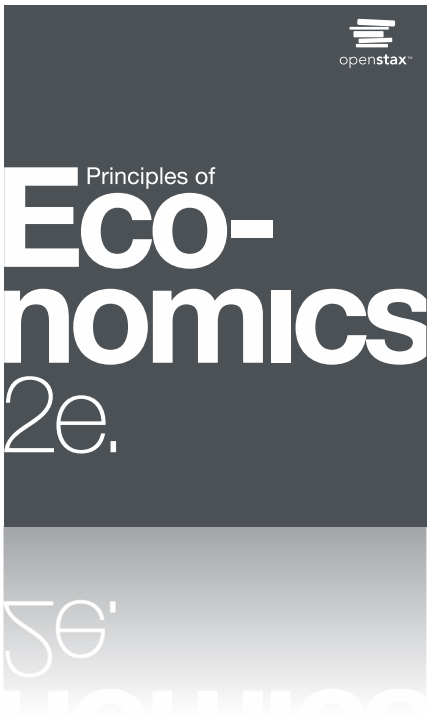
PRINCIPLES OF ECONOMICS 2e

Chapter 13 Positive Externalities and Public Goods



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CH.13 OUTLINE

13.1: Why the Private Sector Underinvests in Innovation

13.2: How Governments Can Encourage Innovation

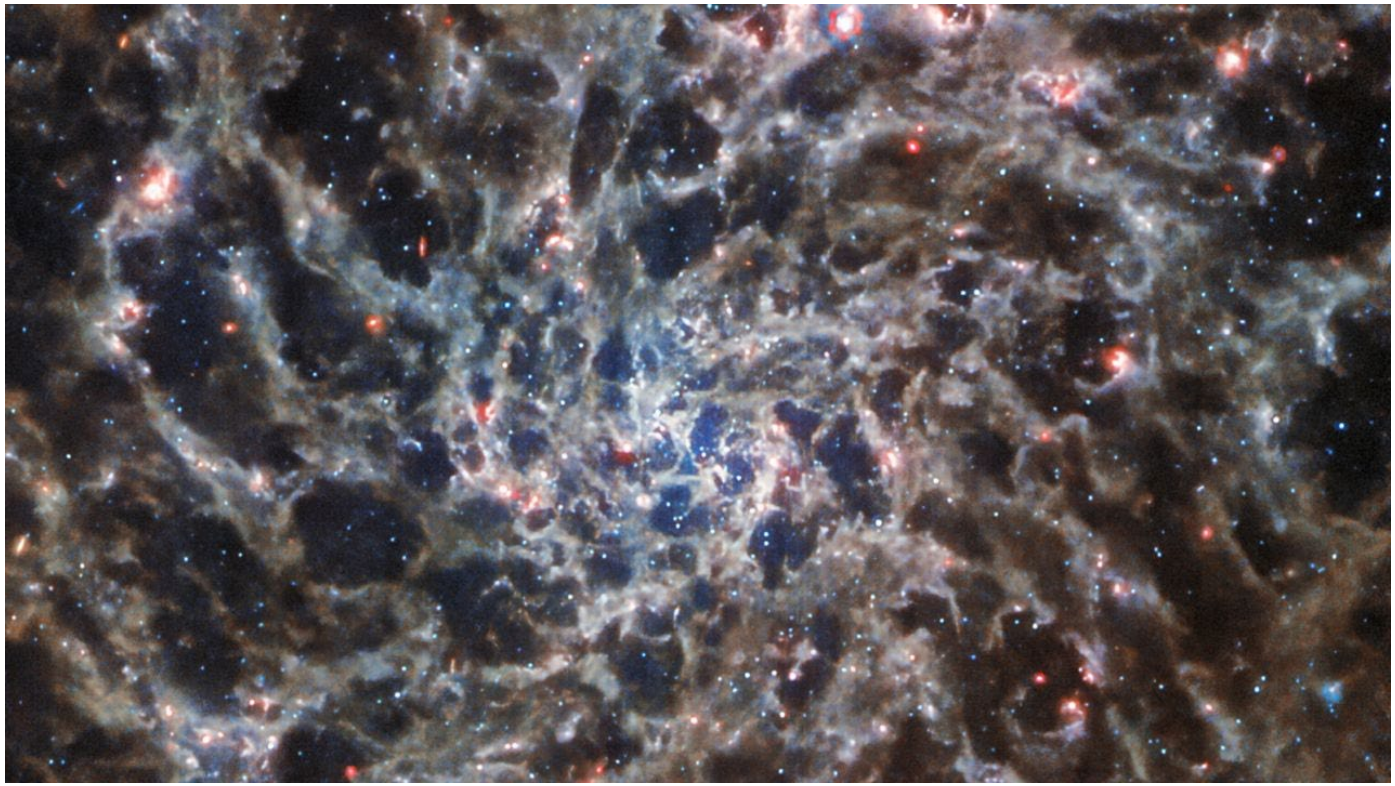
13.3: Public Goods

View from Voyager 1

Credit: modification of work by NASA/JPL

- Launched by NASA in 1977,
- primary mission: provide detailed images of Jupiter, Saturn, and their moons.
- August of 2012: Voyager I apparently entered “interstellar” space—the first human-made object to do so—and it is expected to send data and images back to earth until 2025.

View from James Webb Space Telescope



Launched 25 December 2021 with four key goals:

- search for light from first stars/galaxies formed in after Big Bang
- study galaxy formation and evolution
- understand the formation of stars and planets
- study planetary systems and the origins of life

Space Technology and Everyday Life

Voyager 1 and the Webb telescope are major technological feats that required government investment.

Inventions used every day that were created for space exploration:

Artificial limbs (muscle systems, robotic sensors, diamond-joint coatings, and temper foam)

Scratch-resistant lenses (scratch-resistant plastics)

Insulin pump (vital signs monitoring)

Firefighting equipment (space suit polymers)

DustBusters (ultra-light, compact, cordless)

LASIK (eye tracking)

Shock absorbers for buildings/bridges (designed to protect equipment during space shuttle launches)

Solar cells (photovoltaic technologies)

Phone cameras (1990s NASA-JPL imaging technology)

much more

13.1 Why the Private Sector Underinvests in Innovation

- Market competition can provide an incentive for discovering new technology, because a firm can earn higher profits:
  - by finding a way to produce products more cheaply
  - by creating products with characteristics consumers want.

- In some cases competition can discourage new technology, especially when other firms can quickly copy a new idea.

