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## 生产与增长 Production and Growth

# 生产与增长

## Production and Growth

- 富国的平均收入是穷国的十倍以上。  
**The average income in a rich country is more than ten times the average income in a poor country.**
- 巨大的收入差别也反映在巨大的生活质量差别上。

**There large differences in income are reflected in large differences in the quality of life.**

# 生产与增长

## Production and Growth

- 即使在一个国家内，生活水平也随着时间推移而发生着巨大的变化。

**Within a country there are large changes in the standard of living over time.**

- 美国在过去的一个世纪里，以人均实际 GDP 衡量的平均收入每年增长约 2 个百分点。

**In the United States over the past century, average income as measured by real GDP per person has grown by about 2 percent per year.**

# 生产与增长

## Production and Growth

- 如何解释如此巨大的增长差异?  
**What explains these diverse experience?**
- 富国如何保持其高生活水平? 穷国如何促进增长以迎头赶上?  
**How can the rich countries be sure to maintain their high standard of living, and the poor countries promote more rapid growth and join the developed world?**

# 不同的增长经历

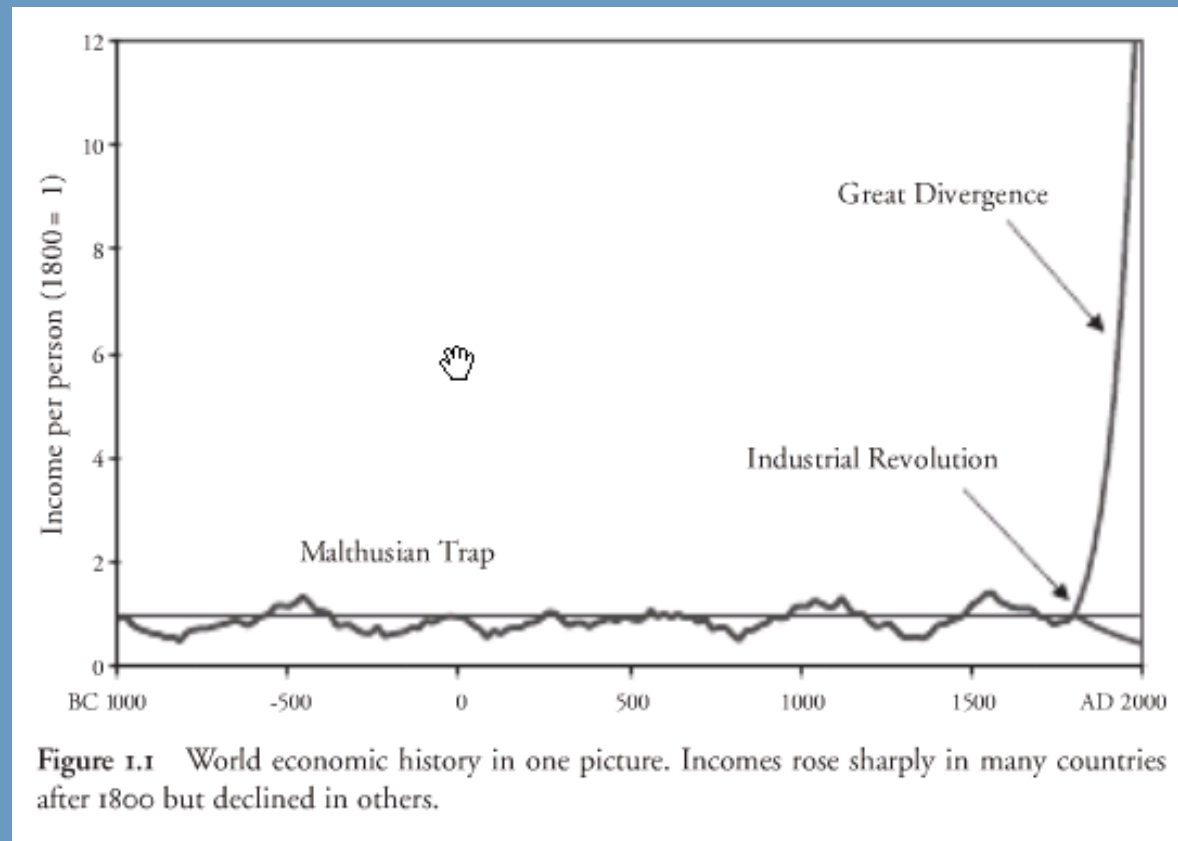
## The Variety of Growth Experiences

Country	Period	Real GDP per person at beginning of period	Real GDP per person at end of period	Growth rate (per year)
Japan	1890–2006	\$1,408	\$33,150	2.76%
Brazil	1900–2006	729	8,880	2.39
China	1900–2006	670	7,740	2.34
Mexico	1900–2006	1,085	11,410	2.24
Germany	1870–2006	2,045	31,830	2.04
Canada	1870–2006	2,224	34,610	2.04
Argentina	1900–2006	2,147	15,390	1.88
United States	1870–2006	3,752	44,260	1.83
India	1900–2006	632	3,800	1.71
United Kingdom	1870–2006	4,502	35,580	1.53
Indonesia	1900–2006	834	3,950	1.48
Bangladesh	1900–2006	583	2,340	1.32
Pakistan	1900–2006	690	2,500	1.22

\* 实际 GDP 以 2006 年美元衡量。 Real GDP is measured in 2006 dollars.

