THE UNIVERSITY OF AUCKLAND
BUSINESS SCHOOL
Department of Economics

07 Network Effects 4

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Reading: *Cabral*, Ch 17

Introduction

- **Objectives of this lecture:** Understand the relationship between expectations and pricing for a monopoly network.

  Introduction to competition between networks and issues about compatibility.

Critical Mass, Expectations and Pricing

- In the simple model of monopoly that we have considered so far, the monopolist has been able to choose its profit maximising network size.
- In reality, pricing and marketing a network good is difficult, even for a monopolist.
- A more realistic scenario is that the monopolist sets a price and then consumers gradually join the network over time.

Critical Mass, Expectations and Pricing

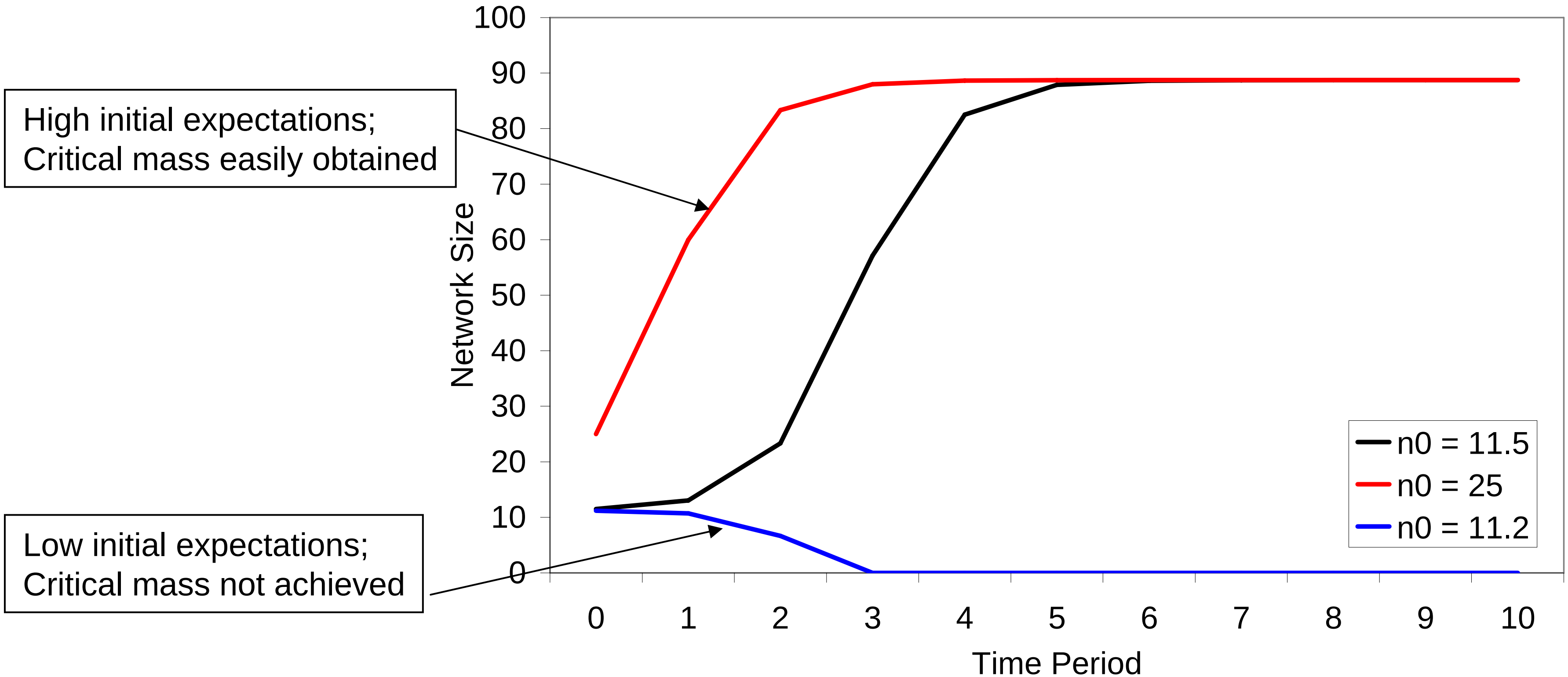
- Using the model of critical mass from the previous lecture:
  - Suppose the monopolist sets a price *p* and the proportion of consumers on the network at time *t* is given by:

$$n_t = 1 - \frac{p}{n_{t-1}}$$

  - Let n_0 be consumers' *initial* expectations of the network size and suppose this is exogenously determined.

