Aggregate Supply and Aggregate Demand

Goals of this Unit

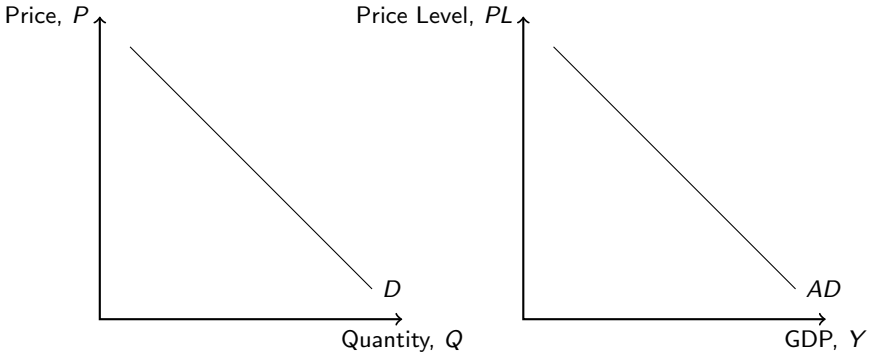
1. Model the macroeconomy economy using the AS/AD Model.
2. Graph shocks to the economy/shifts in Aggregate Demand, Short-Run Aggregate Supply and Long-Run Aggregate Supply and show the effects on price level and output.
3. Explain the importance and implications of sticky prices.
4. Compare Short-Run and Long-Run equilibrium and both explain and graph the transition to Long-Run equilibrium.
5. Model/graph historic events using the AS/AD Model.
6. Graph output gaps and explain their implications.
7. Explain the dangers of deflation.

Textbook Chapter

Krugman and Wells, “Aggregate Demand and Aggregate Supply”

Aggregate Demand (AD) vs Demand from Micro

- Price is now Price Level (such as CPI). Quantity is now total output, or GDP.



Why is AD downward sloping?

- **The Wealth Effect**: At lower prices people buy more
- **The Interest Rate Effect**: When prices go up, people can not save as much. This increases the interest rate, causing Investment to decrease. (Loanable Funds Model)
- Or you can just think of why a Micro Demand curve is downward sloping.

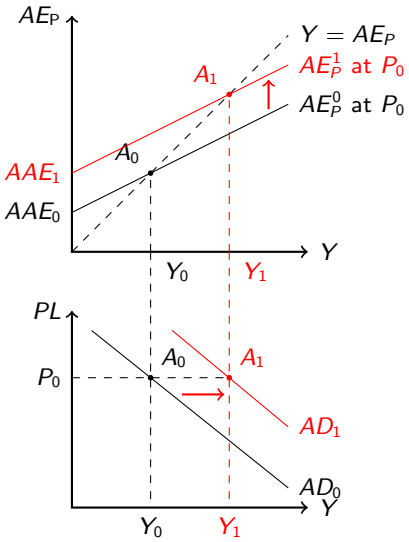
What Shifts AD?

- In Micro we had Changes in Wealth, Tastes and Future Preferences
- In Macro we now have Changes in Overall Wealth, Consumption Levels (or Savings Levels) and Changes in Future Beliefs.
  - If Overall Wealth increase then AD shifts out.
  - If people start consuming more or saving less at all income levels then AD shifts out.
  - If consumers or businesses think the economy will improve then AD shifts out.
- Fiscal Policy
  - Government Spending increases AD shifts out.
  - Taxes increases AD shifts in.
- Investment increases shifts AD out.
- Net Exports Increase shifts AD out. (We will see that NX is influenced by changes in the exchange rate in a later chapter)
  - Exports increase shifts AD out.
  - Imports increase shifts AD in.
- Money Supply increases shift AD out.
  - Interest Rates decrease shift AD out.

Relating Aggregate Demand to Aggregate Expenditure

- Draw two graphs on top of each other.
- In the first show Aggregate Expenditure increasing from AE_0 to AE_1. Find the corresponding equilibrium GDPs (Y_0 and Y_1).
- Holding Price Level fixed, draw two AD curves; AD_0 and AD_1.
- In AE: $\Delta Y = \frac{1}{1-MPC} \times \Delta AAE$.
- Now, technically, that will be how far out the AD curve shifts.

Relating Aggregate Demand to Aggregate Expenditure



Aggregate Supply

- In Micro
  - in the Short Run, at least one input was fixed.
  - in the Long Run, all inputs were variable.

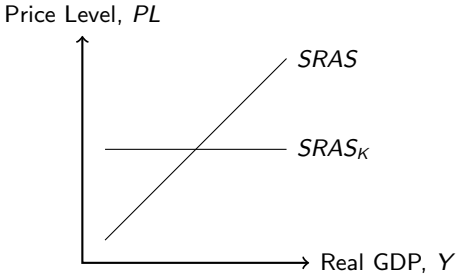
- In Macro
  - In the Short Run, wages and prices are **sticky**.
  - In the Long Run, wages and prices are fully flexible (or variable).

Why Are Prices Sticky Again?

- **Sticky Prices**: Prices that do not readily or immediately change due to new market conditions; are slow to adjust. Also called price rigidity.
- **Sticky Wages**: Wages that are slow to fall even during high unemployment and slow to rise during times of labor shortages. (Wages take a while to adjust).

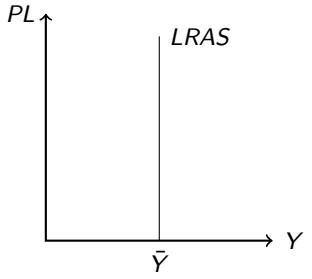
Short-Run Aggregate Supply Curve(s) (SRAS)

- Draw a SRAS Curve where prices are sticky (but not fully fixed). This will be the SRAS Curve we use, unless told otherwise. Put Price Level (PL) on the y-axis and Real GDP (Y) on the x-axis.
- Draw a SRAS Curve where prices are fully fixed. We'll call this the Keynesian SRAS ($SRAS_K$).



Long-Run Aggregate Supply Curve (LRAS)

- LRAS is also known as **Potential GDP** or **Classical Supply Curve**, often denoted as $\bar{Y}$.
- Potential GDP: The level of real GDP the economy would produce if all prices, including nominal wages, were fully flexible (no cyclical unemployment).
- Draw a LRAS Curve where prices are fully flexible. Put Price Level (PL) on the y-axis and Real GDP (Y) on the x-axis. Where LRAS intersects the x-axis label the point $\bar{Y}$



Shifts in Supply Curves

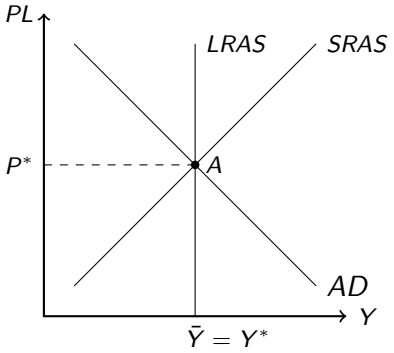
- Technology/Productivity:
  - Increase shifts out both LRAS and SRAS by the same amount.
- Human Capital:
  - Increase shifts out both LRAS and SRAS by the same amount.
- Number of Factors of Production:
  - More Capital or Labor shifts out both SRAS and LRAS by the same amount.
- Input Prices:
  - Input price increases shift in **ONLY** SRAS
  - Increase is the Nominal Wage increase shift SRAS in.
  - Common Examples: Nominal Wages, Oil Prices, Steel Prices.
- Permanent vs Temporary:
  - If a shock is temporary then only SRAS is shifted.

What is a shock?

- A Shock is a change in the economy that causes a curve to shift.
- The terms shock and shifter can be used interchangeably.
- However economists prefer the term shock.
- Negative shock: curve shifts inward.
- Positive shock: curves shifts out.