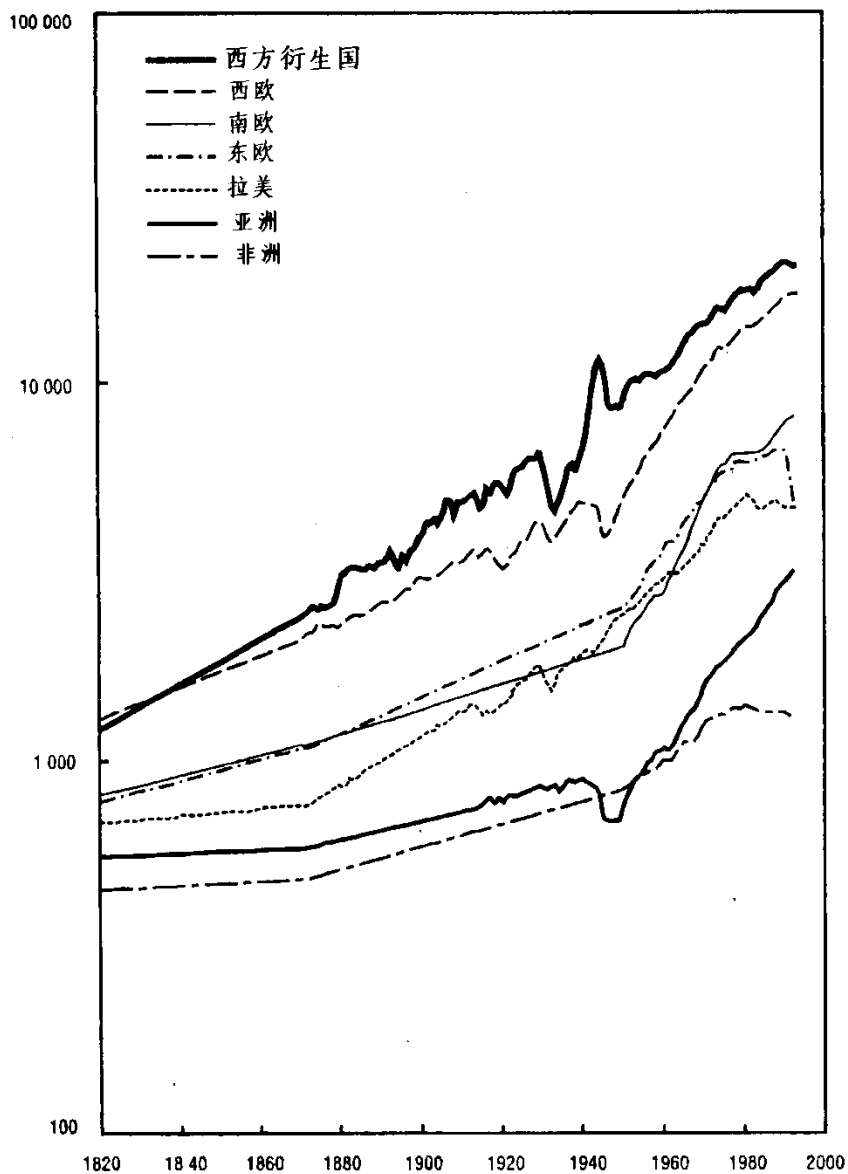
# 不同的增长经历

## The Variety of Growth Experiences



资料来源: *A Farewell to Alms*, by Gregory Clark, Princeton University Press, 2008.

图 1.1 1820—1992,各地区人均 GDP 水平

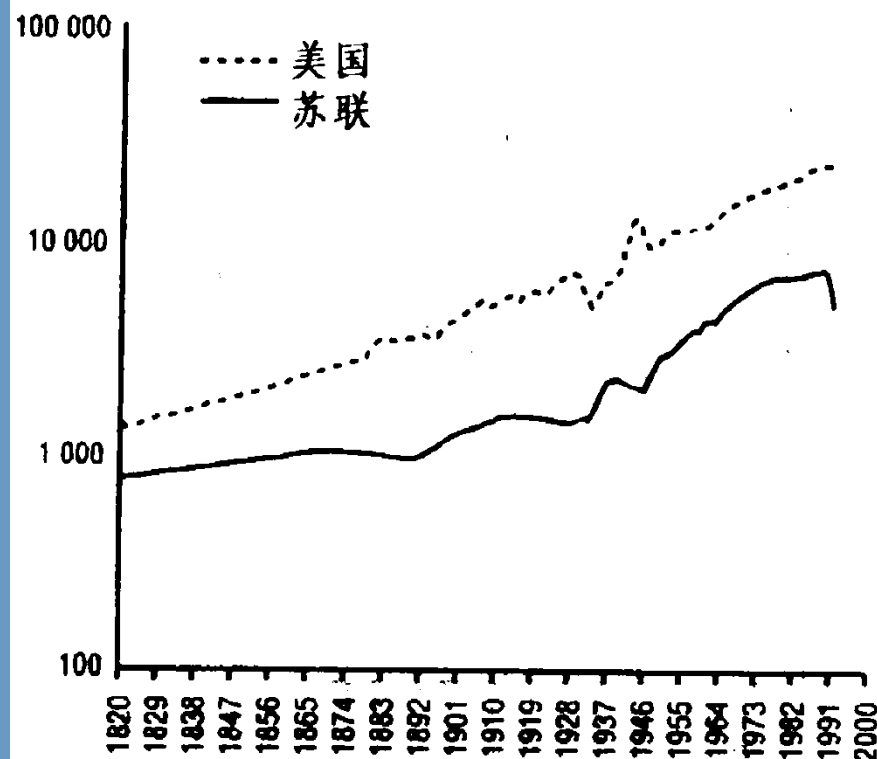
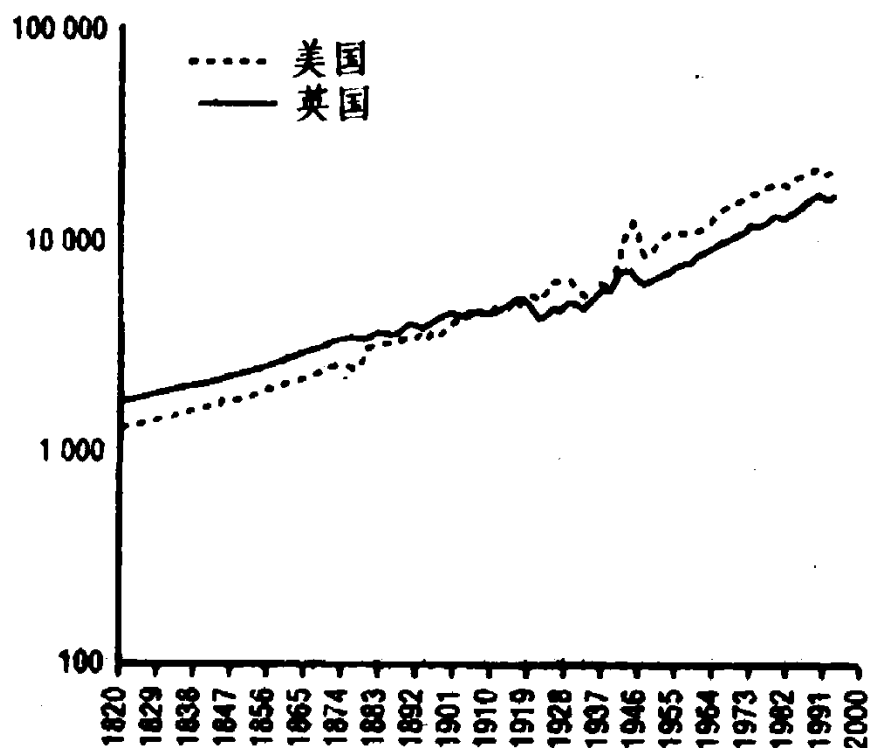


