Chapter 4. The Economics of Ideas

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What is technology?

Let production function be $Y(t) = K(t)^{\alpha}(A(t)L(t))^{1-\alpha}$.

$A(t)$ is an index of technology.

Intuitively, ideas make better technologies (e.g., microchips, the Wal-Mart approach to retailing, Ford's assembly lines, etc.).

The economics of ideas

Ideas→Non-rivalry (one's consumption does not diminish consumption by others)→Increasing returns→Imperfect competition.

Ideas can be *excludable* (one can charge a fee for using an idea). Nonrivalrous and non-excludable goods are public goods (e.g., national defense, basic R&D, calculus).

Non-excludable goods involve "spill-overs" of benefits not captured by producers, called *externalities*.

Nonrivalrous goods involve large fixed costs and low marginal costs (e.g., software). Thus, they involve economies of scale (per unit costs fall the more output is produced).

A simple model

Let x be the amount of labor used to produce a final good y (software), F are the labor costs necessary to produce the first unit (fixed cost). Let $y = f(x) = 100(x - F)$. This production function is increasing returns to scale if $f(\lambda x) = 100(\lambda x - F) > \lambda y = 100\lambda(x - F)$. This happens if $\lambda > 1$, that is if we increase the labor utilized.

Note also that one needs to utilize $F + 1/100$ units of x to produce the first unit of output; $F + 2/100$—2 units of output; $F + 3/100$—3 units of output, etc. The per unit cost, assuming that one unit of x costs \$1, is equal to $F + 1/100$ if 1 unit is produced, $F/2 + 1/100$ if 2 units; $F/3 + 1/100$ if 3 units, etc. That is, the per unit cost is falling if the scale of operation is increased—*economies of scale*.

Marginal-cost pricing (efficient pricing) results in negative profits. Thus, need some form of imperfect competition.

