Intermediate Macroeconomics II

Lecture 3: Aggregate Demand and Aggregate Supply

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Why we need AD–AS after IS–LM

- **Lecture 2 result:** IS–LM determines **aggregate demand** — a mapping from the price level (or inflation) to output.
- But IS–LM alone cannot answer: **when does demand show up as higher Y vs higher prices?**
- **Lecture 3 goal:** add an aggregate supply block so we can talk about
  - inflation vs output movements (demand shocks vs supply shocks),
  - short run vs medium run (adjustment back toward "full employment").

Big picture:

- **AD** tells us "how much the economy wants to buy,"
- **AS** tells us "how much the economy can produce."

Learning objectives (what you should be able to do)

1. Read an AD–AS diagram and translate it into economic language.
2. Explain **what shifts AD** (fiscal policy, monetary policy, expectations).
3. Explain **what shifts AS** (productivity, labor supply, cost shocks).
4. For each shock, predict the sign of changes in (Y, π) and the policy rate.
5. Identify the key lesson: **demand vs supply** shocks have different inflation-output comovement.

Roadmap: what each set of figures is doing

1. **AD from IS + monetary policy:** derive the AD curve in (π, Y) space
   - Figures: `figAD0`, `figAD1`, `figAD2`

2. **AS from the RBC supply block:** re-plot full-employment output in (π, Y) space
   - Figures: `figAS`, `figAS1`, `figAS2`

3. **Put them together:** AD–AS equilibrium and comparative statics
   - Figures: `figADAS`, `figADAS1--figADAS4`

Reading rule: every figure answers one question: *which curve shifts, and what happens to* (Y, π)*?*

Demand side: IS–MP $\Rightarrow$ AD

From IS–LM to IS–MP (modern central banks)

- In Lecture 2 we used **LM** (money market equilibrium) to link Y and the interest rate.
- In practice, modern central banks usually implement policy by **setting an interest rate**, not by fixing money growth.
- So we summarize monetary policy with a simple rule (an "MP curve"):

$$r_t = \bar{r} + \phi_\pi \, \pi_t \qquad (\phi_\pi > 0).$$

- Intuition: when inflation rises, the central bank raises the real interest rate.

Why we do this: it lets us draw aggregate demand directly in (π, Y) space.

Step 1: IS as a goods-demand relation

- IS collects (Y, r) combinations that clear the goods market.
- In this RBC-style benchmark, higher r discourages current spending, so goods demand is decreasing in r.
- We will not solve IS in full detail today; we use only its direction:
  - **Lower** $r \Rightarrow$ **higher goods demand** $\Rightarrow$ higher equilibrium Y.
- When fiscal policy changes (e.g., $G \uparrow$), desired spending shifts and the IS relation shifts.

Key message: IS tells you how output responds when the real interest rate moves.

Step 2: Combine IS with MP to get AD

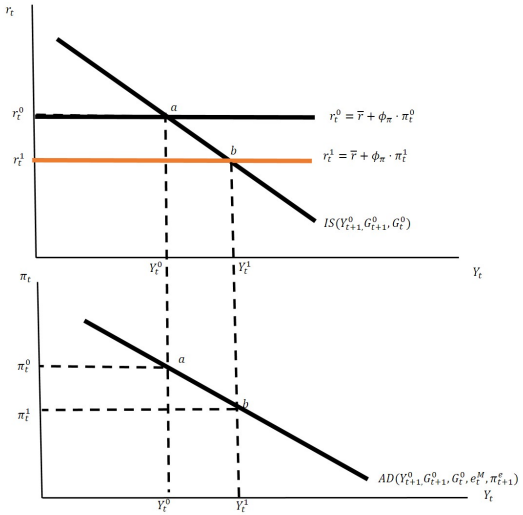
- MP tells us how r responds to inflation: $r_t = \bar{r} + \phi_\pi \pi_t$.
- IS tells us how Y responds to r.
- Putting them together gives a relationship between inflation and output:

$$\text{IS} + \text{MP} \quad \Rightarrow \quad \textbf{AD:}\ \pi \mapsto Y.$$

- Why AD slopes down here:
  - higher $\pi \Rightarrow$ MP raises r,
  - higher r reduces spending $\Rightarrow$ lower Y.

