

# Wages, Prices, and Unemployment

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 Public working draft

**Public working draft.** This is an AI-drafted chapter skeleton for coauthor development. Google Docs remains canonical. Visible source badges identify CORE/UOE adaptations; all prose, mechanisms, examples, and figures remain subject to human editorial and factual review.

**Central question:** How can the choices of workers and firms jointly determine real wages, prices, employment, and persistent unemployment?

**By the end of this chapter, you should be able to:** carry the Chapter 2 wage-setting relationship into a second model; connect demand, productivity, costs, and markups to price setting; build the price-setting curve without relying on algebra; identify a best-response equilibrium using WS and PS; and evaluate what the model explains and omits.

### 3.1 A help-wanted sign, a pay increase, and an unfilled job

A restaurant posts a help-wanted sign, raises starting pay, and still leaves shifts uncovered. The employer may say that “nobody wants to work.” Applicants may say that the pay, schedule, commute, or predictability is not worth accepting. Customers may resist higher prices. Nearby employers may be recruiting from the same pool.

The puzzle cannot be understood by looking at a single choice. The Interdependence principle directs us to the linked actions: workers choose whether to apply, accept, stay, and exert effort; firms choose wages, staffing, monitoring, and prices; customers respond to prices and service; institutions shape each actor’s feasible options.

Before deciding that a vacancy reflects workers’ preferences or an employer’s choices, look at the aggregate labor market. The figure below divides the number of nonfarm job openings by the number of people classified as unemployed. A value of one means one opening per unemployed person nationally. It does **not** mean that every jobseeker has a suitable opening: occupation, place, hours, required skills, pay, and conditions may not match.

## Reading the opening evidence one step at a time

### Final figure

#### The balance between open jobs and jobseekers changes sharply

Monthly, seasonally adjusted

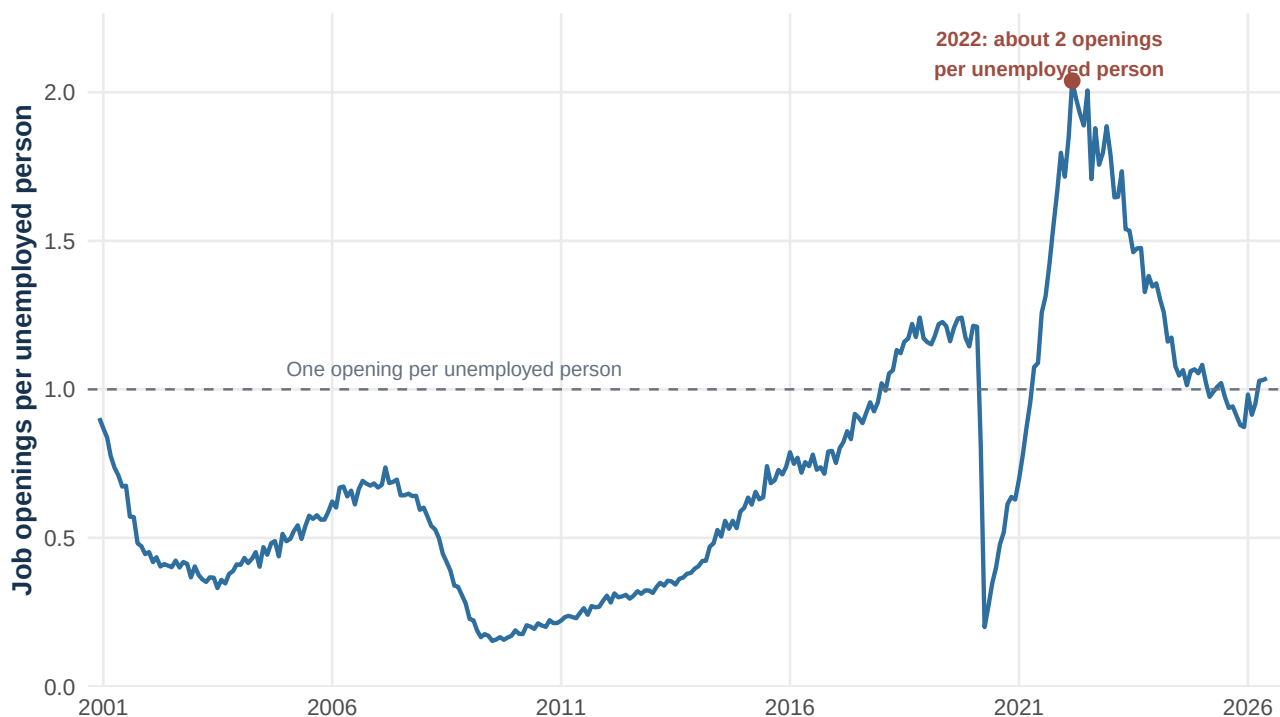


Figure 1: US job openings per unemployed person, December 2000–June 2026. Calculated from BLS JOLTS and CPS series via FRED, JTSJOL and UNEMPLOY. Monthly and seasonally adjusted; draft vintage accessed August 21, 2026.



