



EE 462 Development Macroeconomics (1 / 2012)



Lecture 5 The Economics of Ideas
Read Chapter 4 in Charles Jones

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- Under the Solow model, we focus on modeling the accumulation of K and H . Rates of technological progress cause productivity differences, explain why some countries are rich and others are poor.
 - We will explore the broad issues associated with creating an economic model of technology and technological improvement.

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- Ideas are very different from other economic goods.
 - Ideas are non-rivalrous: once an idea is invented, it can be used by others with no additional cost.
 - Idea production implies IRTS, requiring a models of imperfect competition.
 - Fixed cost in idea production requires price to be set over marginal cost.




What is Technology?


- The way inputs to the production process are transformed into output.
- Given the production function $Y=F(K,L)$, technology is given by the function $F(\bullet)$.
- Example. Cobb-Douglas, $Y=AK^\alpha L^{1-\alpha}$. A is an index of technology.
- Ideas improve the technology of production. We can find better ways to combine inputs and get more output or new output that generates a higher level of utility
- new ideas generate an increase in the index of technology, A .
- Examples: Intel, electricity, assembly line, internet, ipod



Economics of Ideas

- Phelps (1966), Shell (1967), และ Paul Romer (1986) formalized the relationship between the economics of ideas and economic growth in the following way:
- ideas → non-rivalry → increasing returns to scale → imperfect competition
- An inherent characteristic of ideas is that they are nonrivalrous. This non-rivalry implies the presence of IRTS. To model IRTS in a competitive environment with intentional research requires imperfect competition.

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- Romer (1990) : ideas are very different from most of other economic goods.
 - Economic goods are rivalrous: ipad, psychiatric counseling. My use excludes your use of the same ipad and counseling.
 - If 1000 persons each wants to use ipad, we have to provide them with 1000 ipads.
 - In contrast, once an idea has been created, anyone with knowledge of the idea can take advantage of it. Ideas are nonrivalrous.
 - Ex. Iphone design, search engine, assembly lines, drug ingredients, ram design

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- This suggests another important characteristic of ideas, which share with most economic goods: They are, at least, partially, excludable.
 - The degree to which a good is excludable is the degree to which the owner of the good can charge a fee for its use.
 - You can hide your secret formula. Or copyright and patent systems grant inventors the right to charge for the use of their ideas.