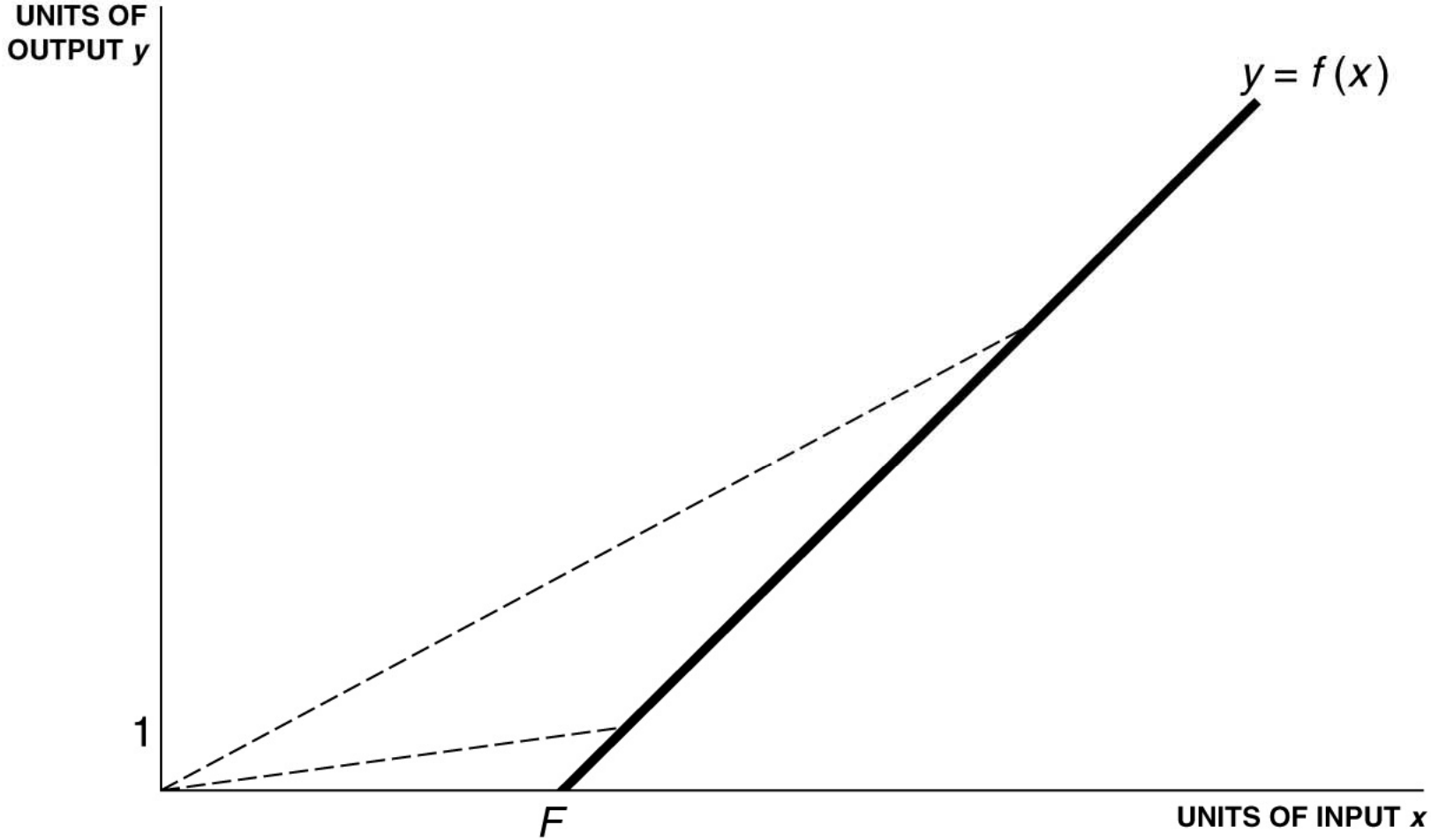

FIGURE 4.2 FIXED COSTS AND INCREASING RETURNS

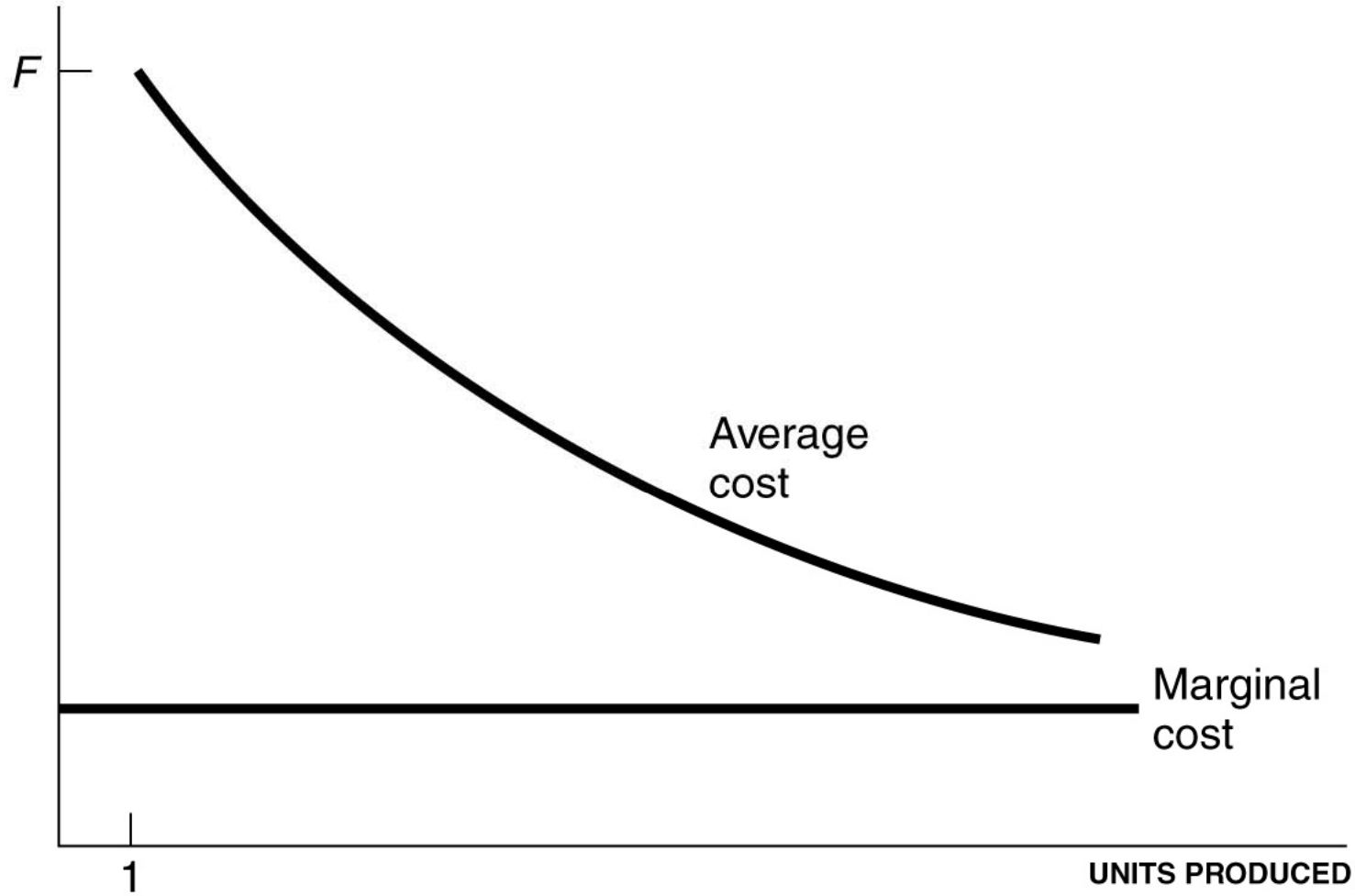

FIGURE 4.3 FIXED COSTS AND INCREASING RETURNS

Intellectual property rights and the data on ideas

Modern sustained economic growth *could be* the result of creating institutions (e.g., patents) allowing entrepreneurs to capture some of the enormous social returns created by their inventions.

The *level* of resources devoted to R&D increased recently (number of persons engaged in research); also, the share of the labor force engaged in R&D increased (e.g., in Japan this share increased from 0.2% in 1965 to 0.8% in 1990).