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

The 2022 annotation establishes timing, not a complete explanation. Hiring demand, labor-force participation, sectoral reallocation, illness, care responsibilities, migration, wages, and working conditions can all affect the numerator, the denominator, and whether a match occurs.

#### i Side note

##### Everyday Economics 3.1

##### What does “shortage” mean?

A vacancy can coexist with applicants if the wage and conditions do not create an acceptable match. What would persuade a worker to accept? What would persuade the employer to improve the offer?

One vacancy is not the aggregate labor market, and the aggregate ratio is not a universal law about any vacancy. Together, the restaurant story and the data identify actors, goals, constraints, and feedback that the model must organize: why can vacancies and unemployment coexist, how do firms respond, and what do wages and prices have to do with the outcome?

 Review flag

**Reporting flag:** Add a named US employer-worker case only after verifying the timeline, local labor-market conditions, wage measure, and alternative explanations. Verify the JOLTS opening definition and the CPS unemployment denominator; avoid treating either a quote or the national ratio as representative of every occupation and place.

## Questions

**Question 3.1.** In Figure 3.1, what does a ratio of two job openings per unemployed person mean?

A. Every unemployed person has received two acceptable offers B. The national count of reported nonfarm openings is twice the number of people classified as unemployed C. Every employer must double wages D. Unemployment has fallen to zero

## Exercise

### One help-wanted sign

Use Figure 3.1 to compare a month when the openings-to-unemployed ratio is below one with the 2022 peak. Explain why neither the national ratio nor one vacancy proves a shortage for a particular restaurant. Name two worker-side and two firm-side facts you would want before explaining the outcome.

## 3.2 The employment contract is incomplete

An **incomplete contract**<sup>1</sup> cannot specify and enforce every action each party will take in every circumstance. A job description can state hours and tasks, but it cannot list every moment in which a worker should use judgment, help a colleague, solve a problem, or choose how carefully to work.

This creates a **principal-agent problem**<sup>2</sup>. The employer—the principal—wants the worker—the agent—to take actions that contribute to production. Effort is costly to the worker and only partly observable. Monitoring can help, but monitoring is costly and imperfect. UOE Micro Ch. 11

The employment relationship nevertheless creates gains. The firm receives work that helps produce and sell output. The worker receives pay and other benefits. An **employment rent**<sup>3</sup> is the net benefit of keeping the job compared with the worker's **outside option**<sup>4</sup>. If losing the job would be costly, the worker has a reason to meet the employer's required effort even when every action cannot be enforced.

<sup>1</sup>A contract that cannot specify or enforce every action each party will take in every possible circumstance. See also: principal-agent problem; employment rent.

<sup>2</sup>A problem created when a principal wants an agent to take an action that is costly to the agent and cannot be fully observed or enforced. See also: incomplete contract; employment rent.

<sup>3</sup>The net benefit a worker receives from keeping a job compared with the worker's next-best alternative. See also: outside option; incomplete contract.

<sup>4</sup>The next-best alternative available if a current interaction or agreement ends. See also: employment rent.

| Worker receives from job                   | Worker gives up or bears                             |
|--------------------------------------------|------------------------------------------------------|
| Wage, benefits, experience, relationships  | Effort, time, commute, schedule constraints          |
| Continued employment                       | Risk of discipline or dismissal                      |
| Employment rent relative to outside option | Opportunities available in the next-best alternative |

The model does not assume that workers are lazy or employers benevolent. It asks what each actor values and which actions are feasible. Norms, professional identity, trust, fairness, and intrinsic motivation may all matter alongside material incentives.

## Questions

### Question 3.2. What makes an employment contract incomplete?

A. It never states a wage B. It cannot specify and enforce every worker action in every circumstance C. It lasts less than a year D. It is not written on paper

## Exercise

### What the contract leaves out

Choose a job and list three valuable worker actions that would be difficult to specify and enforce completely. Explain how monitoring, norms, and the cost of job loss might affect one action.