Model: Aggregate Supply and Aggregate Demand (AS/AD)

- **Long-run equilibrium**: Situation where AD, LRAS, and SRAS all *intersect at the same point.*
- In a graph with AD, LRAS, and SRAS, find the long-run equilibrium Price Level (P^*) and Real GDP (Y^*).

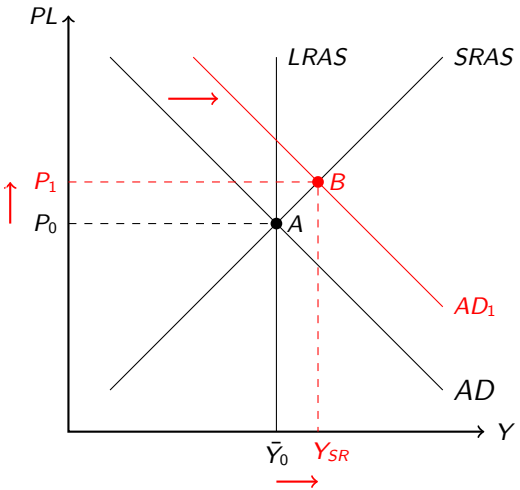


Long-Run equilibrium is where ALL THREE CURVES intersect AT THE SAME POINT

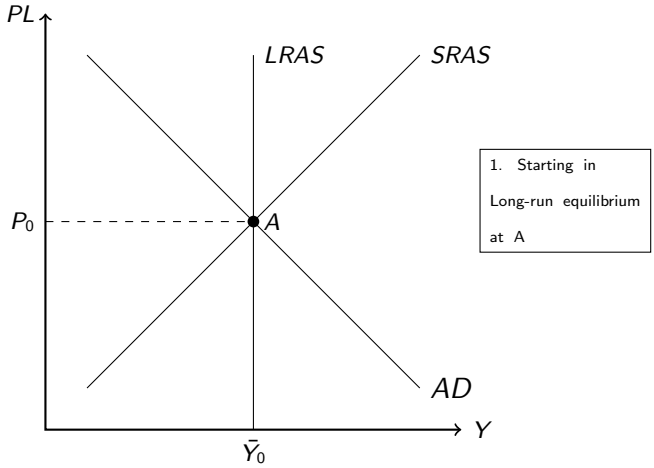
Shifts and Short-Run Equilibrium—G up

- **Short-run equilibrium**: Point where AD and SRAS intersect.
- Start in long-run equilibrium (P_0 and $\bar{Y}_0$) for all of the following, and find the new short-run equilibrium (P_1 and Y_{SR}):
- Government Spending (G) up.
  - $G \uparrow$ shifts AD out to AD_1.
  - New short-run equilibrium at B.
  - In short-run both GDP and Price Level increase: $Y \uparrow, PL \uparrow$.

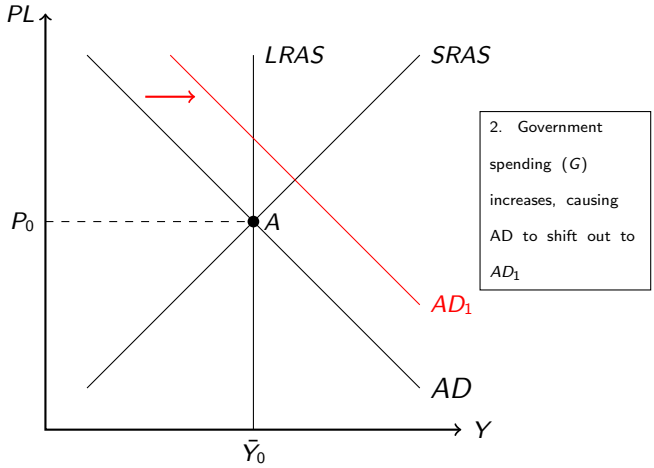
Shifts and Short-Run Equilibrium—G Up, Graphically



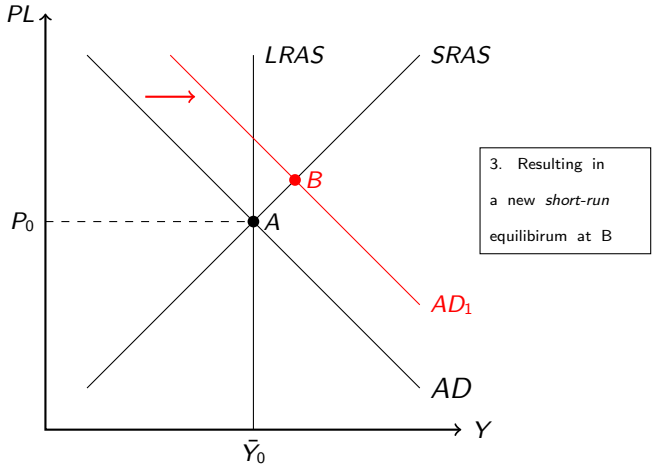
Shifts and Short-Run Equilibrium—G Up, i



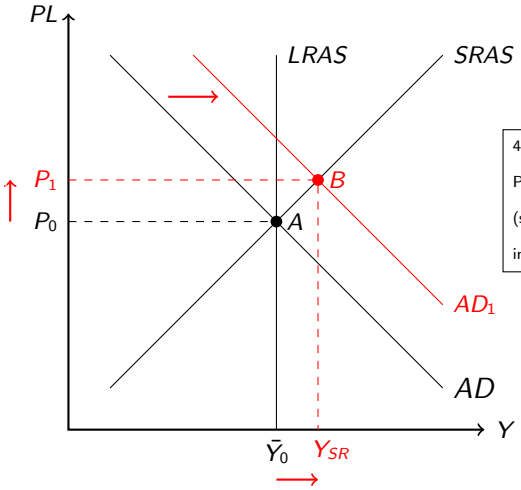
Shifts and Short-Run Equilibrium—G Up, ii



Shifts and Short-Run Equilibrium—G Up, iii



Shifts and Short-Run Equilibrium—G Up, iv

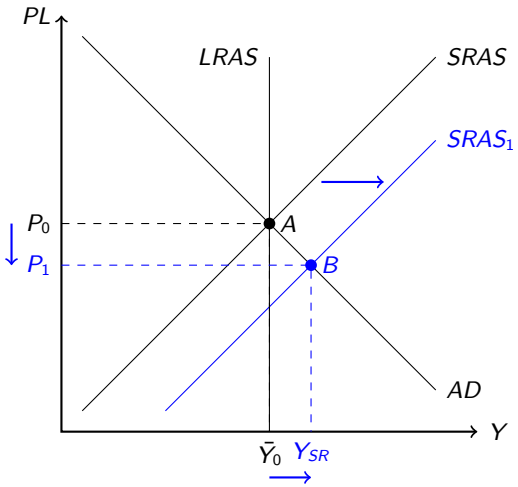


4. With both Price Level and (short-run) GDP increasing

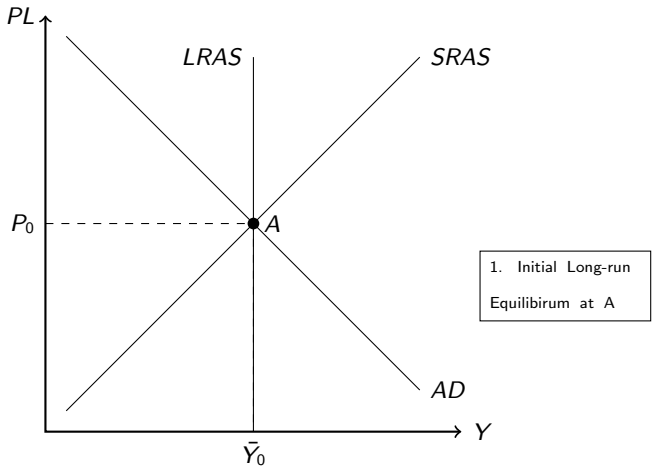
Shifts and Short-Run Equilibrium—Temporary Technology Increase

- **Short-run equilibrium**: Point where AD and SRAS intersect.
- Start in long-run equilibrium (P_0 and $\bar{Y}_0$) for all of the following, and find the new short-run equilibrium (P_1 and Y_{SR}):
- Technology improves *temporarily*.
  - Shifts out *SRAS* to $SRAS_1$ (and only *SRAS* as temporary).
  - New short-run equilibrium at B.
  - In short-run GDP increases and Price Level falls: $Y \uparrow, PL \downarrow$.