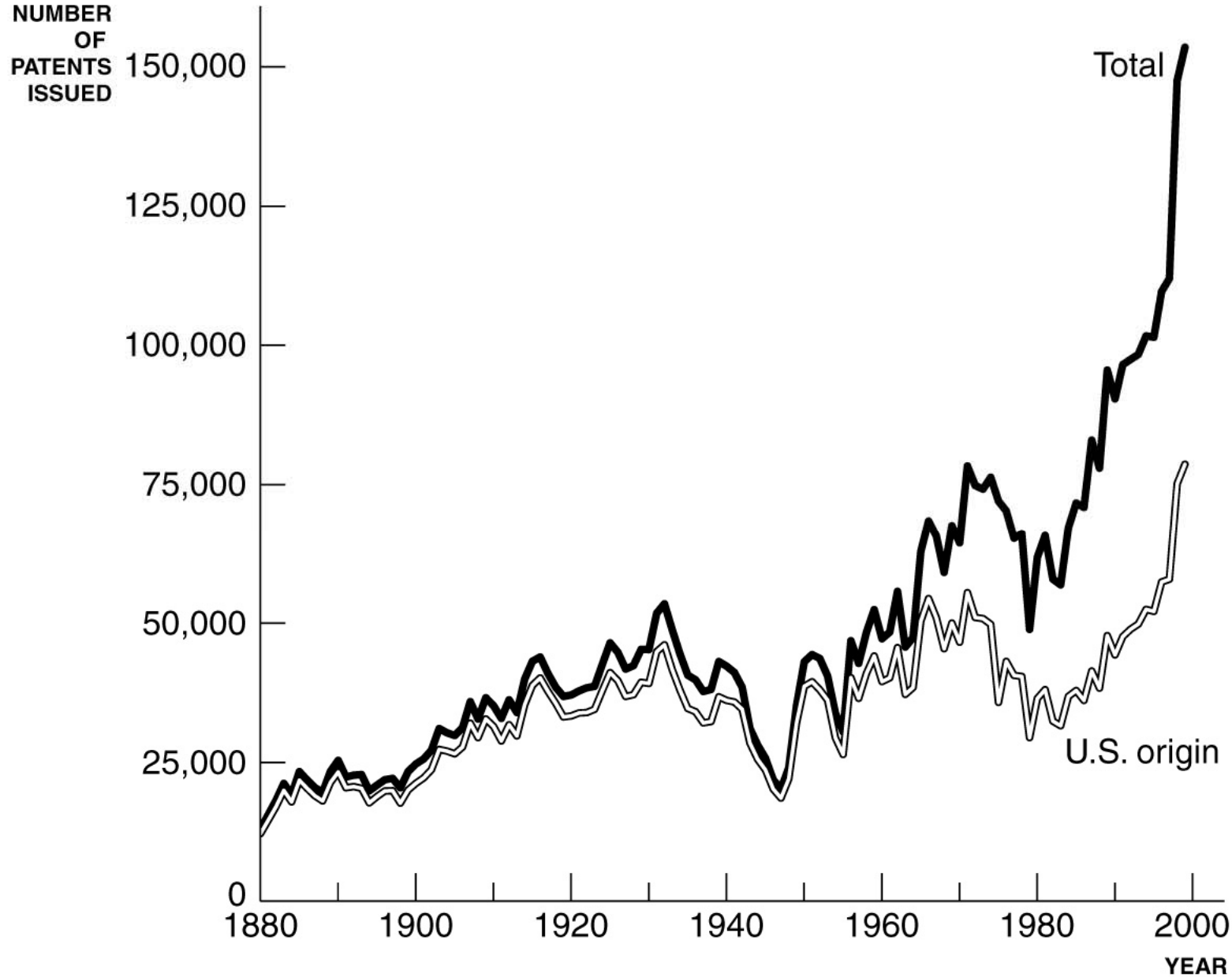

FIGURE 4.5 PATENTS ISSUED IN THE UNITED STATES, 1880–1999

Economic Growth, 2nd Edition

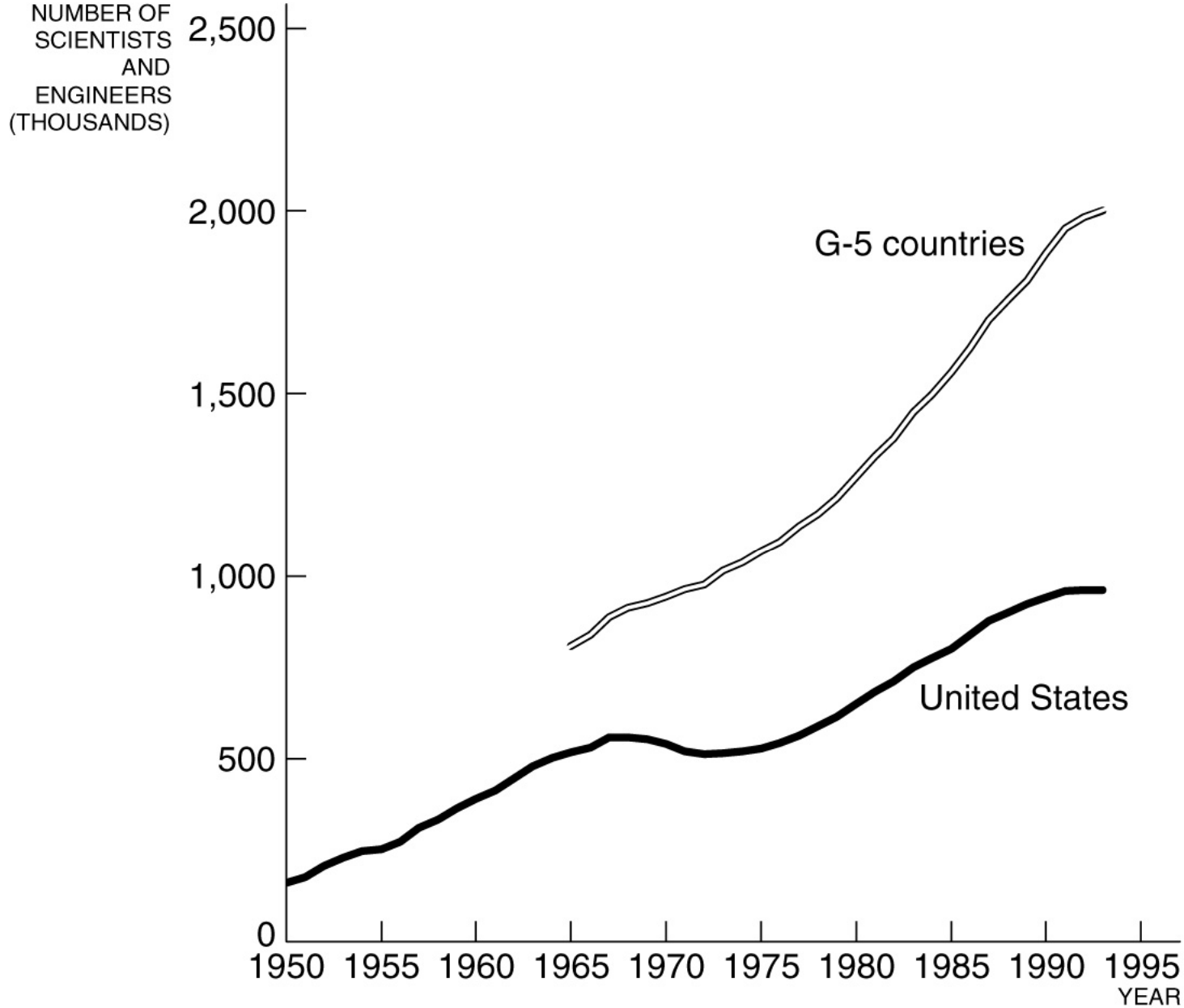

FIGURE 4.6 SCIENTISTS AND ENGINEERS ENGAGED IN R&D, 1950–93