## 3.3 What wage setting brings forward from Chapter 2

Chapter 2 built wage setting from feasible offers. The firm wants to recruit, retain, and motivate workers while controlling costs. The worker values income and job security but also values time and finds effort costly. The firm cannot simply choose the lowest possible wage: a very low wage may cause vacancies, quits, or insufficient effort.

The Doing the best you can principle therefore applies to both sides. A firm chooses a wage it believes will produce the most valued feasible outcome given recruitment and motivation constraints. A worker chooses effort given the wage, monitoring, norms, and consequences of losing the job.

Unemployment affects the outside option. When unemployment is high and job finding is difficult, losing a job is more costly. When the labor market is tight and another job is easier to find, a firm may need to offer a higher real wage to create the same employment rent. The **wage-setting curve**<sup>5</sup> carries this relationship forward: it records the feasible real wage at each employment level. TE 2.0 §1.6

The wage-setting curve is a behavioral relationship, not an accounting identity. Its position depends on institutions and behavior. We now hold it in place temporarily and ask a new question: what real wage is consistent with firms' price choices? Only after building that second constraint will we bring the two together.

<sup>5</sup>The real wage firms need to offer at each economy-wide employment level to recruit, retain, and motivate workers. See also: price-setting curve; best-response equilibrium.

**i** Side note

### Everyday Economics 3.2

#### Why not pay the lowest wage?

Think of a job with costly turnover or difficult-to-observe quality. How could a higher wage save the employer money or improve the product?

### Questions

#### Question 3.3. Why does a tighter labor market tend to raise the wage-setting curve?

A. Jobs become harder to find B. Losing a job becomes less costly, so firms need a larger employment rent C. Productivity must fall D. Prices are legally fixed

### Exercise

#### Build an employment rent

A job pays \$900 per week and requires effort valued by the worker at \$150. The next-best alternative provides \$500 after search costs. Calculate the weekly employment rent and predict how a better outside option changes the wage needed to motivate effort.

### 3.4 Micro tools for price setting

Firms also interact with customers. A firm's demand curve describes how many units customers will buy at alternative prices, holding relevant conditions fixed. Producing another unit creates marginal cost. A firm with some market power weighs the gain from a higher price against the loss of sales. If close substitutes are available, a price increase may lose many customers. If substitutes are scarce, the firm has more room to set price above cost.

UOE Micro Chapters 12–14 build this logic from willingness to pay, costs, demand, and profit. For the macro model, we retain only the bridge: firms set prices above marginal cost when they have market power, and the feasible gap depends on how customers respond and how intense competition is. UOE Micro Chs. 12–14

A **markup**<sup>6</sup> is the gap between price and marginal cost, expressed in a declared way. If marginal cost is \$8 and price is \$10, the dollar markup is \$2. It is 25% of marginal cost, or 20% of price. A final text must always state which convention it uses.

The exact profit-maximizing formula belongs in an optional extension, not in the main path here. The intuition is enough for this chapter: demand constrains the price, production constrains the cost, and competition affects how large a gap the firm can sustain between the two. When many firms make such choices, their prices help determine what a nominal wage can buy.

Do not confuse the demand curve facing one firm with aggregate demand. A firm can lose customers to rivals when it raises its relative price. Aggregate demand concerns total planned spending across the economy and will appear in Chapter 6.

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<sup>6</sup>The gap between a firm's price and its marginal cost, often expressed relative to marginal cost or price. See also: price-setting curve.

## Questions

### Question 3.4. What most directly constrains a firm's price above marginal cost?

A. How buyers respond to the price B. The unemployment definition C. The number of retirees D. The base year of the CPI

## Exercise

### From cost to markup

A firm has marginal cost of \$8 and charges \$10. Calculate the dollar markup and markup as a percentage of marginal cost. Explain why a steeper demand response could constrain the chosen price.

## 3.5 Price setting and the feasible real wage

Suppose labor is the only variable input. If a worker produces more output per hour, the firm can pay a higher real wage for a given markup. If firms charge a larger markup for given productivity, a smaller share of output is consistent with wages. The **price-setting curve**<sup>7</sup> summarizes that feasible real wage. TE 2.0 §1.7

In the simplest version, productivity and competitive conditions are fixed, so the price-setting real wage does not depend on employment. The curve is horizontal. This is an assumption chosen to isolate a mechanism, not a claim that productivity, markups, or competition never change.

