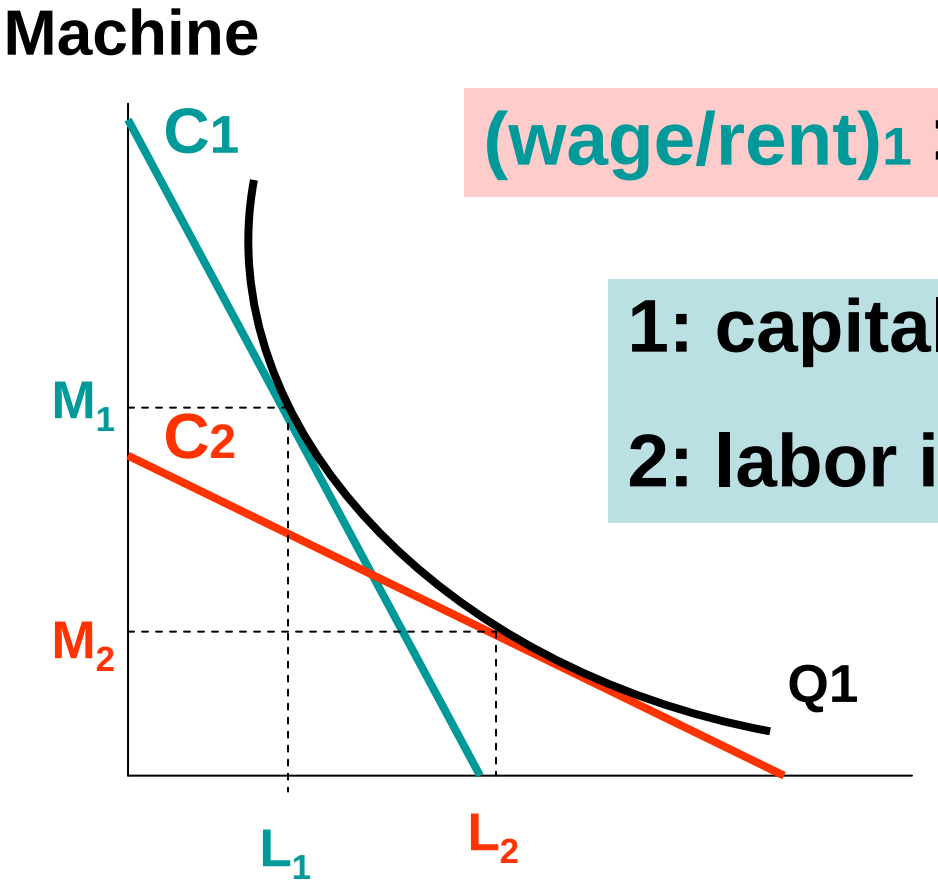
Technology

Technology

Significance

- Technological advance → overcome Multhus's prediction of food shortage and deprivation
- Crucial role in the modern economics growth experienced by developed countries → higher productivity

