

Jobs, Output, and Real Wages

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 Public working draft

Public working draft. This is an AI-drafted chapter skeleton for coauthor development. Google Docs remains canonical. Source badges identify adapted CORE/UOE material; facts, classifications, exercises, and figures still require human review.

Central question: Why can people with similar skills face different jobs and real wages—and why does the wage a firm can feasibly offer depend on employment across the whole economy?

By the end of this chapter, you should be able to: classify labor-market states; distinguish stocks from flows; connect workers, hours, and productivity to output; calculate a real wage; build and interpret a wage-setting curve; distinguish movement along it from a shift; and interpret an empirical wage-setting estimate.

2.1 Graduating into a recession

Imagine two students with the same major, similar grades, and comparable work experience. One graduates when firms are expanding; the other graduates when firms are canceling vacancies. Their qualifications matter, but they do not act alone. Each graduate’s outcome also depends on employers’ hiring plans, other applicants, customers’ spending, credit conditions, and expectations about the future. This is the Interdependence principle: the opportunities facing one person depend partly on the choices and circumstances of others.

A recession can change the opportunity set before a graduate makes any choice. Applications may receive fewer replies; acceptable offers may arrive later; a graduate may take temporary work, continue studying, move home, or leave the labor force. Those changes can affect current earnings, later experience, bargaining power, and expectations.

The labor market they enter can also change how long unemployment lasts. The figure below reports the median duration among people who are unemployed in each month’s survey. It is not an average completed spell and it is not specific to graduates. It nevertheless puts a measurable pattern beside the story: in some periods, a person without work is likely to remain without work much longer than in others.

Reading the opening evidence one step at a time

Final figure

Unemployment can last much longer after a downturn

Monthly, seasonally adjusted



Figure 1: US median weeks unemployed, July 1967–July 2026. Source: U.S. Bureau of Labor Statistics via FRED, series UEMP MED. Monthly and seasonally adjusted; draft vintage accessed August 21, 2026.



Scan to open the live step-by-step figure, or use the linked figure title in the digital chapter.

The annotations identify dates, not causes. The 2010 and 2021 peaks follow very different recessions. Explaining them requires evidence about layoffs, hiring, industry, policy, search, matching, and who remained in the measured unemployed population.

Research using US labor-force data from 1976 to 2015 finds persistent earnings and wage reductions for cohorts entering the labor market in worse economic conditions, especially among less advantaged entrants. That is a causal research claim based on comparisons across cohorts, states, and labor-market conditions—not a conclusion we can read from the duration line alone. [Study and methods: Schwandt and von Wachter, “Unlucky Cohorts.”](#)

i Side note

Everyday Economics 2.1

The same résumé in a different year

Ask someone who entered work in 2009 or 2020 how many applications they sent, what kind of first job they accepted, and which plans they postponed. Which part of the story was personal choice, and which part reflected the macroeconomy?

The figure and story generate a hypothesis; the cohort study supplies a research design. Evaluating the causal result still requires attention to migration, further study, occupation, family resources, how labor-market entry is dated, and how recovery differs across groups.

! Review flag

Fact-check flag: Verify the Schwandt–von Wachter sample, research design, outcome definitions, and heterogeneity claims against the published paper; add one accessible first-person account. Keep the descriptive UEMPMED series separate from claims about long-run scarring.

Questions

Question 2.1. What can Figure 2.1 establish by itself?

A. Every graduate entering work in 2010 was unemployed for 25.2 weeks B. The median reported duration among unemployed people reached 25.2 weeks in June 2010 C. The 2007–09 recession caused every later earnings loss D. The line reports the average completed unemployment spell

Exercise

Same résumé different year

Use Figure 2.1 to state one supported descriptive claim and one causal claim it cannot establish. Then give two macroeconomic reasons why the same graduate might receive fewer offers in a recession and name one comparison the cohort study needs before attributing lower later earnings to labor-market entry conditions.

2.2 Labor-market states are stocks connected by flows

Official labor statistics first classify people’s situations. A person is **employed**¹ if they did paid work during the reference period or had a job from which they were temporarily absent under the survey rules. A person is **unemployed**² if they had no job, were available, and actively sought work, or met

¹Classified as having done paid work during the survey reference period, or as having a job from which one was temporarily absent. See also: unemployed; outside the labor force.