Reading rule: along AD, *inflation is higher because policy is er, so output is lower*.

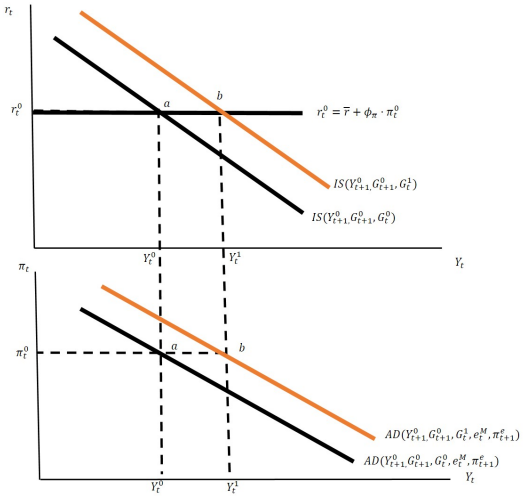
AD curve (IS–MP–AD)



- **What this figure is doing:** re-draw demand equilibrium in (π, Y) space.
- **Mechanism (one line):** $\pi \uparrow \Rightarrow r \uparrow$ (MP) $\Rightarrow Y \downarrow$ (IS).
- **So AD slopes downward.**
- **What is held fixed:** fiscal stance and the policy rule parameters $(\bar{r}, \phi_\pi)$.

Key message: AD is a *policy-dependent* demand curve.

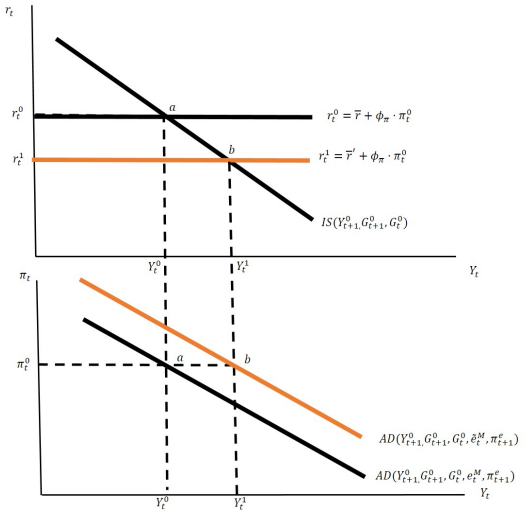
AD shifts right when government spending increases



- **Shock:** $G \uparrow$ increases desired spending.
- **IS shifts:** at any given r, goods demand is higher.
- **AD implication:** for a given π (hence given r from MP), equilibrium Y is higher.

Key message: fiscal expansion shifts AD to the right.

AD shifts right when monetary policy becomes easier



- Think of a policy change that lowers the real rate for any given inflation:

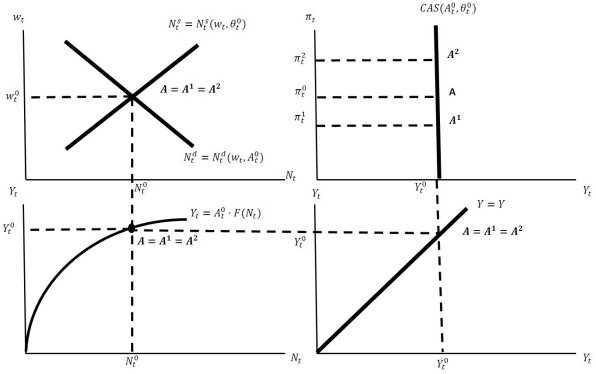
$$\bar{r} \downarrow \quad \text{(or a negative policy shock)}.$$

- **MP shifts down:** at any π, the policy rate is lower.
- **AD implication:** lower r boosts spending $\Rightarrow$ higher Y at each π.

Key message: easier monetary policy shifts AD to the right.