# 不同的增长经历 The Variety of Growth Experiences

资料来源：麦迪森（Angus Maddison），《世界经济二百年回顾》，改革出版社 1997。

# 不同的增长经历

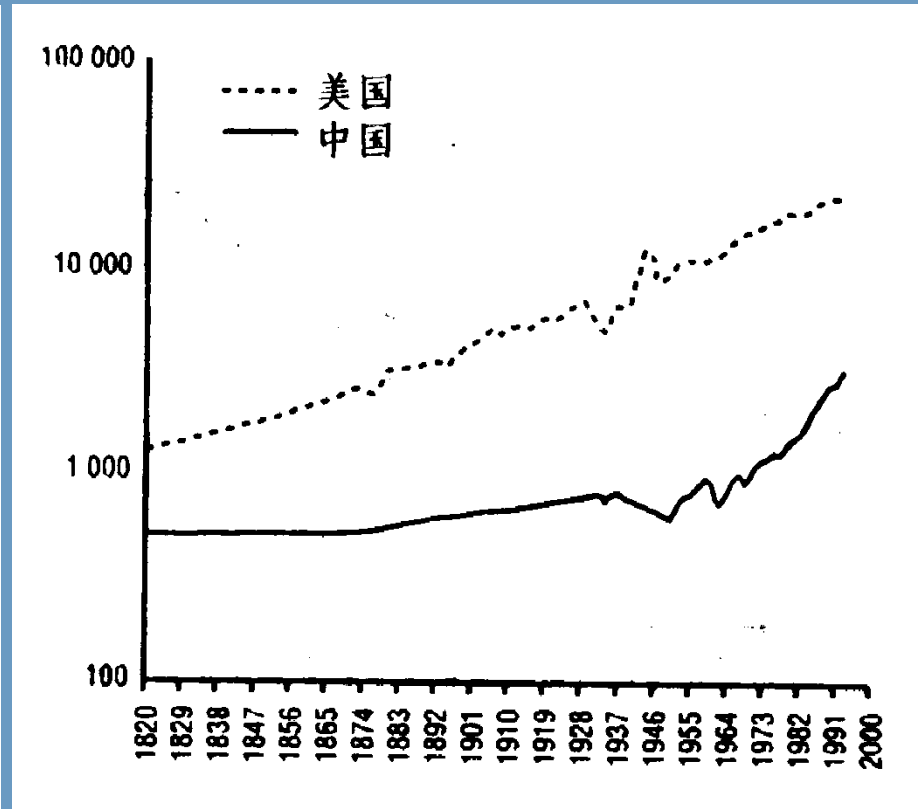
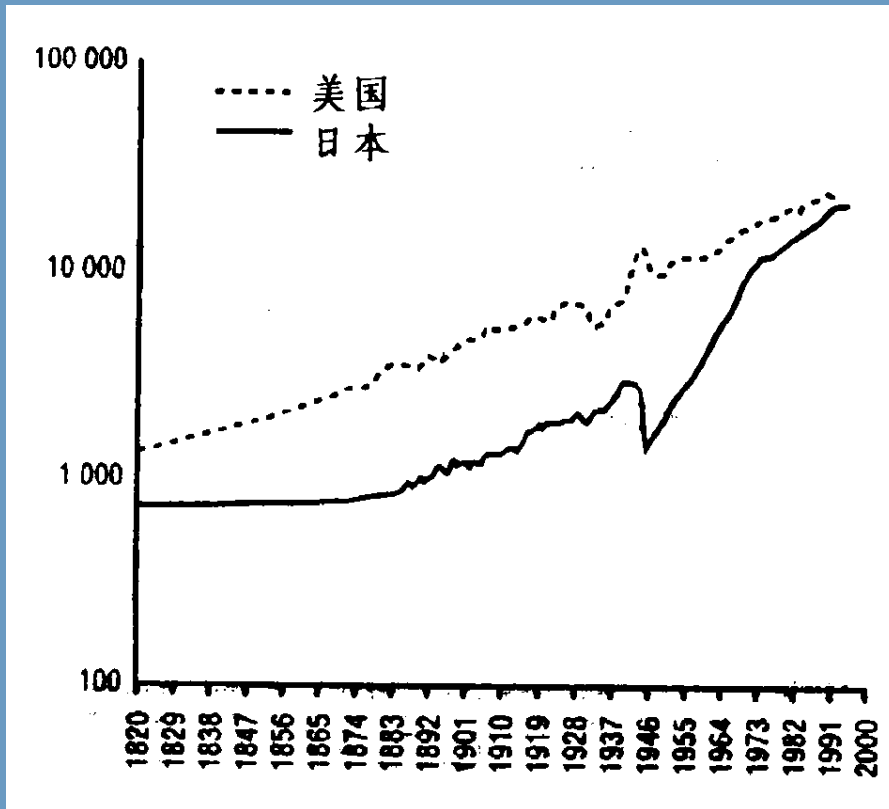
## The Variety of Growth Experiences





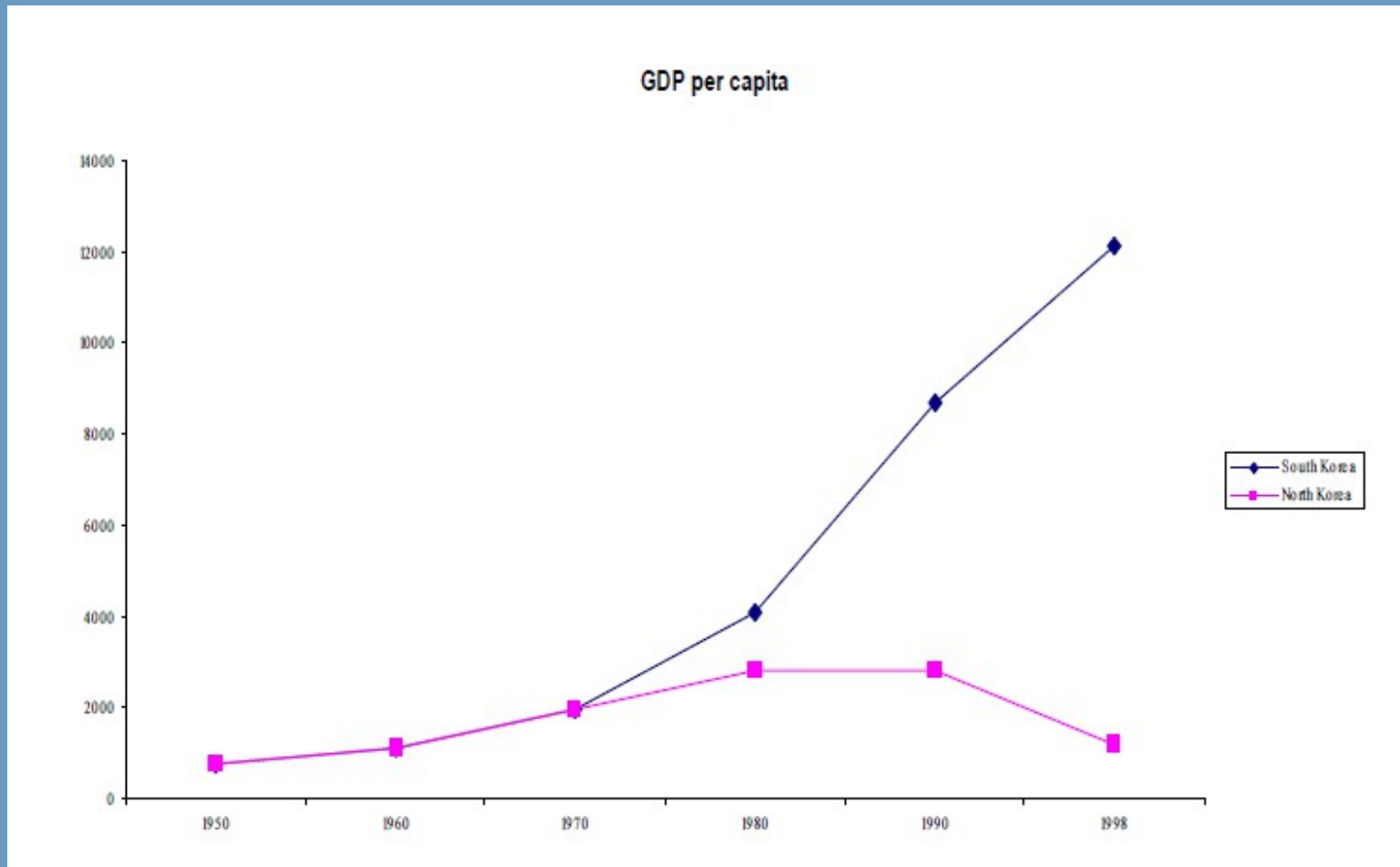
# 不同的增长经历

## The Variety of Growth Experiences



# 不同的增长经历

## The Variety of Growth Experiences





# 复利计算和 70 规则

## Compounding and the Rule of 70

- 年度增长率看起来微小，但按多年的复利来计算，就会变得巨大。

Annual growth rates that seem small become large when compounded for many years.