For a transparent numerical example, suppose a worker produces 20 units per hour and price setting allocates 75% of output per worker to the real wage. The price-setting real wage is 15 units. If productivity rises to 24 with the same share, it becomes 18. If market power instead raises the markup and lowers the wage-consistent share to 65%, it becomes 13 units at the original productivity.

The language “allocates 75%” describes the model's outcome, not a meeting in which a firm literally divides a pile of output. The nominal wage is set in dollars, the firm sets a product price, and their ratio is the real wage. With a larger markup, the price is higher relative to the wage and the real wage is lower. With higher productivity, more output per worker is available to divide.

### Side note

#### Everyday Economics 3.3

##### Productivity is not automatically pay

More output per hour expands what can be divided. Institutions and market power help determine how much appears as wages, profits, lower prices, or other outcomes.

<sup>7</sup>The real wage consistent with firms' price-setting choices for given productivity and competitive conditions. See also: wage-setting curve; markup; best-response equilibrium.

## Reading the price-setting figure one step at a time

### Final figure

#### From output per worker to the price-setting real wage

Step 4 shows how price setting divides output per worker

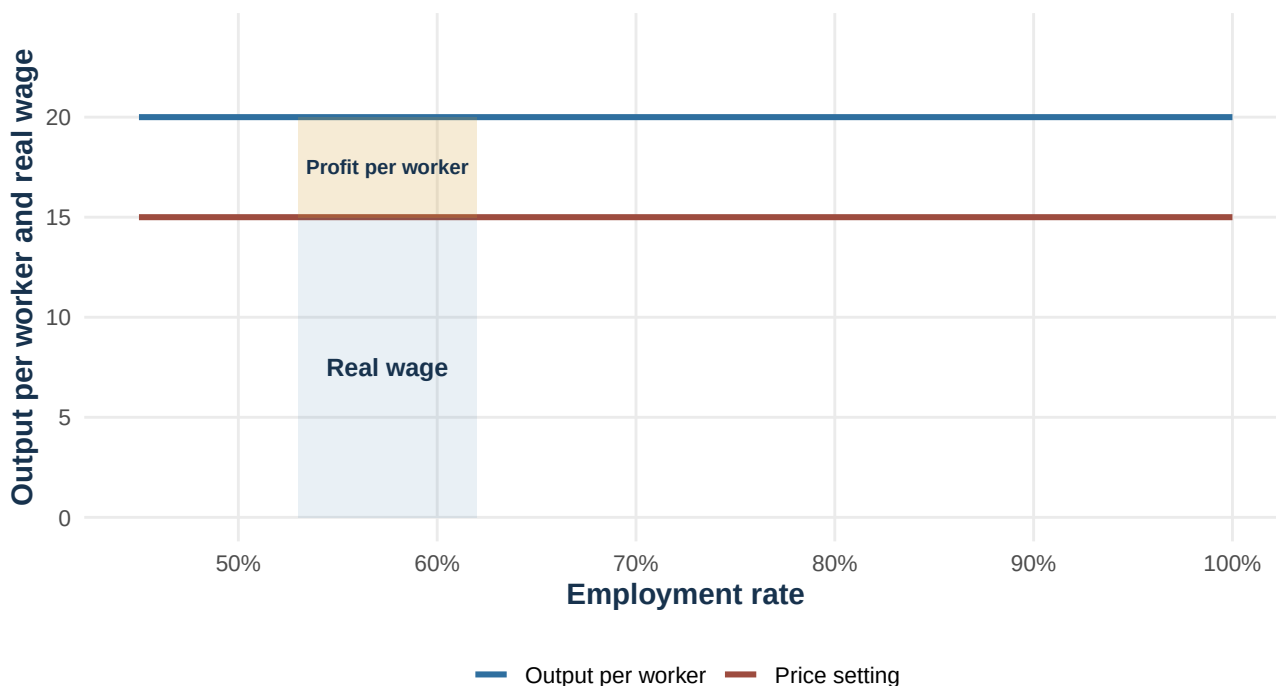


Figure 2: Price setting divides output per worker between the real wage and profit per worker.



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

The distance from zero to PS is the real wage. The remaining distance to output per worker is profit per worker in the simplified model. Higher productivity lifts the upper boundary; stronger competition tends to reduce the profit share and raise PS.