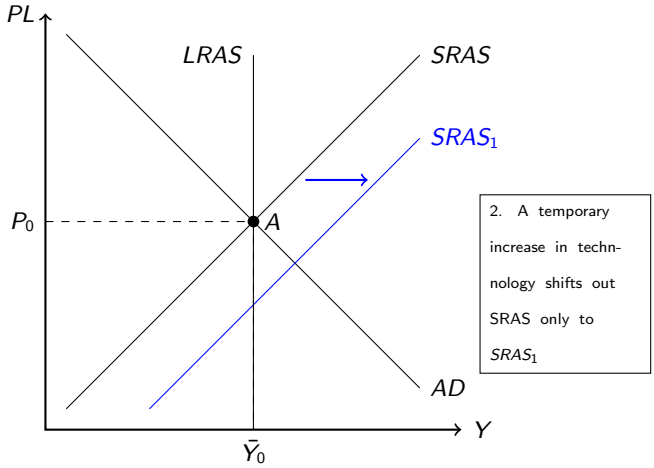
Shifts and Short-Run Equilibrium—Temporary Technology Increase, Full



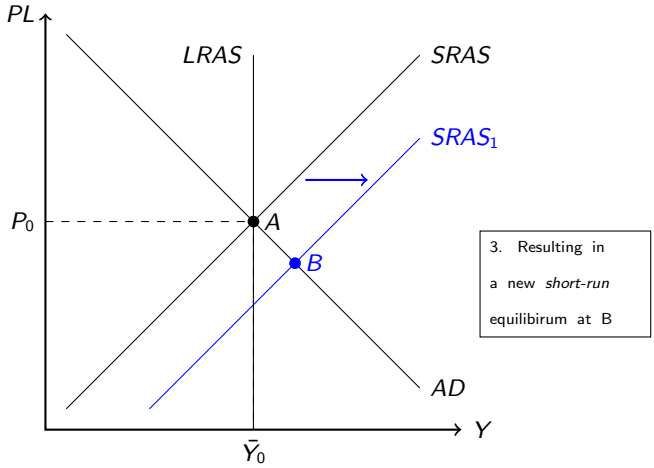
Shifts and Short-Run Equilibrium—Temporary Technology Increase, i



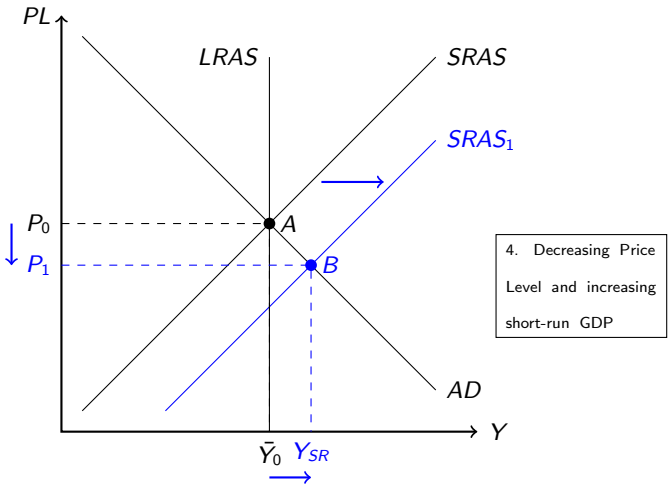
Shifts and Short-Run Equilibrium—Temporary Technology Increase, ii



Shifts and Short-Run Equilibrium—Temporary Technology Increase, iii



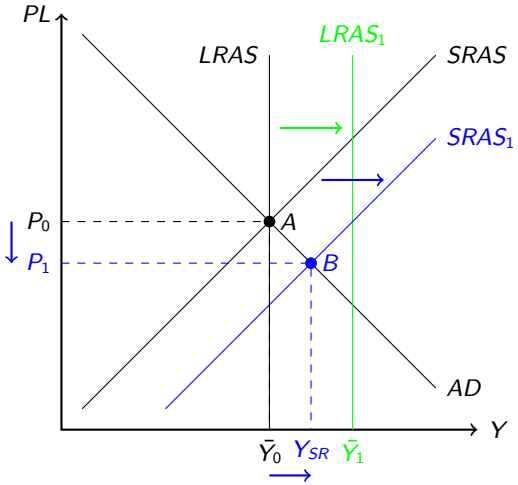
Shifts and Short-Run Equilibrium—Temporary Technology Increase, iv



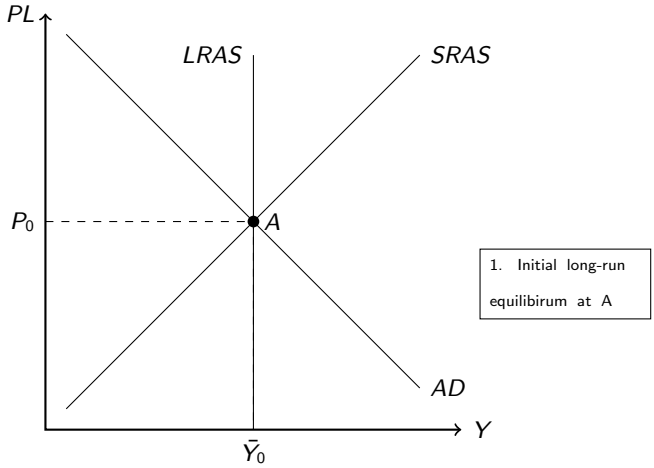
Shifts and Short-Run Equilibrium—Permanent Technology Increase

- **Short-run equilibrium**: Point where AD and SRAS intersect.
- Start in long-run equilibrium (P_0 and $\bar{Y}_0$) for all of the following, and find the new short-run equilibrium (P_1 and Y_{SR}):
- Technology improves *permanently*.
  - Shifts out *both SRAS* and *LRAS*, by the same amount (start at A and go horizontally).
  - New short-run equilibrium at B (we ignore $LRAS_1$ for finding the new *short-run equilibrium*).
  - In short-run GDP increases and Price Level falls: $Y \uparrow, PL \downarrow$.

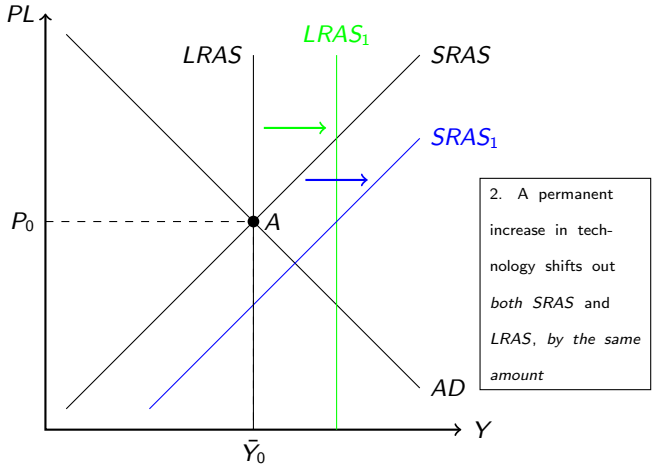
Shifts and Short-Run Equilibrium—Permanent Technology Increase, Full