²Without a job, available for work, and actively seeking work under the statistical definition, or on qualifying temporary layoff. See also: employed; outside the labor force; labor force.

the qualifying temporary-layoff rule. Everyone else is **outside the labor force**³. The **labor force**⁴ is employed plus unemployed people. TE 2.0 §1.3

These categories distinguish situations that everyday language blurs. Someone who wants a job but has not searched recently may be outside the labor force. Someone working one paid hour can be employed even if they want full-time work. A caregiver and a retired person may share a statistical category while facing very different choices and constraints.

The number employed in a month is a **stock**⁵: a quantity measured at a point in time. Hiring, separation, entry, and exit are **flows**⁶: quantities measured over an interval. Employment can end a month unchanged even when millions of people moved into and out of jobs. TE 2.0 §1.6

Reading the stock-and-flow figure one step at a time

Final figure

An unchanged stock can conceal large flows

Hires and separations can offset one another while employment is unchanged

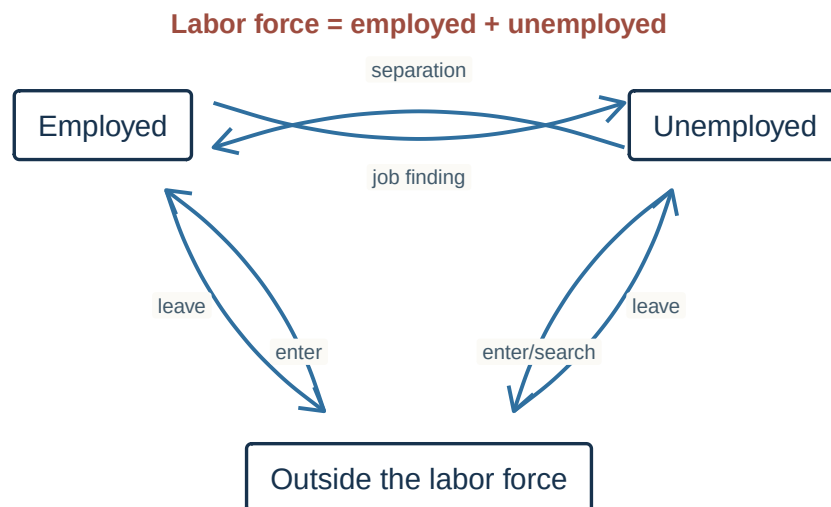


Figure 2: Labor-market stocks and flows. Adapted from CORE Econ and checked against BLS concepts; redrawn in R.

³Neither employed nor classified as unemployed; this group includes many students, retirees, caregivers, and people not actively searching. See also: employed; unemployed; labor force.

⁴The number of people classified as employed plus the number classified as unemployed. See also: employed; unemployed.

⁵A quantity measured at a point in time, such as the number of people employed in a given month. See also: flow.

⁶A quantity measured over an interval, such as hires, quits, or transitions from unemployment to employment during a month. See also: stock.



Scan to open the live step-by-step figure, or use the linked figure title in the digital chapter.

The figure is an accounting map, not a behavioral model. It shows which flows change each stock, but it does not yet explain why those flows change.

Review flag

Note for fact checkers: Validate the classification language against current [BLS CPS definitions](#), especially temporary layoff, active search, and reference-period wording.

Questions

Question 2.2. Employment begins and ends the month at 160 million. What follows?

A. No one was hired or separated B. Net employment change was zero, but gross flows may have been large C. Unemployment must also be unchanged D. Everyone kept the same status

Exercise

Stocks and flows

Classify five people as employed, unemployed, or outside the labor force. Then construct two sets of monthly flows that leave the number employed unchanged and explain what the stock conceals.

2.3 Work, hours, productivity, and output

Aggregate output connects people at work to what the economy produces. In a simple decomposition:

$$\text{output} = \text{workers} \times \frac{\text{hours}}{\text{worker}} \times \frac{\text{output}}{\text{hour}}$$

The final term is **labor productivity**⁷. Output can change because more people work, average hours change, or output per hour changes. TE 2.0 §1.5

Suppose 100 workers each work 35 hours and produce 50 dollars of output per hour. Total output is \$175,000. If employment falls while productivity rises, the direction of output depends on the size of both changes. This is the Principle of aggregation and feedback: individual and firm-level choices add up, and aggregate outcomes feed back into the choices people face.

