Introdução à Economia/Introductory Economics

2. GDP and economic growth, innovation and technological progress

(adapted from CORE, The Economy.

Based on Units 13, 2, 16, 21, 3)

2021/2022

2nd Quarter (P2)

GDP

- What indicators can we use to measure economic conditions?
- Measuring the size of an economy: GDP

The business cycle

Economic growth is not a smooth process.

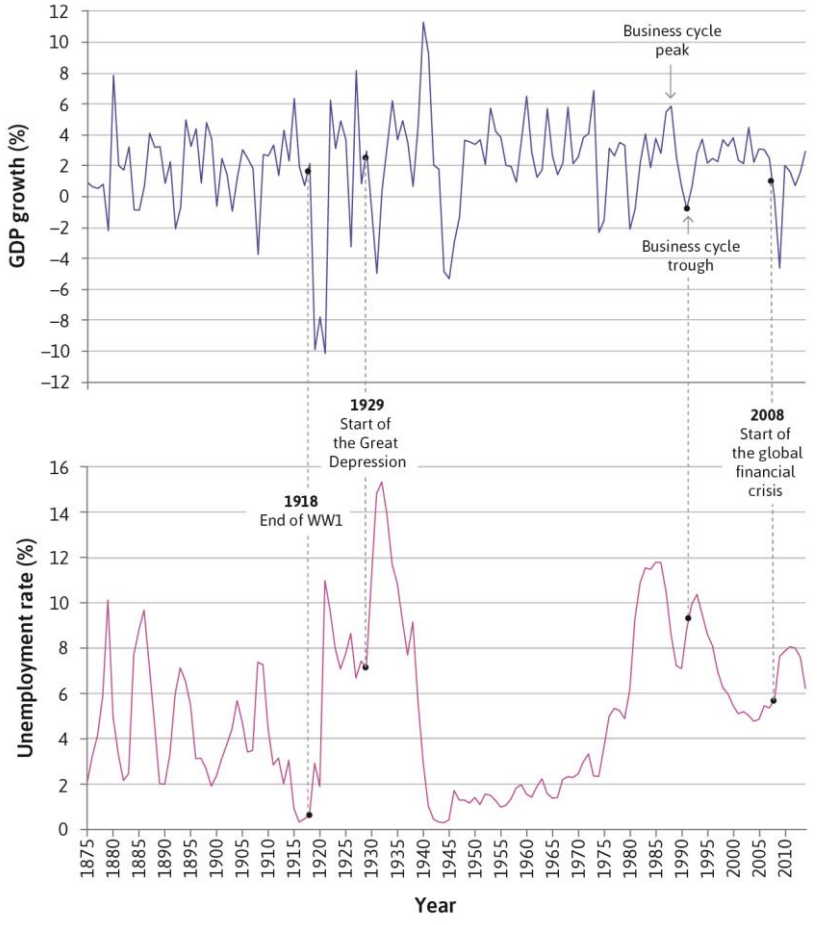
Business cycle = Alternating periods of positive and negative growth rates.

Recession = period when output is declining or below its potential level

Changes in the rate of GDP growth are negatively correlated with the unemployment rate.