Least-cost combination of two regions with different wage and rental rates



(wage/rent)$_1$ > (wage/rent)$_2$

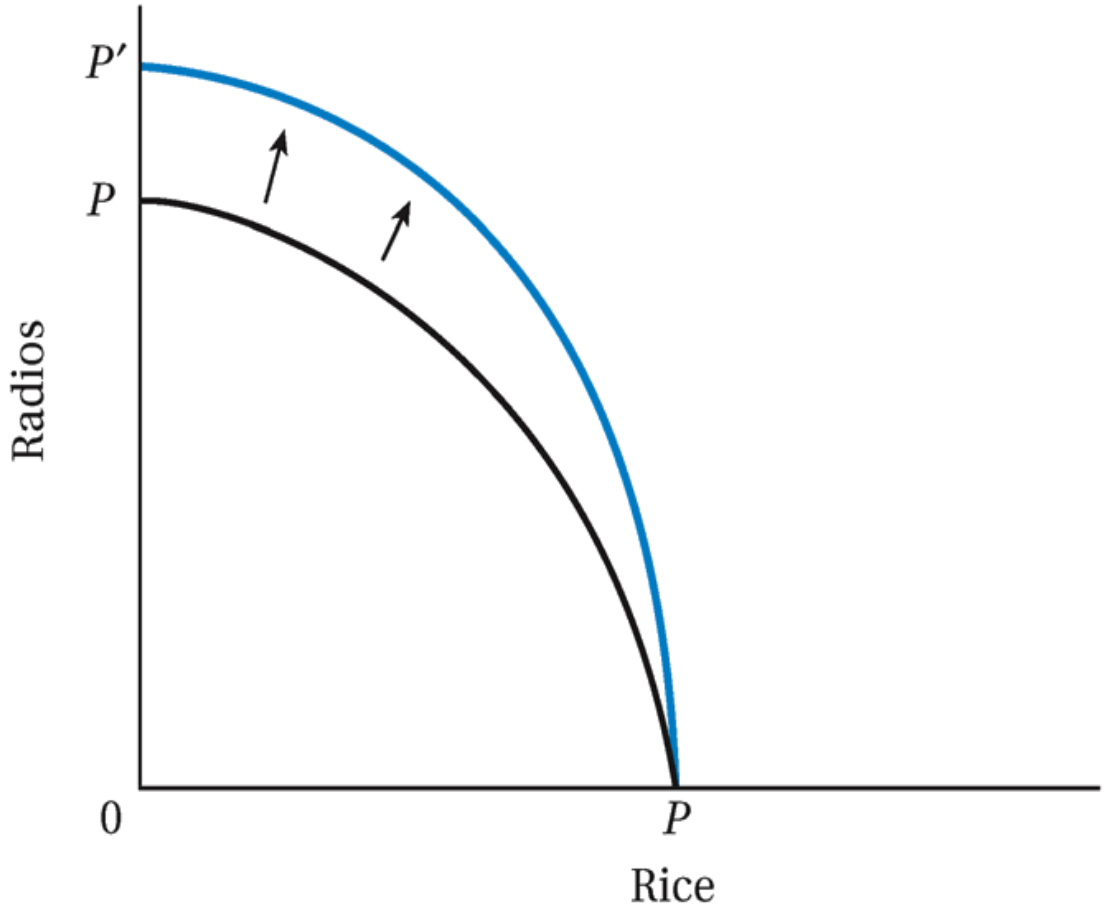
1: capital intensive

2: labor intensive