### Questions

**Question 3.5.** In the simplified model, what raises the price-setting real wage?

- A. Lower labor productivity B. A larger markup with unchanged productivity C. Higher productivity with the markup unchanged D. A different label on the vertical axis

## Exercise

### Productivity and the feasible wage

Compare two economies with the same markup but different output per hour. Use words and a numerical example to show why higher productivity can support a higher price-setting real wage.

## 3.6 Combining wage setting and price setting

Figure 3 places both relationships on common axes. The horizontal axis is the employment rate; the vertical axis is the real wage. At higher employment, unemployment is lower and workers' outside options are generally better. The wage-setting relationship therefore slopes upward. The price-setting relationship is horizontal in the simplified case.

### Reading the combined WS–PS figure one step at a time

#### Final figure

### Wage setting and price setting together

Step 4 identifies the mutually consistent wage, employment, and unemployment outcome

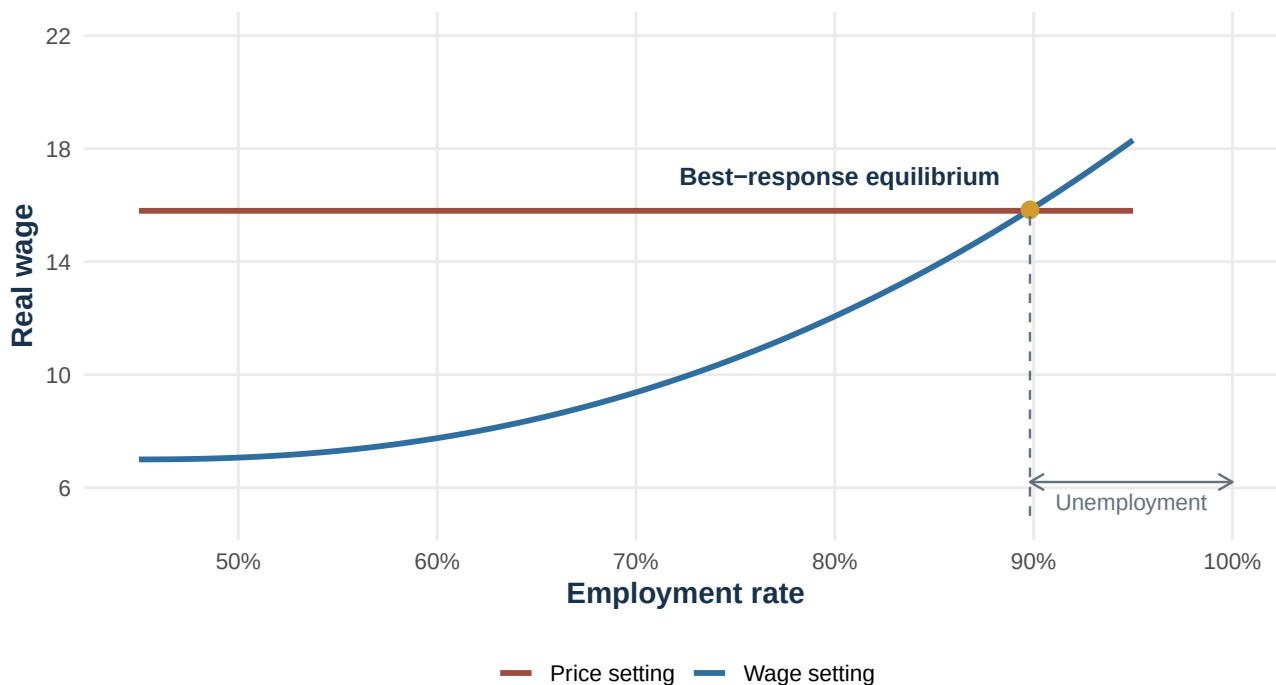


Figure 3: A stylized WS–PS model adapted from CORE Econ and redrawn in R.



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

At the intersection, wage-setting and price-setting choices are mutually consistent. The **best-response equilibrium**<sup>8</sup> includes unemployment: at employment above the intersection, the wage needed to recruit and motivate workers would exceed the real wage consistent with price setting. TE 2.0 §§1.5, 1.8

Unemployed workers cannot necessarily obtain jobs by offering to work for less. A firm that paid a wage too low to create the required employment rent would not believe that effort could be sustained merely because a worker promised it. The equilibrium is not socially ideal by definition; it is an outcome in which individual best responses are mutually consistent.