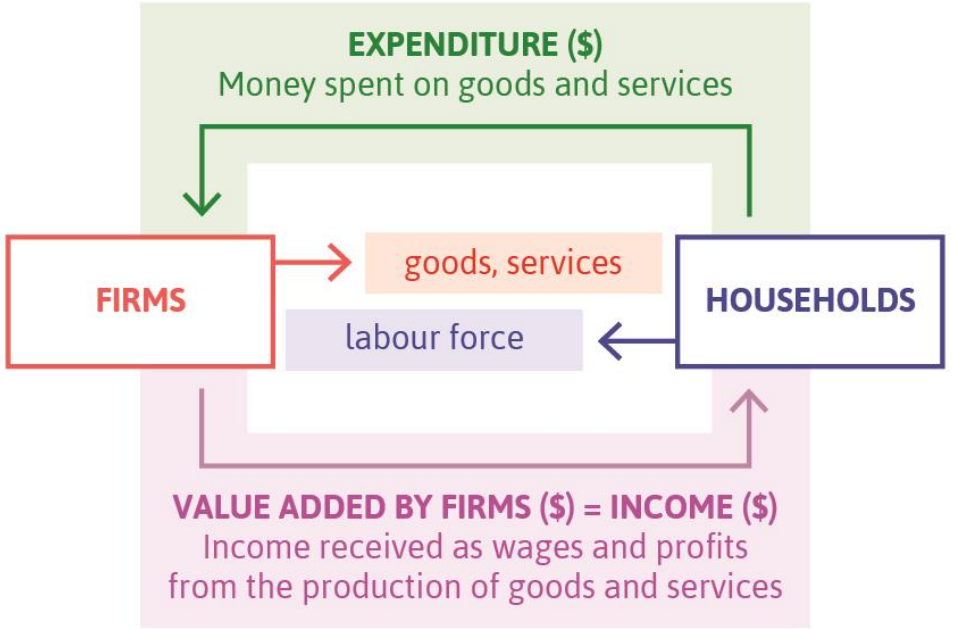
Output falls → Unemployment rises

→ Well-being falls



Measuring the aggregate economy

National accounts = system used to measure overall output and expenditure in a country.



Exports, imports, and government

How do we account for international transactions?
→ We include exports and exclude imports, so that GDP includes domestic production and excludes production made abroad.

How do we incorporate the Government?
→ Treat it as another producer – public services are “bought” via taxes

Components of GDP

- Consumption (**C**) = Expenditure on consumer goods and services
- Investment (**I**) = Expenditure on newly produced capital goods (incl. equipment, buildings, and inventories = unsold output)
- Government spending **(G)** = Government expenditure on goods and services (excluding transfers to avoid double-counting)
- Net exports (**trade balance**) = Exports (**X**) minus imports (**M**)

GDP = C + I + G + X – M

(Also known as Y, or **aggregate demand**)

Components of GDP

	US	Eurozone (19 countries)	China
Consumption (C)	68.4%	55.9%	37.3%
Government spending (G)	15.1%	21.1%	14.1%
Investment (I)	19.1%	19.5%	47.3%
Change in inventories	0.4%	0.0%	2.0%
Exports (X)	13.6%	43.9%	26.2%
Imports (M)	16.6%	40.5%	23.8%

In most countries, private consumption makes up the largest share of GDP

Economic fluctuations and shocks

- Economies fluctuate between good and bad times. This is true for industrialised as well as agrarian societies.

Shock = an unexpected event (such as extreme weather, a pandemic) which causes GDP to fluctuate.

Household shocks

People use two strategies to deal with shocks that are specific to their household:

1. **Self-insurance** – saving and borrowing.
2. **Co-insurance** – support from social network or government.

This reflects that households prefer to smooth their consumption, and that they are (to a degree) altruistic.

Economy-wide shocks

Co-insurance is less effective if the bad shock hits everyone at the same time (e.g. pandemic).

But when these shocks occur, co-insurance is even more necessary.

Consumption smoothing and the aggregate economy

Consumption smoothing is a basic source of stabilisation in an economy.

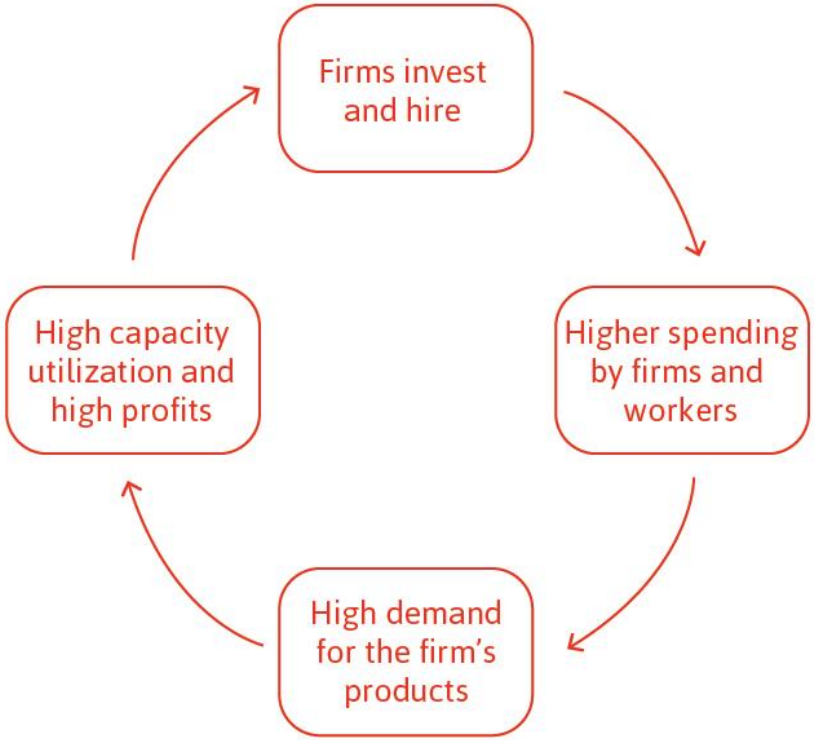
Limitations to consumption smoothing mean it cannot always stabilise the economy; it may amplify the initial shock *(e.g., the paradox of thrift, chapter 5)*.