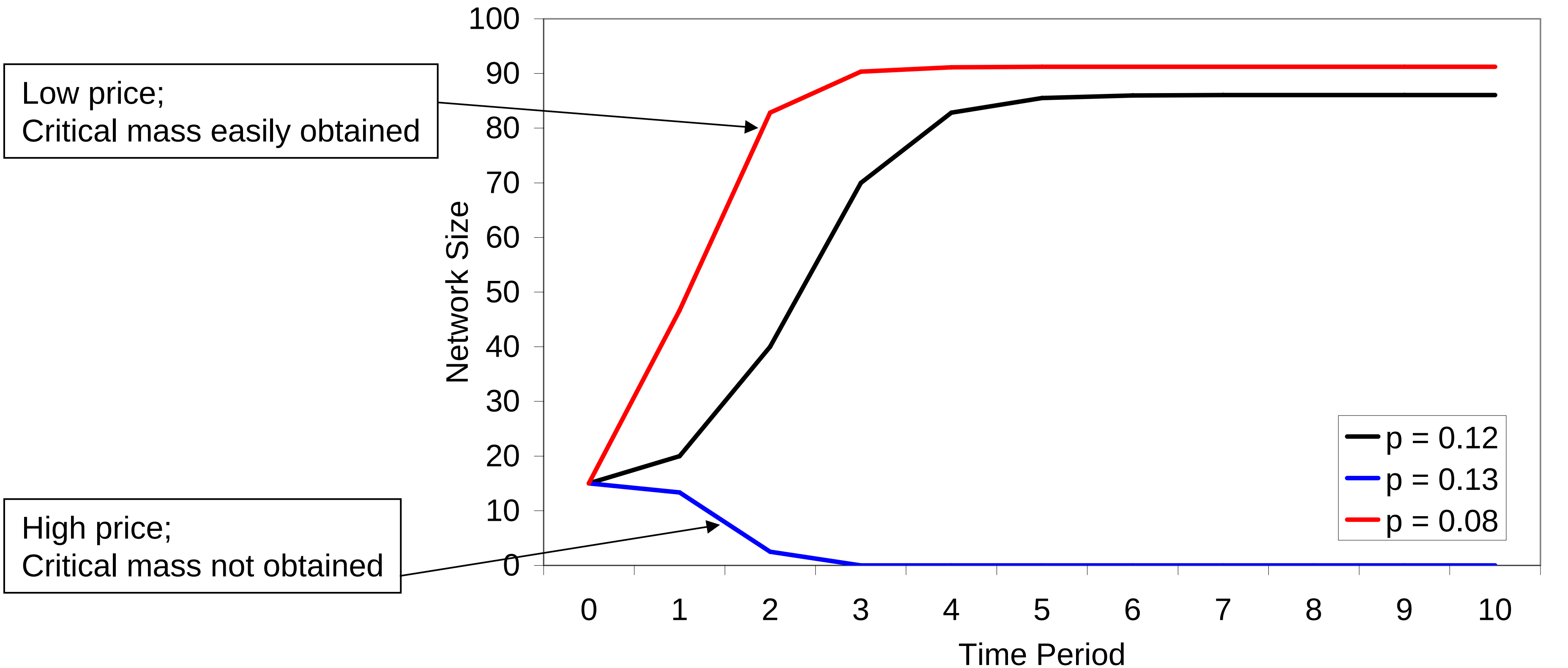
Critical Mass, Expectations and Pricing

- Suppose the monopolist sets a price of $p = 0.1$.
- The network size that the monopolist is able to achieve depends on consumers' initial expectations.



Critical Mass, Expectations and Pricing

- Suppose $n_0 = 0.15$.
- The ease with which critical mass can be achieved also depends on the price.



Critical Mass, Expectations and Pricing

- Prices and expectations both play a role in network adoption over time.

- Good initial expectations help to achieve critical mass more easily (and support higher prices).

- Or, low prices can compensate for poor expectations.

Critical Mass, Expectations and Pricing

- Many networks follow a strategy of *penetration pricing*:
  - Set a low price initially to grow the network size quickly.
  - Raise prices later once network size nears saturation.
  - Examples: eBay, TradeMe.

- Targeting key adopters may also be a good idea
  - Not all consumers are equal; some bring more network benefits than others.
  - Example: eBay power sellers.
  - Target key adopters with price discounts.

How to Influence Expectations

- *Marketing*.
- Make a *commitment* to reaching a large size.
  - Making a big sunk investment in capacity sends a signal to consumers that you expect to achieve critical mass.
- *Reputation*
  - Establishing a reputation for success will help to generate positive expectations.
- Give consumers *information* about what other consumers are doing.
  - Example: Prominent announcements when major movie studios adopted Blu-ray / HD-DVD.

Competing Networks

- So far we have just considered a single monopoly network – now let's think about competition.
- We will restrict attention to the case of two networks (duopoly).
- When networks compete, consumers value different sized networks differently.
  - A bigger network is better, all else equal.
- Networks also compete in terms of *quality* and *brand loyalty*, as well as the prices that they set.

