

# Unit 16

## Technological Progress, Unemployment, and Living Standards in the Long Run

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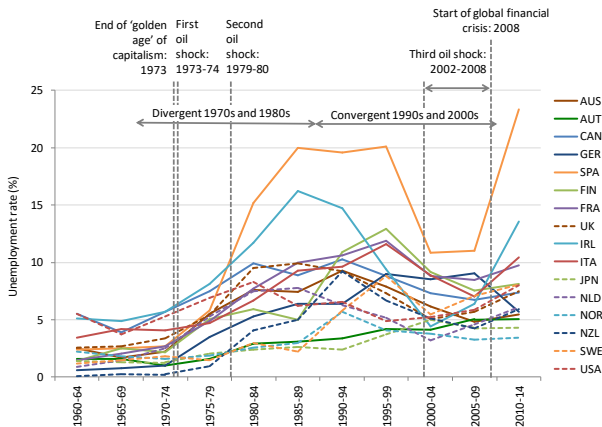


# Introduction

- Tech change long-run living standards  $\uparrow$  yet cause short-run unemployment
- Cross-countries of unemployment cannot be explained by innovation

Figure 16.1. Unemployment rates in selected OECD countries (1960-2014).

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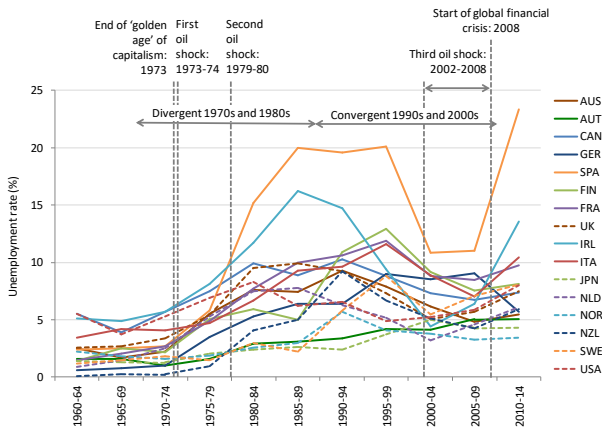


How can institutions and policies explain these differences?

- Production has become more capital intensive, without resulting in mass unemployment. How could this outcome occur?

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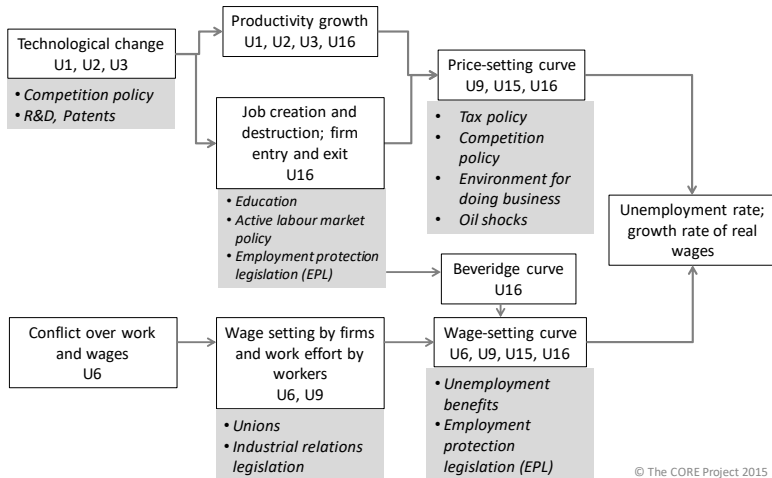
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How can institutions and policies explain these differences?

# Structure of Units

Figure 16.21. The institutions, policies, and shocks that can influence unemployment and real wages.





