ECON0016 T1: Supply Side

Ambrose W

May 16, 2026

1 Chapter 2.1: Overview of the Supply Side

1.1 Labor Discipline Model and Key Ideas

Recruitment Problem – Reservation Wage

- The *reservation wage* is defined as the lowest wage that makes a worker willing to accept a job.
- It depends on:
  - Unemployment benefits and other income sources.
  - Net utility of being unemployed (such as leisure vs. mental health cost).
  - The wage from a previous job, if applicable.

Motivation Problem & Efficiency Wage ("No-shirking wage")

- The efficiency wage is the wage level required to induce workers to exert sufficient effort.
- It is higher than the reservation wage and rises as unemployment falls (since the cost of job loss becomes smaller when jobs are plentiful).
- Key factors that raise efficiency wages:
  - Cost of effort (difficulty or unpleasantness).
  - Probability of detecting shirking and firing.
  - Expected duration of unemployment (linked to the overall unemployment rate).

Why Efficiency Wage?

- Employment contracts are typically incomplete, because actual effort is difficult to verify.
- Piece rates are often not feasible in many industries.
- Higher pay can reduce turnover costs and increase morale (gift exchange idea).

1.2 Wage-Setting (WS) Curve

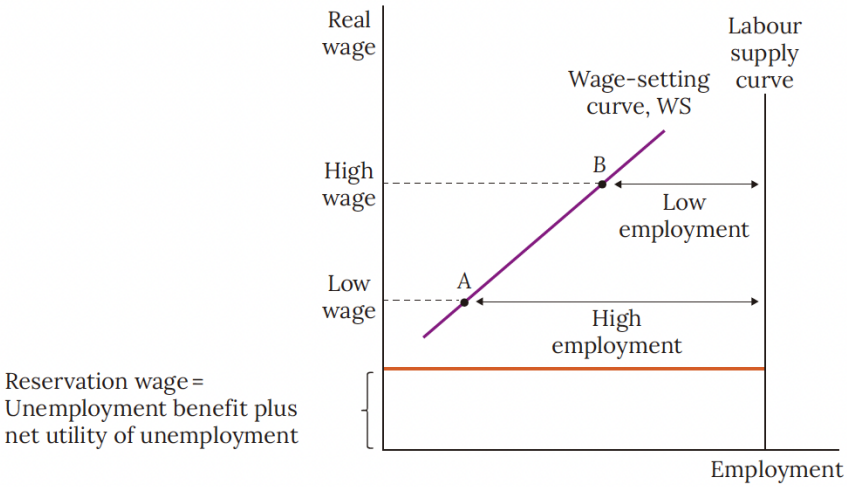

Figure 1: Wage-Setting Curve

- The WS curve shows the real wage required to ensure the necessary effort from workers given the unemployment rate.
- This can also be interpreted as the *no-shirking condition*: when unemployment is low, firms must pay higher wages so that job loss is costly enough to deter shirking.
- There is typically **involuntary unemployment** in this model (the difference between labor supply and actual employment on the WS curve).
- Shifts in WS occur if:
  - Unemployment benefits change (higher benefits shift WS up).
  - Non-wage sources of income or union power change.
  - Costs of effort, monitoring difficulties, or firing costs change.

1.3 Empirical Findings on Efficiency Wages

- The empirical wage curve is often convex: as unemployment nears zero, the required wage to prevent shirking rises markedly.
- Historical examples (e.g. Henry Ford's pay increase) support the idea that higher wages can boost productivity and reduce turnover.

1.4 Union Wage Setting

- In unionized sectors, unions bargain for wages, pushing the WS curve up relative to non-union sectors.

- *Bargaining restraint* by unions can lower unemployment, whereas pushing wages too high can increase it.

