Chapter 11
Externalities

CHAPTER SUMMARY

An externality rises when one party directly conveys a benefit or cost to others. A network externality arises when a benefit or cost directly conveyed to others depends on the total number of other users. An item is a public good if one person's increase in consumption does not reduce the quantity available to others. Equivalently, a public good provides nonrival consumption.

The benchmark for externalities and public goods is economic efficiency. At that point, all parties maximize their net benefits. Externalities can be resolved through unilateral or joint action, but resolution may be hampered by differences in information and free riding. Similarly, the commercial provision of a public good depends on being able to exclude free riders. Excludability depends on law and technology.

Markets with network externalities differ from conventional markets in several ways. Demand is insignificant until a critical mass of users is established. Expectations of potential users help to determine the attainment of critical mass.

KEY CONCEPTS

externality	critical mass	rival
positive externality	tipping	congestible
negative externality	nonrival	excludable
externality is resolved	public good	patent
free rider	private good	copyright
network externality		

GENERAL CHAPTER OBJECTIVES

1. Discuss positive and negative externalities, and their economically efficient level.
2. Explain why it is profitable to resolve externalities, and how to do so.
3. Identify network externalities and apply the concept to the Internet and e-commerce.

4. Distinguish the managerial implications of markets with network externalities from conventional markets.
5. Discuss the concept of a public good and its economically efficient level.
6. Examine the role of technology and law in excluding users from a public good.

NOTES

1. **Externalities - Benchmark**.
   (a) An externality arises when one party directly (rather than through a market) conveys a benefit or cost to others.
      i. The presence of an externality implies the relevant market does not exist.
      ii. A positive externality arises when one party directly conveys a benefit to others, e.g., additional business generated by a new store to the existing shops.
      iii. A negative externality arises when one party directly imposes a cost to others, e.g., business taken away by a new store from the existing shops.
   (b) In deciding on the levels of investments that give rise to externalities:
      i. If the source considers only the benefits and costs to **itself**, and ignores the benefits and costs to others, i.e., ignoring the externalities.
         (1). It maximizes profit where individual marginal benefit equals individual marginal cost.
      ii. When the source considers the benefits and costs of an externality to its **group** of members:
         (1). The group marginal benefit curve from an externality is the vertical sum of the individual marginal benefits.
         (2). If one party generates **positive** externalities, the group maximizes profit where the *group* marginal benefit equals the marginal cost of the *activity* generating the externality.
         (3). The group marginal cost curve from an externality is the vertical sum of the individual marginal costs.
         (4). If one party generates **negative** externalities, the group maximizes profit where the *individual's* marginal benefit from the activity generating the externality equals the *group* marginal cost.
   (c) **Benchmark level of an externality**.
      i. If one party generates both **positive and negative** externalities, the group maximizes profit at the following benchmark: where the *sum* of the marginal benefits from the activity generating the externalities equals the *sum* of the marginal costs.
         (1). This is the **economically efficient** level (of the activity generating the externalities).

(2). This is the point where an externality is **resolved**.

ii. Suppose the marginal benefits exceeds the marginal cost of a positive externality, there is a profit opportunity for an intermediary to collect fees from the recipients (up to their respective marginal benefits) to pay the source (an amount sufficient to cover the source's marginal cost) to increase the externality.

iii. The same benchmark applies when the source is separate from the recipients.

2. **Resolving an externality**.

(a) Involves deliberate action, not accomplished through the market.

(b) **Merger** of the source and recipient of an externality.

i. Once the source and recipient of the externality are combined, no matter who acquires whom, the single entity will take account of all benefits and costs of its investments and invest up to the economically efficient level (group marginal benefits equal group marginal costs).

(c) **Joint action.** Where merger is not feasible:

i. The source and recipient of the externality could negotiate and resolve the externality (while remaining separate entities).

(1). They collect information on the benefits and costs to the various parties and plan the level of activity that generates the externality.

(2). E.g., in the case of a positive externality, the recipient will pay the source (a contribution equal to the recipient's marginal benefit from the activity generating the externality) to increase the source's investment.

(3). The source will maximize profit by choosing the level of activity where marginal benefits equal marginal costs.

ii. Then, they must enforce the agreed plan: monitoring the source and applying incentives to ensure that the source complies with the planned level of activity.

(d) **Free riders**.

i. A free rider is a party that contributes less than its marginal benefit to the resolution of the externality.

ii. Informational differences and free riders hamper the resolution of an externality.

(1). Information differences on benefits make it difficult to ascertain whether a recipient is bluffing (claiming a lower benefit and attempting to make a smaller contribution in joint action).

(2). It may be costly to exclude certain parties from receiving a benefit, especially when the externality affects many recipients and the recipients differ widely in their marginal benefits.