Competing Networks

- Competition between separate networks can be quite *intense*, because if you cut your price, you get some customers from your rival, **and** your existing customers are willing to pay more if they belong to a bigger network.

- Thus there is a strong incentive to cut prices, which leads to low prices.

- BUT consumers are now divided across two separate networks, which reduces consumer welfare compared to a single large network at the same price.

Competing Networks

- Let’s suppose we have two networks, A and B, in competition with one another.
- For simplicity we can ‘normalise’ the total market size to $N = 1$.
- Denote the two network sizes by n_A and n_B and $n = n_A + n_B$ is the total number of consumers who join a network.
- Assume that firms compete by choosing their network sizes (‘quantities’) simultaneously.

Competing Networks: Demand Faced by Each Firm

- Net utilities from joining either network:

$$u_A = xn_A^e - p_A$$

$$u_B = xn_B^e - p_B$$

- In a situation where both networks have some customers we must have $u_A = u_B$.

- Thus the consumer who is indifferent between joining a network or not is located at: $x = \frac{p_A}{n_A^e} = \frac{p_B}{n_B^e}$

- With correct expectations, we obtain the inverse demands:

$$p_A(n_A, n_B) = n_A(1 - n_A - n_B)$$
$$p_B(n_A, n_B) = n_B(1 - n_A - n_B)$$

Compatibility

- The previous slide assumed that the networks are not *compatible*.
  - Consumers can only ‘access’ other consumers who join the same network.
- The networks of two firms are said to be *compatible* if a consumer on either network can ‘access’ a consumer on the other network.
- If networks are compatible, then from a consumer’s point of view there is essentially just one combined network.

Compatibility

- Compatibility may be *full* or *partial*
  - With **full** compatibility, there is no restriction on communication across the networks
  - With **partial** compatibility, communication across the networks is not as good as communication within either network
  - Example: Word can open Wordperfect files, but cannot always display them properly. Word is partially compatible with Wordperfect.
- Compatibility may also be between competing networks, or between new and old versions of the same product (backwards compatibility).

Compatibility

- Compatibility may also be *two-way* or *one-way.*

- Two-way compatibility means that consumers on both networks can communicate with each other in either direction.
  - Example: Customers with Vodafone mobile phones can call customers with Telecom mobile phones and vice versa. The networks have two-way compatibility.
  - Requires cooperation between both firms.

- One-way compatibility means that consumers on one network can communicate with consumers on the other, but not the other way.
  - Example: Word can open Wordperfect files but cannot save Wordperfect files. The networks have one-way compatibility.

Compatibility

- One-way compatibility can sometimes be achieved by one firm unilaterally constructing an “adaptor”
  - Example: Apple built floppy disk drives into its computers that could read and write PC disks.
- Firms with existing networks may try to block other firms from achieving one-way compatibility through making an adaptor.
  - It doesn’t benefit their own consumers since they can’t communicate with customers on the new network.
  - An adaptor makes it easier for consumers to switch to the new network.
  - Can use legal restrictions e.g. patents to block adaptors.

Competing Compatible Networks

- As before, suppose we have two competing networks, A and B, and there are no costs.

- With compatibility, a consumer who joins either network effectively joins a network of size $n = n_A + n_B$.
  - Full two-way compatibility

- As before we will assume that the networks compete by choosing their network sizes (‘quantities’).

Competing Compatible Networks

- Compared to competition among incompatible networks, competition between compatible networks may be *less intense*.

- If you cut your price, you gain some customers from your rival, but your existing customers are no better off because they could already communicate with the new customers thanks to compatibility.

- Thus there is less incentive to cut prices, and prices may be higher than with incompatible networks.

- On the other hand, the total network that consumers have access to may be larger than with incompatibility.

Compatible Networks: Demand Faced by Each Firm

- Net utilities from joining either network:

$$u_A = x\left(n_A^e + n_B^e\right) - p_A$$

$$u_B = x\left(n_A^e + n_B^e\right) - p_B$$

- If both networks have some customers we must have $u_A = u_B$, hence $p_A = p_B = p$

- Thus the consumer who is indifferent between joining a network or not is located at: $x = \dfrac{p}{n_A^e + n_B^e}$

- With correct expectations, we obtain the inverse demands:

$$p_A(n_A, n_B) = (n_A + n_B)(1 - n_A - n_B)$$

$$p_B(n_A, n_B) = (n_A + n_B)(1 - n_A - n_B)$$

Example 1

- Graph the demand faced by network A when $n_B = 1/4$ when networks are incompatible and compatible.

- Compare and comment on the difference between the incompatible and compatible cases.