- **复利计算**指增长率在一段时间上的累积。  
。 **Compounding** refers to the accumulation of a growth rate over a period of time.



# 复利计算和 70 规则

## Compounding and the Rule of 70

按照 **70 规则**，如果某个变量以每年百分之  $x$  增长，那么那个变量在大约  $70/x$  年后翻一番。

According to the **rule of 70**, if some variable grows at a rate of  $x$  percent per year, then that variable doubles in approximately  $70/x$  years.

# 举 例

## An Example of the Rule of 70

- 5000 美元以年利率 7 % 投资， 10 年以后其数量翻一番。

**\$5,000 invested at 7 percent interest per year, will double in size in 10 years**

$$70 / 7 = 10$$



# 举例

## An Example of the Rule of 70

- 在 2000 年，中国的人均 GDP（按购买力平价）是美国的  $1/9$ ，中国 GDP 总量是美国的  $1/2$ （人口是美国的 4.5 倍）。
- 假如中国 GDP 年均增长比美国快 3.5 个百分点（比如美国的年增长率为 3.5%，中国的年增长率为 7%）……
- 那么中国将在 20 年后（2020 年）在经济总量上超过美国。
- 假定两国人口增长率相等，则人均 GDP 需要在 2060 年（翻 3 番）才能接近美国。



# **为什么生产率如此重要**

## **Why Productivity Is So Important**

- **为了理解不同国家生活水平如此巨大的差别，我们必须关注其物品和服务的生产。**

**To understand the large differences in living standards across countries. We must focus on the production of goods and services.**

- **在决定世界上所有国家的生活水平上，生产率都起关键性的作用。**

**Productivity plays a key role in determining living standards for all nations in the world.**



# 为什么生产率如此重要

## Why Productivity Is So Important

**生产率**指的是一个工人在一小时的劳动时间内能够生产的物品和服务的数量。 **Productivity** refers to the quantity of goods and services that a worker can produce from each hour of work.





# 生产率是如何决定的

## How Productivity is Determined

- 生产要素直接决定生产率。  
The factors of production directly determine productivity.
- 用以生产物品和服务的投入被称为生产要素 The inputs used to produce goods and services are called the factors of production.



# 生产要素

## The Factors of Production

- 物质资本 Physical capital
- 人力资本 Human capital
- 自然资源 Natural resources
- 技术知识 Technological knowledge

# 生产要素

## The Factors of Production

- **资本**是生产出来的生产要素。  
**Capital** is a produced factor of production.
- 它作为（当前的）生产过程的投入，却是来自过去的生产过程的产出。  
It is an input into the production process that in the past was an output from the production process.



# 物质资本

## Physical Capital

- **物质资本**是用来生产物品和服务的设备和建筑物的存量。

**Physical capital** is the stock of equipment and structures that are used to produce goods and services.

- 用来建造或维修汽车的工具  
Tools used to build or repair automobiles.
- 用来制造家具的工具  
Tools used to build furniture.
- 办公大楼、学校等  
Office buildings, schools, etc.



# 人力资本

## Human Capital

- **人力资本**是经济学家所用的术语，指工人通过教育、培训和（工作）经历获得的知识和技能 **Human capital** is the economist's term for the knowledge and skills that workers acquire through education, training, and experience.

- 与物质资本相仿，人力资本也能提升一国生产物品和服务的能力。

Like physical capital, human capital raises a nation's ability to produce goods and services.



# 自然资源

## Natural Resources

- **自然资源**是大自然（例如土地、河流和矿藏）提供的用于生产的投入。

**Natural resources** are inputs used in production that are provided by nature, such as land, rivers, and mineral deposits.

- 可再生资源包括树木和森林

Renewable resources include trees and forests.

- 不可再生资源包括石油和煤

Nonrenewable resources include petroleum and coal.

# 自然资源

## Natural Resources

自然资源也许是重要的，但并不是一个经济具有生产物品和服务的高生产率所必需的。

**Natural resources can be important but are not necessary for an economy to be highly productive in producing goods and services.**



# 技术知识

## Technological Knowledge

- **技术知识**是对生产物品和服务的最佳方法的了解。

**Technological knowledge** is the understanding of the best ways to produce goods and services.

- 人力资本就是将这一了解转移到劳动者身上所花费的资源。

**Human capital** refers to the resources expended transmitting this understanding to the labor force.





# 生产函数

## The Production Function

**经济学家常常会用生产函数来描述生产投入数量和生产产出数量的关系 Economists often use a production function to describe the relationship between the quantity of inputs used in production and the quantity of output from production.**



# 生产函数

## The Production Function

$$Y = A F(L, K, H, N)$$

**$Y$**  = 产出量 quantity of output

**$A$**  = 可得到的生产技术 available production technology

**$L$**  = 劳动量 quantity of labor

**$K$**  = 物质资本量 quantity of physical capital

**$H$**  = 人力资本量 quantity of human capital

**$N$**  = 自然资源量 quantity of natural resources

**$F()$**  为一函数，表示要素是怎样进行结合的。  
is a function that shows how the inputs are combined.



# 生产函数

## The Production Function

- 一个生产函数是规模报酬不变的，如果对于任意的正数  $x$ ，有：

A production function has constant returns to scale if, for any positive number  $x$ ,

$$xY = A F(xL, xK, xH, xN)$$

- 也就是说，所有投入增加一倍，导致产出量也增加一倍。

That is, a doubling of all inputs causes the amount of output to double as well

# 生产函数

## The Production Function

- 规模报酬不变的生产函数有一个有趣的含义  
Production functions with constant returns to scale have an interesting implication.
- 设 Setting  $x = 1/L$ ,

$$Y/L = A F(1, K/L, H/L, N/L)$$

这里 Where:

$Y/L$  = 每个工人的产量 output per worker

$K/L$  = 每个工人的物质资本 physical capital per worker

$H/L$  = 每个工人的人力资本 human capital per worker

$N/L$  = 每个工人的自然资源 natural resources per worker

# 生产函数

## The Production Function

上一个等式说明，生产率 ( $Y/L$ ) 依赖于每个工人的物质资本 ( $K/L$ )、每个工人的人力资本 ( $H/L$ )、每个工人的自然资源 ( $N/L$ )，以及技术水平 ( $A$ )。

The preceding equation says that productivity ( $Y/L$ ) depends on physical capital per worker ( $K/L$ ), human capital per worker ( $H/L$ ), and natural resources per worker ( $N/L$ ), as well as the state of technology ( $A$ ).