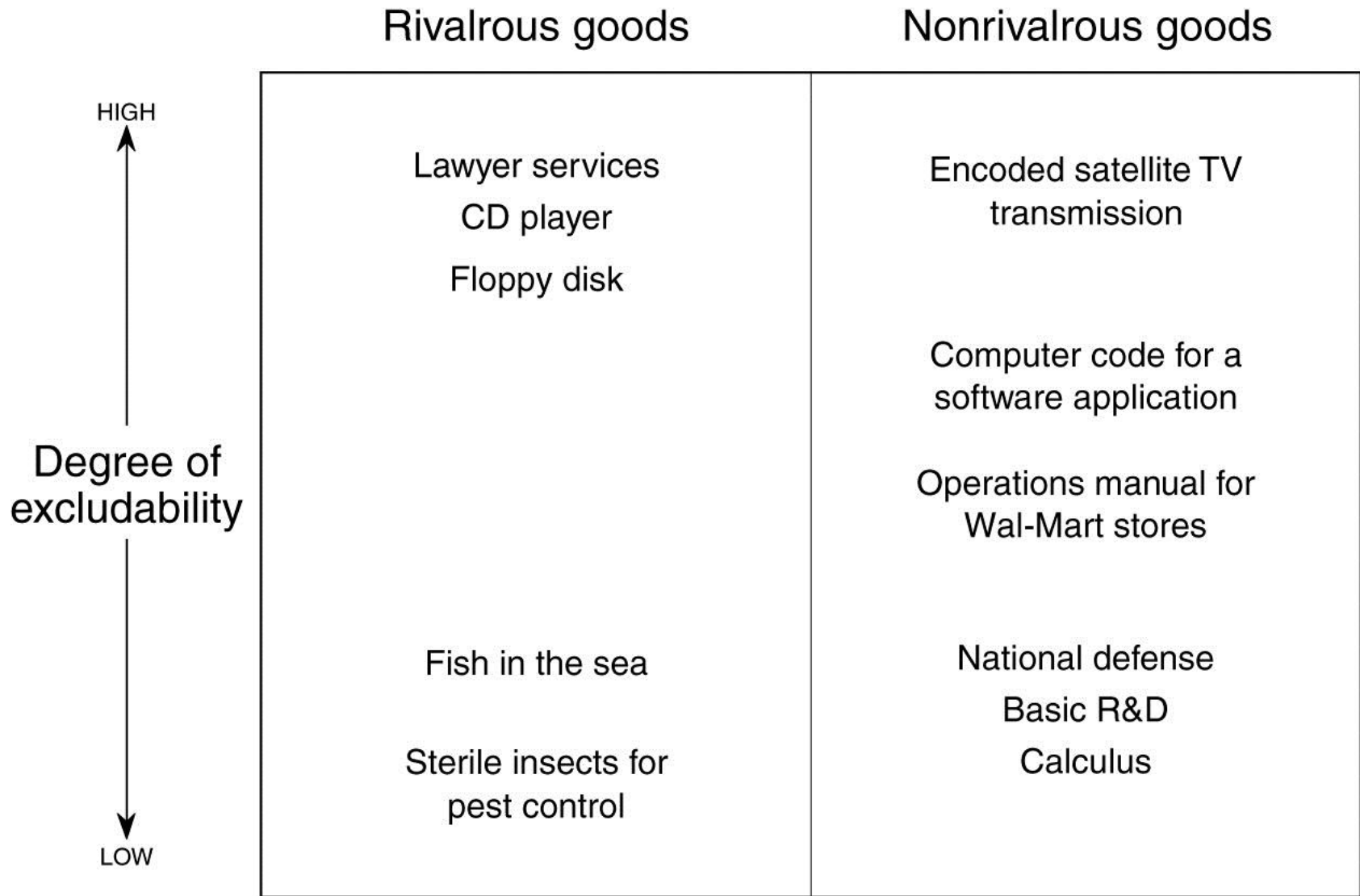





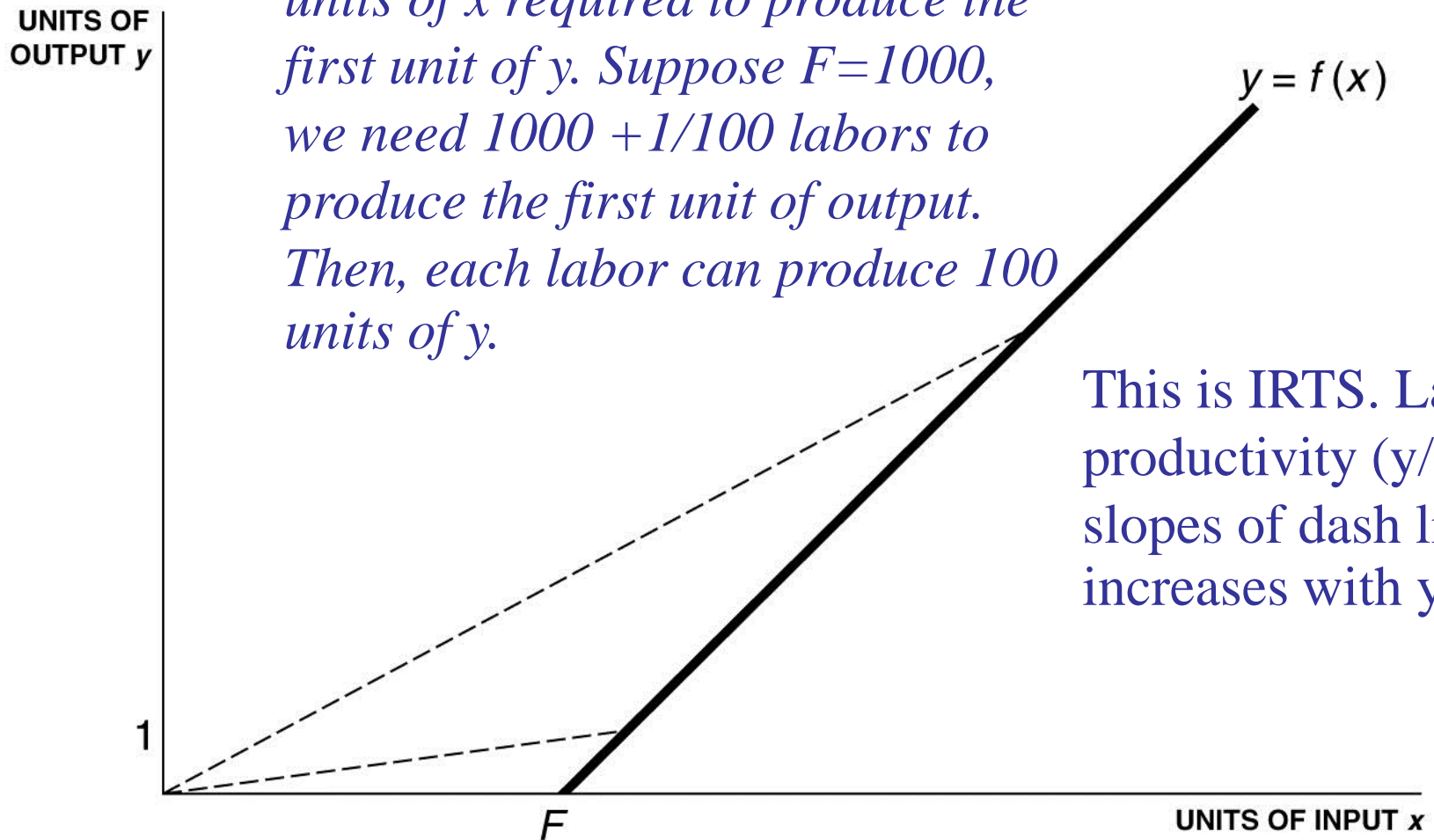
FIGURE 4.1 ECONOMIC ATTRIBUTES OF SELECTED GOODS

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- Goods that suffer from the tragedy of the commons problem are rivalrous but have a low degree of excludability.
 - Common land, forest community, open ocean (over used)
 - Ideas are non-rivalrous, but vary in the degrees of excludability.
 - Non-rivalrous goods that are unexcludable are called *public goods*. Ex. Defense, option pricing formula

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- Goods that are excludable allow their producers to capture the benefits they produce.
 - Goods that are not excludable yield spillovers of benefits that are not captured by producers.
 - Such spillovers are called externalities.
 - Goods with positive spillovers tend to be produced less than the socially optimum level.
Ex. Basic R&D, national defense
 - Goods with negative spillovers may be overproduced by markets. Ex. Tragedy of the commons is a good example.

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- Goods that are rivalrous must be produced each time they are sold, while goods that are non-rivalrous need to be produced only once.
 - Idea production involves a fixed cost and zero marginal cost.
 - Ex. Stiff cost for the first MS-office software, but then subsequent units can be copied very cheaply. First drug formula requires a one-time high research cost. The first electric light bulb requires a great deal of inspiration and perspiration.
 - Since the idea is embodied in a nonrivalrous good, that explain a nonzero marginal cost.

$y = f(x) = 100*(x - F)$, where F is units of x required to produce the first unit of y . Suppose $F=1000$, we need $1000 + 1/100$ labors to produce the first unit of output. Then, each labor can produce 100 units of y .



This is IRTS. Labor productivity (y/x , slopes of dash lines) increases with y .

FIGURE 4.2 FIXED COSTS AND INCREASING RETURNS

If MC is small, why prices of software or drugs are high over MC? When $P=MC$, it incurs loss due to FC or IRTS. To cover firm's FC, it needs to have a mark-up pricing, otherwise it will not enter to this business. The production of new goods or new ideas requires earning profits.

