Unit 16

TECHNOLOGICAL PROGRESS, UNEMPLOYMENT, AND LIVING STANDARDS IN THE LONG RUN



OUTLINE

A. Introduction

B. Job creation and unemployment

C. Long-run labour market model

D. The role of institutions and policies



A. Introduction



The Context for This Unit

Technological change improves long-run living standards but can cause short-run unemployment by replacing labour. (Units 1-2)

However, long-run patterns of unemployment across countries are <u>not explained</u> by national differences in innovation over time.

- How can institutions and policies explain these differences?
- How can we model the effects of institutions and policies on long-run unemployment and economic growth?



This Unit

Unemployment rates were low and similar in the 1960s, then diverged in the 1970s.

Patterns of unemployment across countries reflect differences in institutions and policies.

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



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This Unit



Use a long-run labour market model to explain differences in labour market performance across countries, and look at the effects of technological progress on living standards and inequality.

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B. 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 (creative destruction).

Technological progress and **capital goods** accumulation are complementary:

- New technologies require new machines
- Technological advance is needed for increasingly capital-intensive methods of production to be profitable.

This process allows a sustained increase in average living standards.



Modelling technological progress Capital intensity of production: capital goods per worker Labour productivity: output per worker

Technological progress rotates the production function upwards.

- This increases the APL and offsets the diminishing marginal returns to capital...
- Which makes it profitable to invest domestically, leading to increased capital intensity.



Capital equipment per worker (\$ thousands)



Technological progress over time

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

- Unlike the concave production function, capital productivity remained roughly constant over time in the technology leaders.
- This is because these countries experienced a combination of capital accumulation and technological progress.



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Job creation/destruction





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

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The Beveridge Curve

Job creation is strongly **procyclical** (rises in booms and falls during recessions), whereas job destruction is **countercyclical**. The **Beveridge curve** shows the inverse relationship between the unemployment rate and the job vacancy rate.

- 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 of issues with **labour market matching**:

- 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
- Industry-specific shocks or shocks that prevent workers from moving increase the mismatch (lower efficiency)



The Beveridge Curve

The Beveridge curve can shift over time due to changes in the 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.





C. Long-run labour market model



Long-run unemployment

To explain trends and differences in unemployment over time, we can extend the labour market model to the long run.

In the long run, firms can enter/exit (so capital stock can change)

Long-run employment rate depends on how well policies and institutions deal with:

- Work incentives depend on wage-setting curve
- Investment incentives depend on price-setting curve

Long-run equilibrium in the labour market is when wages, employment level, and the number of firms are constant



Equilibrium profits

The profit rate determines the number of firms in the market. High markup = firms enter; lower markup = firms exit.

- Self-correcting process: more firms = more competition = higher elasticity of demand = lower markup = fewer firms
- Equilibrium profits can change due to legislation e.g. property protection



Number of firms, n



Long-run price-setting curve

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

The price-setting curve depends on:

- Expected long-run tax rates
- 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.



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

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

 $D \rightarrow E$: 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%

Adjustment gap = The lag between some outside change in labour market conditions and the movement to the new equilibrium.
Diffusion gap: takes time for whole economy to adopt the innovation



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



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

A→D: Introduction of a 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%



Long-run vs. short-run



Employment, N

| | In Figure | Employ | Unemploy | Wage | Inequali |
|---|-----------|--------|----------|--------------|------------------|
| | 16.9b | ment | ment | share | ty |
| Short Run (number of firms and their capital stock do not change) | A to D | Down | Up | Down | Up |
| Long run (outcome adjusts fully to the new Nash equilibrium of the model; no change in wage-setting curve) | A to B | Up | Down | No change | Slightly down |

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Effect on inequality

In this example, 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.



Cumulative share of the population from lowest to highest income (%)



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, and the labour market is still adjusting.



D. The role of institutions and policies



Differences across countries



To achieve 'good' economic performance, an economy must:

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

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2. Adjust rapidly and fully so the whole economy benefits from technological progress

Important factors

These 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.

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.

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.



Changing labour market performance

Institutions and policies make a big difference for employment and wage growth, but changing institutions or policies is difficult because it creates winners and losers.

Example: The Netherlands and the UK both had increased unemployment rates in the 1970s due to the oil price shocks and the increased bargaining power of labour.

Both countries managed to shift the wage-setting curve down:

- Netherlands institutions became more inclusive (as in Norway)
- UK policies reduced the power of non-inclusive unions



Global trends: The changing nature of work



The amount of labour devoted to agriculture declines as countries get richer, first moving to manufacturing (after the Industrial Revolution), then from manufacturing to services.



Modelling shifts in production

Labour has been moving out of manufacturing into services, which has slower productivity growth.

- Manufacturing productivity increases, shifting the feasible frontier. Assume
- If consumption patterns don't change, the economy will be at point plane.
 - Labour has shifted from the production of goods to the production of services.



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Does this 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.
- Substitution of goods for services if the relative price of a good falls, consumers typically increase the proportion consumed.
- Increase in relative demand for services as incomes rise, people may choose to spend more of their budget on services.
- Import and export patterns international trade and opportunities for specialization affect which sectors grow/decline.



Summary

- 1. Long-run model of wages and unemployment
- Long-run price-setting curve depends on incentives to invest
- Long-run wage-setting curve depends on productivity
- Beveridge curve shows efficiency of long-run adjustment
- 2. Used model to explain differences in labour market outcomes across countries
- Institutions and policies matter for long-run outcomes
- Successful countries reduced the adjustment and diffusion gap due to technological change







In the next unit

- More about economic performance trends over time
- The role of policies in promoting economic growth and investment
- Causes of recent and historical economic and financial crises

