EC569 Economic Growth

Efficiency

Keisuke Casey Otsu

School of Economics, University of Kent

Lecture 7

- Decomposing productivity into technology and efficiency
- Differences in efficiency
- Types of inefficiency

- Productivity decomposition

$$A = T \times E$$

- T: technology
  - knowledge about how factors of production can be combined to produce output
  - grows over time
- E: efficiency
  - how effectively given technology and factors of productions are actually used
  - bounded between zero and one

- Technology gap

$$\frac{T_{2009,India}}{T_{2009,US}} = \left(\frac{1}{1+g}\right)^{G}$$

where

$$T_{2009,India} = T_{2009-G,US} = \frac{T_{2009,US}}{(1+g)^{G}}$$

- G: the years Indian technology lags from the US technology
- g: the average growth rate of technology in the US
  - productivity growth during 1975-2009 in the US = 0.54%

- Productivity gap

$$\frac{A_{India}}{A_{US}} = \frac{T_{India}}{T_{US}} \times \frac{E_{India}}{E_{US}}$$

  - productivity gap consists of technology gap and efficiency gap
  - we can measure the productivity gap but cannot disentangle into the technology and efficiency gap
  - unless lags in technology are extremely large, efficiency gap is the dominant force of the productivity gaps

Table 10.1 Decomposition of Productivity Gap Between India and the United States
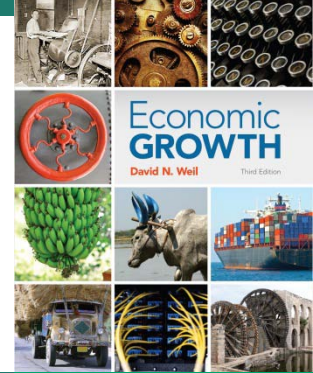
| Years India Lags United States in Technology (G)	Level of Technology in India Relative to United States (T)	Level of Efficiency in India Relative to United States (E)
10	0.95	0.33
20	0.90	0.35
30	0.85	0.36
40	0.81	0.38
50	0.76	0.41
75	0.67	0.46
100	0.58	0.53
125	0.51	0.61

- Efficiency in the Soviet economy: Krugman (1995)
  - output: only one-third of the US per capita level in 1985
  - factors: high investment rate, well educated workforce
  - technology: fairly high especially in defense related industries
  - efficiency must have been low
    - central planning is inefficient if the planner cannot process all information
    - lack of competition/incentives

- Comparing relative productivity among industries in US, Japan and Germany
  - Japanese industrial productivity relative to other countries
    - steel and automobile industries were more productive than others
    - food processing industry was less than half as productive than others
  - differences in industry level productivity are much larger than those in aggregate productivity
    - hard to imagine that the technology levels are so different
    - differences in organizations and regulations seem more important

Table 10.2 Productivity in Selected Industries in the Early 1990s
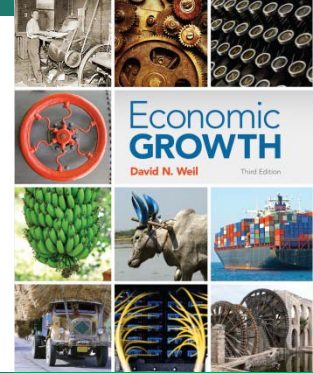
	United States	Japan	Germany
Automobiles	100	127	84
Steel	100	110	100
Food Processing	100	42	84
Telecommunications	100	51	42
Aggregate Productivity	100	67	89

Types of Inefficiency

- Resources not used
- Misallocation: resources are used to produce the wrong things
- Technology blocking

Types of Inefficiency
Resources not Used

- Unproductive activities
  - rent seeking: involve the use of laws or government institutions to bring private benefits
- Idle resources
  - labor hoarding: union protection during recessions
  - capital hoarding: factory shutdown during recessions

Types of Inefficiency
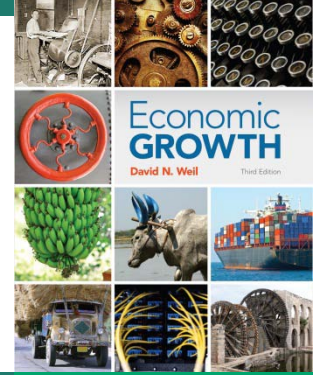Misallocation of Factors among Sectors