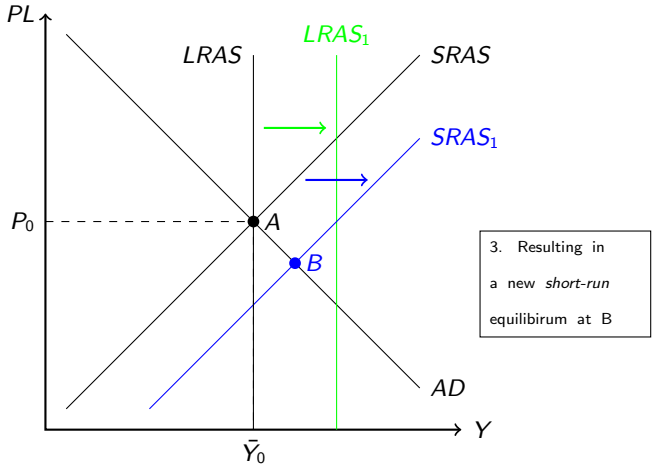
Shifts and Short-Run Equilibrium—Permanent Technology Increase, i



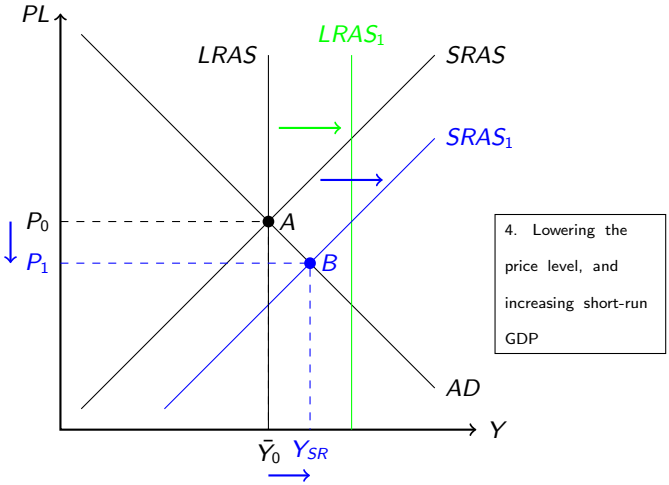
Shifts and Short-Run Equilibrium—Permanent Technology Increase, ii



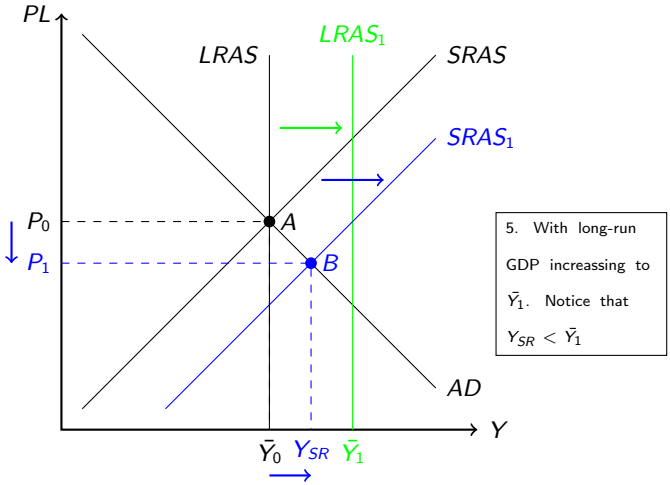
Shifts and Short-Run Equilibrium—Permanent Technology Increase, iii



Shifts and Short-Run Equilibrium—Permanent Technology Increase, iv



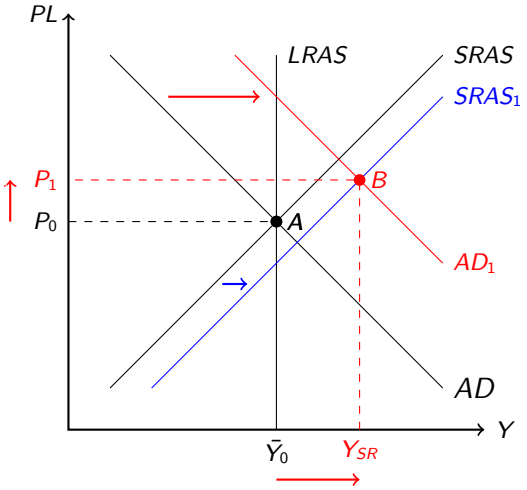
Shifts and Short-Run Equilibrium—Permanent Technology Increase, v



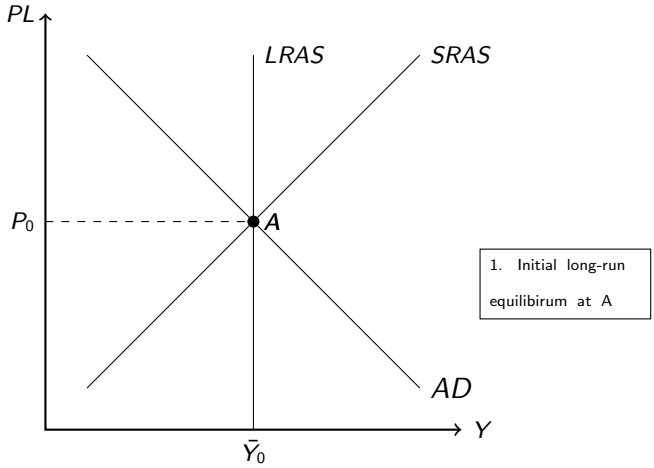
Shifts and Short-Run Equilibrium

- **Short-run equilibrium**: Point where AD and SRAS intersect.
- Start in long-run equilibrium for all of the following, and find the new short-run equilibrium:
- G up, Technology up temporarily. G up larger.
  - G up: AD out.
  - Tech up *temporarily*: *Only SRAS* out.
  - *AD* out *farther* than *SRAS* (start at A and go out horizontally; *AD* is farther away from A).
  - Result: Y up, PL up. New short-run equilibrium at B.
- G up, Technology up Permanently. G up larger.
  - G up: AD out.
  - Tech up *permanently*: *SRAS* and *LRAS* out *by the same amount*. Can you see that in the graph? (Go out horizontally from A, reach *SRAS* and *LRAS* at the same point).
  - *AD* out *farther* than *both* supply curves.
  - Result: Y up, PL up. New short-run equilibrium at B.

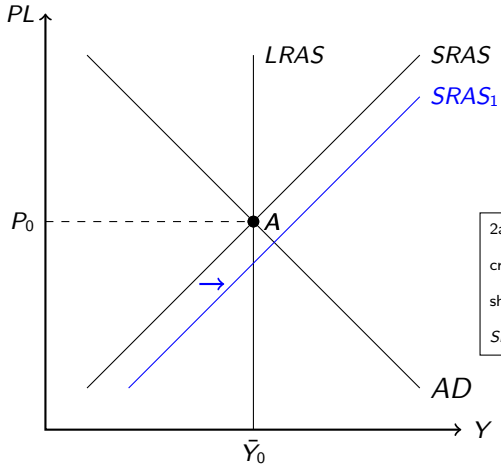
G up, Tech Up Temporarily. G up larger. Graphically



G up, Tech Up Temporarily. G up larger, i

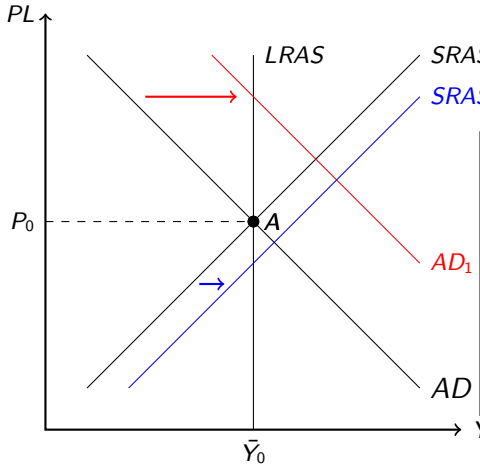


G up, Tech Up Temporarily. G up larger, iia



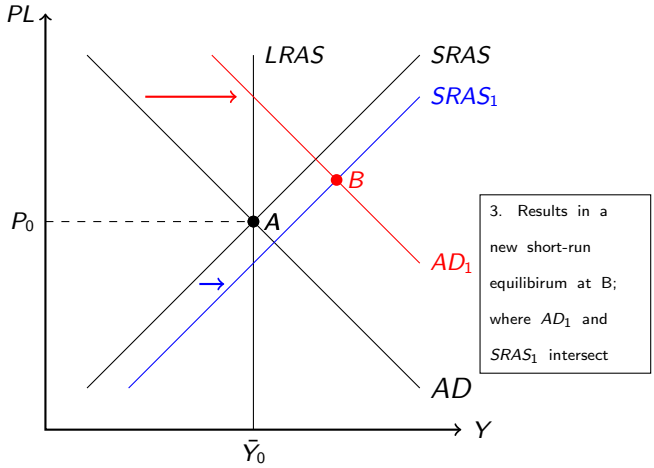
2a. Temporary increase in technology shifts out *SRAS* to $SRAS_1$