1.5 Price-Setting (PS) Curve

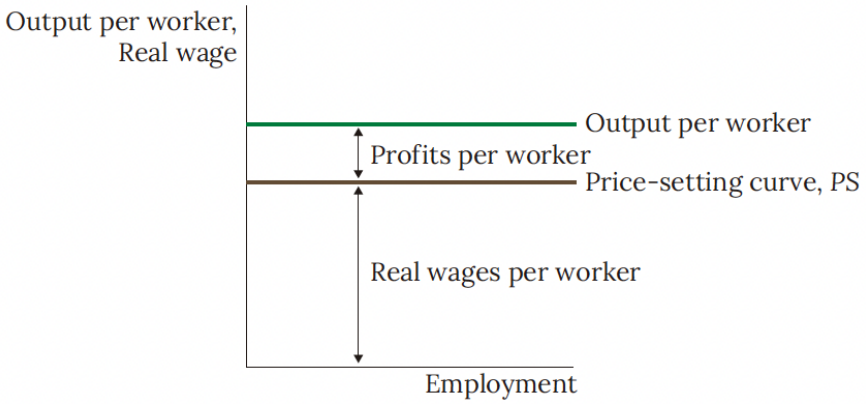

Figure 2: Price-Setting Curve

- Firms set prices based on a desired markup over marginal cost, where marginal cost often involves the nominal wage and labor productivity.
- If average product of labor (APL) = marginal product of labor (MPL) = λ, then total output per worker λ can be split into real wages plus real profit per worker.
- The result is a price-setting real wage below λ by the markup amount.

1.6 WS-PS Model and Equilibrium

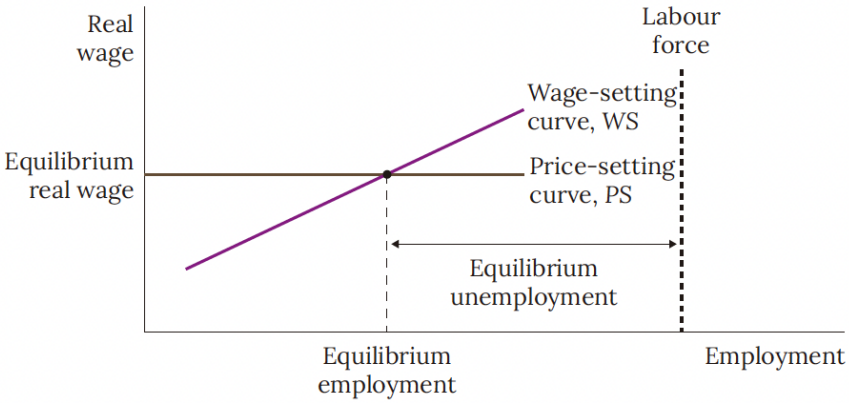

Figure 3: Price-Setting Curve

- In the labor market, equilibrium occurs at the intersection of the WS and PS curves, determining:

  - The equilibrium real wage.
  - The equilibrium employment (and thus the structural/unemployment rate).

- Formally, if w^{WS} is the wage-setting real wage and w^{PS} is the price-setting real wage, the labor market equilibrium satisfies

$$w^{WS} = w^{PS}.$$

- Structural unemployment arises in this equilibrium due to the discipline effect (firms paying efficiency wages).

1.7 Nominal Wages, Real Wages, and Inflation

- Workers care about real wages (W/P), but wages are typically set in nominal terms.
- If the economy aims for constant inflation (e.g. 2%), firms and workers set nominal wages and prices with that target in mind.
- A stable intersection of WS and PS implies a constant inflation equilibrium, though *not* necessarily zero inflation.

1.8 Nominal Rigidity

- In reality, both wages and prices do not continuously adjust.
- Wages are often changed periodically (annual reviews), and frequent price adjustments are also costly or avoided due to concerns about customer or competitor reactions.
- As a result, short-run fluctuations in aggregate demand can cause deviations from the WS-PS equilibrium output and unemployment.

1.9 Non-Accelerating Inflation Rate of Unemployment (NAIRU)

- NAIRU is the unemployment rate at which inflation does not accelerate (often synonymous with structural or equilibrium unemployment).
- Actual unemployment can deviate from NAIRU, but persistent deviation tends to push inflation up or down.