# **经济增长与公共政策**

## **Economic Growth and Public Policy**

**政府能够做许多事情来提高生产率和生活水平。**

**Governments can do many things to raise productivity and living standards.**



# **提高生产率和生活水平的政府政策**

## **Government Policies That Raise Productivity and Living Standards**

- **鼓励储蓄和投资**

**Encourage saving and investment.**

- **鼓励来自国外的投资**

**Encourage investment from abroad**

- **促进教育**

**Foster education**

- **促进健康**



# **提高生产率和生活水平的政府政策**

## **Government Policies That Raise Productivity and Living Standards**

- **建立产权保障和保持政治稳定**  
**Establish secure property rights and maintain political stability.**
- **允许自由贸易**  
**Allow free trade.**
- **控制人口增长**  
**Control population growth.**
- **促进研究开发**  
**Promote research and**





# **储蓄和投资的重要性**

## **The Importance of Saving and Investment**

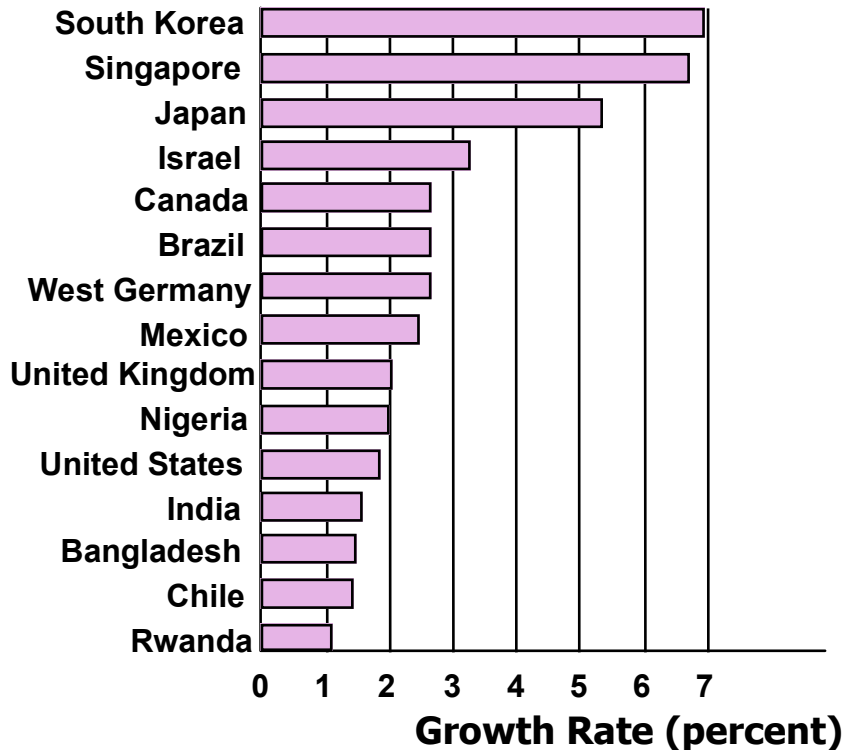
**提高未来生产率的一种途径是将更多现有的资源投入到资本的生产中去。**

**One way to raise future productivity is to invest more current resources in the production of capital.**

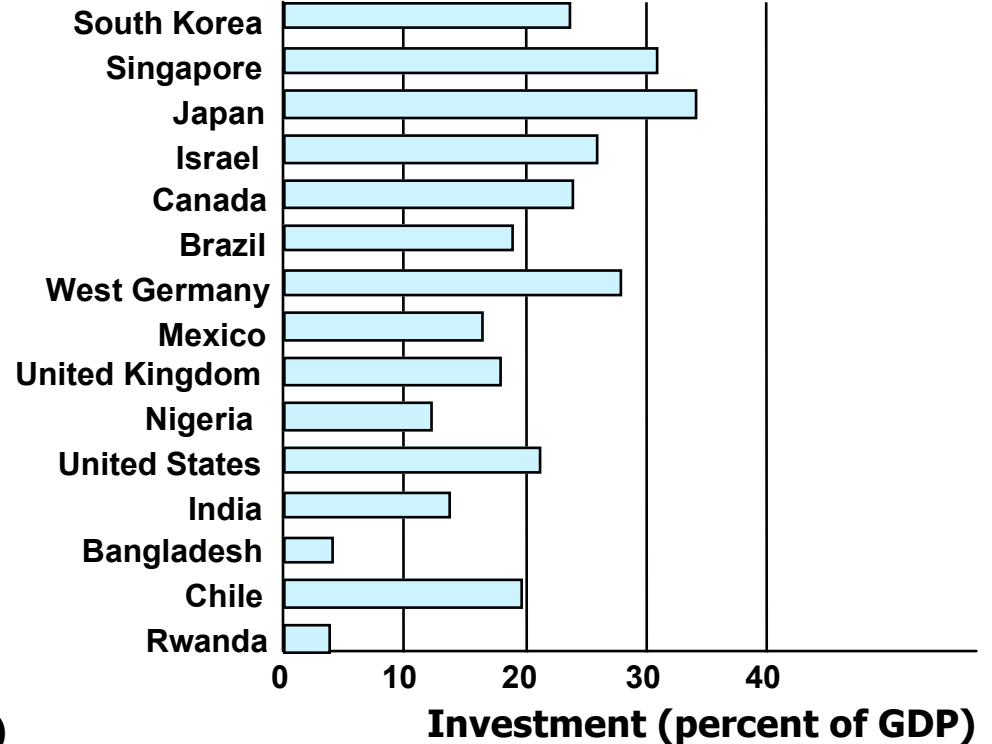
# 增长和投资

## Growth and Investment

(a) Growth Rate 1960-1991



(b) Investment 1960-1991



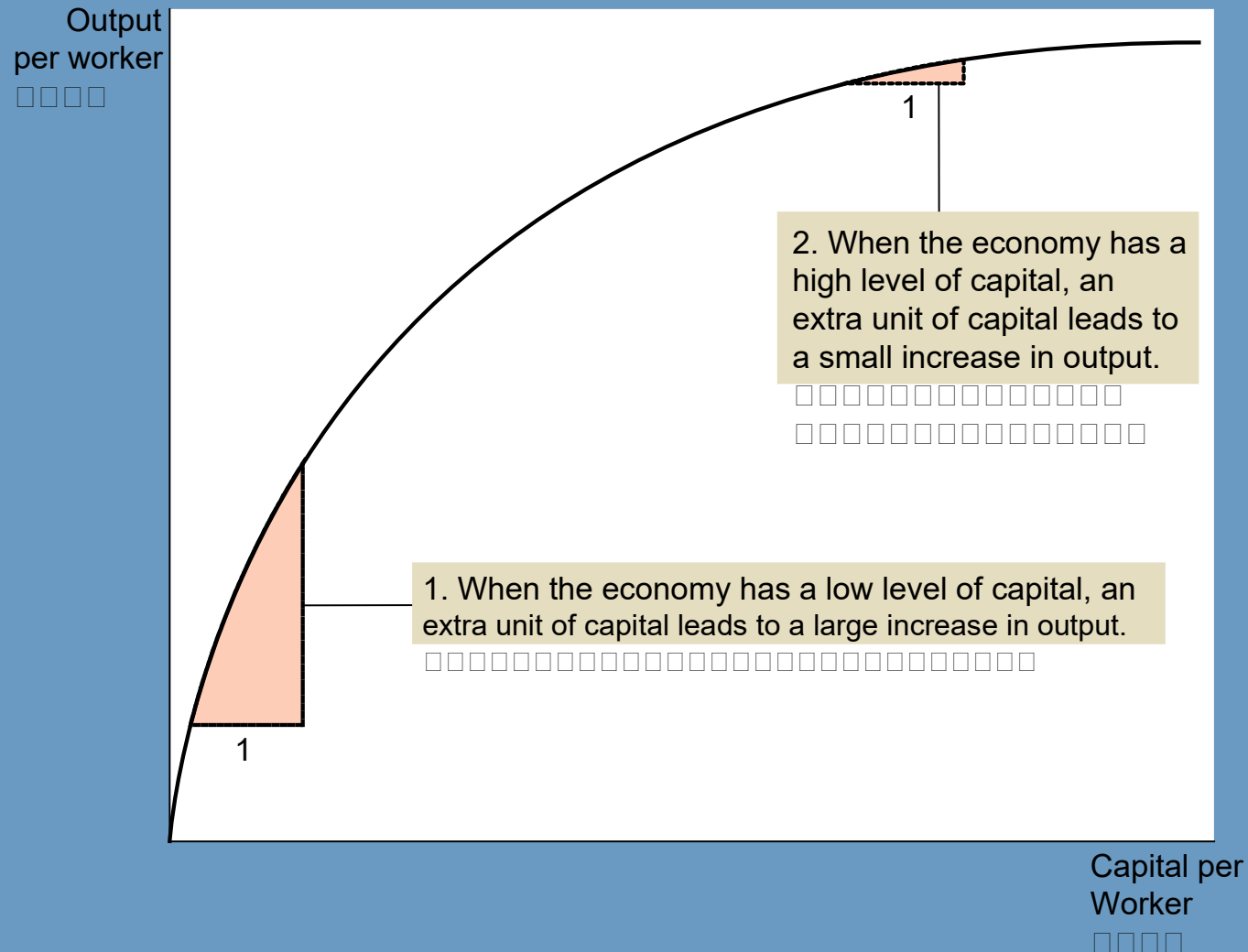
# 报酬递减与追赶效应

## Diminishing Returns and the Catch-up Effect

- 随着资本存量的增加，由新增一单位资本生产出来的额外产出下降；这一性质被称为**报酬（或收益）递减**。

As the stock of capital rises, the extra output produced from an additional unit of capital falls; this property is called **diminishing returns**.

# 报酬递减与追赶效应



# 报酬递减与追赶效应

## Diminishing Returns and the Catch-up Effect

- 因为报酬递减，储蓄率上升导致的更高增长率只能持续一段时间。

Because of diminishing returns, an increase in the saving rate leads to higher growth only for a while.

- 长期来看，更高的储蓄率导致更高的生产率和收入水平，但不是更高的增长率

In the long run, the higher saving rate leads to a higher level of productivity and income, but *not* to higher growth.

# 储蓄和投资的重要性

## The Importance of Saving and Investment

- 资本的报酬递减还意味追赶效应的存在。

The diminishing returns to capital also implies the existence of catch-up effects.

- **追赶效应**指的是在其他条件不变时，开始时相对贫穷的国家更容易快速地增长。

The **catch-up effect** refers to the condition that, other things being equal, it is easier for a country to grow fast if it starts out relatively poor.



# 来自国外的投资

## Investment from Abroad

政府通过鼓励来源于国外的投资来增加资本积累和长期经济增长。

**Governments can increase capital accumulation and long-term economic growth by encouraging investment from foreign sources.**

# 来自国外的投资

## Investment from Abroad

来自国外的投资有若干形式。

Investment from abroad takes several forms:

- **外国直接投资 Foreign Direct Investment**

- 由国外实体所有和运营的资本投资。

Capital investment owned and operated by a foreign entity.

- **外国证券投资 Foreign Portfolio Investment**

- 由外国货币筹资，但由本国居民运营的投资。 Investments financed with foreign money but operated by domestic residents.