Volatile Investment

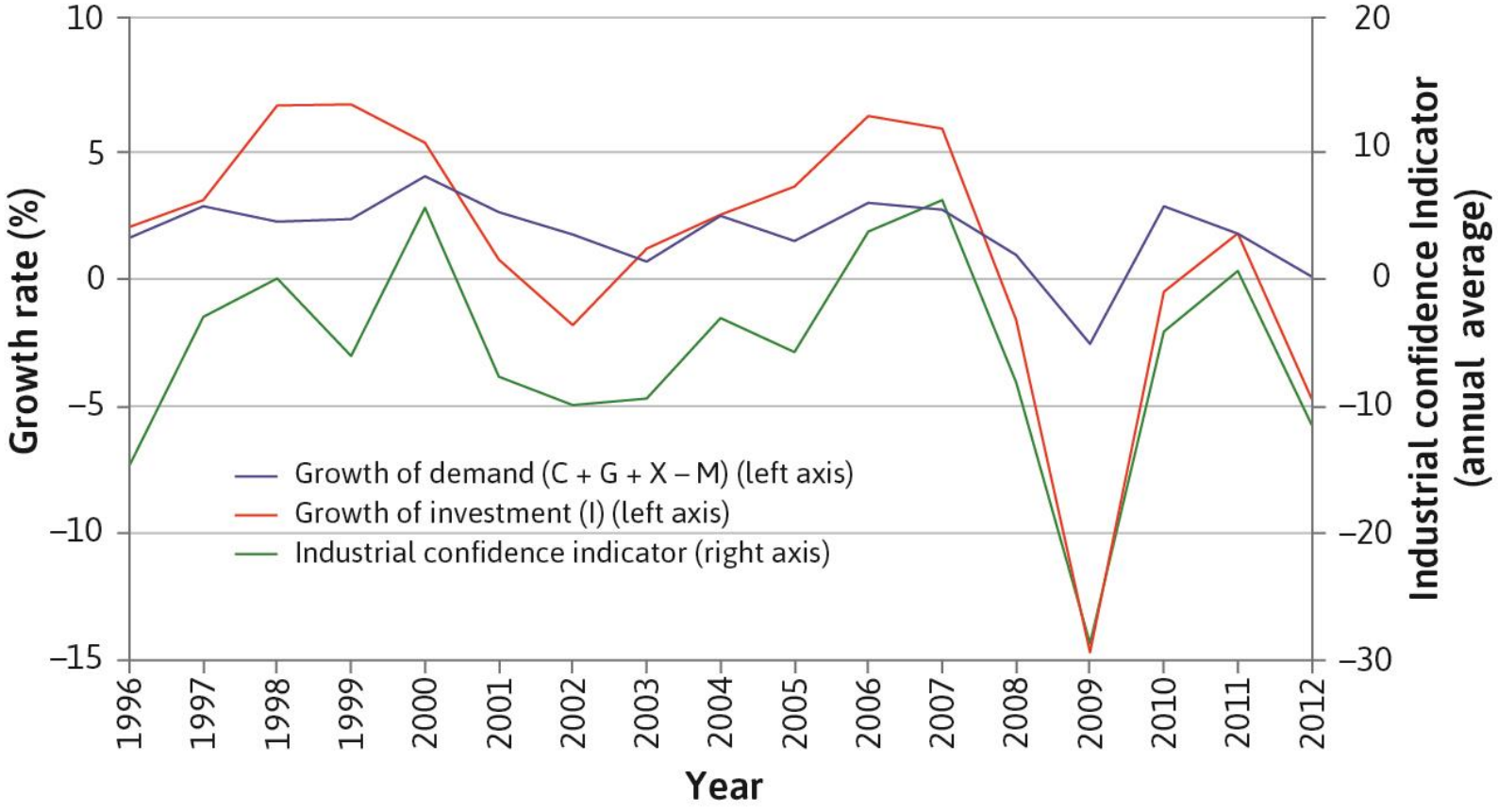
Firms don't have preferences for smoothing like households. They adjust investment plans to both temporary and permanent shocks, to maximize their profits.

High demand → high **capacity utilization**,
→ investment → even higher demand

Investment decisions depend on firms' <u>expectations about future demand</u>



Business confidence



Business confidence coordinates firms to invest at the same time.