2 Chapter 2.2: Labor-Discipline Model, Inequality, and Nominal Rigidity

2.1 Wage-Setting Curve Details

Nominal Wage-Setting and Expected Real Wage

$$W \;=\; P^E \cdot B(N,\, \mathbf{z}_w),$$

where W is the nominal wage, P^E the expected price level, N the level of employment, and $\mathbf{z}_w$ a set of wage-push variables. Workers want to maintain real purchasing power, leading to the wage-setting real wage:

$$w^{WS} \;=\; \frac{W}{P^E} \;=\; B(N,\, \mathbf{z}_w).$$

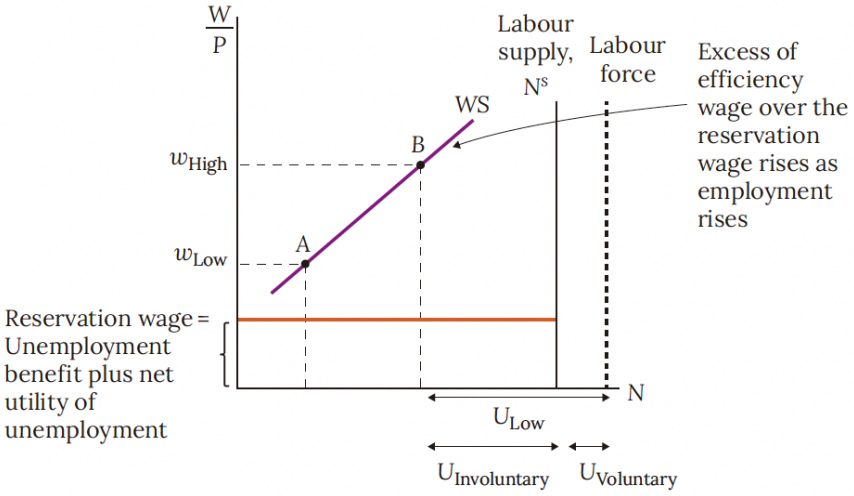

Figure 4: Wage-setting Curve

Shifts in the WS Curve

- A rise in unemployment benefits, non-employment income, or the net utility of unemployment shifts WS upward.
- Increased difficulty in monitoring effort, more expensive firing, or stronger unions also raise the wage-setting curve.

2.2 Price-Setting Curve and Derivations

Cost-based Mark-up Approach

$$P \;=\; \big(1+\mu_c\big)\,\frac{W}{\mathrm{MPL}},$$

where μ_c is the markup over marginal cost. The corresponding *price-setting real wage* is

$$\frac{W}{P} \;=\; \frac{\mathrm{MPL}}{1+\mu_c}.$$

Price-based Mark-up

$$\frac{W}{P} \;=\; \mathrm{MPL}\,(1-\mu),$$

where μ is the markup on price. Note that μ_c (markup on cost) and μ (markup on price) are related by

$$\mu = \frac{\mu_c}{1+\mu_c}, \qquad \mu_c = \frac{\mu}{1-\mu}.$$

Tax wedge

- Distinguish real consumption wage vs. real product wage.
- A wedge arises from payroll taxes, income taxes, and indirect taxes on goods; this effectively shifts the PS curve.

PS Equation including Tax Wedge

$$w^{PS} = \frac{W}{P_C} = \frac{\lambda\,(1-\mu)}{(1+t_d)(1+t_i)},$$

where λ is productivity, t_d represents direct tax rates, and t_i indirect tax rates.

2.3 Equilibrium in the Labor Market (LME)

$$w^{WS} = w^{PS} \quad \Longrightarrow \quad B(N,\, \mathbf{z}_w) = \lambda\, F(\mu, \mathbf{z}_p).$$

This determines the equilibrium employment N^* (and hence the equilibrium rate of unemployment).

2.4 Lorenz Curve, LME, and Inequality

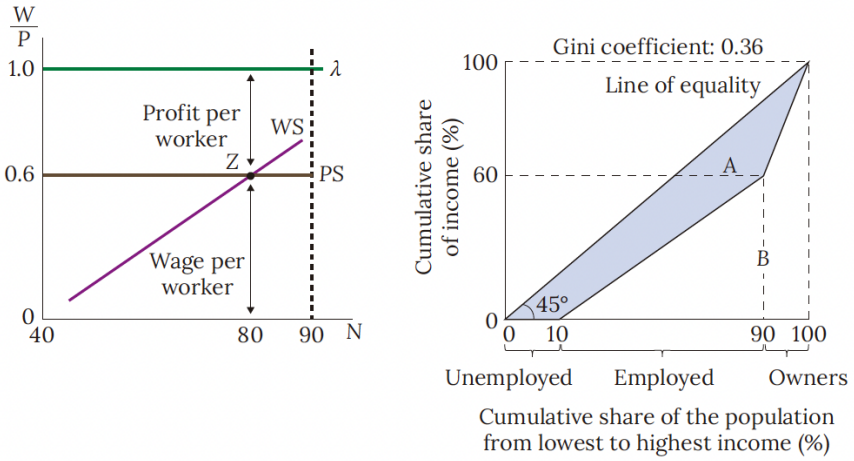

Figure 5: Lorenz Curve

- When monopoly power (markup) is higher, profit share rises and can raise income inequality.