# 教育

## Education

- 对于一国的长期增长来说，教育至少和物质资本的投资同等重要。

**For a country's long-run growth, education is at least as important as investment in physical capital.**

- 在美国，每一年正规教育平均来说使一个人的工资提高 10 %。

**In the United States, each year of schooling raises a person's wage on average by about 10 percent.**

- 因此，政府提高生活水平的一条途径就是提供学校，并鼓励人们利用这些学校。

**Thus, one way the government<sup>41</sup> can enhance the standard of living is to provide schools**

# 教育 Education

一个受过教育的人可能会想出生产物品和服务的新的最佳方法，这些新的想法可能会进入到社会的知识库中，向其他人提供了一个**外部收益**。

An educated person might generate new ideas about how best to produce goods and services, which in turn, might enter society's pool of knowledge and provide an **external benefit** to others.

# 教育 Education

贫穷国家面临的一个问题就是**人才外流**——许多受过最好教育的工人向富裕国家的移民。

One problem facing some poor countries is the **brain drain**--the emigration of many of the most highly educated workers to rich countries.



# 健康与营养

## Health and Nutrition

- **更健康的工人更有生产率。**  
**Healthier workers are more productive.**
- **对人们健康的投资能够提高生活水平。**  
**Good investments in the health of the population can lead to increase living standards.**

# 健康与营养

## Health and Nutrition

- **健康与财富之间的因果关系是双向的。**  
**The causal link between health and wealth runs in both directions.**
- **一国可能陷入一个恶性循环之中。**  
**Countries can get caught in a vicious cycle.**
- **但这也意味着良性循环的可能：促进增长的政策也促进了健康，反过来又进一步促进增长。**  
**But this fact opens the possibility of a virtuous circle: Policies that lead to more rapid economic growth would naturally improve health outcomes, which in turn would further promote economic growth.**



# 产权和政治稳定

## Property Rights and Political Stability

- 产权指的是人们对他们所拥有的资源行使权力的能力。

*Property rights* refer to the ability of people to exercise authority over the resources they own.

- 经济中对产权的广泛尊重是价格体系正常运转的前提条件。

An economy-wide respect for property rights is an important prerequisite for the price system to work.

- 有必要让投资者感到他们的投资是安全的。

It is necessary for investors to feel that

# 案例研究：殖民地不同表现

## Case Study: Colonial Experiment

- 欧洲在不同的殖民地采取了非常不同的殖民化政策，与之关联的则是不同的制度。

**Europeans adopted very different colonization policies in different colonies, with different associated institutions.**

- 在欧洲人面临很高死亡率的地方，他们不能定居，从而倾向于建立掠夺性的制度。这些制度延续到今天。

**In places where Europeans faced high mortality rates, they could not settle and were more likely to set up extractive institutions; these institutions persisted to the present.**

- 将这一死亡率的不同作为现今制度的工具变量（即差异的原因），可以发现制度对于人均收入的巨大影响。

**Exploiting differences in European mortality rates as an instrument for current institutions, we estimate large effects of institutions on income per capita.**