The same technology but different techniques

(input subsititution)

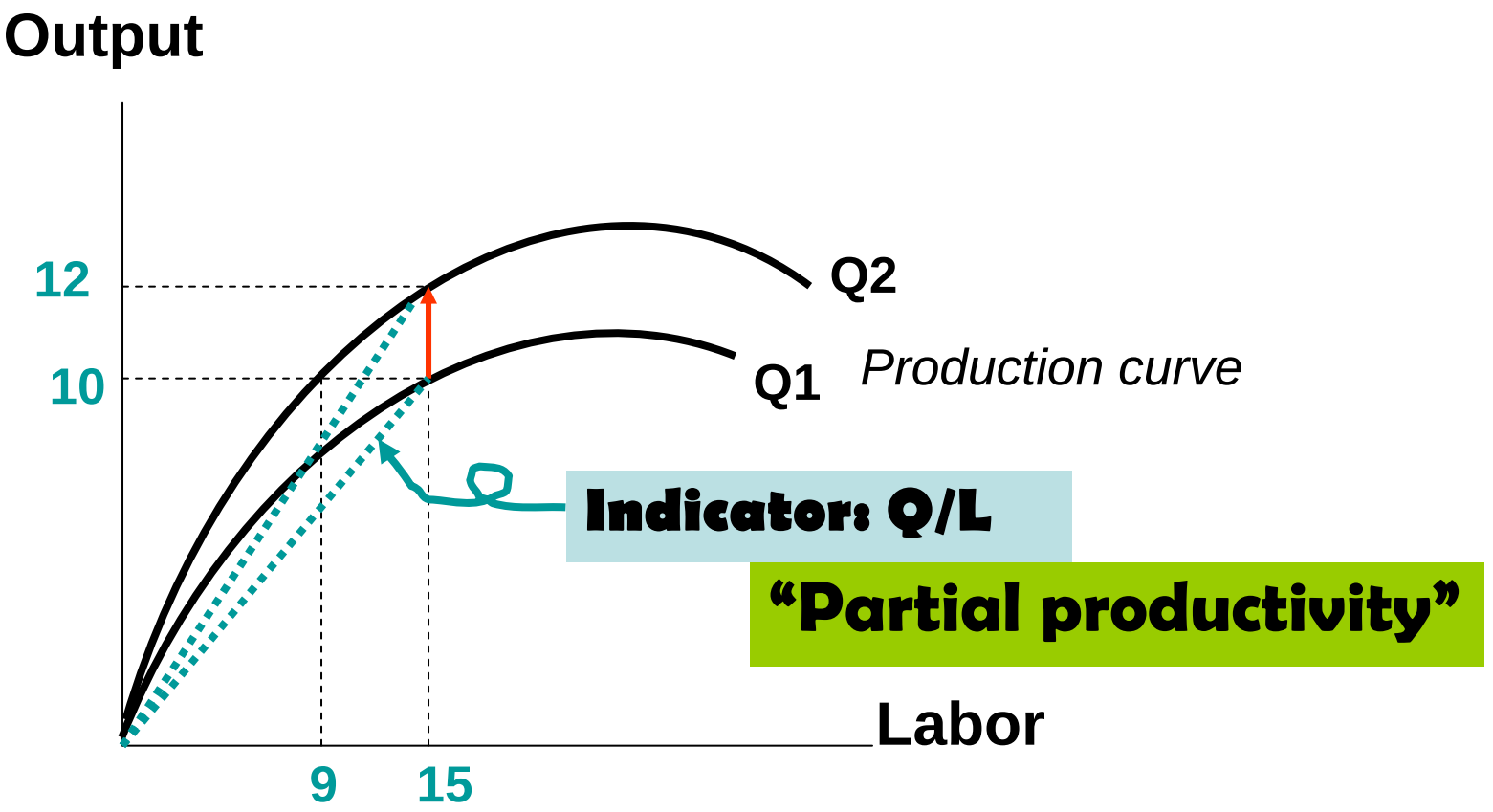
Example: Effect of Technological Change in the Industrial Sector on the Production Possibility Frontier