G up, Tech Up Temporarily. G up larger, iib

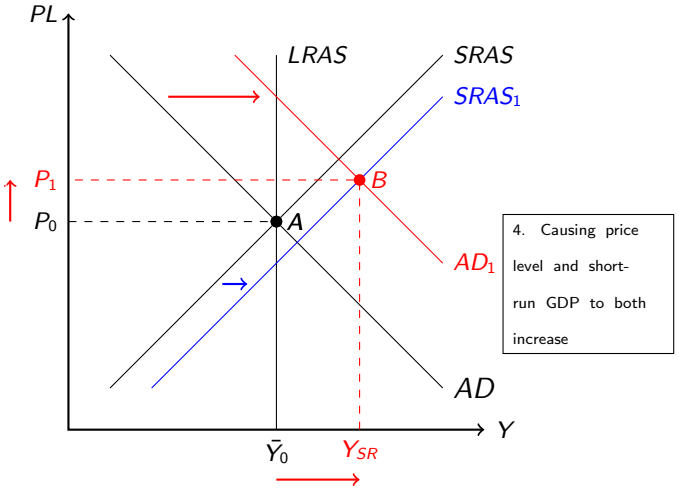


2b. Government spending up, shifts AD out. And since we know G up has the larger effect, we shift AD out more than we shifted SRAS

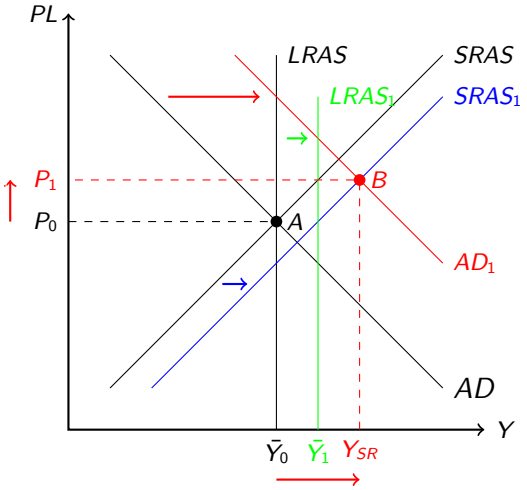
G up, Tech Up Temporarily. G up larger, iii



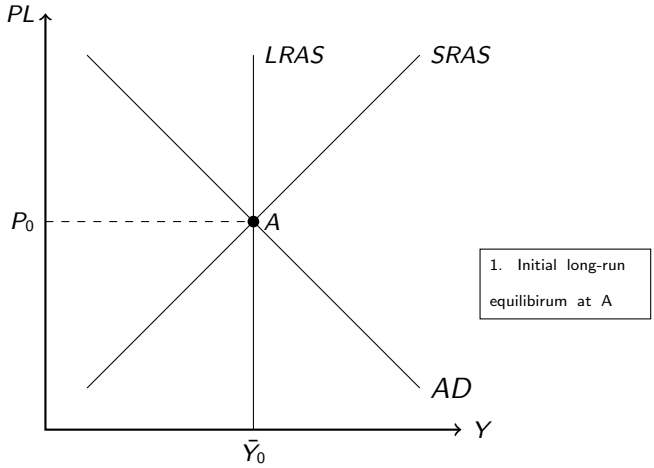
G up, Tech Up Temporarily. G up larger, iv



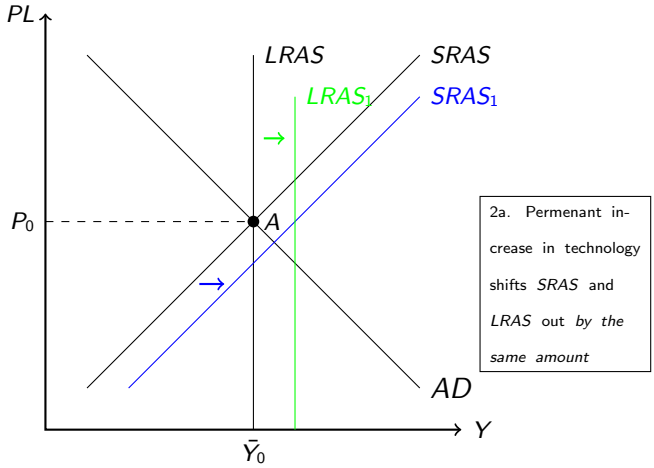
G up, Tech Up Permanently. G up larger. Graphically



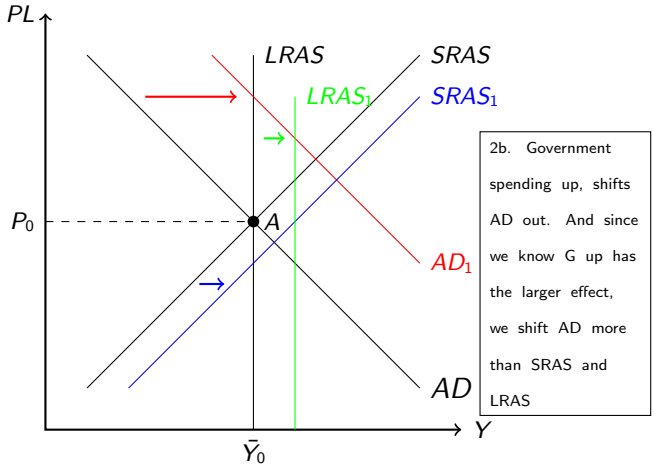
G up, Tech Up Permanently. G up larger, i



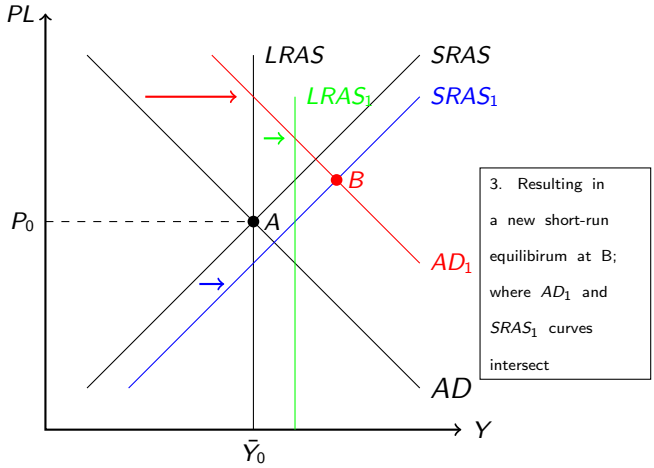
G up, Tech Up Permanently. G up larger, iia