Investment and the aggregate economy

- The benefits of coordinating investment makes cycles self-reinforcing.
- Firms respond positively to the growth of demand in the economy.
- This is why investment is more volatile than GDP.

Other components of GDP

- Government spending is less volatile than investment (it does not depend on business confidence)

- Exports depend on demand from other countries, so will fluctuate according to the business cycles of major export markets.

Innovation and technological progress

The recent rapid, sustained increase in income and living standards is largely due to technological progress.

These major changes started very suddenly, 200 years ago.

Use economic models to explain the rapid growth in real wages and population in the last 2 centuries, and the stagnation in the centuries before that.

Why do we need models?

What happens in an economy depends on the actions and interactions of millions of people.

We use models to see the big picture.
Models necessarily omit many details. This is their feature, not a bug.
Less is more: **Ceteris paribus** = simplification that involves "holding other things (in/outside the model) constant".

Equilibrium of a model = situation that is self-perpetuating, that is, it does not change unless an external force is introduced that alters the model's description of the situation.

A good model…

- is clear: it helps us better understand something important
- predicts accurately: its predictions are consistent with evidence
- improves communication: it helps us to understand what we agree (and disagree) about
- is useful: we can use it to find ways to improve how the economy works

Explaining the Industrial Revolution

Why did the **Industrial Revolution** happen first in the 18th Century, on an island off the coast of Europe?

There are many alternative explanations, among which:

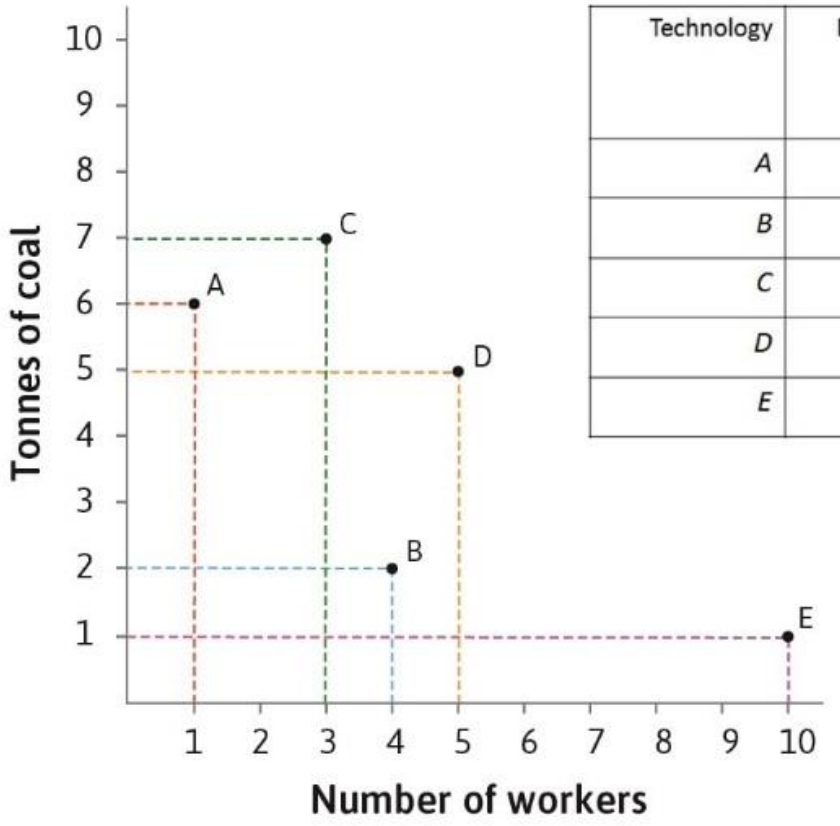
- relatively high cost of labour and cheap local sources of energy
- Europe's scientific revolution and Enlightenment
- cultural attributes such as hard work and savings
- abundance of coal and access to colonies

Modelling technology

Technology = A process that uses inputs to produce an output.

Suppose there are 5 different ways to produce 100 metres of cloth, using labour (number of workers) and energy (tonnes of coal) as inputs.

E: relatively labour-intensive technology; A: relatively energy-intensive technology.



Technology	Number of workers	Coal required (tonnes)
A	1	6
B	4	2
C	3	7
D	5	5
E	10	1

Firm’s choice: inferior technologies

Firms choose between technologies (specific combinations of inputs) to produce outputs.

Some technologies are **dominated** by other technologies.

