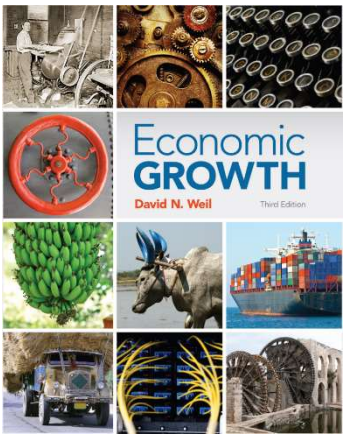
Chapter 10

EFFICIENCY



Syllabus

Economic Growth
D. Weil

PART I: OVERVIEW
Chapter 1: The Facts to be Explained
Chapter 2: A Framework for Analysis
PART II: FACTOR ACCUMULATION
Chapter 3: Physical Capital
Chapter 4: Population and Economic Growth
Chapter 6: Human Capital

PART III: PRODUCTIVITY
- Chapter 7: Measuring Productivity
- Chapter 8: The Role of Technology in Growth

PART IV: FUNDAMENTALS
- Chapter 12: Government
- Chapter 14: Culture
- Chapter 15: Geography, Climate, and Natural Resources

PART V: CONCLUSION
- Chapter 17: What We Have Learned and Where We are Headed

No appendices

2

Exam – fac simile

The written exam consists of three open questions (closed books) on the topics taught in the course. Students choose to answer just one out of three:

1. Explain the role of human capital in economic growth
2. What are main determinants of income differences
3. Explain the role of technological change in economic growth
4. Explain the importance of fundamentals in the process of economic dynamics and provide some detail on one of these determinants.
5. Explain the importance of fundamentals in the process of economic dynamics and provide some detail on the role of the government and institutions

Themes for presentations

1. Malek, Khaoula, Peppe, Fabrizio, Misha
   Green economy
2. Lina, Maha, Monica, Yana, Julia
   Trade policies
3. Marta, Inaki, Arka, Marco, Mia
   Business Environment

1. Joanna, Joanna, Natalia, Patrik, Ivan
   Education
2. Giulio, Matthew, Annike, Itziar, Timon
   Business Environment

Calendar

1. Malek, Khaoula, Peppe, Fabrizio, Misha
   3 dec
2. Lina, Maha, Monica, Yana, Julia
   4 dec
3. Marta, Inaki, Arka, Marco, Mia
   5 dec
4. Joanna,Joanna, Natalia, Patrik, Ivan
   10 dec
1. Giulio, Matthew, Annike, Itziar, Timon
   11 dec

Efficiency

So far, focus on technology in explaining productivity (A).
But A can also represent how *efficient* we are in using the factors of production (workers & capital).

- Missing or perverse incentives.
- Lack of competition.
- Corruption. Institutions.
- Culture.

Decomposing efficiency and technology

Framework: Assume productivity is

$$A = T \times E,$$

where T is technology and E is efficiency.

Relative productivity is then

$$\frac{A_i}{A_j} = \frac{T_i}{T_j} \times \frac{E_i}{E_j}$$

Decomposing efficiency and technology

Assume i technology is G years behind j,

$$T_{t,i} = T_{t-G,j},$$

and that technology growth rates g are the same everywhere. Then

$$T_{t,i} \times (1+g)^G = T_{t,j}$$

$$\frac{T_{t,i}}{T_{t,j}} = (1+g)^{-G}$$

And relative productivity

$$\frac{A_i}{A_j} = (1+g)^{-G} \times \frac{E_i}{E_j}$$

Case studies

USSR
Textiles workers 1910.
Across-industry productivity differences.
U.S. coal mining.