# Job Creation and Unemployment



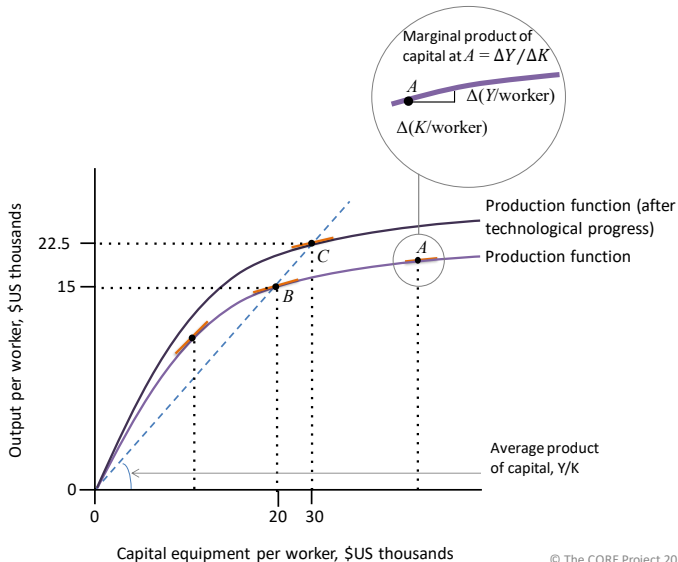
# Technological progress and living standards

- Firms can earn **innovation rents** by introducing new technology.
- Firms that cannot keep up with innovation eventually fail
  - $\Rightarrow$  Schumpeter: creative destruction
- New technologies require new machines
- Technological advance relies on capital-intensive methods of production to be profitable.
- This process allows a sustained increase in average living standards.



# Classical Growth Model: Decreasing MPK

Figure 16.2. The economy's production function and technological progress.

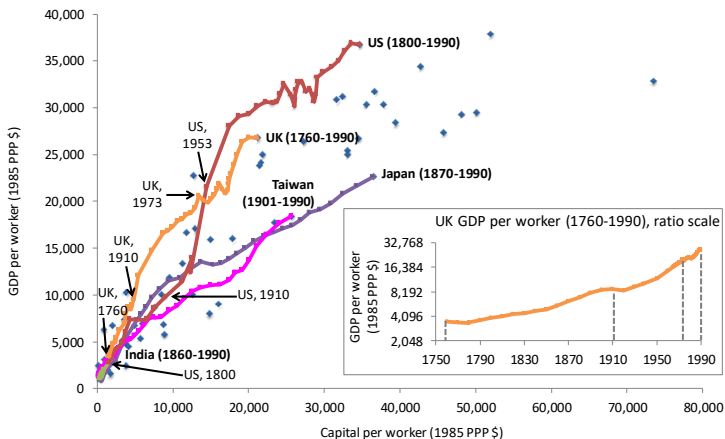






# Technological progress over time

Figure 16.3. Long-run growth trajectories of selected economies.

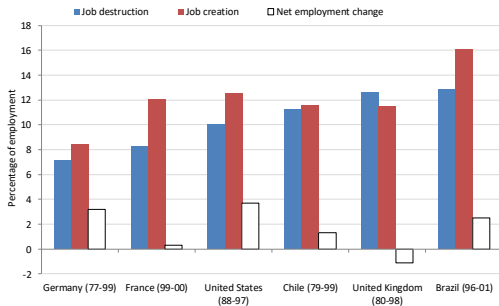


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capital productivity remained roughly constant, why?



Figure 16.4. Job destruction, job creation, and net employment across countries.



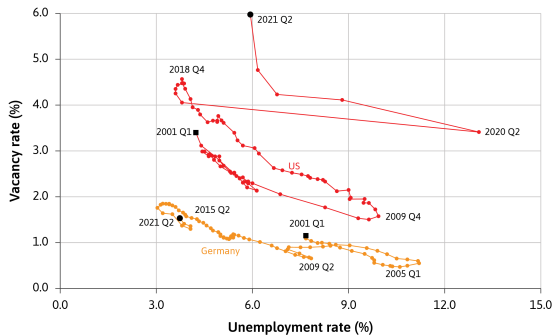
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- Labour-saving technological progress can also create jobs
- e.g. reallocation of work from low- to high-productivity firms
- Net employment change = job creation – job destruction



# The Beveridge Curve

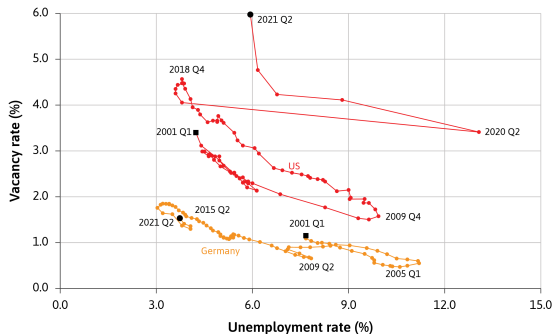
- **Def:** inverse relationship between the **unemployment rate** and the **job vacancy rate**
- **Recession:** post fewer vacancies and lay off more workers
- **Boom:** post more vacancies and need more workers





# The Beveridge Curve

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





# Labor Market Matching

Beveridge curve can shift over time!