The equation is an identity: it must hold when the quantities are measured consistently. It does not say that increasing hours causes productivity to stay fixed, or that hiring one more worker mechanically creates demand for the output. Behavioral and causal claims require a mechanism beyond the accounting.

⁷Output per unit of labor input, measured here as output per hour or output per worker.

i Side note

Everyday Economics 2.2

More output without more workers

A restaurant can serve more meals by adding workers, extending shifts, reorganizing the kitchen, or adopting better equipment. Which margin changes workers' time, and which changes output per hour?

Questions

Question 2.3. Which expression decomposes total output using labor input?

A. Workers + hours + output per hour B. Workers $\times$ average hours per worker $\times$ output per hour C. Output per worker $\div$ employment D. Nominal wage $\times$ price index

Exercise

Decomposing output

An economy has 100 workers, 35 hours per worker, and 50 units of output per hour. Calculate output. Recalculate after employment falls 5%, hours fall 2%, and productivity rises 3%, and identify each contribution.

2.4 Nominal wages, real wages, and job quality

A **nominal wage**⁸ is measured in current dollars. A **price index**⁹ summarizes the prices of a specified basket relative to a base period. A **real wage**¹⁰ adjusts the nominal wage for prices so that it tracks purchasing power rather than dollars alone. TE 2.0 §1.4

Suppose the hourly wage rises from \$20 to \$21, a 5% nominal increase. If the price index rises from 120 to 129, prices rise 7.5%. The real wage falls: \$20/1.20 is about 16.67 base-period dollars, while \$21/1.29 is about 16.28.

For small changes, a useful approximation is:

$$\text{real-wage growth} \approx \text{nominal-wage growth} - \text{inflation}$$

This calculation still leaves things out. A national price index may not match a household's purchases. Taxes, benefits, hours, predictability, risk, and working conditions matter. The Trade-offs and opportunity costs principle reminds us that a worker evaluates the whole job against the next-best alternative—not the hourly wage in isolation.

⁸A wage measured in current dollars, without adjusting for the prices of goods and services. See also: real wage; price index.

⁹A statistical measure that summarizes the prices of a specified basket relative to a base period. See also: nominal wage; real wage.

¹⁰A wage adjusted by a price index so that changes reflect purchasing power rather than dollars alone. See also: nominal wage; price index.

Questions

Question 2.4. A nominal wage rises 4% while prices rise 6%. What happens approximately to the real wage?

A. It rises 10% B. It rises 2% C. It falls about 2% D. It is unchanged

Exercise

Nominal and real pay

A worker's hourly wage rises from \$20 to \$21 while a price index rises from 120 to 129. Calculate the percentage change in nominal pay and the approximate and exact change in real pay. Name one dimension of job quality the result omits.

2.5 From feasible wage offers to wage setting

Now we move from measurement to mechanism. A firm's human-resources problem has two parts. It must recruit enough workers, and it must make it worthwhile for them to stay and provide the required effort. A **reservation wage**¹¹ is the lowest wage at which a worker is willing to accept a job, given the value of remaining unemployed and searching for another one. Workers have different reservation wages because their alternatives, needs, locations, information, and preferences differ.

Paying the reservation wage may bring a worker through the door, but it may not solve the motivation problem. Because effort and judgment cannot be written completely into a contract, firms may need to offer a **no-shirking wage**¹²: the wage just sufficient to make providing the required effort preferable to shirking and risking dismissal. TE 2.0 Figures 1.18–1.20

This language is deliberately about **feasible offers**, not a wage firms freely choose without constraints. At a given employment level, the firm's lowest feasible wage must be high enough to attract the desired workers and make job loss costly enough to support effort. A still higher wage may be possible but more expensive; a lower one may fail to recruit, retain, or motivate the workforce the firm needs.

When unemployment is high, another job may take longer to find, so job loss is costly. When employment is high and unemployment low, outside options improve and other firms compete more intensely for workers. A firm must generally offer more to create the same reason to keep the job. Aggregating these feasible firm choices gives the **wage-setting curve**¹³.

¹¹The reservation wage summarizes the value of not accepting the current job, including income while unemployed, expected time to another offer, and the expected quality of alternative work. Workers can therefore have different reservation wages even when they have similar skills. See also: no-shirking wage; wage-setting curve.