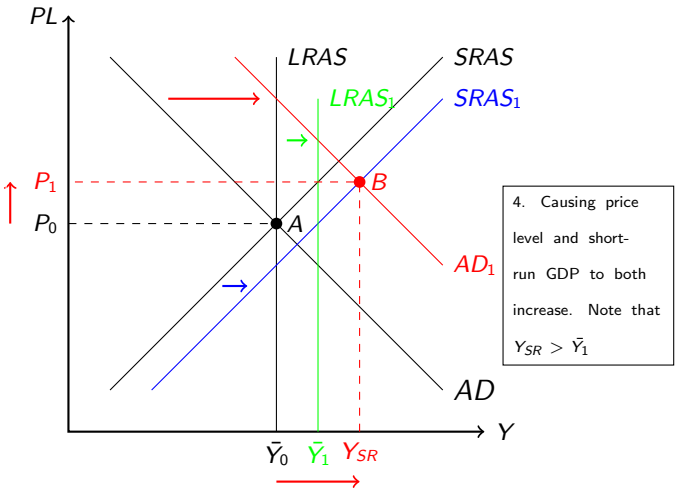
G up, Tech Up Permanently. G up larger, iib



G up, Tech Up Permanently. G up larger, iii



G up, Tech Up Permanently. G up larger, iv

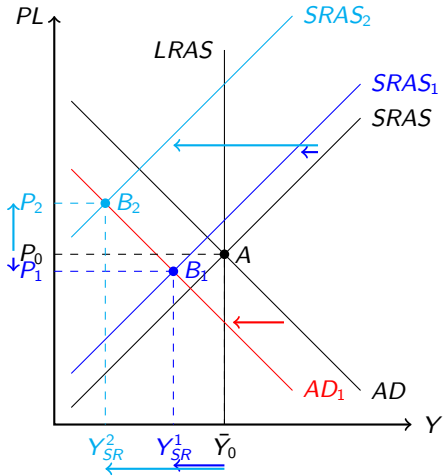


4. Causing price level and short-run GDP to both increase. Note that $Y_{SR} > \bar{Y}_1$

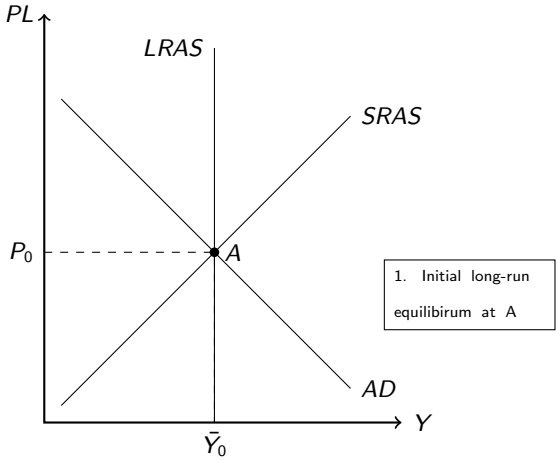
Shifts and Short-Run Equilibrium (cont)

- Start in long-run equilibrium for all of the following find the new short-run equilibrium:
- Lump-Sum Taxes (T) up, Oil prices up.
  - T up: AD in.
  - Oil Prices up: $SRAS$ in.
  - *No ranking*, therefore make one $SRAS$ small, the other large.
  - Y down, PL ambiguous.
- Lump-Sum Taxes (T) up, Oil prices up. Tax shock is larger than the oil price shock.
  - T up: AD in.
  - Oil Prices up: $SRAS$ in.
  - Tax shock larger, means AD in more than $SRAS$ in.
  - Y down, PL down.