- Studies by economists have found that the original inventor receives 1/3 to 1/2 of the total economic benefits from innovations, while other businesses and new product users receive the rest.

The Positive Externalities of New Technology

- **Private benefits** - the benefits a person who consumes a good or service receives, or a new product's benefits or process that a company invents that the company captures.

- **Social benefits** - the value of all the positive externalities of the new idea or product (whether enjoyed by other companies or society as a whole), as well as the private benefits the firm that developed the new technology receives.

= private benefits + external benefits

- **Positive externalities** or **benefits** - beneficial spillovers to a third party or parties.

Positive Externalities and Technology

- Big Drug faces a cost of borrowing of 8%.
- If the firm receives only the private benefits of investing in R&D, then we show its demand curve for financial capital by $D_{Private}$, and the equilibrium will occur at $30 million.
- Because there are spillover benefits, society would find it optimal to have $52 million of investment.

Positive Externalities and Technology, Continued

- If the firm could keep the social benefits of its investment for itself, its demand curve for financial capital would be D_{Social} and it would be willing to borrow $52 million. (The firm's private demand curve would be the same as society's demand curve.)
- But, unless there is a way for the company to fully enjoy the total benefits, then it will borrow less than the socially optimal level of $52 million.

Why Invest in Human Capital?

- Investment in human capital (e.g., education or training) requires a certain upfront cost with an uncertain future benefit.
- Goal: *higher* levels of educational attainment will eventually serve to *increase* the person's future productivity and subsequent ability to earn.
- Economists have found though several studies that the rate of return of a college education to that person, in the United States, is approximately 10-15%.
- **Private rates of return** - the estimated rates of return go primarily to an individual; like, earning interest on a savings account.