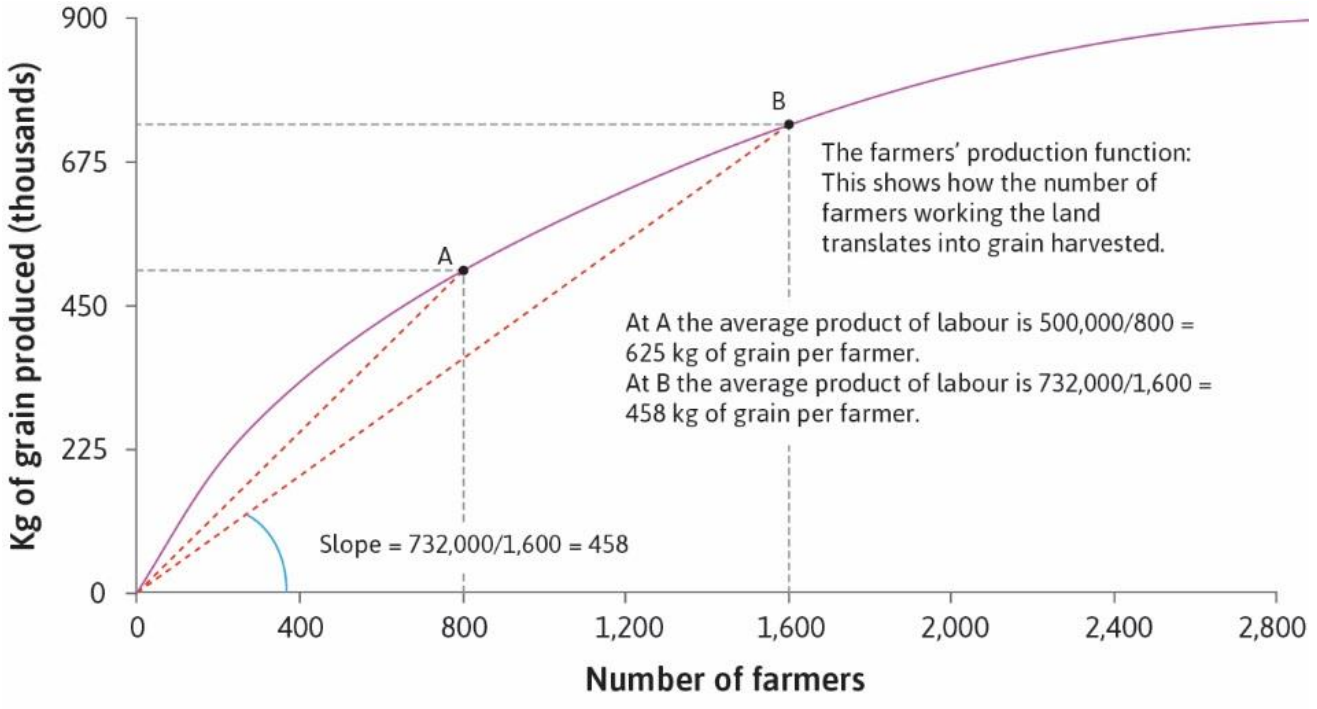
For instance, D is dominated by B and C by A, because they use more resources to produce the same level of output.

The firms’ choice of technology depends on economic information about relative prices of inputs.

Diminishing average product of labour

Production function gives maximum output for a given set of inputs.

If we hold one input (land) fixed, and expand the other input (labour), the average output per worker is going to fall. This is the **law of diminishing average product of labour**.



Change in relative prices in Britain

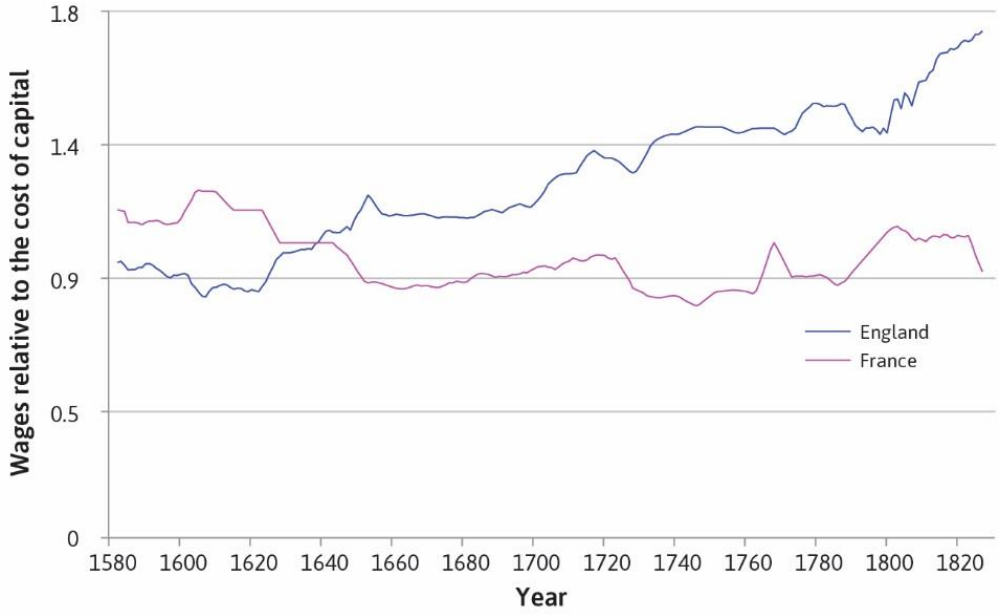
Technology was labour-intensive before the Industrial Revolution.