Technology

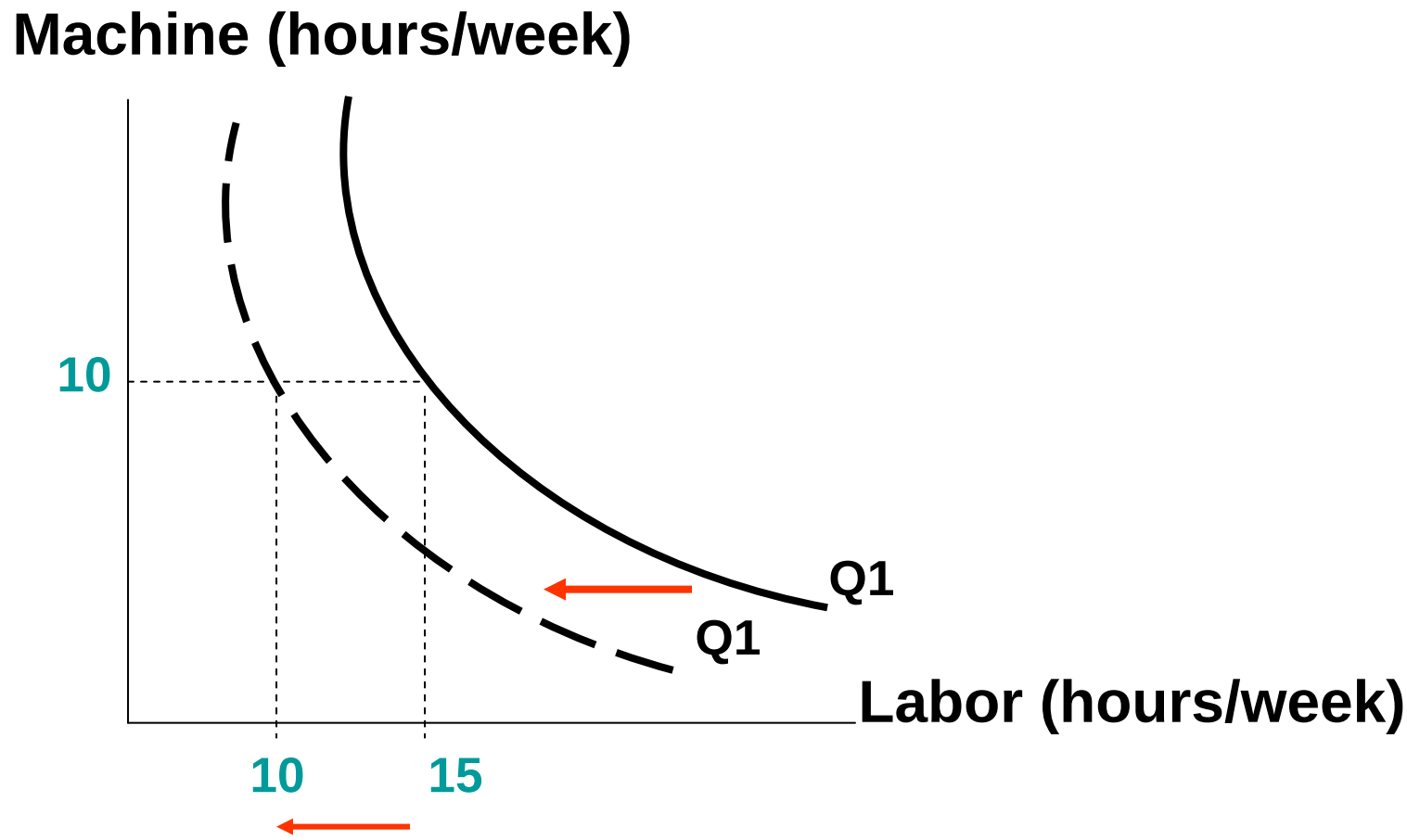
technological improvement = producing the same amount of output with less inputs and lower cost

