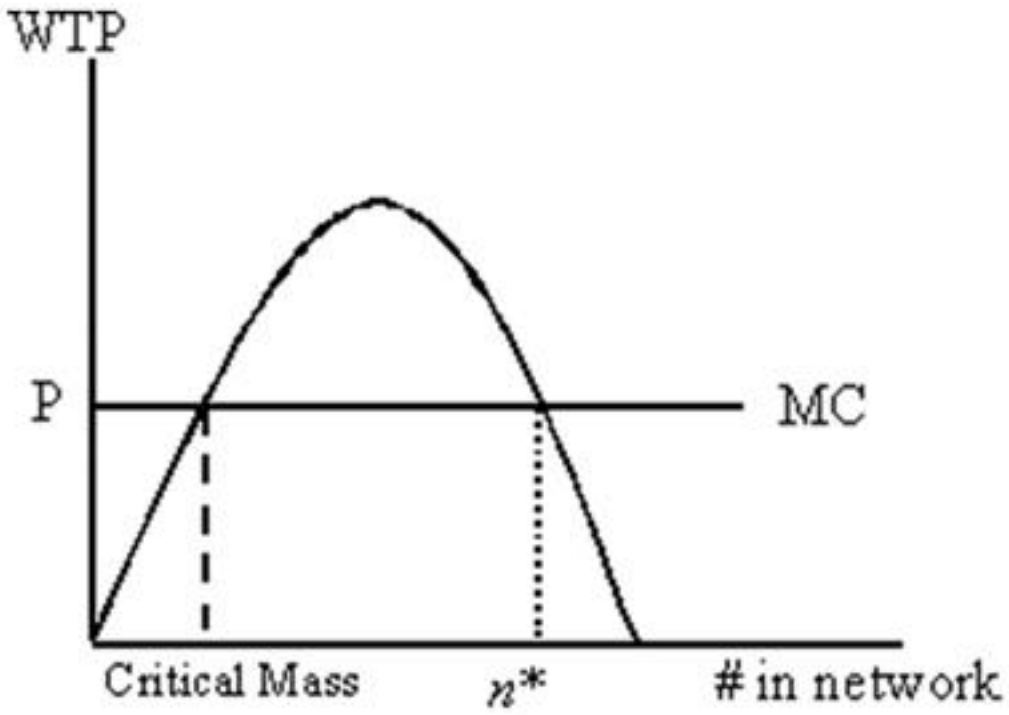
Critical mass: Real-life examples

1. You plan on having a wild party this Friday. How do you advertise it? “Hey guys, I’m having a party on Friday, and you should know that Ms. X and Mr. Y are also coming!”
2. A university requires a minimum number of students to enroll, otherwise, the course is not offered
3. A mobile-phone programmer decides on a minimum number of Android users that will make it profitable to write apps for
4. Users of social media determine the minimum number of Google+ users that would induce them to switch from Facebook to Google+

OR

Demand for telecommunication services

- WTP increases with the total number of users
- later, declines as low WTP consumers start buying
- 2 equilibria: “Low” one is unstable. High one n* is stable