- Misallocation among sectors: marginal product of inputs are not equal across sectors
  - barriers to mobility
    - geographical isolation
    - wage policy: e.g. sectoral minimum wage
  - wages $\neq$ marginal product of labor
    - market segmentation: potentially productive people are unable to work in certain sectors

- Efficiency gains from sectoral reallocation
  - reallocation from agriculture to manufacture: Lewis
    - Taiwan: 0.7% of 5.4% annual growth over 1966-1991
    - Korea: 0.7% of 5.7% annual growth over 1960-1990
    - US: fraction of agricultural labor 50% to 3% over 1880-1980
    - China: fraction of agricultural labor 69% to 40% over 1980-2009

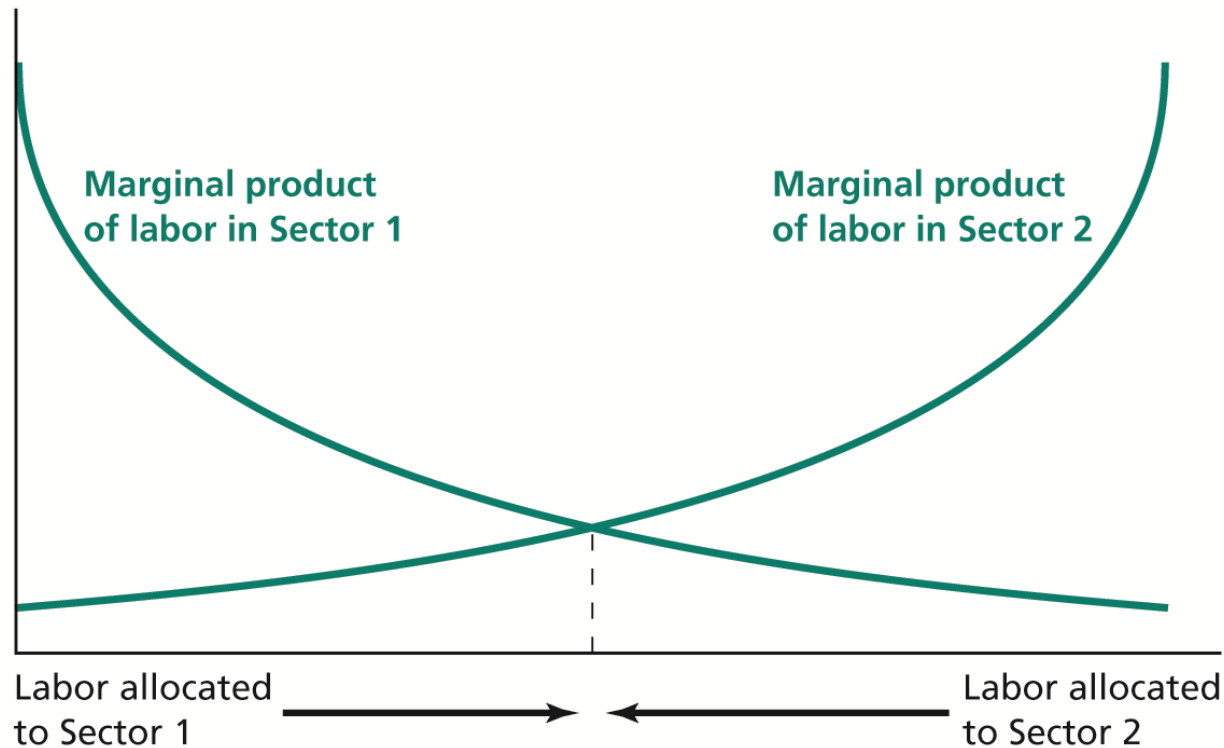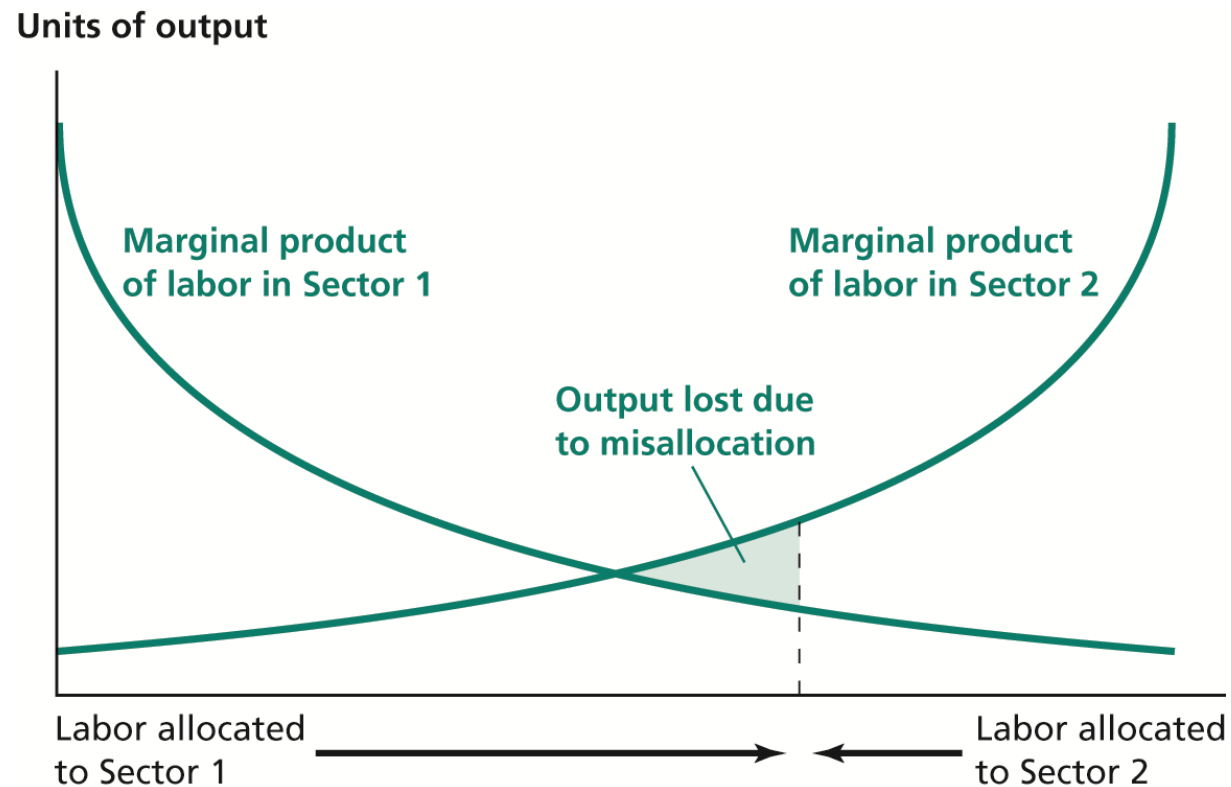# **Figure 10.3** Efficient Allocation of Labor between Sectors

Figure 10.4 Overallocation of Labor to Sector 1

Units of output

Marginal product of labor in Sector 1

Marginal product of labor in Sector 2

Output lost due to misallocation

Labor allocated to Sector 1

Labor allocated to Sector 2

- Misallocation among firms: marginal product of inputs are not equal across firms
  - government-owned firms over-employ: political power
  - monopolies under-employ: monopolistic profit
  - financial frictions prevent efficient allocation of capital: financial development and growth

- Measuring misallocation among firms: Hsieh and Klenow (2009)
  - misallocation: differences in marginal products across firms
  - misallocation among manufacturing firms is larger in India and China than in US
  - reallocation of factors among firms would significantly improve productivity

- Agents deliberately prevent the use of technology
  - Gutenberg's printing press (1453): scribes
  - automated weaving loom (19th century): Luddites
  - margarine (late 19th century): dairy farmers
  - Netscape browser: Microsoft

- Isn't technological progress beneficial to the economy?
  - creative destruction and technology blocking
  - the success of technology blocking depends on the relative power of the opposer/supporter
  - rich countries are more prone to technology blocking
    - technology blocking requires a well functioning government