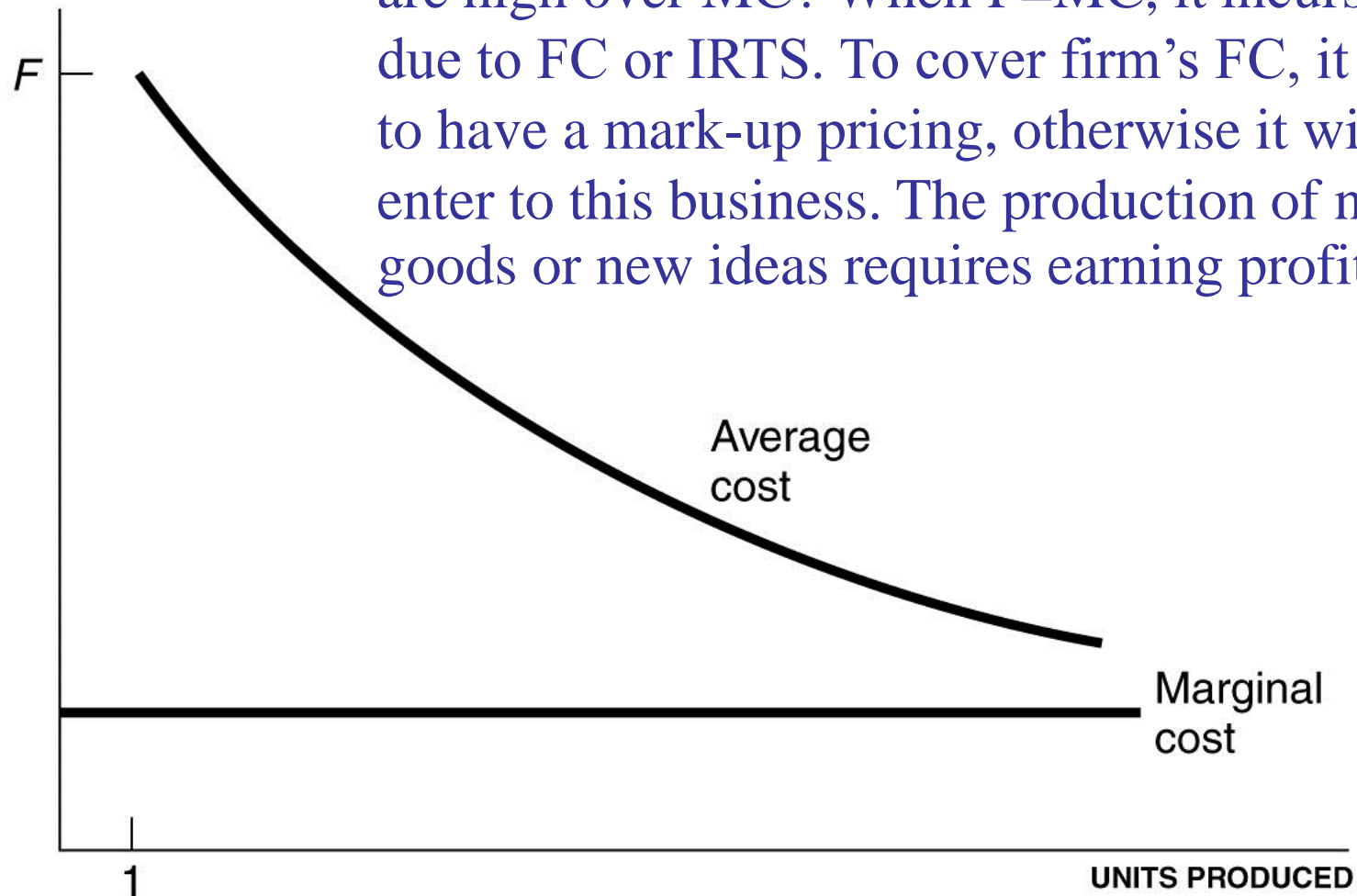


FIGURE 4.3 FIXED COSTS AND INCREASING RETURNS



Intellectual Property rights and the industrial revolution

- Patents and copyrights are legal mechanisms that grant investors monopoly power for a time to reap return from their investment. That is to increase the degree of excludability.
- Before the industrial revolution around 1760s, world has not experienced a rapid growth in per capita income.
- Why just happened during the 18th and 19th centuries?
- Changes in institutional arrangement that investors can grasp as private benefits of large social benefits from their ideas.