¹²Because effort cannot be specified and enforced completely, a firm may need to offer more than the worker's reservation wage. The resulting employment rent gives the worker something to lose if dismissed. See also: reservation wage; wage-setting curve.

¹³The wage-setting curve slopes upward because higher employment means lower unemployment and generally better outside options for workers. A point on the curve combines a feasible real wage with an employment and unemployment level; a shift changes the feasible wage at the same employment rate. See also: reservation wage; no-shirking wage.

Reading the wage-setting figure one step at a time

Final figure

Building the wage-setting curve

Step 4 reads each point as a wage, employment, and unemployment combination

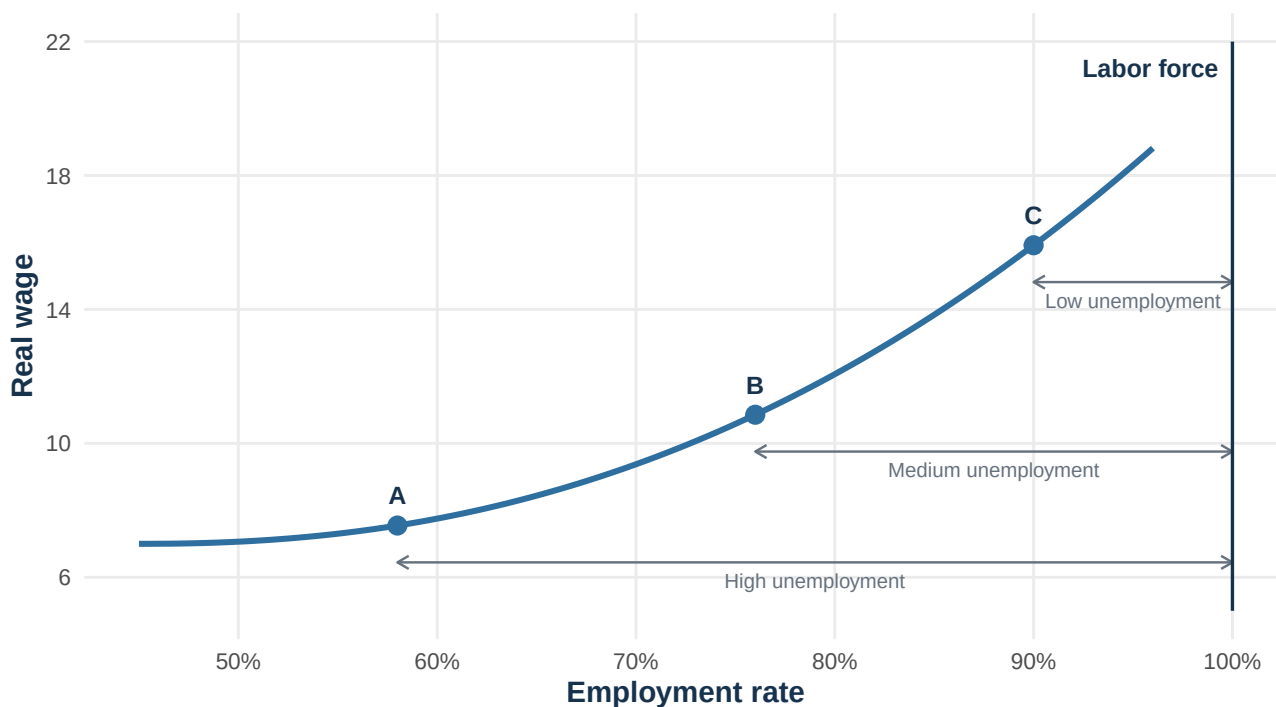


Figure 3: A stylized wage-setting curve adapted from CORE Econ and redrawn in R.



Scan to open the live step-by-step figure, or use the linked figure title in the digital chapter.

Each point implies both an employment rate and an unemployment gap. Moving from A to C means moving along the same curve: unemployment falls and the real wage firms need to offer rises.

Questions

Question 2.5. Why might a firm offer more than a worker's reservation wage?

A. To make job loss costly enough to support effort and retention
B. Because all workers have the same outside option
C. Because effort is completely enforceable in court
D. To guarantee that unemployment is zero

Exercise

Three feasible offers

Use Figure 2.3 to compare points A, B, and C. For each point, state the relative employment, unemployment, and real wage. Explain why a tighter labor market can require a higher feasible wage.