3. **Network effects/externalities**.
   (a) A **network externality** arises when a benefit or cost **directly conveyed** to others depends on the total number of other users. The adjective network emphasizes that the externality is generated by the entire network of users.
      i. Network externalities explain the growth of the Internet and other communications technologies.
      ii. In the presence of network externalities, marginal benefit and demand depend on price, income, prices of related products and the *total number of other users*.
      iii. If the network externality is not completely resolved, there exist opportunities for profit from resolving the difference between the sum of marginal benefits and the sum of marginal costs.
   (b) A **network effect** arises when a benefit or cost depends on the total number of other users. There is a market to resolve the network effect.
   (c) Distinguishing features of markets with network externalities/effects (vis a vis conventional markets).
      i. In the presence of network externalities/effects, demand is insignificant until a *critical mass* of users is established.
         (1). Critical mass is the number of users at which the quantity demanded becomes positive.
         (2). An alternative way to measure the size of the critical mass is the size of the installed base, the quantity of complementary hardware in service.
      ii. Expectations of potential users help to determine the attainment of critical mass. Expectations can be influenced through commitments and hype.
      iii. Demand in markets with network externalities/effects is extremely sensitive to small differences among competition, and such markets are more likely to tip.
         (1). Tipping is the tendency for the market demand to shift toward a product that has gained a small initial lead in user base.
         (2). It is unlikely that several competing products will coexist.
   (d) The presence of network externalities/effects affects the price **elasticity** of demand.
      i. Market demand.
         (1). When market demand is below critical mass, demand is zero, and extremely price *inelastic*.
         (2). When demand exceeds critical mass, the network externality/effect tends to amplify the effect of a price change on quantity demanded and causes demand to be relatively more *elastic*.
      ii. Relation among competing sellers.
         (1). If all competing products have attained a critical mass of demand, the market demand could tip in favor of one, and

individual demand for each product will be extremely price *elastic*.

4. **Public goods**.
   (a) There is a continuum between nonrival, congestible, and rival consumption.
      i. Consumption is nonrival if one person's increase in consumption does not reduce the quantity available to others, i.e., a **public good** (such as fireworks).
      ii. Consumption is congestible if one person's increase in consumption by some quantity reduces the total quantity available to others but by less than that quantity, e.g., Internet usage, certain forms of entertainment.
      iii. Consumption is rival if one person's increase in consumption reduces the total available to others by the same quantity, i.e., a **private good** (such as food and clothing).
   (b) Provision of a public good.
      i. Content vis a vis delivery.
         (1). Content is always a public good.
         (2). Delivery may be a public good (delivery by over the air transmission unless excluded via certain technology) or a private good (delivery via cable).
      ii. There is an extreme economy of scale in providing a public good. Provision involves only a fixed cost and the marginal cost of serving additional consumers or users is zero.
      iii. Economic efficiency: When vertical sum of marginal benefits equals the marginal cost. Opportunities for profit from adjusting provision are exhausted at that point.
      iv. **Excludability**. (The basis for commercial provision of many public goods is to deliver them in the format of private goods.)
         (1). It is a fundamental condition for the commercial production of any product. (Otherwise free riders will cut into the seller's revenues, profits and hamper provision.) Consumption is excludable if the provider can exclude particular consumers.
         (2). Excludability depends on law (which establishes excludability through intellectual property) and the cost of enforcement.
            a. Patent: a legal, exclusive right to a product or process (associated with scientific knowledge).
            b. Copyright: a legal, exclusive right to an artistic, literary or musical expression.
            c. Infringements may result in awards of damages to the owner of a patent.
         (3). Excludability depends on technology, e.g., scrambling technology, access via passwords.
         (4). Note that law and technology change with time and place.

ANSWERS TO PROGRESS CHECKS

11A. (1) The horizontal sum of individual demand curves is the market demand curve: At every price, we add the *quantities* demanded by the individuals to get the market quantity. The curves are added in a horizontal direction. (2) The vertical sum of individual marginal benefit curves is the group marginal benefit curve: At every quantity, we add the *marginal benefit*s of the individuals to get the group marginal benefit. The curves are added in a vertical direction.

11B. (1) Sol's marginal cost curve will be higher. (2) The level of investment that maximizes the group profit will be lower. Please refer to Figure 11B on page 545 of the text.

11C. (a) Network externality. (b) Probably a network effect since the issuer of the credit card would resolve the externality.

11D. See Figure 11D on page 545 of the text.

11E. There are only a few users of techniques for coronary bypass, hence, usage is relatively easy to monitor. See Figure 11E on page 546 of the text.

ANSWERS TO REVIEW QUESTIONS

1. [omitted].