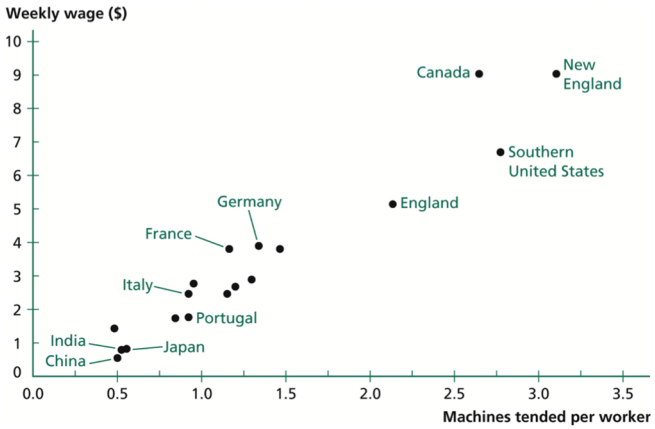
(1) USSR

Well-known example of poor growth due to inefficiency.
GDP/capita 1/3 of U.S. level in 1985.

- No lack of physical capital. Relatively high education (human capital).
- Relativly high technology levels (defence, space technology, etc.).
- But a centrally planned economy.
  - Bureaucrats determined how factors of production were allocated.
  - Lack of incentives - inputs of production not channeled to firms that value them the most.
  - $\longrightarrow$ low E.

(2) 1910 textile workers

Wages and machines in the textile industry, 1910:



US government study:

Technology, capital, raw materials essentially the same in every country.

Then why so large wage differentials?

(3) Across-industry productivity differences

Productivity, early 1990s:

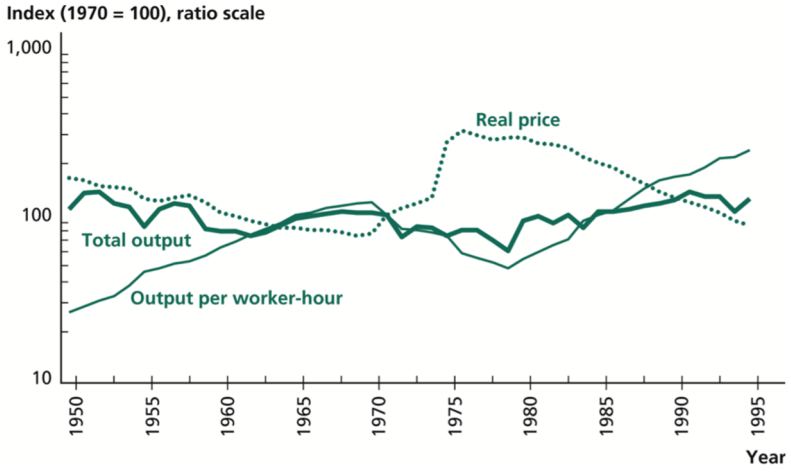
	United States	Japan	Germany
Automobiles	100	127	84
Steel	100	110	100
Food Processing	100	42	84
Telecommunications	100	51	42
Aggregate Productivity	100	67	89

Minor technology differences across these countries.

Nevertheless, large productivity differences.

Points to efficiency differences due to organization of production and more.

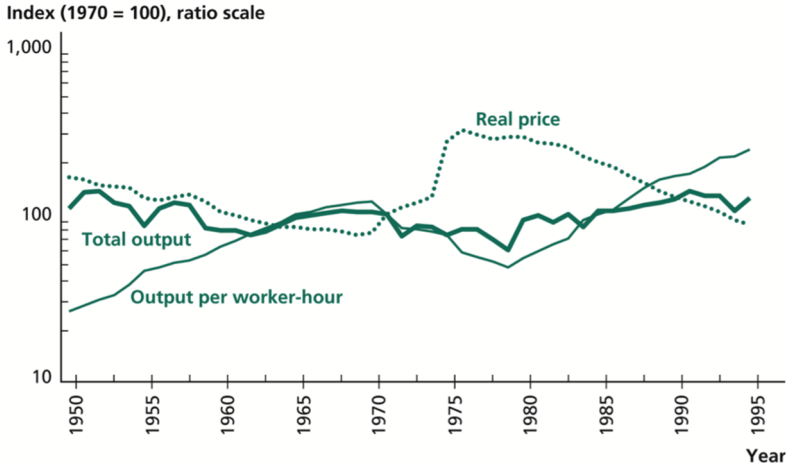
(4) U.S. coal mining



50% fall in productivity 1969-1978. Not technology!