Supply side: RBC $\Rightarrow$ AS

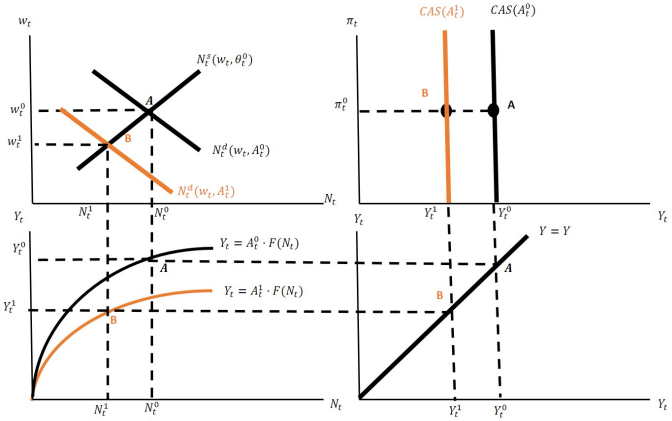
Aggregate Supply: the FE benchmark



- **What this figure is doing:** re-plot the RBC supply block in (π, Y) space.
- In the classical/RBC model, output at a point in time is pinned down by
  1. labor demand and labor supply,
  2. the production function (productivity and capital).
- That level of output does not depend on inflation today.

Key message: Aggregate Supply (CAS) is vertical at the full-employment (potential) level of output.

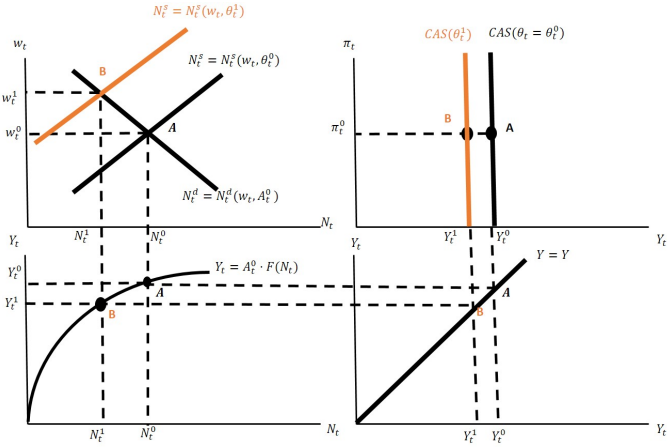
CAS shifts left when productivity falls



- **Shock:** $A \downarrow$ reduces the marginal product of labor.
- Labor demand shifts left $\Rightarrow$ equilibrium employment falls.
- With lower employment and productivity, full-employment output falls.

Key message: negative productivity shocks shift CAS left.

CAS shifts left when labor supply falls



- **Shock:** $\theta \uparrow$ (a preference/distortion that reduces labor supply).
- Labor supply shifts left $\Rightarrow$ equilibrium employment falls.
- Lower employment reduces potential output.

Key message: labor supply disruptions also shift CAS left.

Demand vs supply shocks: the comovement test

- **Demand shocks** (AD shifts) typically move output and inflation in the **same direction**.

- **Supply shocks** (AS shifts) typically move output and inflation in **opposite directions**.

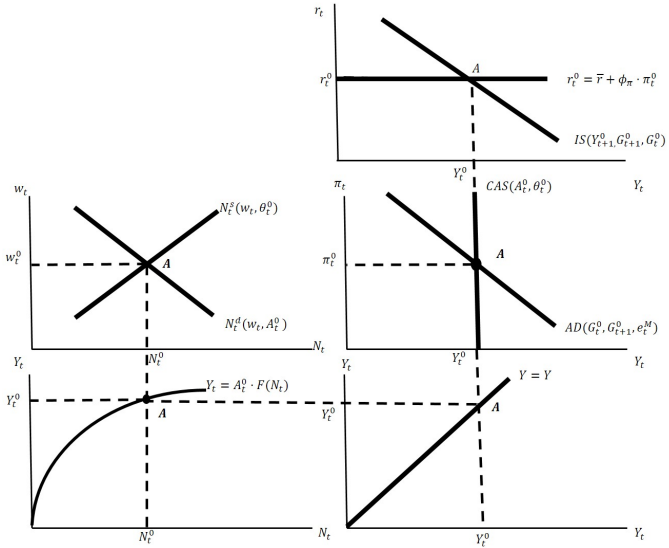
1. AD $\uparrow$: $(Y \uparrow, \pi \uparrow)$

2. AS $\leftarrow$: $(Y \downarrow, \pi \uparrow)$ ("stagflation")

Key message: this difference is the first diagnostic tool for inflation episodes.