2.6 Points on the curve and an empirical wage-setting relationship

The most common reading mistake is to call every change a shift. If unemployment falls because economy-wide demand for labor rises while institutions and the recruitment-and-motivation problem are unchanged, the outcome moves **along** the wage-setting curve. The lower unemployment rate makes workers' outside options better, and the feasible wage rises.

The model's claim can be compared with evidence. Figure 4 reproduces the empirical curve reported in TE 2.0, estimated by Stephen Machin from US Current Population Survey Outgoing Rotation Group microdata for 1979–2019. The sample is men aged 26–64, and the estimate controls for age, education, race, state, and year. It uses variation across local labor markets rather than plotting the national wage and unemployment rate in each year. TE 2.0 Figure 1.21

Reading the empirical wage-setting figure one step at a time

Final figure

An empirical wage-setting curve for the United States

Step 3 interprets the association and states what the estimate is

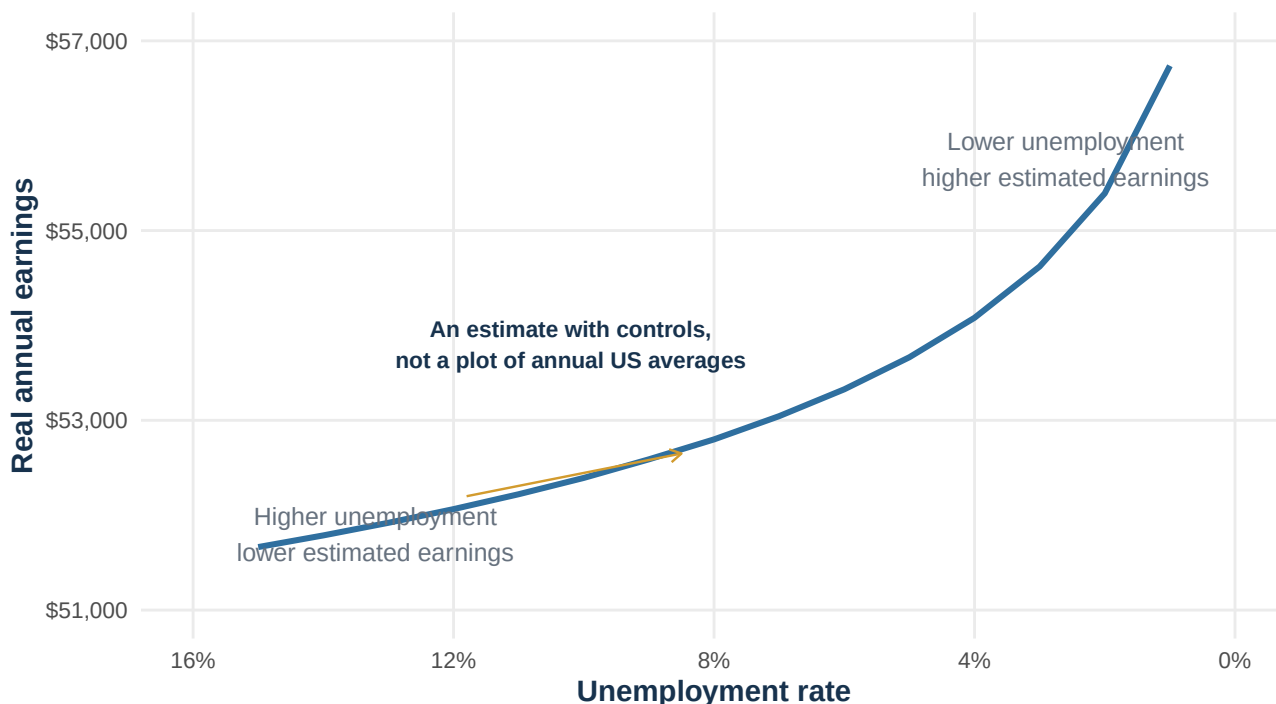


Figure 4: Empirical wage-setting curve adapted from TE 2.0 Figure 1.21 and redrawn in R.



Scan to open the live step-by-step figure, or use the linked figure title in the digital chapter.