- $\therefore$  changes in the labour market matching efficiency
- **Skill Mismatch**: the unemployed may not have the **skills required** for the job jobseekers
- **Geographical constraint**: vacancies may be located in different parts of the country
- Policies and technology can improve efficiency



# Long-run Labor Market Model



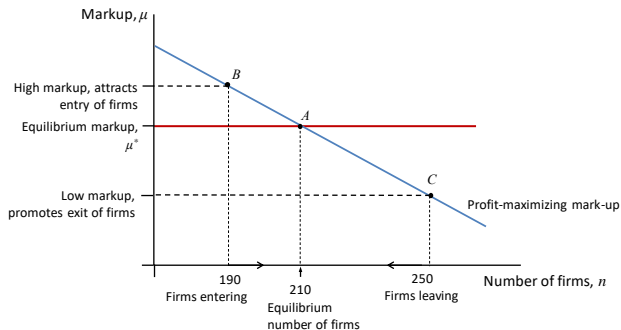
# Long-run unemployment

- In the long run, firms can enter/exit (so capital stock can change)
- **Work incentives**: depend on **wage-setting curve**
- **Investment incentives**: depend on **price-setting curve**
- **Long-run equilibrium** in the labour market is when
  - ① wages,
  - ② employment level, and
  - ③ the number of firms are constant

# Equilibrium Profit

Figure 16.7a. Firm entry, exit, and the equilibrium markup.

- Profit determines the number of firms in the market.
- High markup = firms enter
- lower markup = firms exit.



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# Equilibrium Profit

■ Self-correcting process:

■ more firms

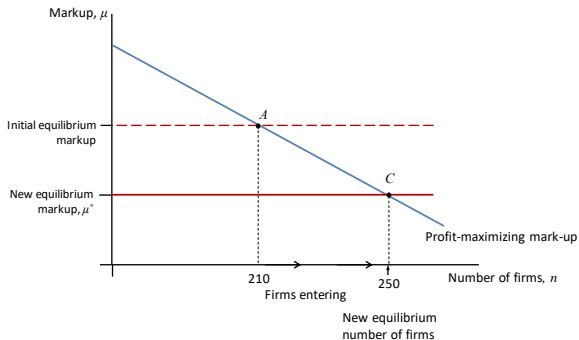
■ = more competition

■ = higher elasticity of demand

■ = lower markup

■ = fewer firms

Figure 16.7b. An improvement in conditions for doing business: Firm entry, exit, and the equilibrium markup.



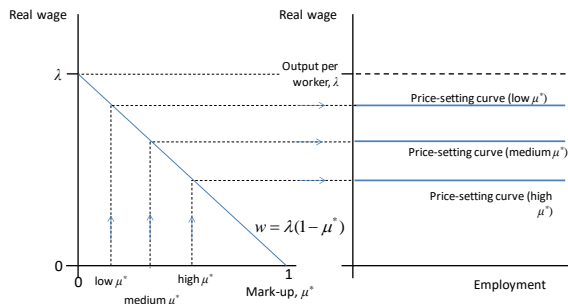
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Equilibrium profits can change:  
e.g. property protection legislation

# Long-run price-setting curve

- Real wage depends on productivity ( $\lambda$ ) and equilibrium profits ( $\mu^*$ ).
- Long-run price-setting curve:  
 $w = \lambda(1 - \mu^*)$
- The price-setting curve depends on:

Figure 16.8. Changes in the long-run markup shift the price-setting curve.



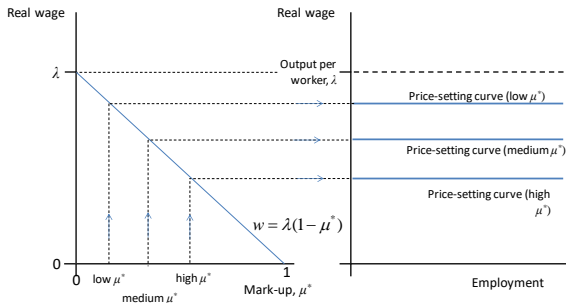


# Long-run price-setting curve

- Expected long-run tax rates

Figure 16.8. Changes in the long-run markup shift the price-setting curve.