Increase in wages relative to price of coal in Britain creates the incentive to innovate more capital-intensive technologies.

Why was Britain first?

English wages were higher than wages elsewhere, and coal was cheaper in Britain than in the other countries.

The combination of capacity to innovate and changing relative prices of inputs led to a switch to energy-intensive technology.



The benefits of innovation

Because relative prices of inputs changed, a firm that will switch to the new cost-minimising technology will have an advantage over its competitors.

$$\text{profit} = \text{revenue - costs}$$

The change in profit is equal to the fall in costs associated with adopting the new technology. This is the **innovation rent**.

Key concepts

Innovation: the invention and diffusion of new products or production methods.

Two types:

- **Process innovation** – producing an existing good at lower costs
- **Product innovation** – producing a new good at an attractive cost

Inventions can be **radical** (major advance over existing goods) or **incremental** (improvement of an existing good).

Innovation: Costs and rents

- Firms that successfully innovate earn **innovation rents**, which are eventually competed away when their innovation is copied.
- Other firms must keep up with innovation or go out of business.
- There is a tradeoff between encouraging **innovation** (e.g., via patents) and allowing knowledge **diffusion.**

Creative destruction

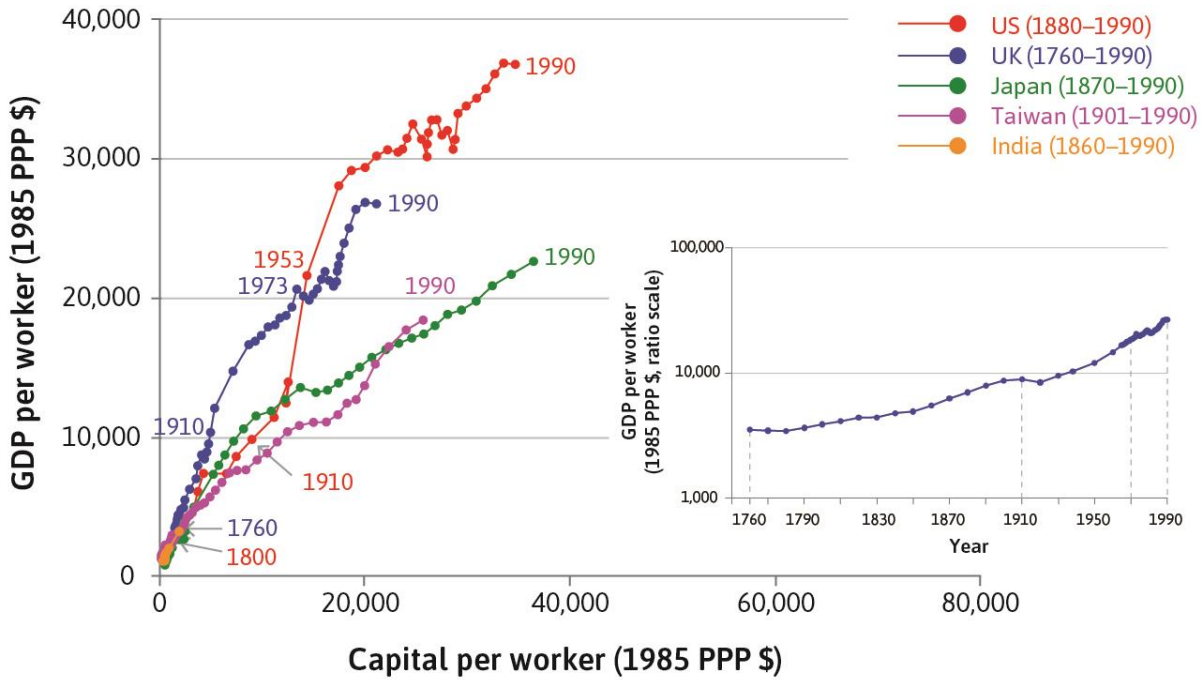
The first adopter is called an **entrepreneur**. An entrepreneurial firm is willing to try out new technologies and to start new businesses.