AD–AS equilibrium and comparative statics

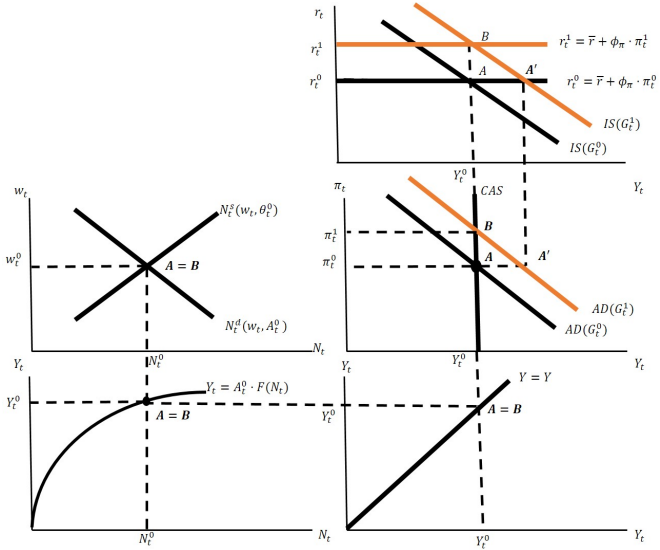
AD–AS equilibrium (benchmark)



- **Equilibrium:** intersection of AD and CAS pins down (π, Y).
- **Interpretation:**
  - AD tells you which (π, Y) are consistent with IS + policy.
  - CAS tells you which Y is feasible at full employment.
- In this classical benchmark, Y is pinned by CAS; AD determines π.

Key message: with flexible prices, output is supply-determined; inflation adjusts.

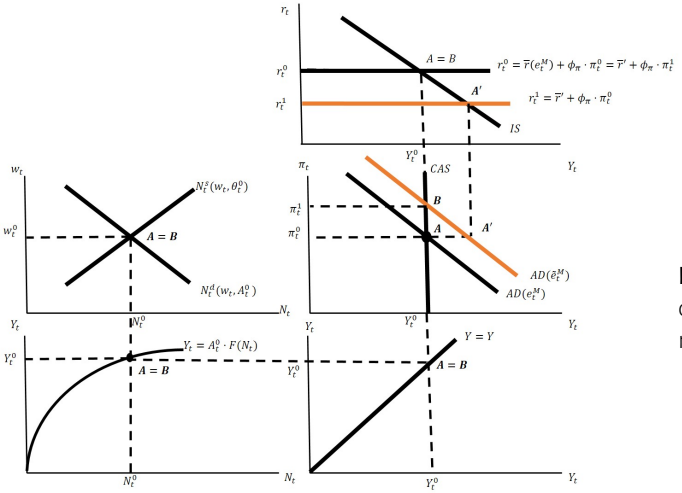
Demand shock: $G \uparrow$ (fiscal expansion)



- **Shift:** AD moves right.
- **With vertical CAS:** output stays at potential Y.
- **Adjustment:** inflation rises until MP raises r enough to bring demand back to Y.

Key message: in the classical benchmark, fiscal expansion shows up as higher inflation, not higher output.

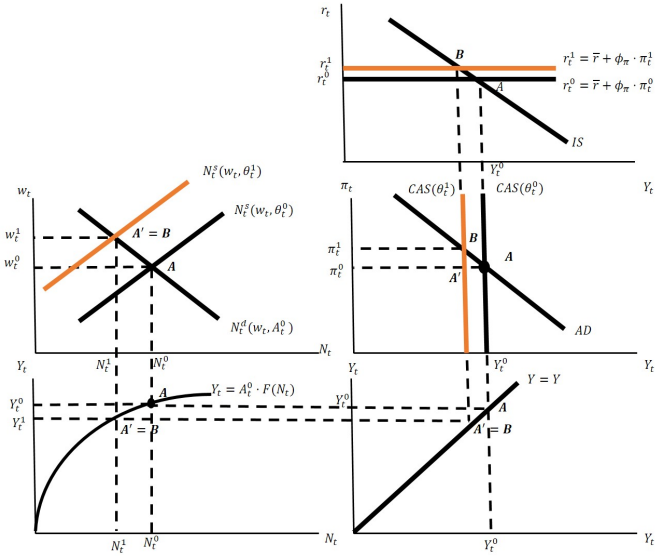
Demand shock: easier monetary policy



- **Shift:** AD moves right (policy is easier for any given π).
- **With vertical CAS:** output stays at potential Y.
- **Adjustment:** inflation rises; MP then raises r as π rises.