# 案例研究：殖民地不同表现

## Case Study: Colonial Experiment

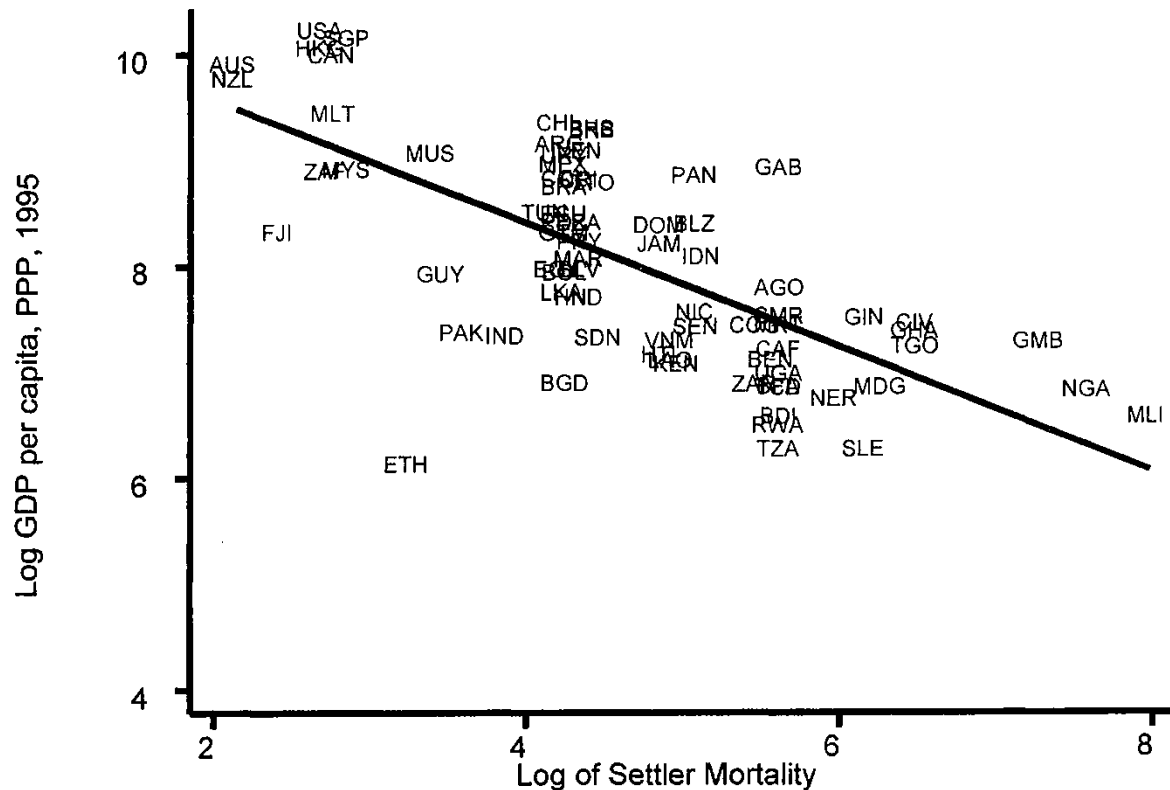


FIGURE 1. REDUCED-FORM RELATIONSHIP BETWEEN INCOME AND SETTLER MORTALITY

当年殖民者死亡率越低的殖民地，现今的生活水平越高…… 48



# 案例研究：殖民地不同表现

## Case Study: Colonial Experiment

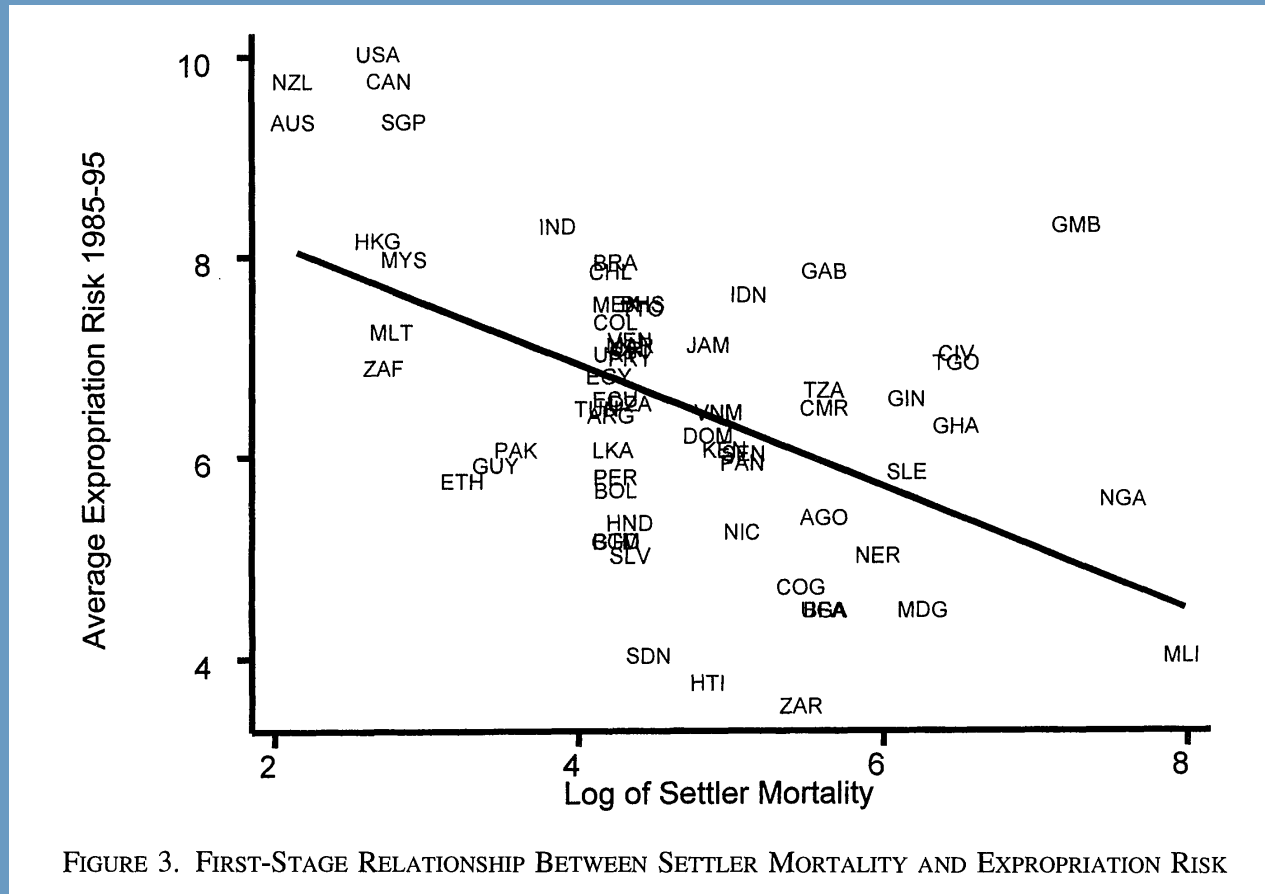
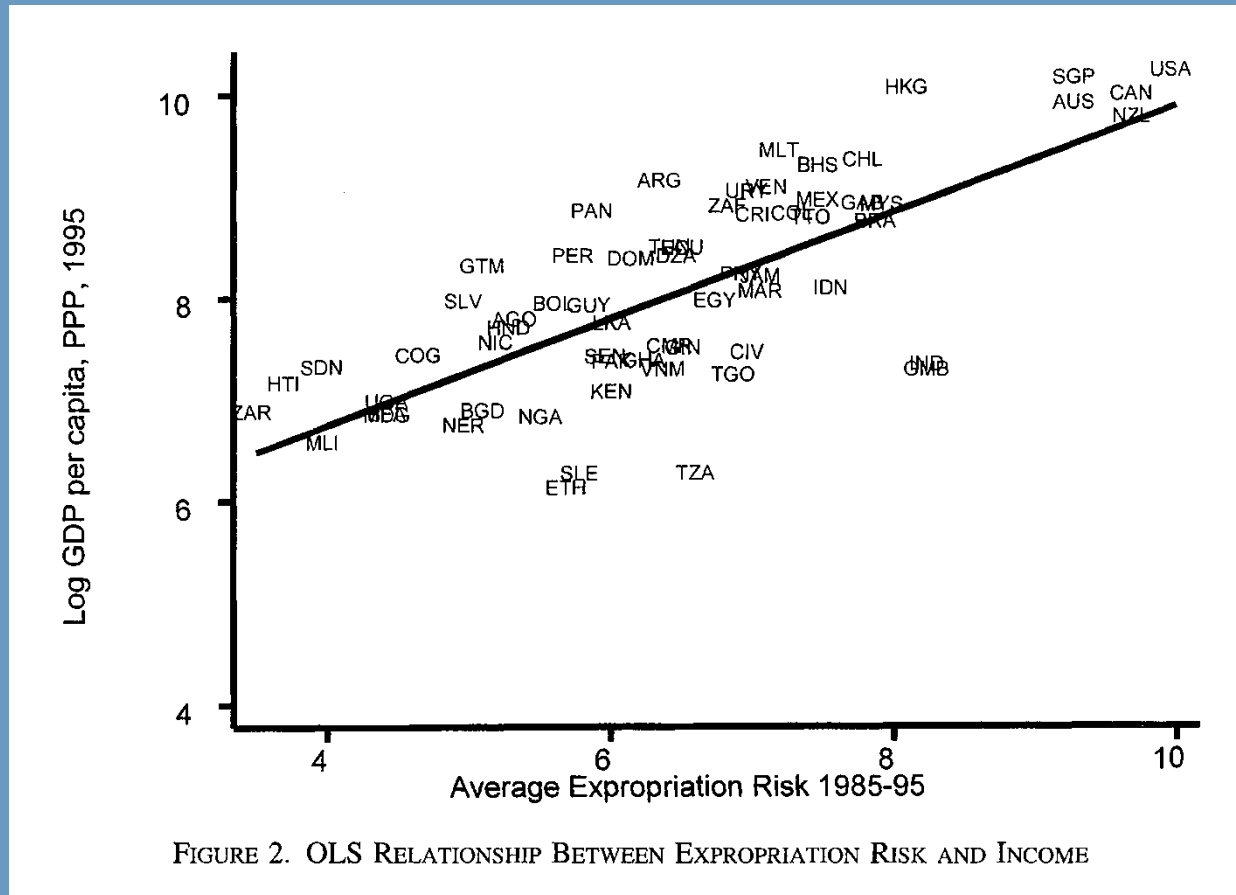