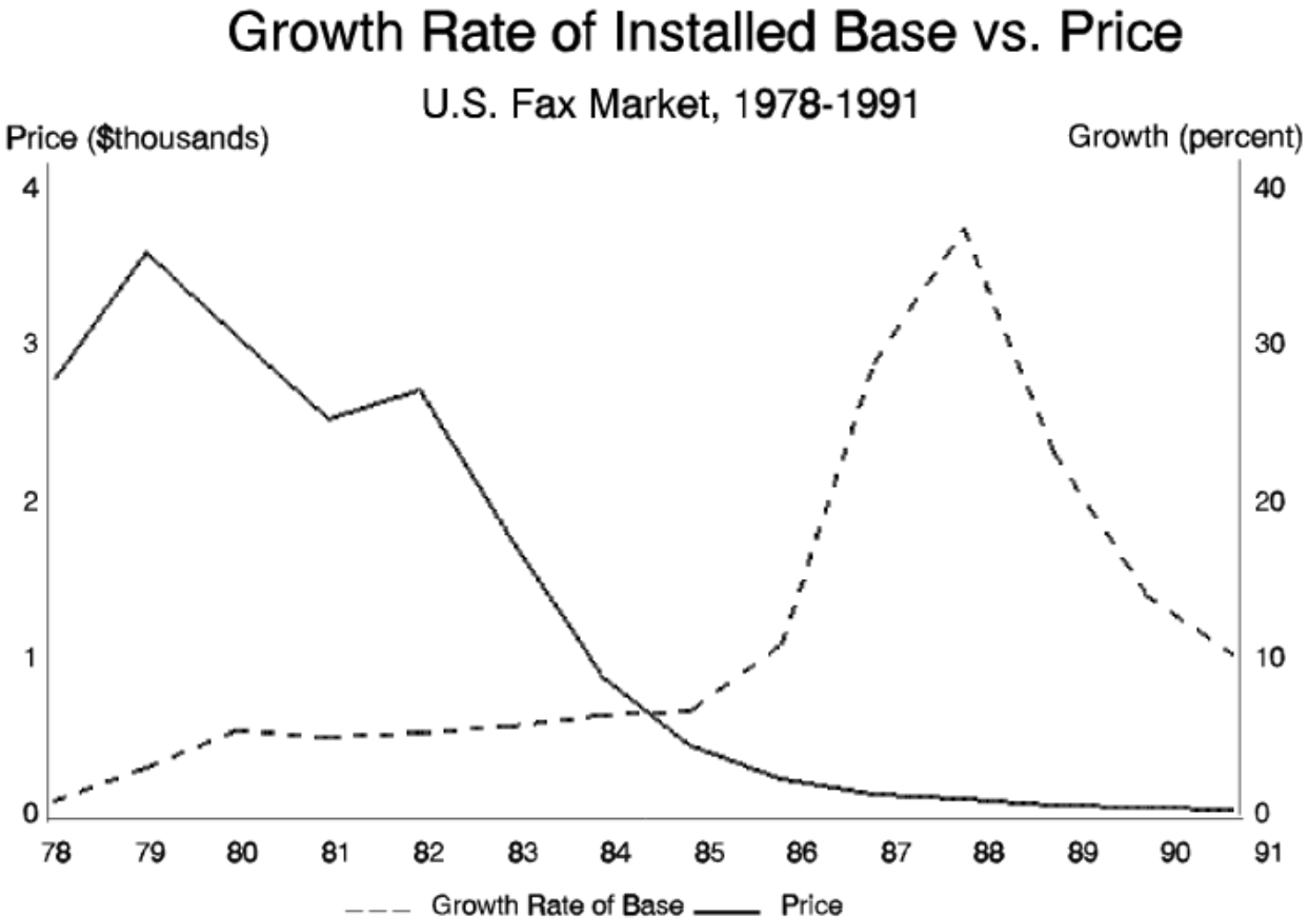
CM = Minimum # users needed to induce consumers to buy at a given price P.

If # users < CM, at a given price P, no one will buy!

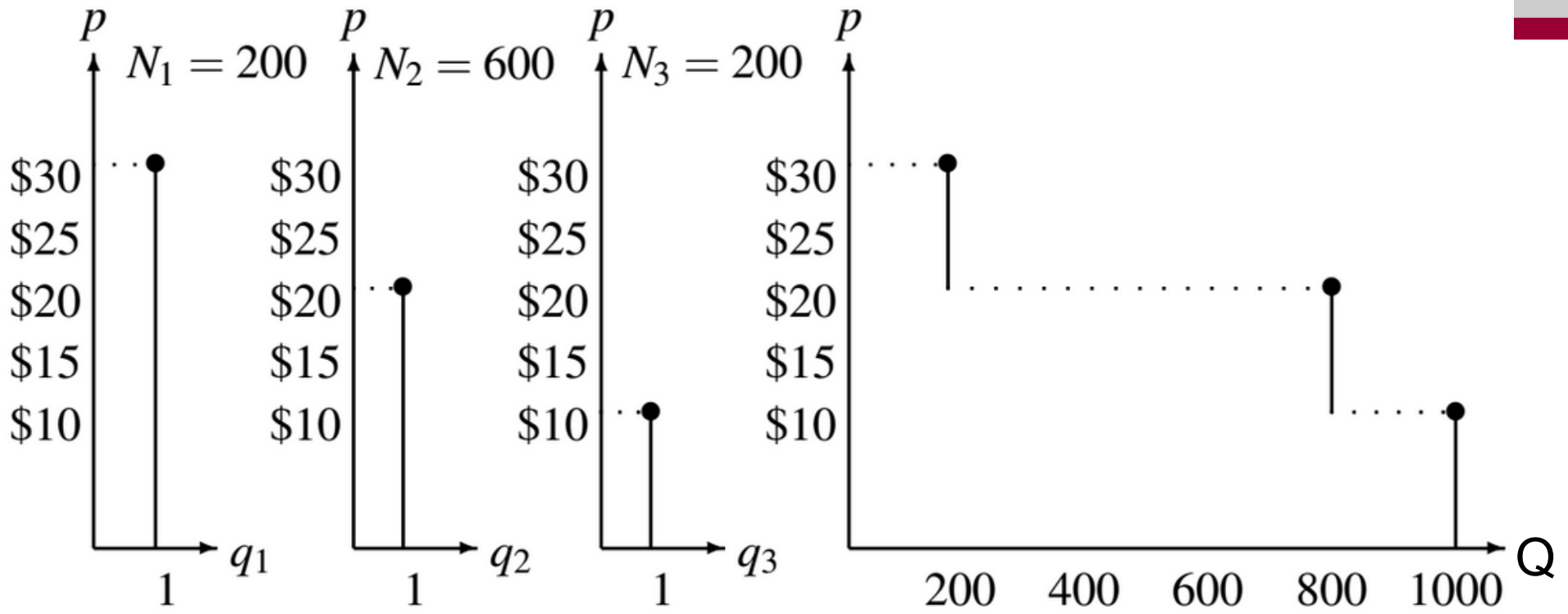
Rohlfs, Jeffrey, *Bell Journal of Economics*, 1974, vol. 5, issue 1, pages 16-37

Adoption of fax machines: Actual data

Source: Economides and Himmelberg (Stern School, 1995)



Constructing demand curves *without* network externalities: Example #1 (unit demand for today's rock concert: Buy either 1 unit or 0)



N_1=200 are willing to pay no more than V_1=\$30 (max valuation)
N_2=600 are willing to pay no more than V_2=\$20
N_3=200 are willing to pay no more than V_3=\$10

Question: How valuations would look like in the presence of network externalities?