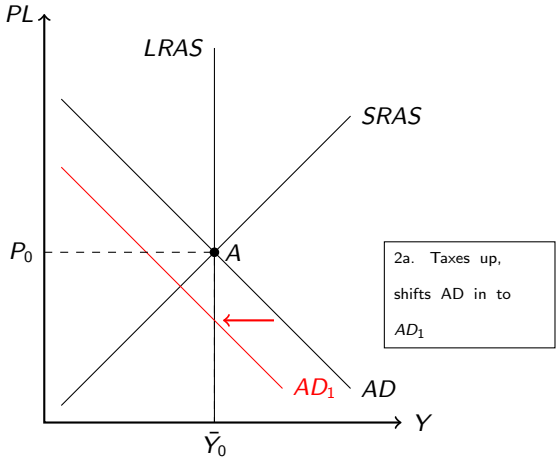
T up, Oil Prices Up, Full Graph



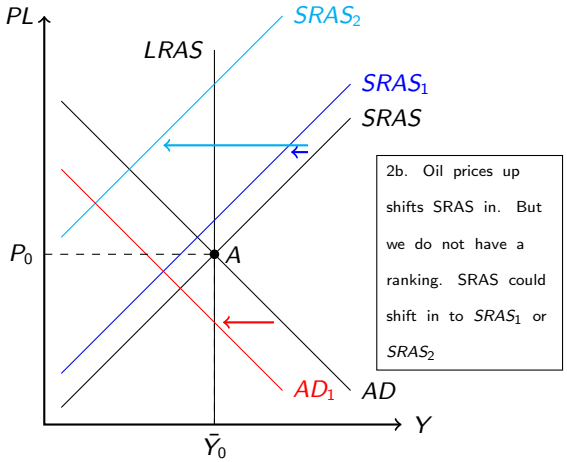
T up, Oil Prices Up, i



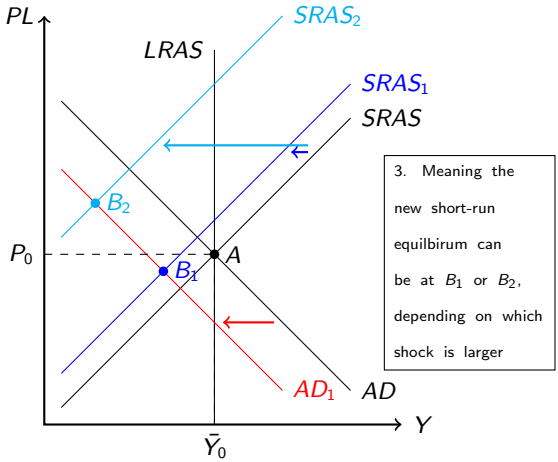
T up, Oil Prices Up, iia



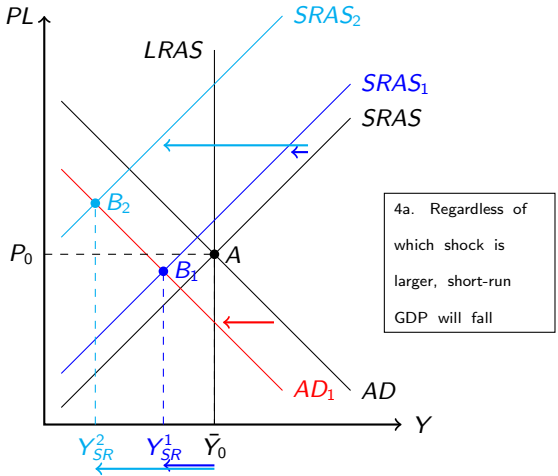
T up, Oil Prices Up, iib



T up, Oil Prices Up, iii

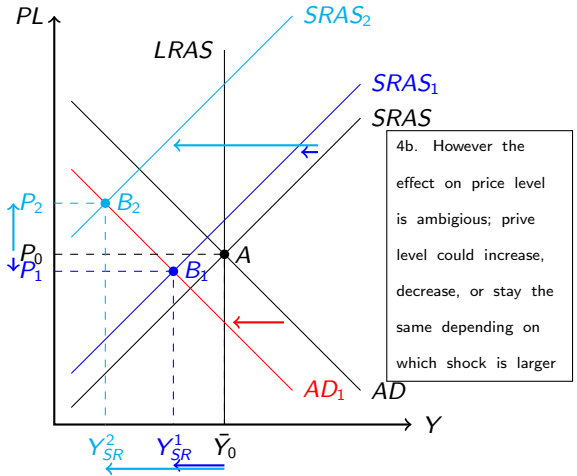


T up, Oil Prices Up, iva

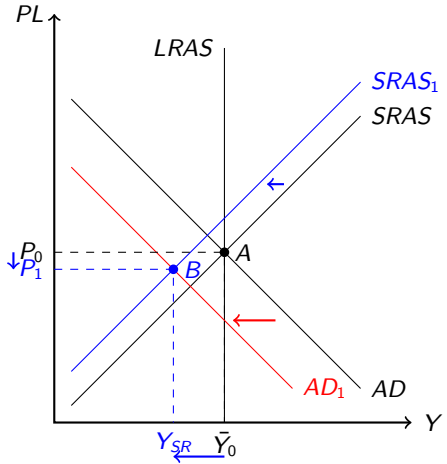


4a. Regardless of which shock is larger, short-run GDP will fall

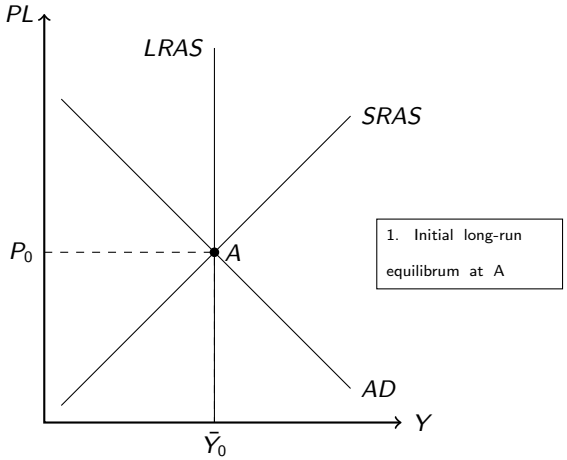
T up, Oil Prices Up, ivb



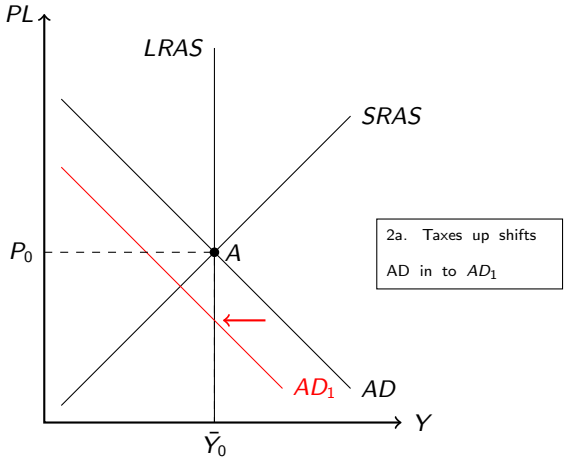
T up, Oil Prices Up, Tax Shock Larger, Complete



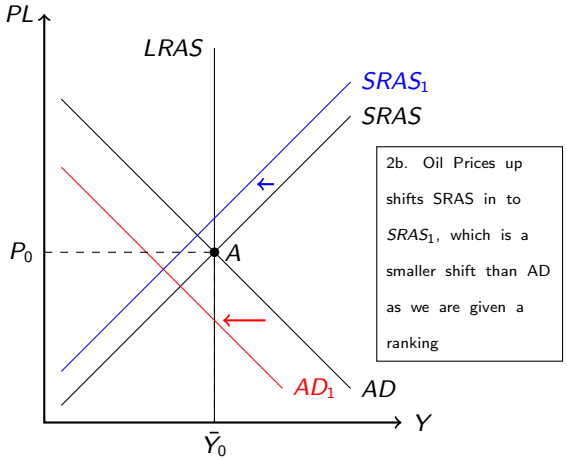
T up, Oil Prices Up, Tax Shock Larger, i



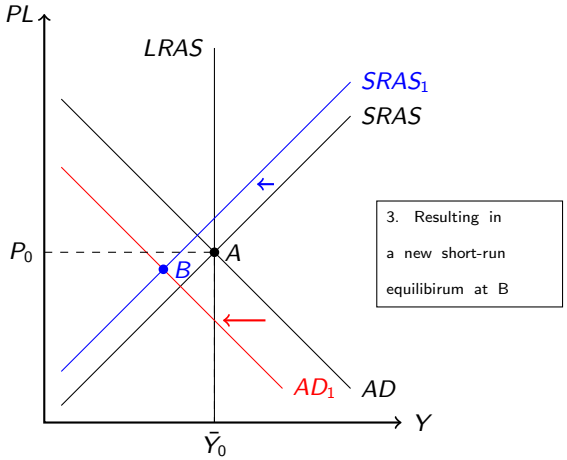
T up, Oil Prices Up, Tax Shock Larger, iia



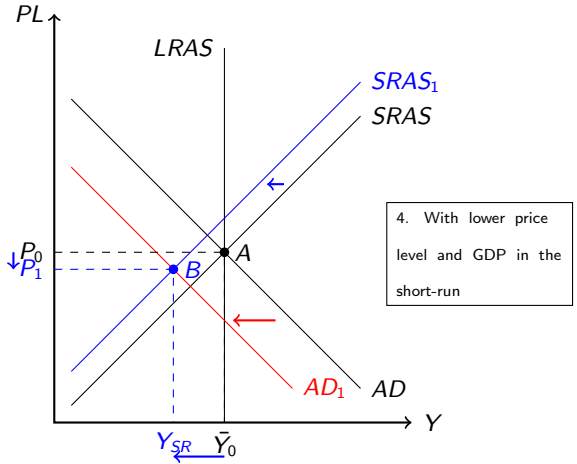
T up, Oil Prices Up, Tax Shock Larger, iib



T up, Oil Prices Up, Tax Shock Larger, iii



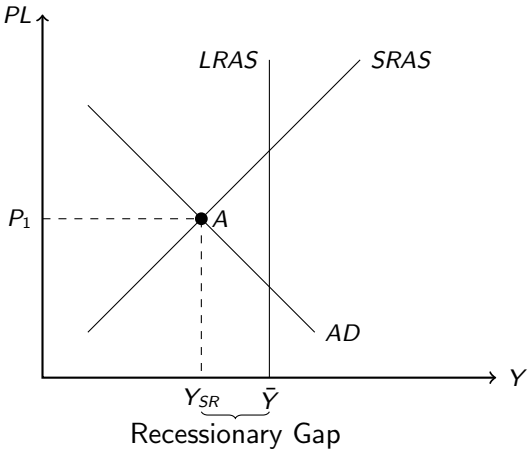
T up, Oil Prices Up, Tax Shock Larger, iv



Short-Run equilibrium is where ONLY AD AND SRAS intersect AT THE SAME POINT

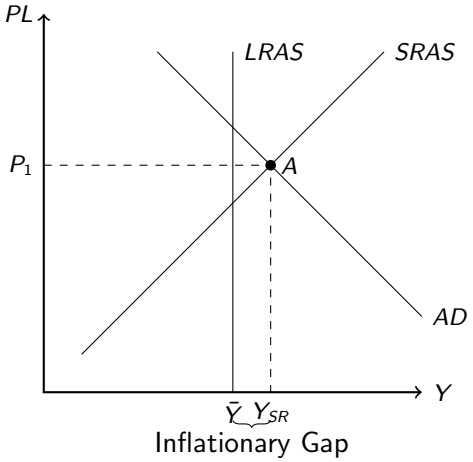
Output Gaps

- **Recessionary Gap**: Current GDP $<$ Potential GDP. $Y_{SR} < \bar{Y}$.



Output Gaps – Inflationary Gap

- **Inflationary Gap**: Current GDP $>$ Potential GDP. $Y_{SR} > \bar{Y}$.



Output Gaps are a Short-Run Phenomenon. In Long-Run Equilibrium, there is not an Output Gap!