- Competition
- Risk of expropriation
- Quality of human capital/infrastructure
- Opportunity cost of capital
- Expected material costs

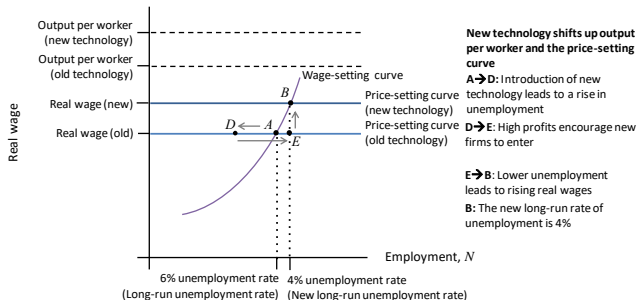


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# Technological Improvement

- 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.

Figure 16.9b. The long-run unemployment rate and new technology.



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# Technological Improvement

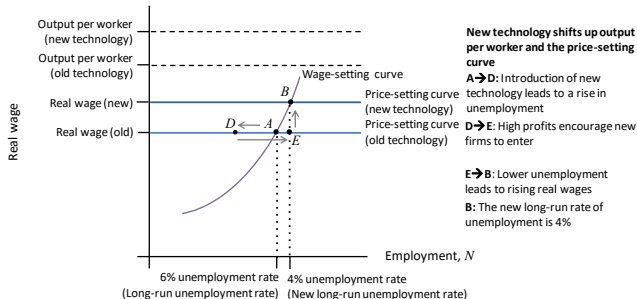
## ■ Adjustment gap:

The lag between outside labor market conditions and the movement to the new equilibrium.

## ■ Diffusion gap:

time for whole economy to adopt the innovation

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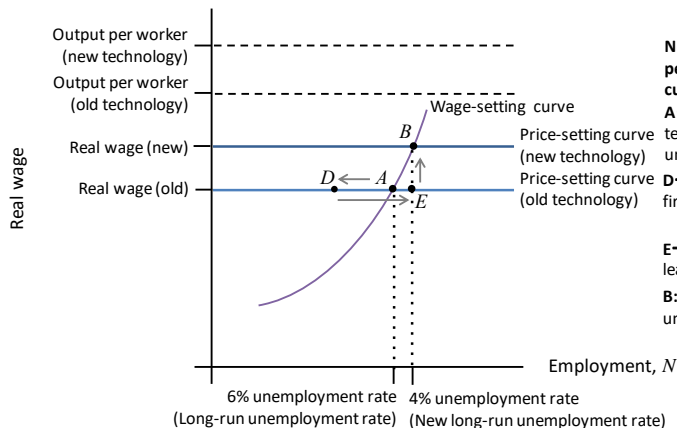
## Long-run wage-setting curve

Unemployment does not continuously fall with technological progress because the **wage-setting curve can shift upwards**.

Technological change can indirectly shift the wage-setting curve due to:

- Fair shares bargaining by unions
- Policies to help those affected e.g. employment protection laws
- Greater disutility of effort
- Improvement in the reservation wage

# Long Run v.s. Short Run



**New technology shifts up output per worker and the price-setting curve**

**A → D:** Introduction of new technology leads to a rise in unemployment

**D → E:** High profits encourage new firms to enter

**E → B:** Lower unemployment leads to rising real wages

**B:** The new long-run rate of unemployment is 4%

	In Fig	Employment	Unemployment	Wage share	Inequality
Short run	A → D	Down	Up	Down	Up
Long run	A → B	Up	Down	No change	Slightly Down

## Effect on Inequality

Technological change increased inequality in the short run but reduced inequality in the long run:

- Employees' share of output returned to initial levels due to an increase in real wages
- The higher real wage motivated employees to work hard at a lower level of unemployment.

Figure 16.11. Effects of a new technology on inequality in the short and long run.





# 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 labor 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, and the labour market is still adjusting.