Featherbedding:

(4) U.S. coal mining



50% fall in productivity 1969-1978. Not technology!

Featherbedding:

High profits −→ improved bargaining position of workers (strikes more costly) −→ hiring more workers than needed −→ lower productivity.

Does management matter?

Figure 1: Management Scores Across Countries

Note: Averages taken across all firms within each country. 5,850 observations in total. Firms per country in the right column
Source: Bloom, Genakos, Sadun and Van Reenen (2009)

"Preliminary results suggest that 1/4 of cross-country and within-country TFP gaps can be accounted for by management practices."

Does management matter?

An economic experiment (Bloom et al, 2013): Give a random sample of Indian textile firms free consulting services in management practices.

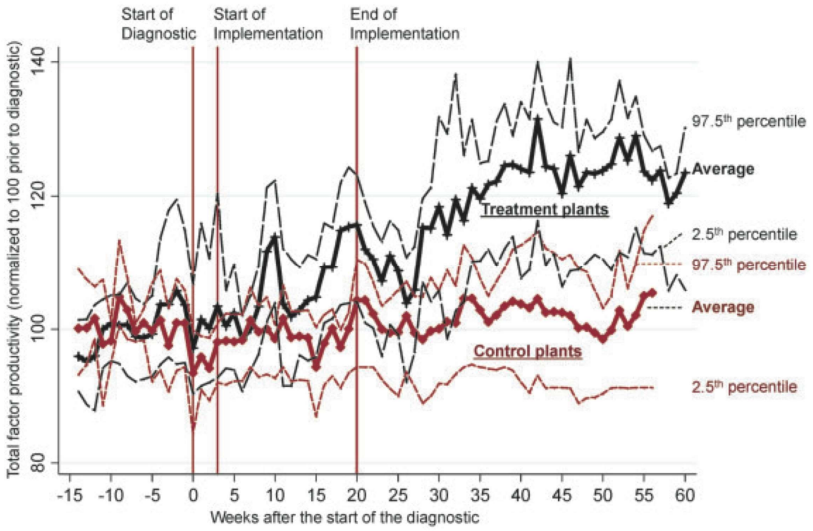
- Quality control, e.g. the measurement of quality defects, machine downtime.
- Inventory management.

Observe their adoption rate of management practices, productivity, etc. before and after, for non-treated and treated firms.

Result:

- 17% productivity increase within 1st year.
- Annual profits up by $350,000 per firm.

Does management matter?



But since new practices were profitable, why didn't the firms adopt them long ago?

15 / 29

Types of inefficiency

Unproductive activities.
Idle resources.
Misallocation of factors across sectors.
Misallocation of factors across firms.
Technology blocking.

16 / 29

(1) Unproductive activities

Theft, smuggling, civil war.

- E.g. Angolean civil war 1975-2002. GDP/capita lower in 2002 than 1974.

Rent seeking:

(1) Unproductive activities

Theft, smuggling, civil war.

- E.g. Angolean civil war 1975-2002. GDP/capita lower in 2002 than 1974.

Rent seeking:

Activities to increase one's share of existing wealth without creating wealth.

- E.g. efforts to obtain subsidies by bribery, lobbying etc.
- Lower output/capita, poor allocation of resources, lost government revenue, increased income inequality.

(2) Idle resources

Unemployment.

- E.g. U.S. GDP/capita decreased by 30% during the Great Depression.