This mutual dependence is the Principle of aggregation and feedback. Each firm responds to economy-wide unemployment and prices. All firms' wage, price, hiring, and output choices together create those aggregate outcomes.

## Questions

### Question 3.6. What is true at the WS–PS intersection?

- A. Unemployment is necessarily zero B. Wage-setting and price-setting choices are mutually consistent  
C. Every worker and firm receives the same income D. No institution affects the outcome

## Exercise

### Read the equilibrium

Use Figure 3.3 to identify the equilibrium real wage and employment conceptually. Then explain why unemployed workers cannot necessarily obtain jobs simply by offering to work for less.

## 3.7 Productivity, competition, and labor-market tightness

Comparative statics changes one condition and traces its effect through the model.

- **Higher productivity:** shifts the price-setting relationship upward for a given markup, permitting a higher equilibrium real wage and potentially more employment.
- **A larger markup or weaker competition:** shifts price setting downward, reducing the real wage consistent with firms' prices and, in the basic diagram, lowering equilibrium employment.
- **A stronger worker outside option:** shifts wage setting upward because firms must offer more to recruit, retain, or motivate workers.
- **A tighter labor market with curves unchanged:** is movement along the wage-setting curve, not a shift of the curve.

These are model predictions under stated assumptions. Real economies add aggregate demand, matching, investment, expectations, policy, worker and firm differences, and adjustment over time. When the data move differently from the prediction, the right response is to investigate which assumption or omitted mechanism matters.

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<sup>8</sup>An outcome in which each actor's action is a best response to the actions and conditions created by others. See also: wage-setting curve; price-setting curve.

### Planned Data Extension 3.1: Productivity, real compensation, and unemployment

- Begin from the pinned Chapter 1 productivity and compensation series.
- Add a carefully selected unemployment measure over a common period.
- Explain why the graph is evidence about co-movement but not a direct measurement of either WS or PS.
- Ask students to propose a productivity, markup, or outside-option story and identify evidence that would distinguish them.

### Questions

#### Question 3.7. Which change most directly shifts the price-setting relationship upward?

- A. Higher labor productivity B. A higher cost of job loss C. Lower unemployment with curves unchanged  
D. More active job search

### Exercise

#### Shift one relationship

For higher productivity, weaker product-market competition, and more generous unemployment insurance, state which relationship shifts first and trace the predicted changes without assuming other mechanisms are absent.

### 3.8 What the model explains—and leaves out

The WS–PS model is an institutional map. It connects incomplete contracts and employment rents in the labor market with demand, costs, and markups in product markets. It explains why persistent unemployment can coexist with optimizing workers and firms, and it provides disciplined predictions about changes in productivity, competition, and outside options.

It leaves out much that matters: job matching, occupations, discrimination, unions as strategic actors, household care constraints, varying productivity, multiple products, aggregate demand, inflation dynamics, finance, and policy adjustment. Later chapters add these mechanisms rather than asking one diagram to explain the whole economy.

### Seeing the principles in action

| Principle                                   | Example                                                                                                                        | Everyday Economics                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Interdependence principle</b><br>— focal | Workers' effort depends on wages and outside options; firms' wage and price choices depend on what other firms and workers do. | An employer's pay decision changes when nearby employers raise wages and workers can leave more easily. |

| Principle                                                    | Example                                                                                                                                                      | Everyday Economics                                                                                                     |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Doing the best you can principle — focal</b>              | Workers choose effort given the cost of effort and job loss; firms choose wages and prices subject to recruitment, motivation, demand, and cost constraints. | Paying the lowest possible wage may not maximize profit if it causes quits or low effort.                              |
| Rules of the game principle                                  | Employment protection, unions, minimum wages, unemployment insurance, and product-market regulation change outside options and feasible markups.             | A change in unemployment insurance can alter the cost of job loss and therefore the wage-setting relationship.         |
| Trade-offs and opportunity costs principle                   | Higher effort is costly to workers, while a higher wage raises a firm's cost but can increase the value of keeping the job.                                  | A worker compares the benefit of conserving effort today with the risk and cost of losing the job.                     |
| Principle of gains from cooperation and conflict of interest | Employment produces output and income that benefit workers and firms, but they have conflicts over effort, wages, prices, and the division of output.        | A profitable employment relationship can still involve bargaining over schedules and pay.                              |
| Principle of individual and societal interests               | Profit-seeking wage and price decisions can be mutually consistent while leaving some willing workers without jobs.                                          | No individual firm may want to hire at a lower wage even though unemployed workers would prefer employment.            |
| <b>Principle of aggregation and feedback — focal</b>         | Each firm's wage and price responds to economy-wide unemployment and prices, while all firms' choices together create those aggregate outcomes.              | A wage increase at one firm is local; similar increases across firms can also affect costs, prices, and the real wage. |