The evidence is consistent with wage-setting logic, but it is not the analytical curve observed directly. The controls and research design matter; other samples, periods, wage measures, and local-area definitions may produce different estimates.

Review flag

Data-review flag: The plotted line was digitized from the published CORE SVG. Before canonical transfer, verify the extracted values and citation with the original figure or obtain the underlying estimated series from the author.

Questions

Question 2.6. In Figure 2.4, why does unemployment fall from left to right?

A. To make the empirical figure comparable with the employment-rate direction in Figure 2.3 B. Because unemployment can never rise C. Because the figure is a national time series D. Because earnings are measured in nominal dollars

Exercise

Analytical curve and empirical estimate

Compare Figures 2.3 and 2.4. Identify one shared prediction, two differences in construction, and one reason the empirical estimate does not by itself prove the entire wage-setting mechanism.

2.7 When the wage-setting curve shifts

A shift occurs when the feasible wage changes at the **same employment rate**. Consider an improvement in workers' fallback position. More adequate unemployment insurance, faster job search, a more attractive set of alternative jobs, or stronger collective bargaining may reduce the cost of losing the current job. To recruit, retain, or motivate workers at the original employment rate, firms must offer more.

Reading the wage-setting shift one step at a time

Final figure

A stronger outside option shifts wage setting

Step 3 explains the shift: at any employment rate, firms must offer more

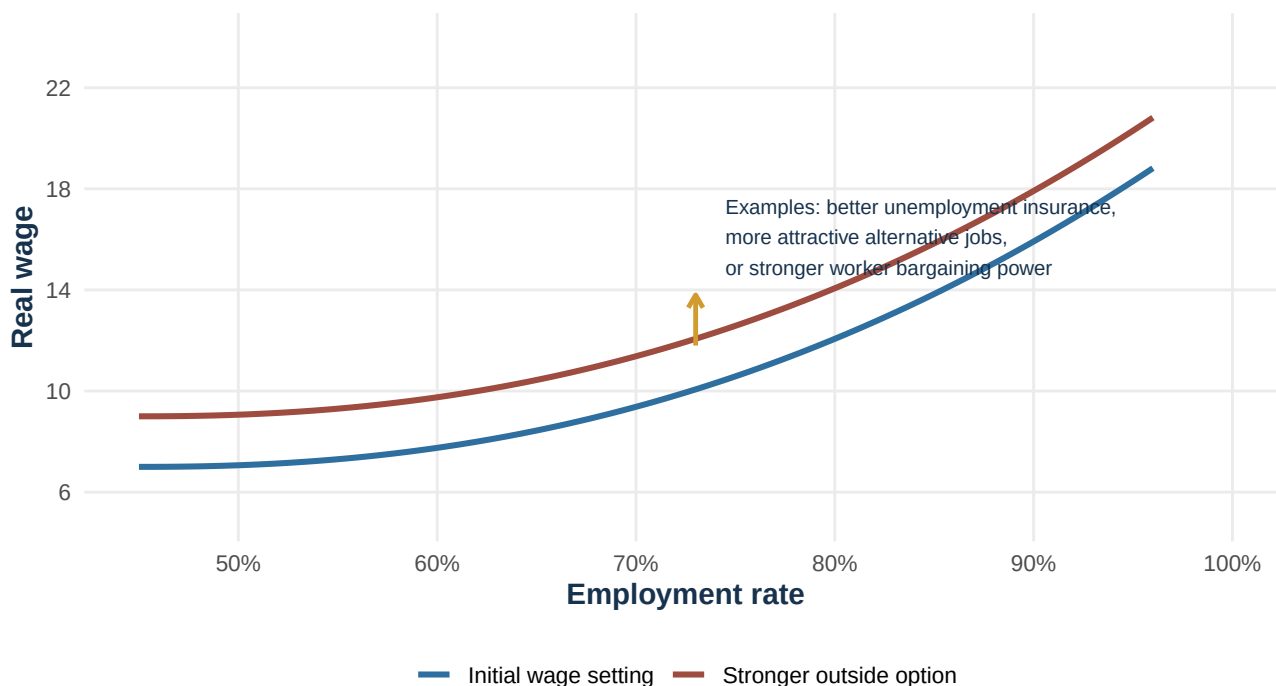


Figure 5: A stronger outside option shifts wage setting upward.