Technological Improvement:



Technological Improvement:

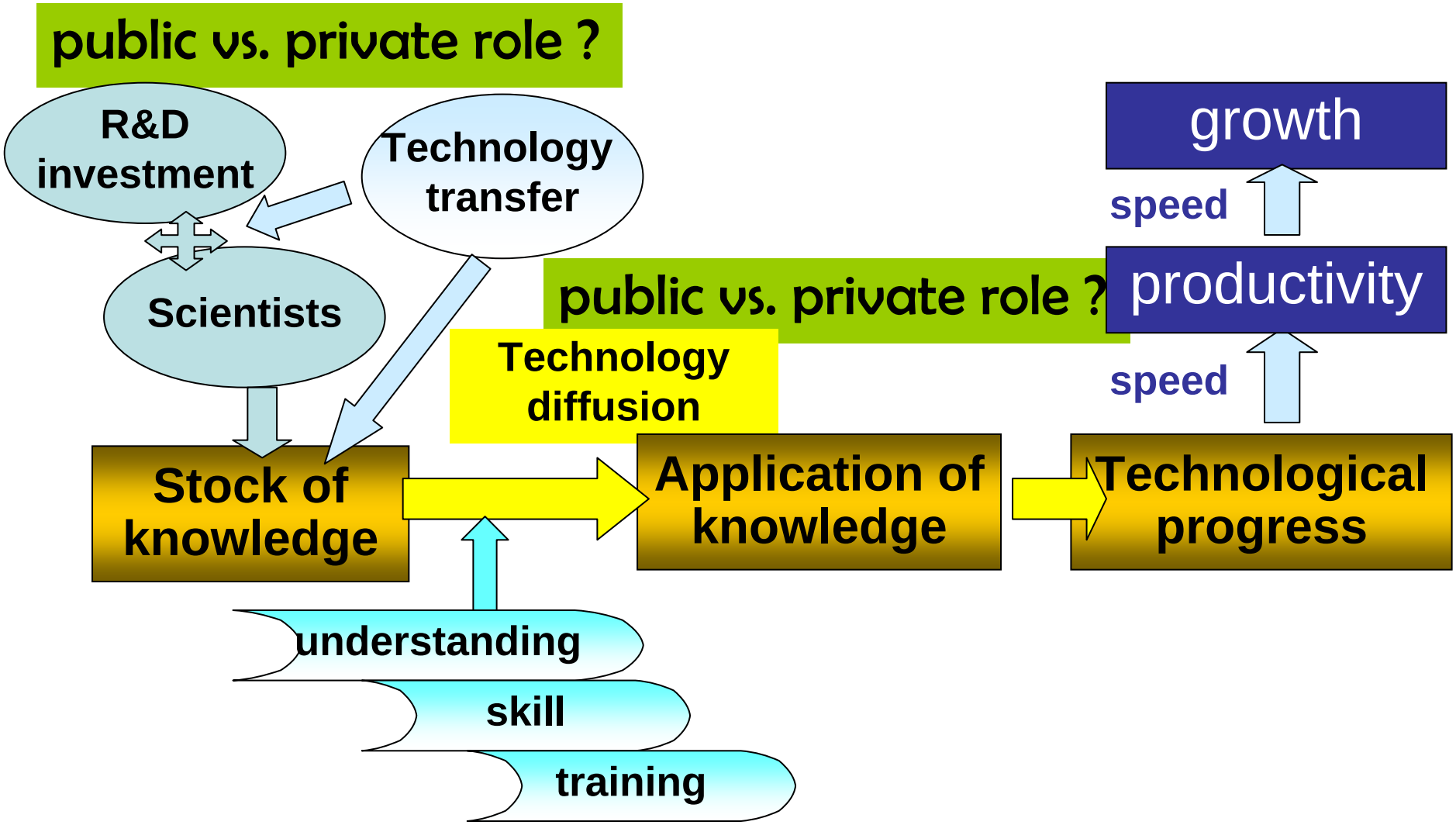
same output quantity, less input



Need Investment

- High social marginal rates of return
- Need investment
  - by whom ?
- Why underinvestment in LDCs?
- What direction is appropriate?
- Institution may facilitate or obstruct the spread of technology

Process of technological progress



Process of Technological Improvement

Investment in Agricultural Research

By scientists or innovative farmers

- In a laboratory
- At an experimental station
- On farm

Extension of Technology

By extension workers/officers

Training and Visiting (TV) system

Economics of Ag. Research

- Technology comes from investment
- Time lag between investment and outcome (new knowledge)
- Uncertain whether to achieve the new knowledge or not
- Technology (stock of knowledge) is a public goods
  - The use by one farm will not reduce its availability to another farm
  - Can be diffused and, often, costly to exclude those who do not pay

Therefore,

→Market (private) tends to under-invest in R&D

→Investment by the government

→Unless an incentive system is provided to the private sector

e.g. patent system,

technology embodied in inputs that cannot be duplicated easily (e.g. machine, corn seed)

Why are rice HYVs developed by public research but corn HYVs are developed actively by private firms?

- The world has a number of international research institutes
  - IRRI: International Rice Research Institute
  - CYMMYT
- Is it justified to have an international collaboration?
  - Yes, as technology is a public goods and have economies of scale

Forms of Technology

- Mostly embodied in a form of new inputs or inputs with improved quality e.g. new type of machines, HYV seeds, package of inputs
- New technique, new production process, cultural practices