- The Lorenz curve orders the population from poorest to richest. In basic WS-PS examples:
  - A fraction of the population is employed and receives wages.
  - A fraction is unemployed and receives little or no income.
  - Firm owners receive profits, which can be a large share of total income if markups are high.
- **Gini Coefficient** often measures inequality; higher markup or higher unemployment tends to increase inequality.

2.5 Wage-Setting Curve in Linear Form (Phillips Curve Context)

In one simplified treatment, the wage-setting (WS) real wage in relation to output is written as:

$$w^{WS}(y_t) \;=\; \frac{W}{P}\Big|_{WS} \;=\; B \;+\; \alpha\big(y_t - y^e\big) \;+\; z_w,$$

where

- B is a constant representing factors such as unemployment benefits or base utility of unemployment.
- $\alpha\big(y_t - y^e\big)$ is the *bargaining gap* linked to how output y_t deviates from equilibrium output y^e.
- $\big(y_t - y^e\big)$ is the *output gap*
- z_w stands for additional wage-push factors (e.g. union power, effort cost).

2.6 Wage Inflation

When output y_t exceeds y^e, workers have stronger bargaining power and seek to restore (or even increase) their real wage relative to last period's prices. Under *forward-looking* or *adaptive* expectations, a standard approximation is:

$$\frac{\Delta W}{W}\Big|_t \;\approx\; \frac{\Delta P}{P}\Big|_{t-1} \;+\; \alpha\big(y_t - y^e\big).$$

- $\dfrac{\Delta W}{W}\Big|_t$ is the rate of nominal wage increase at time t.
- $\dfrac{\Delta P}{P}\Big|_{t-1}$ is the previous period's price inflation (often assumed to be workers' baseline expectation for future inflation).
- $\alpha\big(y_t - y^e\big)$ captures how wage-setters adjust nominal wage growth to account for the bargaining gap at time t.

2.7 Price Inflation

Once wages are set, firms update their prices. Assuming *constant labor productivity* (i.e. no change in λ) and ignoring any other cost shocks, price inflation mirrors wage inflation:

$$\left.\frac{\Delta P}{P}\right|_t = \left.\frac{\Delta P}{P}\right|_{t-1} + \alpha\big(y_t - y^e\big).$$

$$\underbrace{\pi_t}_{\text{Current Inflation}} = \underbrace{\pi_{t-1}}_{\text{Lagged Inflation}} + \underbrace{\alpha\overbrace{(y_t - y_e)}^{\text{Output gap}}}_{\text{Bargaining Gap}}$$

Thus, if an economy remains persistently above its equilibrium output ($y_t > y^e$), inflation at each new wage/price round increases further compared to the previous period.

2.8 Adaptive Expectation Phillips Curve

Putting the above into standard "Phillips curve" notation, let $\pi_t = \left.\frac{\Delta P}{P}\right|_t$ be the *current inflation rate*, and suppose $\pi_t^E = \pi_{t-1}$ (adaptive expectations). Then:

$$\pi_t = \pi_{t-1} + \alpha\left(y_t - y^e\right).$$

This highlights that any persistent gap between actual output y_t and the equilibrium level y^e implies an ongoing acceleration or deceleration in inflation.