Scan to open the live step-by-step figure, or use the linked figure title in the digital chapter.

The figure does not say that every stronger outside option has the same effect, or that employment is unchanged after the economy adjusts. It isolates the first step of comparative statics: which relationship changes and why.

Monitoring, workplace norms, turnover costs, discrimination, and bargaining institutions can also change wage setting. Some changes may affect productivity or the composition of jobs at the same time. Chapter 4 will treat institutions as more than one-dimensional curve shifters.

Questions

Question 2.7. Which change is a shift rather than movement along the wage-setting curve?

- A. Employment rises while the recruitment-and-motivation relationship is unchanged
- B. A stronger outside option raises the feasible wage at the same employment rate
- C. Unemployment falls as employment rises
- D. A point is relabeled from A to B

Exercise

Move or shift

Classify each as movement along WS or a possible shift: lower unemployment with unchanged institutions; more generous unemployment insurance; easier monitoring; better alternative jobs. For each shift, explain the first-step mechanism.

2.8 What Chapter 2 has built—and what comes next

We began with measured labor-market states and flows, then connected employment, hours, and productivity to output and nominal pay to purchasing power. Those measures established what must be explained. The wage-setting relationship supplied the first behavioral building block: firms' feasible wage offers depend on workers' outside options, and those outside options depend partly on employment across the economy.

The wage-setting curve alone does not determine employment or the real wage. It tells us what wage is consistent with recruitment and motivation at each employment level. Chapter 3 adds firms' price-setting choices and the division of output per worker between wages and profits. Only then can we ask where both sets of choices are mutually consistent.

National averages also conceal unequal access to jobs, outside options, bargaining power, and income. UOE Micro's matching-market analysis supplies one bridge from classification to unequal opportunity. UOE Micro Ch. 10 Chapter 4 will ask how institutions and power change both the size and distribution of the gains from employment.

Seeing the principles in action

Principle	Example	Everyday Economics
Interdependence principle — focal	A graduate's opportunities and a firm's feasible wage both depend on the hiring and search choices made throughout the labor market.	The same résumé or wage offer can receive different responses in a booming labor market and a recession.
Doing the best you can principle	Workers decide whether to search, accept a job, study, or provide care given income needs, time, transport, information, and available jobs.	Someone may stop searching because another month of search is costly even when paid work remains their preferred outcome.
Rules of the game principle	BLS definitions determine recorded labor-market states, while unemployment insurance and bargaining rules change workers' outside options and can shift wage setting.	A more adequate fallback may change which job offers workers can reject and which wages firms can feasibly offer.

Principle	Example	Everyday Economics
Trade-offs and opportunity costs principle — focal	Accepting a job now provides earnings but may end a search for a better match; studying or caregiving uses time that could have been paid work.	The opportunity cost of one more week of job search depends on savings, benefits, and the offers currently available.
Principle of gains from cooperation and conflict of interest	A productive job match can benefit worker and employer, while they may conflict over wages, hours, security, and working conditions.	A job offer can create gains for both sides even when neither side receives everything it wants.
Principle of individual and societal interests	A firm's decision to cut hours can protect its finances while reducing household income and aggregate output.	What is sensible for one employer during a downturn may deepen the downturn when many employers act similarly.
Principle of aggregation and feedback — focal	Individual transitions determine aggregate employment, while aggregate unemployment feeds back into workers' outside options and firms' feasible wage offers.	One firm's vacancy is local; widespread hiring changes unemployment and can alter the wage every firm must consider.

Skills and learning objectives

- Interpreting labor market statistics
- Reading a flow chart
- Reading an analytical graph
- Reading and interpreting an empirical graph (and its terms)
- Adjusting a model in response to economic or institutional changes
- Understanding the difference between causality and correlation
- Defining important economic terms
- Applying the interdependence and opportunity cost and trade-offs principles

Concepts to learn

- Employment, unemployment, the labor force, stocks, and flows
- Employment, hours, labor productivity, and aggregate output
- Nominal wages, price indexes, real wages, and purchasing power
- Reservation wage, no-shirking wage, and employment rent
- Feasible wage offers and the wage-setting curve
- Employment and unemployment as points on wage setting
- Empirical wage-setting estimates
- Movement along a curve and shifts in a curve

Glossary

Chapter 2 terms

employed

Classified as having done paid work during the survey reference period, or as having a job from which one was temporarily absent.