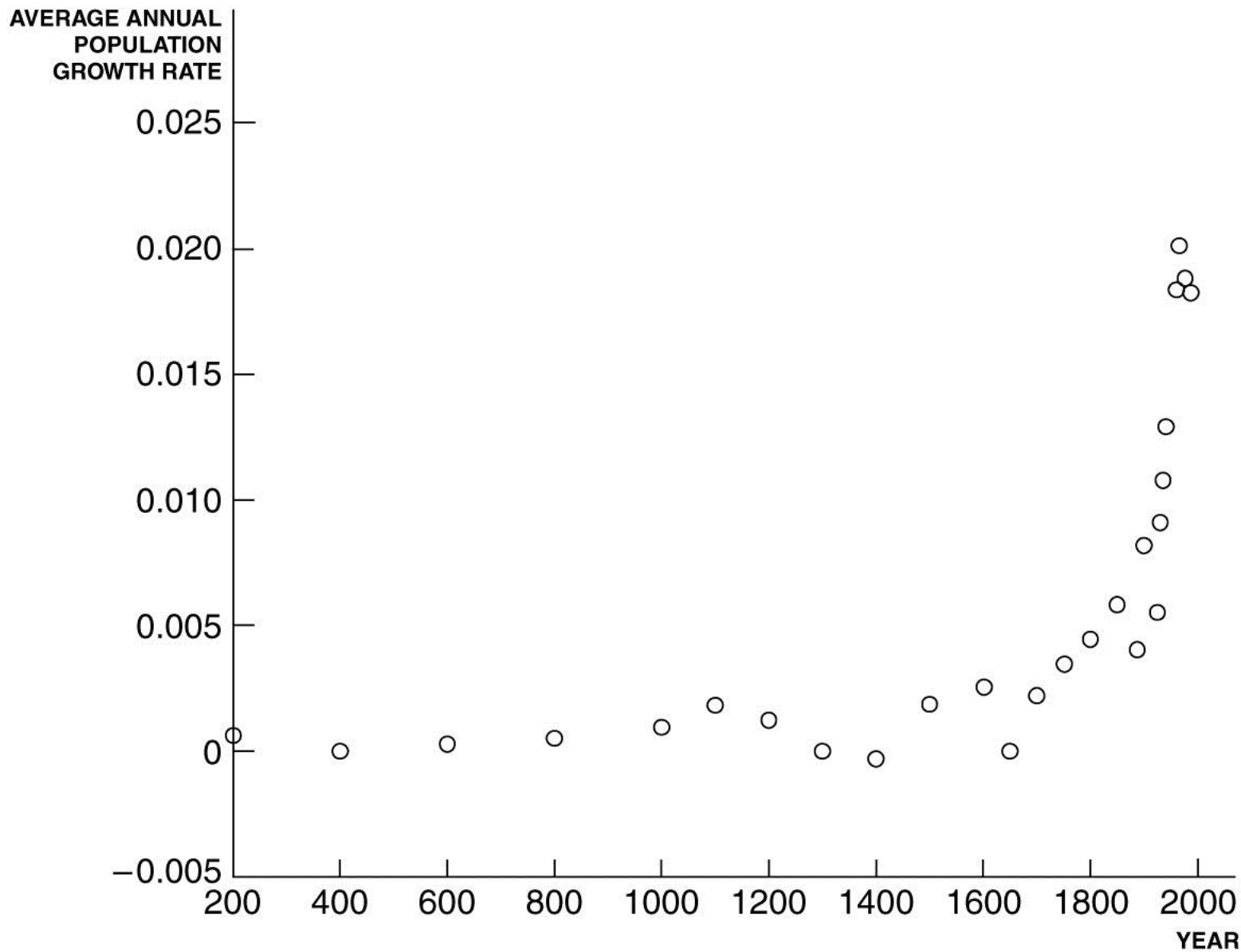


FIGURE 4.4 WORLD POPULATION GROWTH, 1 A.D. TO 1990



Data on Ideas

- Inputs into the production of the ideas: R&D is an important input into the production function for ideas. (cons: many ideas are not produced or using resources)
- Outputs: Patent counts may provide a simple measure of the number of ideas produced, if valuable ideas are patented. (cons: many ideas are not patented; not know its economic value)