Society Gains When People Learn

- BUT: Society also gains from investing in the education of another student.

- The social rate of return on schooling is also positive:
  - better health outcomes for the population
  - lower levels of crime
  - a cleaner environment
  - a more stable, democratic government

- **Social rate of return** - when the estimated rates of return going to all of "society".

Social Rate of Return

The social internal rate of return refers to the costs and benefits to society of investment in education.

Social cost includes:

- the opportunity cost of having people not participating in the production of output
- the full cost of the provision of education rather than only the cost borne by the individual.

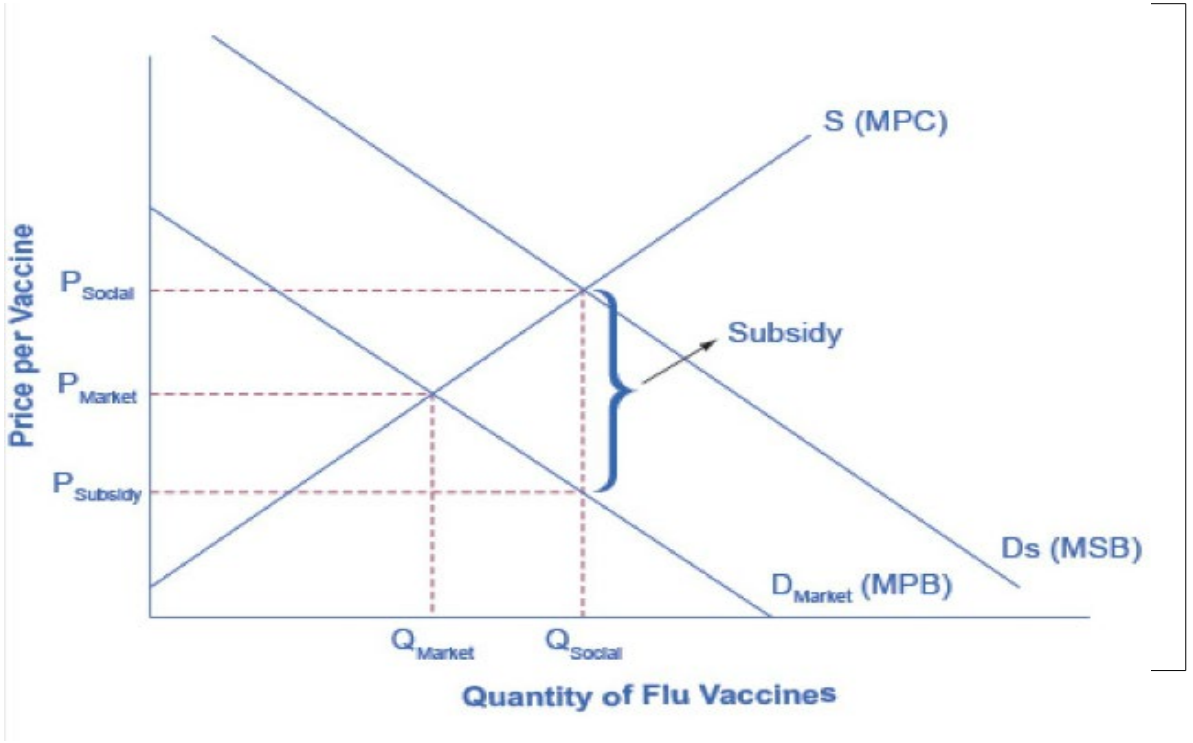
Social benefit includes:

- the increased productivity associated with the investment in education
- possible non-economic benefits, such as lower crime, better health, more social cohesion and more informed and effective citizens.

Positive Externalities Response

- The appropriate public policy response to a positive externality, like a new technology, is to help the party creating the positive externality receive a *greater share of the social benefits*.