The first adopters will enjoy **Schumpeterian (innovation) rents**.

Creative destruction = the process by which old technologies and the firms that do not adapt are swept away by the new, because they cannot compete in the market.

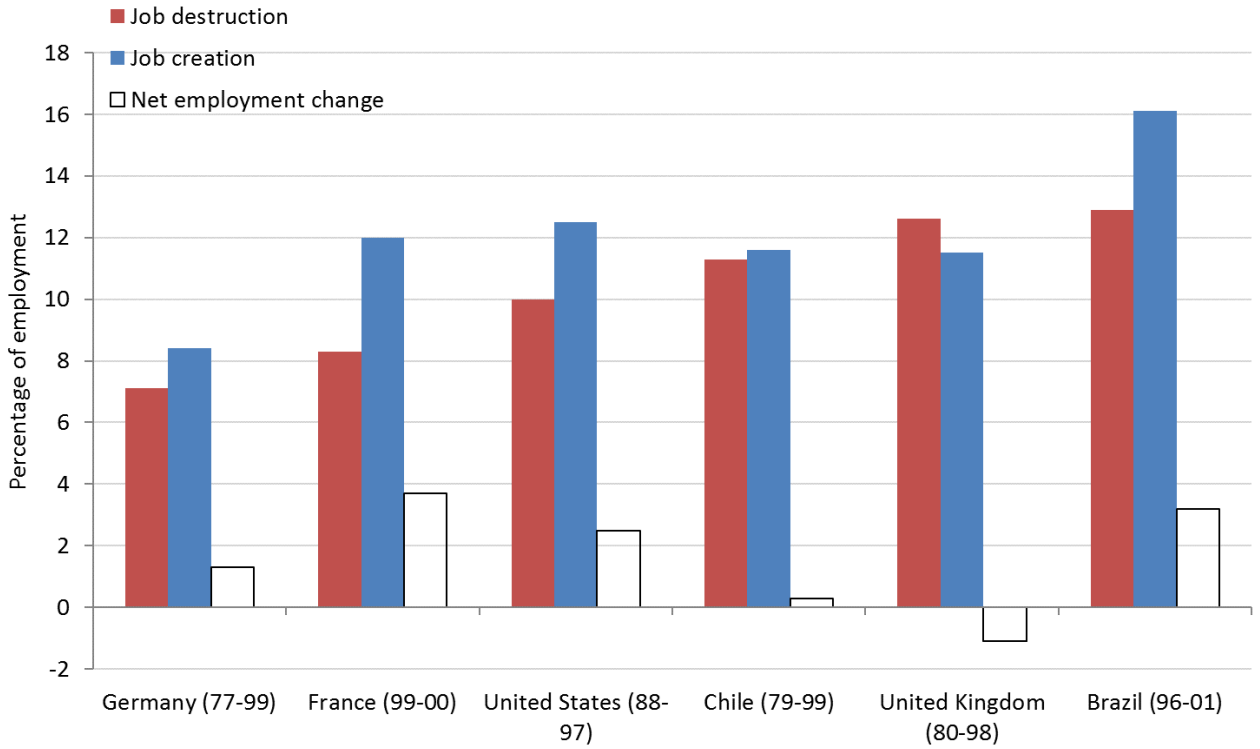
Technological progress over time

Countries that are rich today have had labour productivity rise over time as they became more capital intensive.



- Technological change improves long-run living standards but can cause short-run unemployment by replacing labour.

Job creation/destruction



Labour-saving technological progress can also create jobs
(e.g., through reallocation of work from low- to high-productivity firms).
Net employment change = job creation – job destruction

Job creation/destruction

Job creation is strongly **procyclical** (rises in booms and falls during recessions), whereas job destruction is **countercyclical.**

- During recessions, firms post fewer vacancies and lay off more workers due to lower demand.
- During booms, firms post more vacancies and need more workers to cope with rising demand.