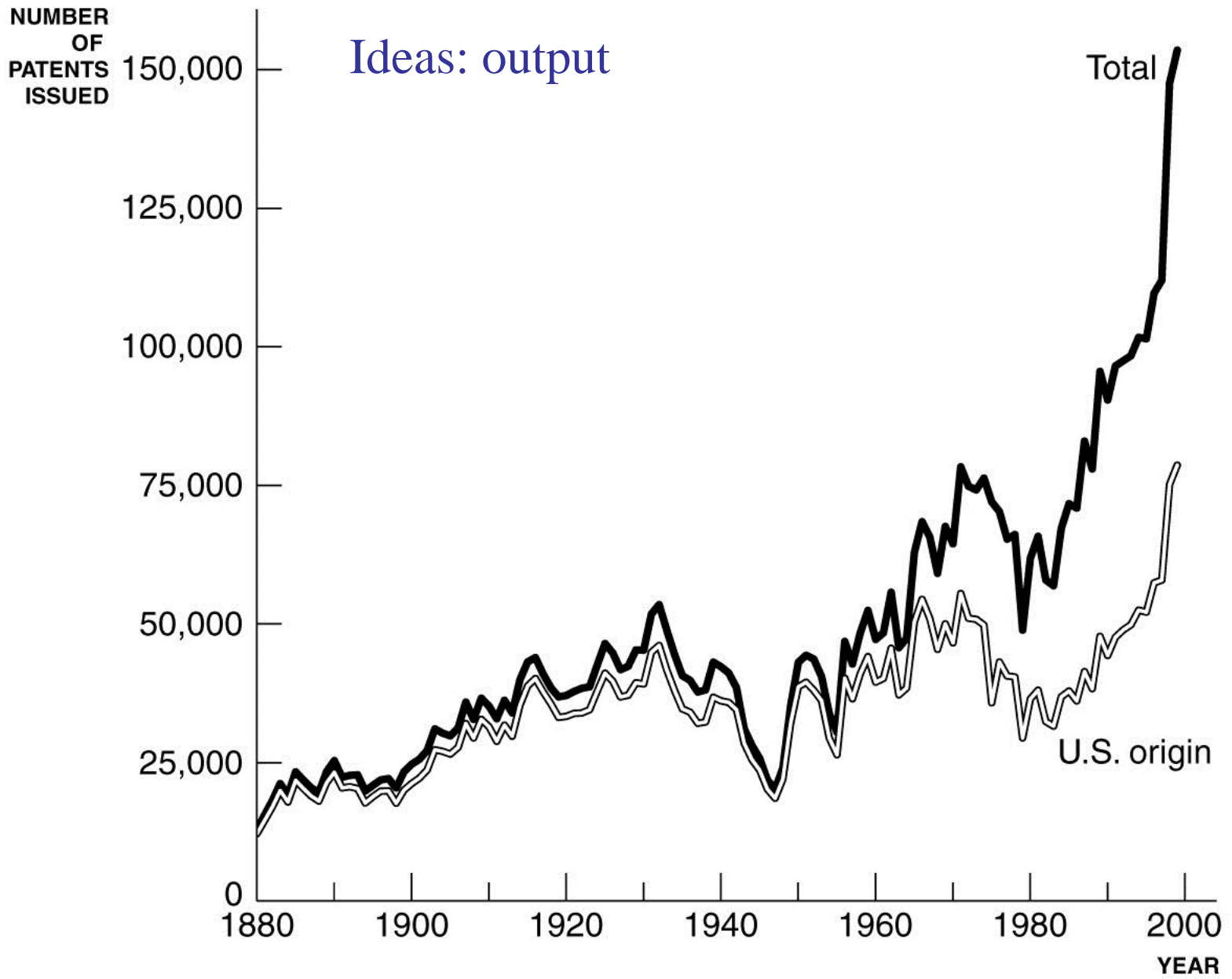


FIGURE 4.5 PATENTS ISSUED IN THE UNITED STATES, 1880–1999

NUMBER OF
SCIENTISTS
AND
ENGINEERS
(THOUSANDS)