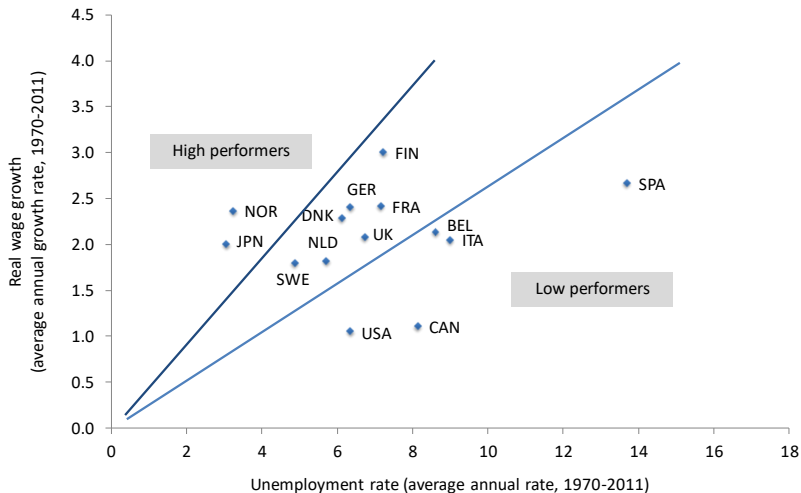


# The role of institutions and policies

# Differences across countries

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Figure 16.12. Long-run unemployment and real wage growth across the OECD (1970-2011).





# Important Factors

To achieve “good” economic performance, an economy must:

- 1 Ensure price-setting curve shifts up more than wage-setting curve

Possible explanation for cross-country differences are:

No magic formula: Institutions and policies used differ across successful countries and over time



# Important Factors

To achieve “good” economic performance, an economy must:

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- ② Adjust rapidly and fully  $\Rightarrow$  whole economy benefits from tech progress

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Possible explanation for cross-country differences are:

- 1 **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.
- 2 **Policies**: well-designed unemployment insurance schemes and job placement services can achieve low unemployment rates.

No magic formula: Institutions and policies used differ across successful countries and over time



# Examples

- ① Norway: Inclusive trade unions and employers' associations set wage demands in accordance with the productivity of labour, and also supported legislation and policies that shifted the wage-setting curve downwards, further expanding long-run unemployment.





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- ② Japan: Employers' associations coordinate wage setting across firms. Corporations deliberately do not compete in hiring workers, to avoid raising wages.



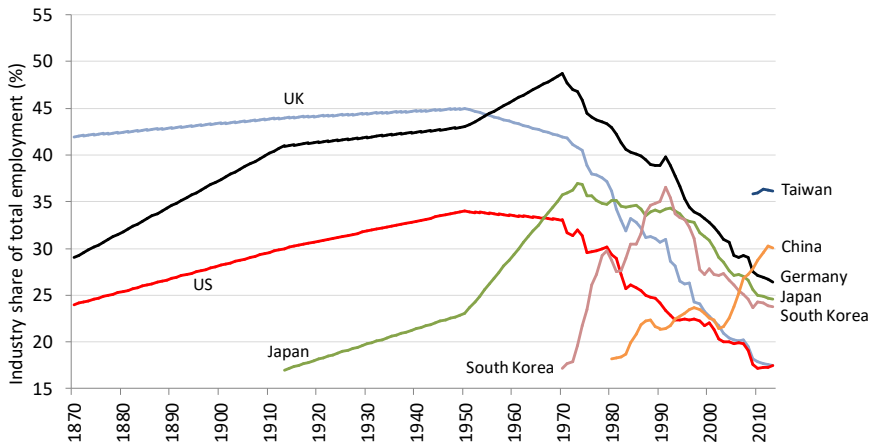
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- 2 Japan: Employers' associations coordinate wage setting across firms. Corporations deliberately do not compete in hiring workers, to avoid raising wages.
- 3 Spain: A combination of non-inclusive unions and government legislation that protects jobs rather than workers may help to account for Spain's 'poor' labour market performance.



# Global trends: The changing nature of work

## Share of employment in Agriculture



Countries get richer, industry moves:  
 agriculture → manufacturing → services.



# Modelling shifts in production



Labor has been moving out of manufacturing (high productivity) into services (low productivity)



# Does shifts in production actually happen?

Yes, but some offsetting factors are excluded from this model:

- Productivity increases in some services – productivity advances have been large in music sharing and digital information.



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- Import and export patterns – international trade and opportunities for specialization affect which sectors grow/decline.