### Skills and learning objectives

- Translating a story into an abstract model
- Reading an analytical graph
- Interpreting a graph with multiple curves
- Adjusting a model in response to economic or institutional changes
- Explaining a causal mechanism
- Defining important economic terms
- Applying principles to a specific scenario

### Concepts to learn

- Incomplete contracts and principal-agent problems
- Employment rents, outside options, and worker effort
- Wage setting and the wage-setting curve
- Demand facing a firm, marginal cost, price, and markup

- Price setting and the price-setting curve
- Best-response equilibrium and equilibrium unemployment
- Comparative statics, adjustment, and model limitations

## Glossary

### Chapter 3 terms

#### **incomplete contract**

A contract that cannot specify or enforce every action each party will take in every possible circumstance.

See also: [principal–agent problem](#); [employment rent](#).

#### **principal–agent problem**

A problem created when a principal wants an agent to take an action that is costly to the agent and cannot be fully observed or enforced.

See also: [incomplete contract](#); [employment rent](#).

#### **employment rent**

The net benefit a worker receives from keeping a job compared with the worker’s next-best alternative.

See also: [outside option](#); [incomplete contract](#).

#### **outside option**

The next-best alternative available if a current interaction or agreement ends.

See also: [employment rent](#).

#### **wage-setting curve**

The real wage firms need to offer at each economy-wide employment level to recruit, retain, and motivate workers.

See also: [price-setting curve](#); [best-response equilibrium](#).

#### **markup**

The gap between a firm’s price and its marginal cost, often expressed relative to marginal cost or price.

See also: [price-setting curve](#).

### price-setting curve

The real wage consistent with firms' price-setting choices for given productivity and competitive conditions.

See also: [wage-setting curve](#); [markup](#); [best-response equilibrium](#).

### best-response equilibrium

An outcome in which each actor's action is a best response to the actions and conditions created by others.

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

### Flashcards

**i** Expandable web content

#### **What makes an employment contract incomplete?**

Not every action or circumstance—especially worker effort—can be specified, observed, and enforced.

**i** Expandable web content

#### **Why does lower unemployment tend to raise the wage needed to motivate workers?**

Jobs are easier to find, so losing the current job is less costly and firms must offer a larger employment rent.

**i** Expandable web content

#### **What determines the price-setting real wage in the simplified model?**

Labor productivity and the markup created by firms' price-setting choices.

**i** Expandable web content

#### **What does the WS–PS intersection represent?**

A best-response equilibrium where economy-wide wage-setting and price-setting choices are mutually consistent.

### Questions

#### **Question 3.8. Which is a limitation of the basic WS–PS model?**

A. It distinguishes wage setting from price setting B. It compresses worker, firm, and job differences into aggregate relationships C. It contains an equilibrium concept D. It can be drawn as a graph

## Exercise

### Evaluate the model

Write one outcome the WS–PS model organizes well, one important omission, and one empirical comparison that could test a claim made using the model.

## 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 3.1:** B. The national count of reported nonfarm openings is twice the number of people classified as unemployed

Correct. The ratio divides two aggregate BLS series measured in thousands.

**Question 3.2:** B. It cannot specify and enforce every worker action in every circumstance

Correct. Hidden or hard-to-verify actions create the principal–agent problem.

**Question 3.3:** B. Losing a job becomes less costly, so firms need a larger employment rent

Correct. Better outside options weaken the cost of job loss.

**Question 3.4:** A. How buyers respond to the price

Correct. A price that is too high can cause a large loss of sales.

**Question 3.5:** C. Higher productivity with the markup unchanged

Correct. More output per hour can support a higher real wage.

**Question 3.6:** B. Wage-setting and price-setting choices are mutually consistent

Correct. Each side is a best response to the conditions created by the other.

**Question 3.7:** A. Higher labor productivity

Correct. More output per hour raises the feasible real wage for a given markup.

**Question 3.8:** B. It compresses worker, firm, and job differences into aggregate relationships

Correct. Heterogeneity and matching are simplified.