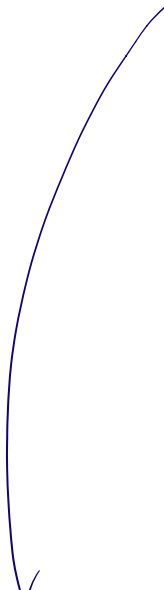


Technological Progress & Ideas

What is Technological Progress?



Examples of Ideas

► New (better) products / equipment:

- steam engine (James Watt)
- computers (Turing, von Neuman).
- software. (GUIs by Gates, Jobs & Wozniak)
- genetically modified crops. (Monsanto)

► New processes:

- assembly line. (Toyota, Walmart)
- management of inventories. (Southwest Airline)
- aircraft boarding sequencing
- open road touring.

Important Lessons

1. Old ideas are important inputs into new ideas
2. New ideas are simultaneously being searched by many researchers

Economics of Ideas

- ▶ What is a good economic notion of an idea?
- ▶ Simple (and incomplete) answer: Ideas are another form of capital, intangible capital...

Ideas = Capital?

- ▶ Inventors *invest* time to create ideas
- ▶ Ideas enhance the future *productivity* of the economy

Ideas \neq Physical Capital?

- ▶ Ideas can be used by many simultaneously
- ▶ It can be hard to prevent people from copying ideas
- ▶ Production of goods and services that embody ideas can exhibit increasing returns to scale

Ideas \neq Physical Capital?

- ▶ Ideas can be used by many simultaneously [non-rival]
 - ▶ It can be hard to prevent people from copying ideas [non-excludable]
 - ▶ Production of ideas might exhibit increasing returns to scale
- don't depreciate.*

*e.g. software . non rival
non excludable*

Why are these differences important?

Basic Economics of Ideas

cost lots to develop.
"blue print"
but not a unit
of product.

► Innovation entails:

1. high fixed costs *← develop.*
2. low variable cost (due to nonrivalrous nature)

► Real world examples include:

- pharmaceuticals
- high tech manufacturing (new commercial aircraft, passenger car engines.
-

A Simple Technology

$$y(x) = \begin{cases} 0 & \text{if } x \leq F \\ A(x - F) & \text{if } x \geq F \end{cases}$$

↙ fixed cost.

→ developing.

↓

problem in perfect competition.

A Simple Technology: Costs

Total Cost: $C(y) = \bar{F} + \frac{y}{A}$

Marginal Cost: $\frac{\partial C}{\partial y} = \frac{1}{A}$

Average Cost: $\frac{C(y)}{y} = \frac{\bar{F}}{y} + \frac{1}{A}$

A Simple Technology: Equilibrium

If the industry is perfectly competitive, prices equal marginal costs in equilibrium:

$$P = \frac{\partial C}{\partial y} = \frac{1}{A}$$

need to
price above
the marginal cost. \Rightarrow

In this case, firms are **NOT** profitable:

\rightarrow never be profitable.

profit $\pi = p y - C(y)$

$$= p y - F - \frac{\gamma}{A}$$

$$= \frac{1}{A} y - F - \frac{\gamma}{A}$$

$$= -F$$

no one will enter the industry.

Open Questions

market structure

- ▶ How do we incorporate ideas in a growth model?
- ▶ How do the predictions of the Solow Model change when we endogenize technological progress?