Key message: money is neutral in the classical benchmark: policy changes mainly change inflation.

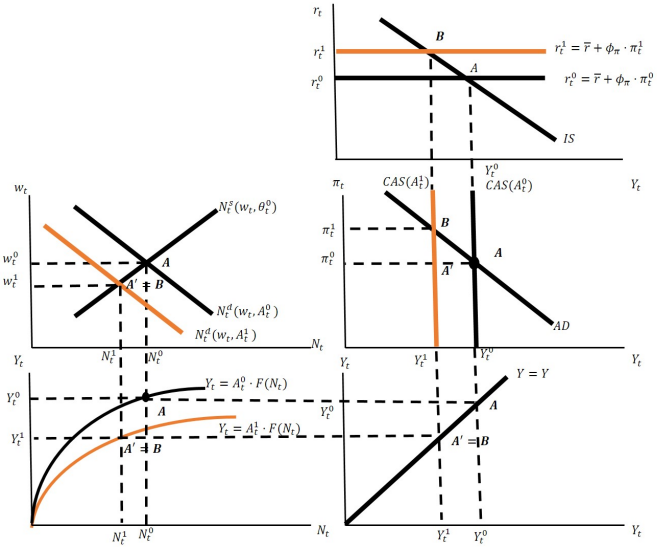
Supply shock: labor supply disruption ($\theta \uparrow$)



- **Shift:** CAS moves left (potential output falls).
- **Outcome:** output falls *and* inflation rises.
- **Policy response:** higher π triggers a higher real rate via MP.

Key message: supply shocks generate stagflation: ($Y \downarrow$, $\pi \uparrow$).

Supply shock: productivity declines ($A \downarrow$)



- **Shift:** CAS moves left (potential output falls).
- **Outcome:** lower output and higher inflation.
- **Intuition:** less supply pushes up marginal costs / scarcity, raising inflation pressure.

Key message: negative productivity shocks also produce stagflation.

Summary table: shock $\Rightarrow$ shifts $\Rightarrow$ outcomes

Shock	**Curve shift**	**Output** Y	**Inflation** π
$G \uparrow$ (fiscal)	AD $\rightarrow$	$\rightarrow$	$\uparrow$
Easier policy ($\bar{r} \downarrow$)	AD $\rightarrow$	$\rightarrow$	$\uparrow$
$\theta \uparrow$ (labor supply down)	CAS $\leftarrow$	$\downarrow$	$\uparrow$
$A \downarrow$ (productivity)	CAS $\leftarrow$	$\downarrow$	$\uparrow$

How to read this: demand shifts move π with Y fixed in the classical benchmark; supply shifts move Y and π in opposite directions.

Wrap-up

What this benchmark explains — and what it cannot

- **Explains well:**
  - a clean diagnostic: demand vs supply shocks using (Y, π) comovement,
  - why policy rules matter for demand (AD is policy-dependent),
  - why potential output shifts matter for inflation.
- **Cannot explain (yet):**
  - persistent output gaps (because CAS is vertical),
  - gradual disinflation without large output losses,
  - the central role of expectations in inflation dynamics.

Key message: this classical AD–AS is a benchmark; next we add nominal rigidities (New Keynesian model).

Preview: what changes with sticky prices (next lecture)

- With price/wage rigidity, the supply side is no longer vertical in the short run.
- Then AD shifts can raise output *and* inflation in the short run.
- We will replace "CAS" with a **Phillips curve**:

$$\pi_t = \beta \mathbb{E}_t[\pi_{t+1}] + \kappa(Y_t - Y_t^*) + u_t.$$

- That introduces expectations and persistence — the core of modern inflation analysis.

Key message: NK = AD (IS + policy rule) + AS (Phillips curve) + expectations.

Next time

- Short-run aggregate supply with sticky prices
- Phillips curve logic and inflation persistence
- Monetary policy rules and the “Taylor principle” (why the anchor matters)