Labour market matching

Newly posted vacancies are not filled instantly because:

- Mismatch – unemployed workers may not have the skills required for the job; jobseekers and vacancies may be located in different parts of the country
- Jobseekers and/or employers may not know about each other

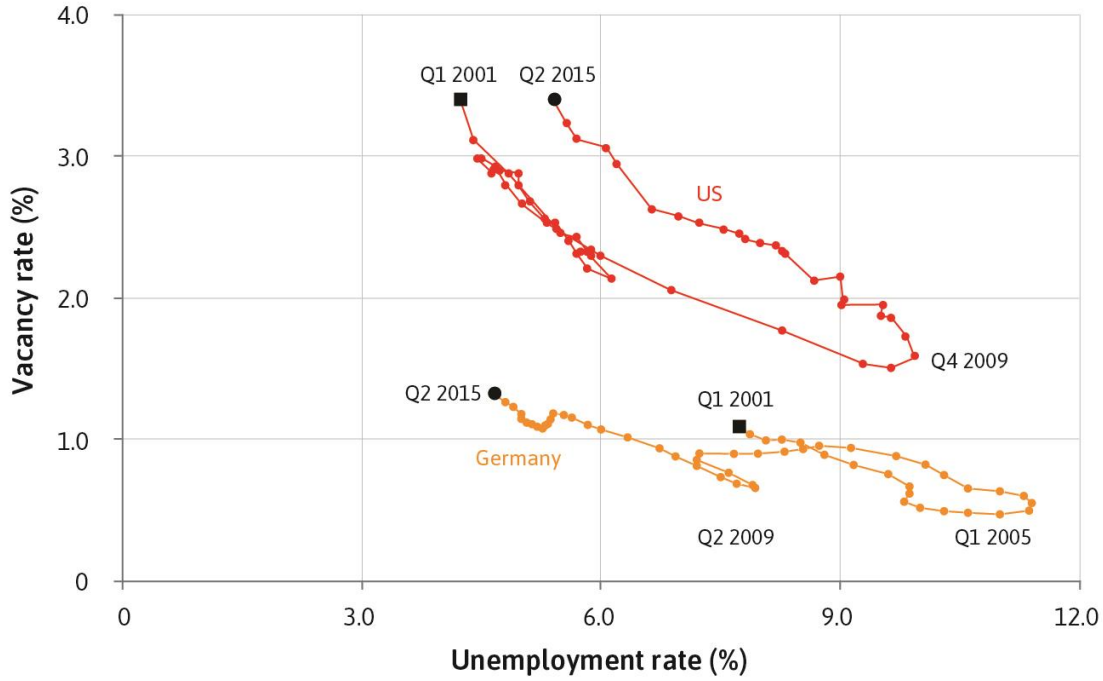
Policies and technology can improve efficiency

The Beveridge Curve

Beveridge curve: graphical representation of the relationship between unemployment and the job vacancy rate (number of unfilled jobs as a percentage of the labour force)

The Beveridge curve can shift over time due to changes in **labour market matching** efficiency.

- The German Beveridge curve shifted closer to the origin due to reforms that helped unemployed workers find jobs.
- The US curve shifted away from the origin due to a skill-based mismatch and limited worker mobility.



Technological improvement

- New technology can increase both real wages and employment in the long-run.
- The adjustment process takes time and may involve job destruction in the short-run (adjustment gap).
- Actually, unemployment does not continuously fall with technological progress because this can contribute to increasing wages due to, among others: policies to help those affected (e.g., employment protection laws); greater disutility of effort, hence improvement in the reservation wage.

How long is the long run?

The economy can go through a long adjustment process before reaching the new long-run equilibrium.

Example: Adjustment of the US labour markets to the Chinese import shock.

- Many economists thought that this shock would not have a major negative effect on wages or employment, because workers in import-competing sectors could easily relocate to other regions.
- However, they underestimated the size of the shock and overestimated the degree of labour mobility – 2.4 million jobs were lost.

Important factors

Cross-country differences can be explained by:

- Institutions – inclusive trade unions (represent many firms and sectors) choose not to exercise maximum bargaining power because wage increases affect job creation in the long run.
- Policies – well-designed unemployment insurance schemes and job placement services can achieve low unemployment rates.

Two important effects

Consider a wage increase – it will have 2 effects:

- Your total earnings increase, holding working hours fixed (**income effect**). A wage increase gives more income per hour worked -> incentive to decrease working hours

The opportunity cost of free time increases (**substitution effect**)
→ incentive to increase hours worked

Overall effect on labour choice

Overall effect = **Income effect**
+ **Substitution effect**

Income effect is positive (increase hours of free time)
Substitution effect is negative (decrease hours of free time)

Which effect dominates depends on individual/country preferences

Additional reading

- “GDP, Why is this metric becoming obsolete”, in Fenix
- https://ftp.iza.org/dp14309.pdf
- “Do we need to shrink the economy to stop climate change?”