See also: [unemployed](#); [outside the labor force](#).

unemployed

Without a job, available for work, and actively seeking work under the statistical definition, or on qualifying temporary layoff.

See also: [employed](#); [outside the labor force](#); [labor force](#).

outside the labor force

Neither employed nor classified as unemployed; this group includes many students, retirees, caregivers, and people not actively searching.

See also: [employed](#); [unemployed](#); [labor force](#).

labor force

The number of people classified as employed plus the number classified as unemployed.

See also: [employed](#); [unemployed](#).

stock

A quantity measured at a point in time, such as the number of people employed in a given month.

See also: [flow](#).

flow

A quantity measured over an interval, such as hires, quits, or transitions from unemployment to employment during a month.

See also: [stock](#).

labor productivity

Output per unit of labor input, measured here as output per hour or output per worker.

nominal wage

A wage measured in current dollars, without adjusting for the prices of goods and services.

See also: [real wage](#); [price index](#).

real wage

A wage adjusted by a price index so that changes reflect purchasing power rather than dollars alone.

See also: [nominal wage](#); [price index](#).

price index

A statistical measure that summarizes the prices of a specified basket relative to a base period.

See also: [nominal wage](#); [real wage](#).

reservation wage

The reservation wage summarizes the value of not accepting the current job, including income while unemployed, expected time to another offer, and the expected quality of alternative work. Workers can therefore have different reservation wages even when they have similar skills.

See also: [no-shirking wage](#); [wage-setting curve](#).

no-shirking wage

Because effort cannot be specified and enforced completely, a firm may need to offer more than the worker's reservation wage. The resulting employment rent gives the worker something to lose if dismissed.

See also: [reservation wage](#); [wage-setting curve](#).

wage-setting curve

The wage-setting curve slopes upward because higher employment means lower unemployment and generally better outside options for workers. A point on the curve combines a feasible real wage with an employment and unemployment level; a shift changes the feasible wage at the same employment rate.

See also: [reservation wage](#); [no-shirking wage](#).

Flashcards**i** Expandable web content**What is the difference between a labor-market stock and a flow?**

A stock is measured at a point in time; a flow records movement over an interval.

i Expandable web content

How do employment, hours, and productivity combine to produce output?

Output equals workers times average hours per worker times output per hour.

i Expandable web content

Why can the feasible wage rise when unemployment falls?

Workers can find alternatives more easily, so firms may need a higher wage to recruit, retain, and motivate them.

i Expandable web content

Movement along WS or a shift?

A change in employment with the relationship unchanged is movement along WS; a change in the feasible wage at the same employment rate is a shift.

Questions

Question 2.8. Why does Chapter 2 not yet determine equilibrium employment?

A. The wage-setting curve contains no real wage B. A second relationship is needed to identify which wage and employment combination is mutually consistent C. Employment cannot be measured D. Firms never set prices

Exercise

Build the next question

State what the wage-setting curve determines and what it does not. Then explain why a price-setting relationship is needed before the model can identify an equilibrium real wage and employment rate.

References

Answers to Questions

The website provides answer-specific feedback after each choice. This print key gives the correct option and the feedback attached to it.

Question 2.1: B. The median reported duration among unemployed people reached 25.2 weeks in June 2010

Correct. That is the descriptive claim supported by the series.

Question 2.2: B. Net employment change was zero, but gross flows may have been large

Correct. A stock can be unchanged despite substantial movement.

Question 2.3: B. Workers $\times$ average hours per worker $\times$ output per hour

Correct. Workers times hours gives total hours; multiplying by output per hour gives output.

Question 2.4: C. It falls about 2%

Correct. Approximate real-wage growth is nominal-wage growth minus inflation.

Question 2.5: A. To make job loss costly enough to support effort and retention

Correct. The employment rent can help solve recruitment and motivation problems.

Question 2.6: A. To make the empirical figure comparable with the employment-rate direction in Figure 2.3

Correct. Moving right means a tighter labor market in both figures.

Question 2.7: B. A stronger outside option raises the feasible wage at the same employment rate

Correct. The entire relationship shifts upward.

Question 2.8: B. A second relationship is needed to identify which wage and employment combination is mutually consistent

Correct. Chapter 3 adds the price-setting constraint.