2.9 Conflict Theorem of Inflation

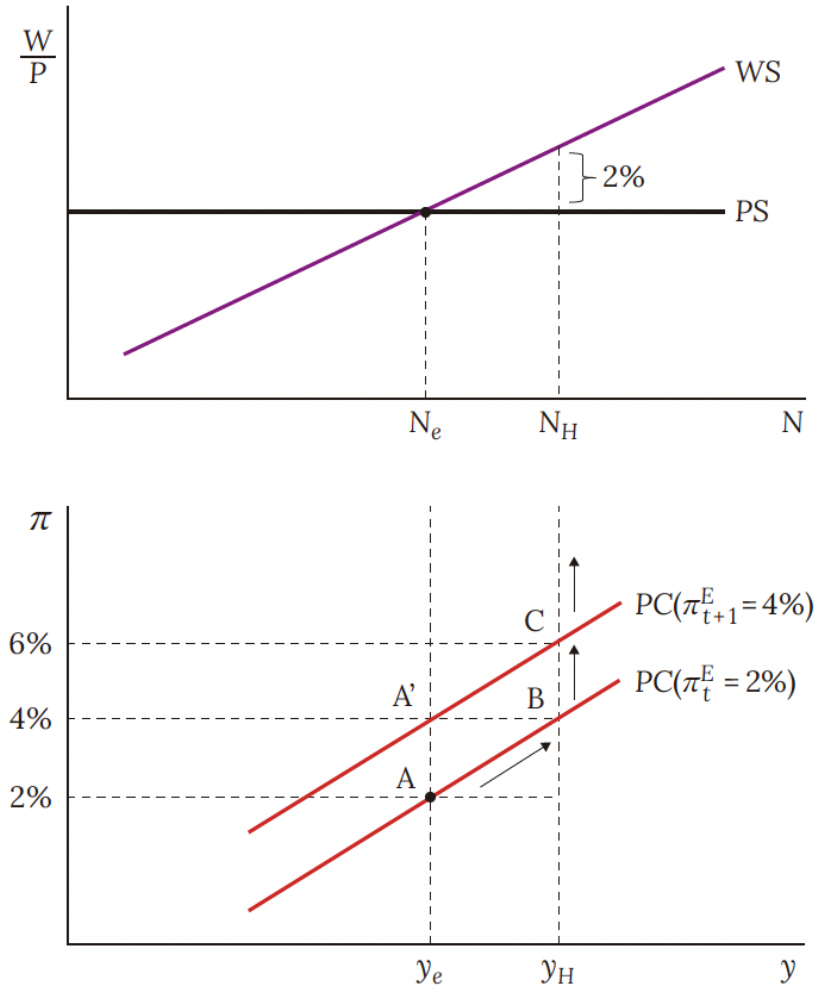

Figure 6: Conflict Theorem of Inflation

Conflict Theorem (Rowthorn 1977; Lorenzoni and Werning 2023) views inflation as the outcome of continuous *conflict* between workers' claims for higher wages and firms' desire to maintain or increase profits. Key points:

- At the labor market equilibrium (where WS meets PS), inflation is stable at some rate (e.g. 2%).
- A positive *bargaining gap* appears when output/employment exceed their equilibrium levels. Workers demand wage increases above the normal (e.g. above 2%), and firms pass along these higher labor costs as higher prices.
- In successive rounds, if output stays above equilibrium, each year's inflation builds on the last year's inflation, *ratcheting* inflation ever higher. This upward creep illustrates the self-reinforcing nature of wage-price spirals.

- Conversely, if output is below its equilibrium, there is a negative bargaining gap, leading to lower wage growth and hence reduced inflation pressure.

3 Chapter 2.10: Shocks Without Stabilization & Inequalities

3.1 Shocks in the Absence of Stabilizing Policy

- **Positive AD Shock:**
  - Shifts the IS curve right, raising output from y^* to y'.
  - Labor discipline model: if employment exceeds its equilibrium level, there is a positive bargaining gap.
  - Phillips curve shifts upward over time, leading to rising inflation each year if the shock persists and no policy offsets it.
- **Supply-Side Shocks:**
  - Can shift the WS curve (e.g. changes in unemployment benefits) or the PS curve (e.g. changes in markups).
  - A downward shift in WS (e.g. reduced benefits) increases equilibrium employment and can create a negative bargaining gap at the old employment level, temporarily reducing wage and price inflation.
  - A downward shift in PS (e.g. from increased market power) reduces the real wage and employment, raising inequality.

3.2 Supply Side and Inequality: Markups & Unions

- A **rise in markups** (less competition) shifts PS downward, reducing equilibrium employment and raising profit share. This generally increases inequality.
- Historical patterns show markup changes can coincide with changes in the pre-tax Gini coefficient.
- Weaker unions (lower union density or coverage) can also shift the WS curve differently and affect both unemployment and wage dispersion, often raising inequality.