2. The amount that the recipients of the negative externality are willing to pay for a marginal reduction is less than or equal to the marginal cost. The amount that the source is willing to accept for a marginal reduction is greater than or equal to the marginal benefit. Since the sum of the marginal costs exceeds the marginal revenue, the intermediary could make money.

3. (a) and (b).

4. (a) The new exit will increase Moonlight's business. (b) Moonlight is taking a free ride on the investments by the other property owners.

5. More difficult in (b).

6. [omitted].

7. Most Web content can be equally well browsed in Microsoft Explorer and Netscape Navigator. If more people choose Internet Explorer, it does not affect my benefit from Netscape Navigator.

8. More price sensitive when competing products have similar market shares, and less price sensitive when one product is dominant and the competing products lack critical mass.

9. Technical standards are more important in markets with network effects. If products are not standardized, it will be relatively harder for any to reach critical mass.

10. [omitted].

11. (i) CBS is a public good.

12. Because the item makes available the same quantity to benefit all potential users.

13. (a), (c), and (d).

14. Patents protect inventions of products or processes, while copyright protects artistic and literary expression.

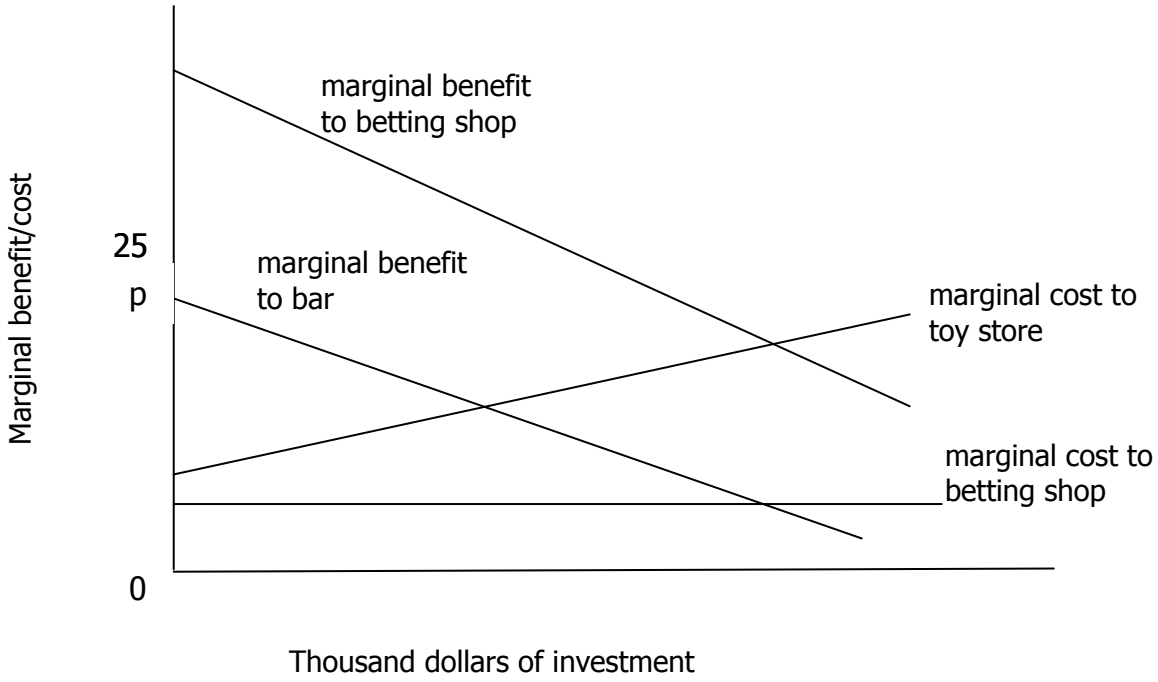
15. [omitted].

WORKED ANSWER TO SAMPLE DISCUSSION QUESTION

In some countries, betting shops are allowed in general retail areas. A betting shop can attract a large volume of customers, who may spill over to other nearby businesses. On the other hand, the presence of a betting shop may hurt toy stores and other businesses that target women and children.

a. On a suitable diagram, illustrate the marginal benefit and marginal cost of investment by a betting shop, the marginal benefit/cost to a bar, and the marginal benefit/cost to a toy store.
b. What rent would the owner of a shopping mall charge to a betting shop as compared with a bank?
c. Do you expect to find relatively more betting shops in malls or on open streets?

Answer:



a. See figure above. The bar receives a benefit, while the toy store incurs a cost.
b. The typical shopping mall targets families. A bank would generate positive externalities to the other stores in a shopping mall. A betting shop would generate negative externalities. The mall owner would charge the betting shop a higher rent than the bank?
c. On open streets, betting shops are less likely to be subject to higher rents. Hence they tend to locate on open streets rather than in malls.