Constructing demand curves under network externalities: Example #1 (valuations with network externalities)

Valuations (max WTP without network externalities)

N_1=200 are willing to pay no more than V_1=\$30 (max valuation)

N_2=600 are willing to pay no more than V_2=\$20

N_3=200 are willing to pay no more than V_3=\$10

Valuations (max WTP with network externalities)

N_1=200 are willing to pay no more than V_1=\$30 + 0.1 Q

N_2=600 are willing to pay no more than V_2=\$20 + 0.1 Q

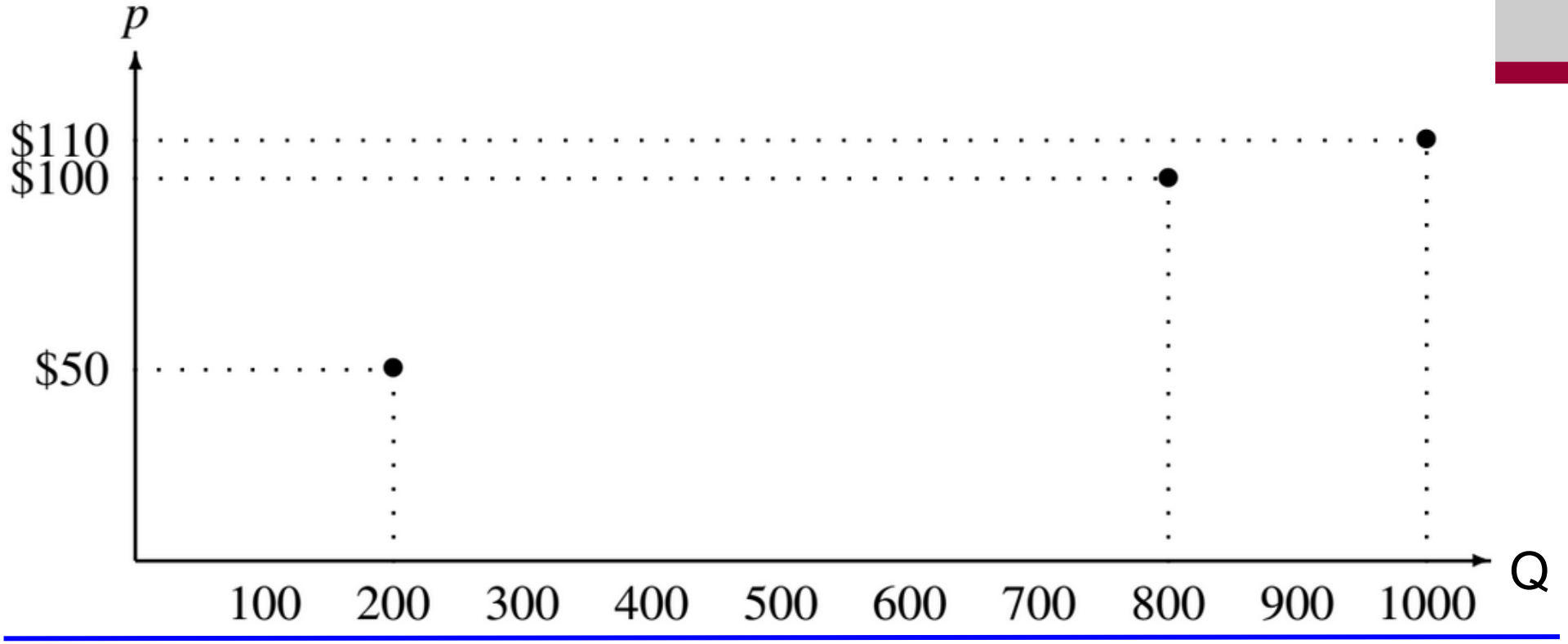
N_3=200 are willing to pay no more than V_3=\$10 + 0.1 Q

where Q is the total number of buyers (each buys 1 ticket)

Note the positive social influence (network externality)

Problem: How do we graph the market (aggregate) demand curve?

Constructing demand curves under network externalities: Example #1 (graphing aggregate demand)



First to buy: N_1=200 buy ⇒ V_1=30+0.1 200 = $50

Second: N_2=600 buy ⇒ V_2=20+0.1 (200+600) = $100

Third: N_3=200 buy ⇒ V_3=10+0.1 (200+600+200) = $110