The Market for Flu Shots with Spillover Benefits (A Positive Externality)



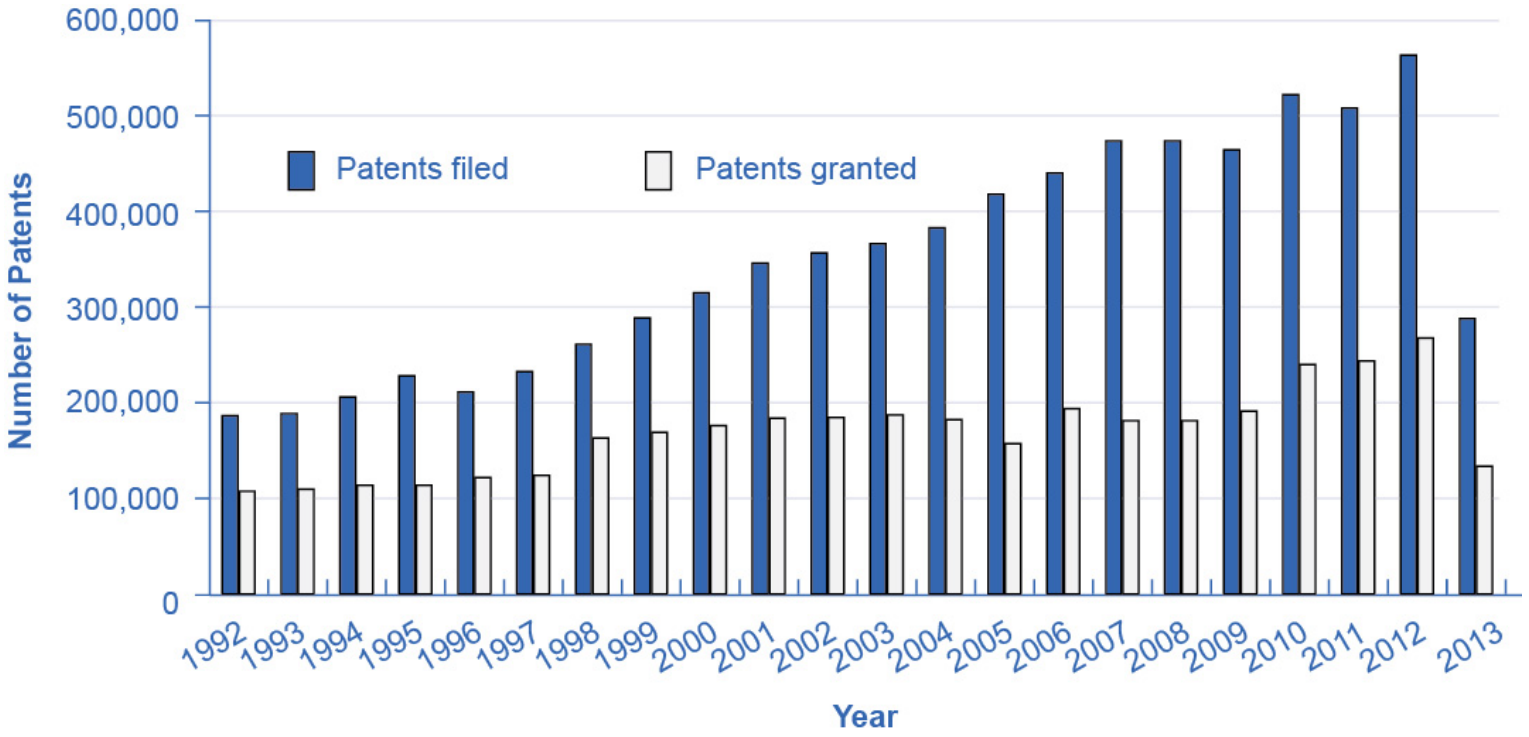
- Equilibrium is produced in the market where MPB = MPC: quantity of flu shots is Q_{Market} and the price of flu shots is P_{Market}.
- Market demand does not reflect the positive externality of flu vaccinations, so only Q_{Market} will be exchanged.
- This outcome is inefficient because the marginal social benefit *exceeds* the marginal social cost.