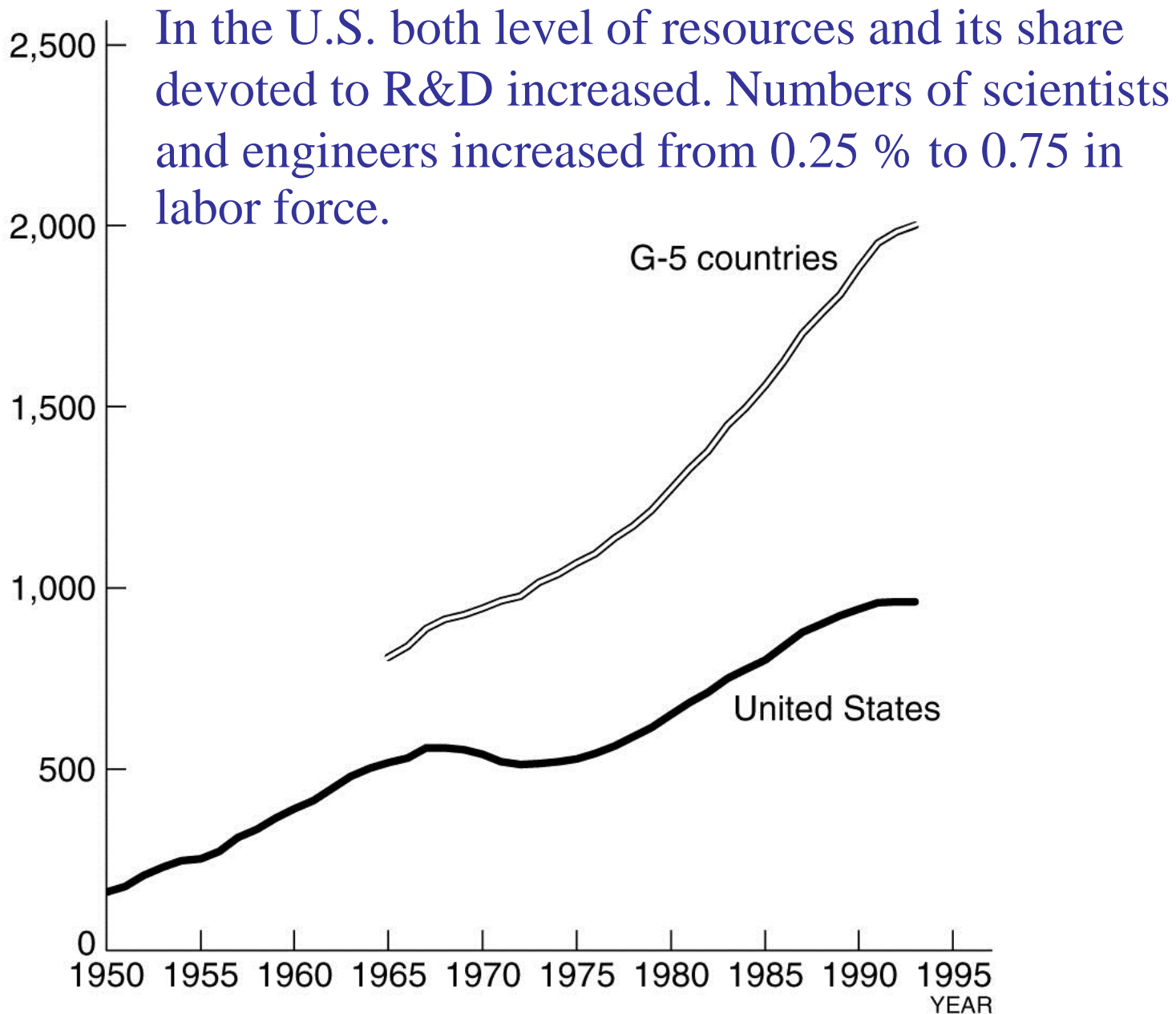


FIGURE 4.6 SCIENTISTS AND ENGINEERS ENGAGED IN R&D, 1950–93