FIGURE 3. FIRST-STAGE RELATIONSHIP BETWEEN SETTLER MORTALITY AND EXPROPRIATION RISK

当年殖民者死亡率越低的殖民地，现今的制度越不具有掠夺性……

# 案例研究：殖民地不同表现

## Case Study: Colonial Experiment



现今越不具有掠夺性的制度，带来越高的生活水平……



# 自由贸易

## Free Trade

- 从某种角度讲，贸易是一种技术。  
Trade is, in some ways, a type of technology.
- 一个消除了贸易限制的国家所经历的，将不亚于重大技术进步以后出现的经济增长。  
A country that eliminates trade restrictions will experience the same kind of economic growth that would occur after a major technological advance.

# 自由贸易 Free Trade

- 某些国家采取的是

Some countries engage in . . .

. . . **内向型**的贸易政策，即避免和其他国家进行往来

**inward-orientated** trade policies,  
avoiding interaction with other countries.

. . . **外向型**的贸易政策，即鼓励和其他国家进行往来

**outward-orientated** trade  
policies, encouraging interaction with other  
countries.



# **研究和开发**

## **Research and Development**

- **技术知识的进步导致了更高的生活水平。**

**The advance of technological knowledge has led to higher standards of living.**

- **许多技术进步来自企业和个人发明家的私人研究。 Most technological advance comes from private research by firms and individual inventors.**
- **政府能够通过研究拨款、税收减让和专利制度来促进新技术的开发。**

**Government can encourage the development of new technologies through research grants, tax breaks, and the patent system.**



# 控制人口

## Control of Population Growth

- 人口是一国劳动力的关键性决定因素。  
Population is a key determinant of a country's labor force.
- 巨大的人口导致更大的总 GDP，但减少了人均 GDP，而后者才是经济福利的较好衡量指标。  
Although large populations tend to produce greater total GDP, it reduces GDP per person, which is a better measure of economic well-being.

# 控制人口

## Control of Population Growth

- 不过，经济和社会学家对于人口如何影响社会争论已久。

**However, economists and other social scientists have long debated how population growth affects a society.**

- 人口增长与不同的生产要素都发生联系，以不同的方式影响增长。

**Population growth interacts with various factors of production and affects growth in different ways.**

- 导致资源紧张      **Stretching natural resources**
- 稀释资本存量      **Diluting the capital stock**
- 促进技术进步      **Promoting technological progress**

# 中国经济增长的关键是什么

## What Account for China's Growth

- **过去：平均 GDP 增长 9.3%(1978-98)**
  - 物质资本积累增加最重要（5.7%，占 62%）
  - 劳动力扩大就业很小（0.9%，占 10%）
  - 技术进步和制度变化的贡献较大（2.7%，占 28%）
- **未来**
  - 物质资本积累 vs 人力资本积累
  - 技术进步 vs 制度变化





# 总结

## Summary

- 以人均实际 GDP 衡量的经济繁荣，在世界各地差别很大。

**Economic prosperity, as measured by real GDP per person, varies substantially around the world.**

- 世界上最富国家的人均收入是世界上最穷国家的 10 倍以上。

**The average income of the world's richest countries is more than ten times that in the world's poorest countries.**

- 一个经济的生活水平依赖于这个经济生产物品和服务的能力。

**The standard of living in an economy depends on the economy's ability to**



# 总结

## Summary

- 生产率依赖于工人能够得到的物质资本、人力资本、自然资源和技术知识。 **Productivity depends on the amounts of physical capital, human capital, natural resources, and technological knowledge available to workers.**
- 政府政策可以从许多方面影响经济增长。 **Government policies can influence the economy's growth rate in many different ways.**



# 总结

## Summary

- 资本积累受制于报酬递减。

The accumulation of capital is subject to diminishing returns.

- 因为报酬递减，更高的储蓄导致一段时间的更高增长，但最终增长会放慢。

Because of diminishing returns, higher saving leads to a higher growth for a period of time, but growth will eventually slow down.

- 也是由于报酬递减，资本的报酬在贫穷国家尤其高。

Also because of diminishing returns, the return to capital is