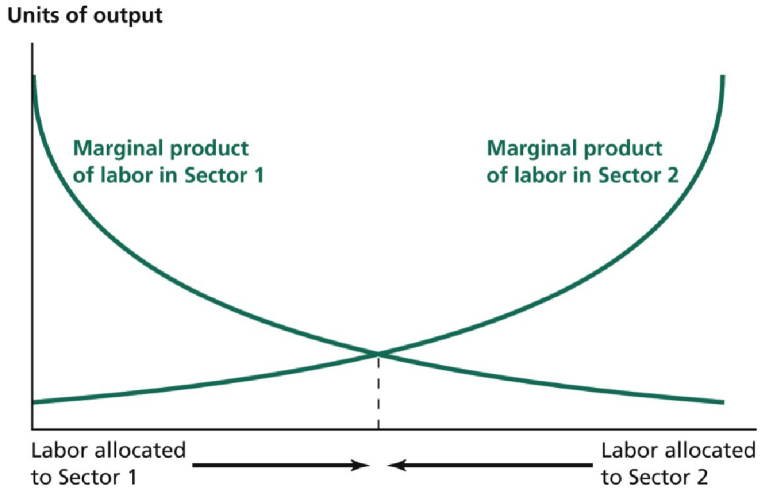
Overstaffing / underemployment.

- E.g. 500 workers per airplane in Air Afrique (2001).
- 66 workers/airplane among most efficient airlines.

..of labor and capital.

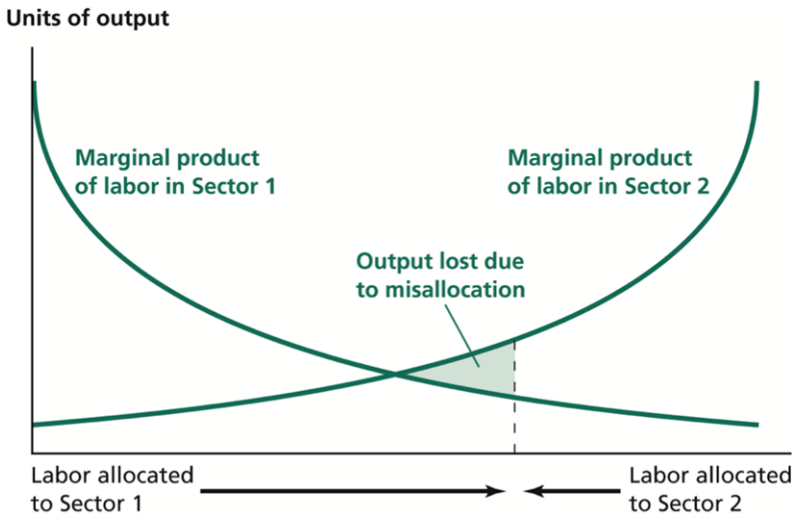
NEET, young people (18-24) *not (engaged) in education, employment or training… in Italy one out of four…*

(3) Misallocation of factors across sectors



In market economy, wage=MPL1=MPL2. Value of output maximized.

(3) Misallocation of factors across sectors



(3) Misallocation of factors across sectors

Overallocation in Sector 1 due to e.g.

Distortions in wages/prices (e.g., $w_1 > MPL_1$).

Barriers to mobility (geographic, regulatory).

Huge potential for productivity improvement from more efficient allocation:

Reallocation from low to high MPL industries in Taiwan & South Korea (1960-1990). Agriculture to manufacturing.

China today.

- Geographic mobility from poor to rich areas.
- Sectoral mobility from agriculture to manufacturing.
- Agricultural employment share down from 69% to 40% (1980-2008).

(4) Misallocation of factors across firms

Enormous heterogeneity in productivity across firms within an industry.

- 100% productivity spreads between 10th and 90th percentile firms within same homogeneous industry, e.g. cement (Foster, Haltiwanger and Syverson, 2008).

In a market economy, high *A* firms will employ a larger share of inputs.

Sources of misallocation:

- Collusion between high and low productive firms.
- Subsidies, export quotas etc.
- Monopoly / lack of competition.

Misallocation causes too much resources (labor and capital) to be used in low productivity activities.