  e.g. tissue culture, tapping system for rubber, genetic engineering

Technology can be <u>depreciated</u>

Theory of Induced Innovation

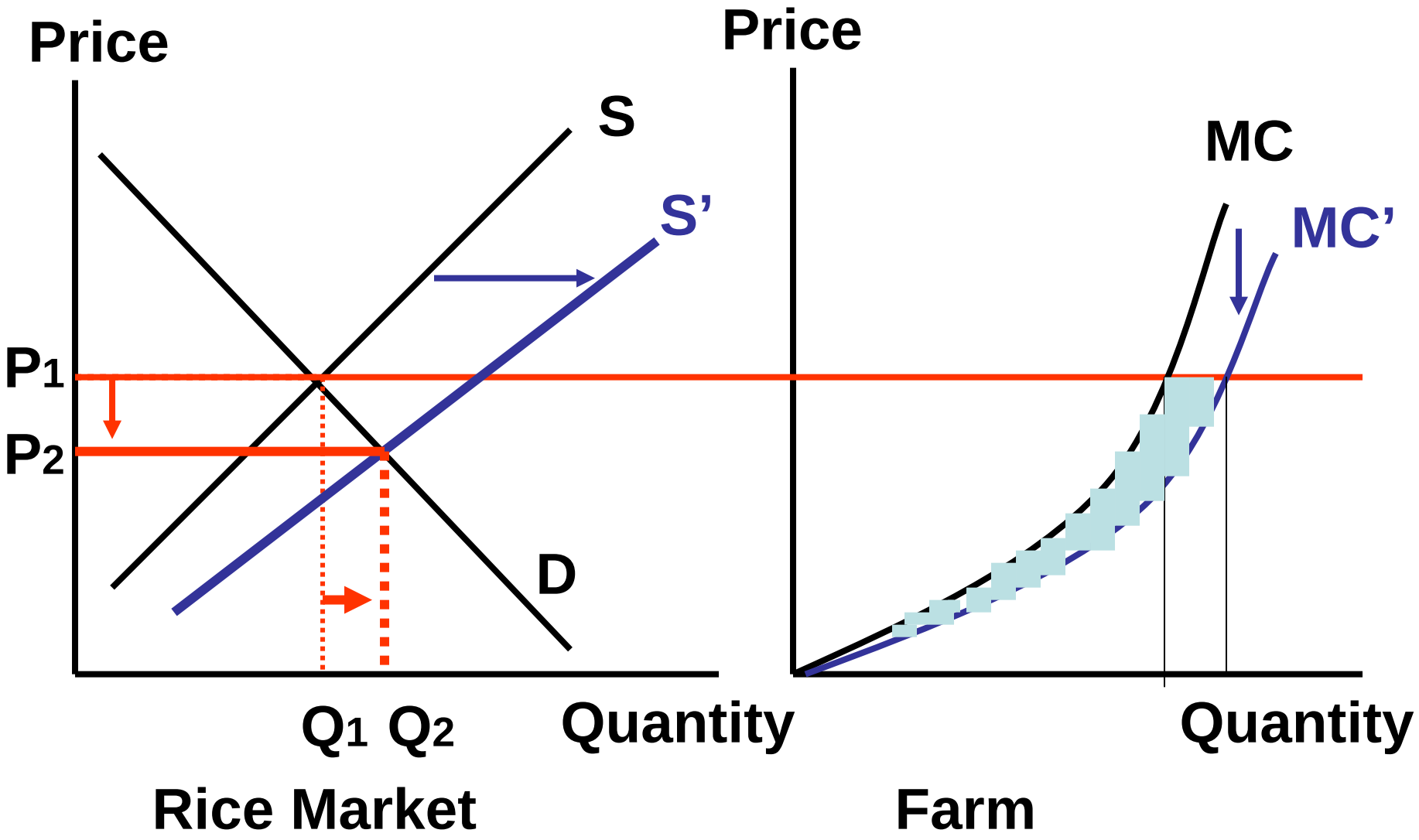
- By Hayami and Ruttan
- Innovation is induced by type of factors endowment
- Innovation that can reduce production cost is the one that saves the utilization of expensive inputs (scarce resources) and uses the cheaper inputs (abundant resources).
- "x-using" or "x-saving" or "x-neutral" type of technology

Appropriate Technology

Is technology always beneficial?

Technology

- Given output, use less inputs → reduce production cost
- Given inputs, produce more output → increase input productivity


Price
S
S'
P1
P2
D
Q1 Q2
Quantity
Rice Market
Price
MC
MC'
Quantity
Farm

- **If a farm generates or early adopt the new technology**

Lower cost → more surplus → produce more

- **After technology diffusion**

Market supply increase → Price falls

Net Impacts

+ surplus due to cost down

- surplus due to price down

Beneficiaries

- Product with a highly elastic market demand

  (a falling price increases quantity demand significantly, or

  a quantity increases without falling price)

e.g. a small importer or exporter of rice in the world market

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- The one who controls the technology (without diffusion)
- Early adopters of the technology (mostly large farms)

Research and Extension in Thailand

- Mostly, public activities, innovative farmers, a few private firms
- Thailand focuses on extension rather than research, and often assumes that "appropriate" technology exists.
  - Tends to ignore factor price ratio in generating new technology
  - Ignore that ag. technology is location-specific

  => lack of appropriate technology
  - Underinvestment in research (Why?)

uzuk


1

2

3

4

5

6

7

Case of Khao Hom Mali

- Premium rice with higher price
- A policy to increase its planted area by developing a new variety "Pathum60" that has similar characteristics to (but cannot be exactly the same as) Hom Mali
- Price of Hom Mali falls because
  - Increase in output of a close substitute
  - Mix of Pathum60 lowers the quality of rice as consumers cannot differentiate the product

Case of GMOs

- GMOs = genetically modified organisms
- Genes of preferable characteristics of one species are transferred into DNA sequences of another species by technique of genetic engineering
- e.g. corn, soybean, tomato, papaya
- Protested by NGOs
  - Unknown impacts on health and environment
  - The technology tended to be monopolized by a private company

e.g. Roundup-Ready Soybean

- GMOs soybean, resistant to herbicide named "roundup ready"
- Farmers can grow "RRSoybean" while spraying "roundup ready" to kill weeds

  ➔ labor-saving, convenient

- The company can sell more of both "RRSoybean" and "Roundup ready"