13.2 How Governments Can Encourage Innovation

- Different government policies can increase the incentives to innovate:
  - guaranteeing intellectual property rights
  - government assistance with the costs of research and development (R&D)
  - cooperative research ventures between universities and companies.

- **Intellectual property rights**: the body of law including patents, trademarks, copyrights, and trade secret law that protect the right of inventors to produce and sell their inventions.
  - Patents - give the inventor the exclusive legal right to make, use, or sell the invention for a limited time.
  - Copyright laws - give the author an exclusive legal right over works of literature, music, film/video, and pictures.

Patents Filed and Granted, 1981–2012



- The number of applications filed for patents increased substantially from the mid-1990s into the first years of the 2000s, due in part to the invention of the Internet, which has led to many other inventions and to the 1998 Copyright Term Extension Act. (Source: http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm)

Government Spending on Research and Development

- If the private sector does not have sufficient incentive to carry out R&D, one possibility is for the government to fund such work directly.

- Government spending can provide direct financial support for R&D conducted at:
  - colleges and universities
  - nonprofit research entities
  - sometimes by private firms
  - government-run laboratories

Tax Breaks for Research and Development

- A complementary approach is to give firms a *reduction in taxes* depending on how much R&D they do.
- The federal government refers to this policy as the research and experimentation (R&E) tax credit.
- Studies find that each dollar of foregone tax revenue through the R&E Tax Credit causes firms to invest at least a dollar or more in R&D.

Cooperative Research

- State and federal governments support research in a variety of ways, such as through partnerships and grants for innovative projects.
    - Examples: National Institutes of Health, National Academy of Scientists, and the Agriculture and Food Research Initiative.
- Cooperation between government-funded universities, academies, and the private sector can spur product innovation and create whole new industries.

13.3 Public Goods

- **Public good**:
  - nonexcludable and nonrival
  - difficult for market producers to sell to individual consumers.

Nonexludable - it is costly or impossible to exclude someone from using the good, and thus hard to charge for it.

Nonrival - even when one person uses the public good, another can also use it.

Examples: fire fighting; policing; national defense; basic research

Classification of Types of Goods

		Excludable: Yes	Excludable: No
Rival	Yes	Private Goods	Common Pool Resources
	No	Club Goods	Public Goods

Good and services may lie on a spectrum

- from rival to nonrival
- from excludable to nonexcludable

Examples:

Private goods: today's cold brew

Common Pool: aquifer

Club good: Spotify

Public good: national defense; FOSS

Tragedy of the Commons (common pool resources)

Video: The Tragedy of the Commons by Jesse Agar

Video: Prisoner's Dilemma

The Free Rider Problem of Public Goods

- **Free rider** - those who want others to pay for the public good and then plan to use the good themselves.
  - If many people act as free riders, the public good may never be provided.

- The free rider problem can be expressed in similar terms as the prisoner's dilemma game.

The Role of Government in Paying for Public Goods

- Paying for public goods: assure that *everyone* will make a contribution and to prevent free riders. E.g.,
  - taxes: every taxpayer contributes (no free riders)
  - gvt spending: provision of the public good

- In some cases, markets can produce public goods.
  - Creates an indirect way of "charging" for it.
  - Example: radio is a public good, but revenue is made by selling advertising, and "charging" listeners by taking up some of their time.
  - Example: Linux OS (development funded by IBM)

- Social pressures and personal appeals can also reduce the number of free riders and to collect resources for the public good.

Positive Externalities in Public Health

- Advances in public health have all been closely linked to p*ositive externalities* and *public goods*.
- Rise in life expectancy linked to public health programs/goods:
  - Public sanitation: waste disposal and clean water limit disease
  - Medical discoveries from government or university-funded research, such as:
    - Examples: Immunizations, Antibiotics, High blood pressure reducers
  - Behavior change through government health campaigns.
    - Examples:
      - Hand washing
      - Food storage and protection
      - Reducing tobacco smokers
      - Precautions against sexually transmitted diseases

END