- Removing frictions can give large gains.
- Manufacturing productivity ↑ 25-40% (China) and 50-60% (India) if misallocation ↓ to U.S. level (Hsieh and Klenow, 2009).

22 / 29

(5) Technology blocking

If someone prevents the use of new technology.
Insiders may lose from adoption of new technology. Examples:

Gutenberg's printing press vs scribes.

- The printing press delayed 20 years in Paris.

Railroads vs owners of canals, turnpikes and stagecoaches in 1st half of the 19th century.

Uber vs taxi today.

23 / 29

Financial markets

So far, we have analyzed sources of inefficiency in the real economy.

But the extent of *misallocation* between sectors/firms also depends on the performance of the financial system.

- Banks, pension funds, insurance companies, equity markets, bond markets.

The role of finance:

Financial markets

So far, we have analyzed sources of inefficiency in the real economy.

But the extent of *misallocation* between sectors/firms also depends on the performance of the financial system.

- Banks, pension funds, insurance companies, equity markets, bond markets.

The role of finance:

Direct capital to the highest return activities.

Convert savings into large investment projects.

Spread risk.

Increase liquidity and speed up transactions.

Misallocation from *zombie* banks (Caballero, Hoshi and Kashyap, 2008).

24 / 29

Back to Solow

Let's extend the Solow model with exogenous growth in productivity, growth rate $\hat{A}$ (Appendix Ch8).

Production function as before $Y = AK^{\alpha} L^{1-\alpha}$.

Define $e \equiv A^{1/(1-\alpha)}$. PF is then

$$Y = e^{1-\alpha} K^{\alpha} L^{1-\alpha} = K^{\alpha} (eL)^{1-\alpha}$$

Think of eL as the number of effective workers.

Define $y \equiv Y/(eL)$ and $k \equiv K/(eL)$.

Output per effective worker (intensive form)

$$y \equiv \frac{Y}{eL} = k^{\alpha}$$

Capital accumulation

The growth of $k \equiv K/(eL)$:

$$\dot{k} = \frac{\partial \frac{K}{eL}}{\partial t} = \frac{\dot{K}eL - (\dot{e}L + e\dot{L}K)}{(eL)^2}$$

$$= \frac{\dot{K}}{eL} - \frac{K}{eL}\left(\frac{\dot{e}L}{eL} + \frac{e\dot{L}}{eL}\right)$$

$$= \frac{\dot{K}}{eL} - k(\hat{e} + n)$$

where $n \equiv \dot{L}/L$ and $\hat{e} \equiv \dot{e}/e$.

Insert capital accumulation $\dot{K} = \gamma Y - \delta K$ into equation above to get

$$\dot{k} = \frac{\gamma Y - \delta K}{eL} - k(\hat{e} + n)$$

$$= \gamma k^{\alpha} - (\delta + \hat{e} + n)k$$

Steady state

Steady state: $\dot{k} = 0$ or

$$\gamma k^{\alpha} = (\delta + \hat{e} + n)k$$

$$k^{\alpha-1} = \frac{\delta + \hat{e} + n}{\gamma}$$

$$k = \left(\frac{\gamma}{\hat{e} + \delta + n} \right)^{1/(1-\alpha)}$$

Is the capital stock K growing?
Is capital per capita K/L growing?

Growth in GDP per capita

In steady state,

$$y = k^{\alpha} = \left(\frac{\gamma}{\hat{e} + \delta + n} \right)^{\alpha/(1-\alpha)}$$

Recall that $y = Y/eL$, so

$$\hat{y} = \hat{Y} - \hat{e} - \hat{L} \quad \Leftrightarrow \Rightarrow$$

$$\hat{Y} - \hat{L} = \hat{y} + \hat{e}$$

$$= \hat{e} = 1/(1-\alpha) * \hat{A}$$

because $\hat{y} = 0$ in steady state and $e = A^{1/(1-\alpha)}$.

GDP/capita is growing at a higher rate than A (recall if $\alpha = 1/3$, then $1/(1-\alpha) = 3/2$).

Why?