Gap Joke

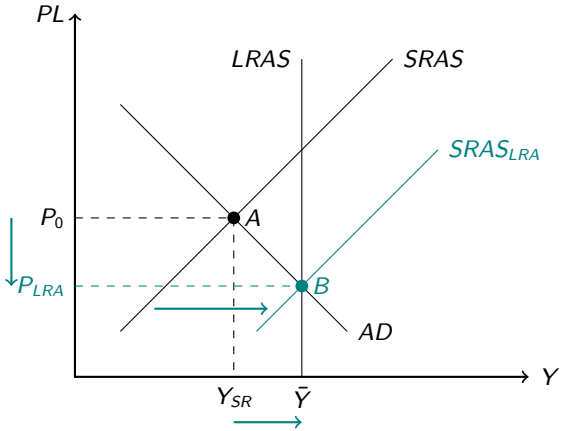
I was downtown in some town and they had store, store, store, and then there was an open area, then they had more stores. It said in the open area "Coming soon: The Gap" I'm like Man. It's coming soon and it's already here. —Mitch Hedberg

Long-Run Adjustment (Self-Correcting Mechanism)

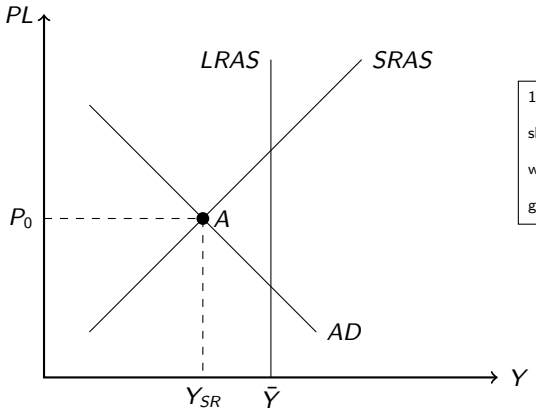
- To reach long-run equilibrium nominal wages adjust; remember wages are sticky.
- **Sticky Wages**: Wages that are slow to fall even during high unemployment and slow to rise during times of labor shortages. (Wages take a while to adjust).
- In a Recessionary Gap nominal wages *fall*, shifting *SRAS* out to the intersection of *AD* and *LRAS*.
- In an Inflationary Gap, nominal wages *rise*, shifting *SRAS* in to the intersection of *AD* and *LRAS*.
- At times referred to as how the economy *self-corrects*.
- Self-correcting can take years in a deep recession!
- Show the long-run adjustment mechanism in both a recessionary gap and an inflationary gap:
- Show how the second example on the previous slides adjust to the new long-run equilibrium:

Long-Run Adjustment in a Recessionary Gap

- Recessionary gap means *nominal wages* need to fall. Nominal wages falling shifts out $SRAS$ to $SRAS_{LRA}$, this process can take months to years.

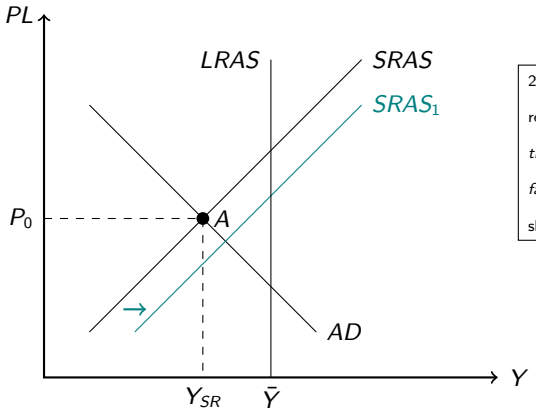


Long-Run Adjustment in a Recessionary Gap, i



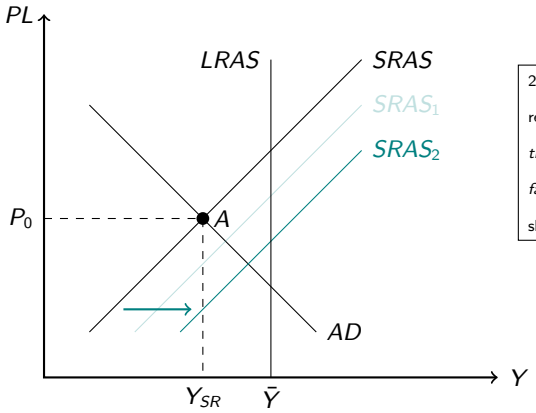
1. Starting in a short-run equilibirum with a recessionary gap ($Y_{SR} < \bar{Y}$)

Long-Run Adjustment in a Recessionary Gap, iia



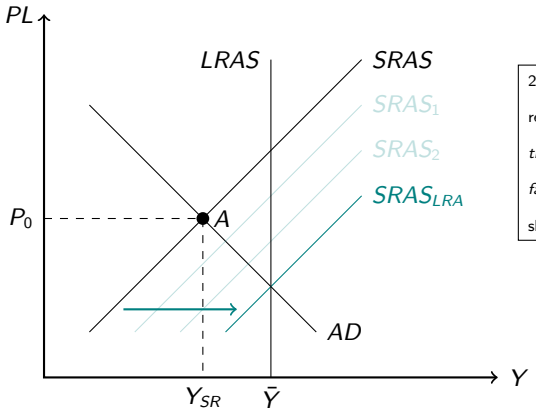
2a. Due to the recessionary gap, *over time* nominal wages *fall* causing SRAS to shift out

Long-Run Adjustment in a Recessionary Gap, iib



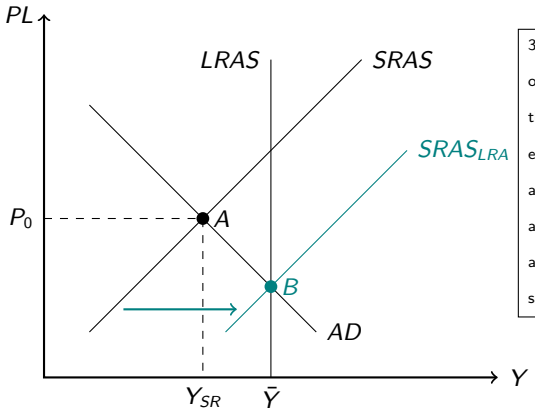
2b. Due to the recessionary gap, *over time* nominal wages *fall* causing SRAS to shift out

Long-Run Adjustment in a Recessionary Gap, iic



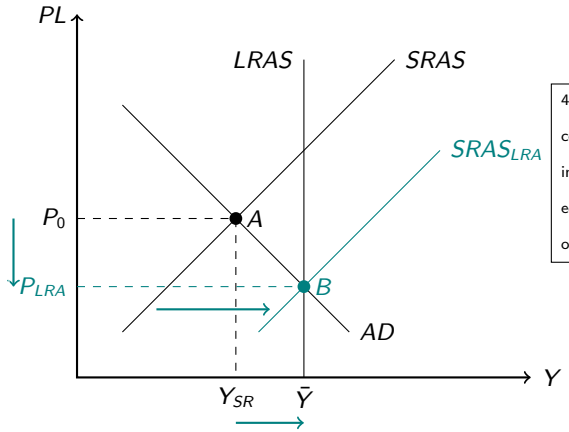
2c. Due to the recessionary gap, *over time* nominal wages *fall* causing SRAS to shift out

Long-Run Adjustment in a Recessionary Gap, iii



3. SRAS shifts out over time, until the new long-run equilibirum is reached at B (AD, LRAS, and the new SRAS all intersect at the same point)

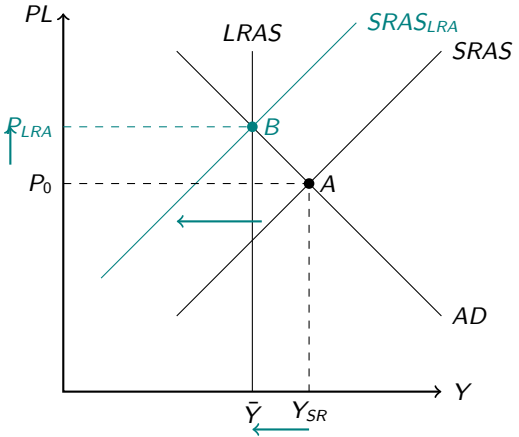
Long-Run Adjustment in a Recessionary Gap, iv



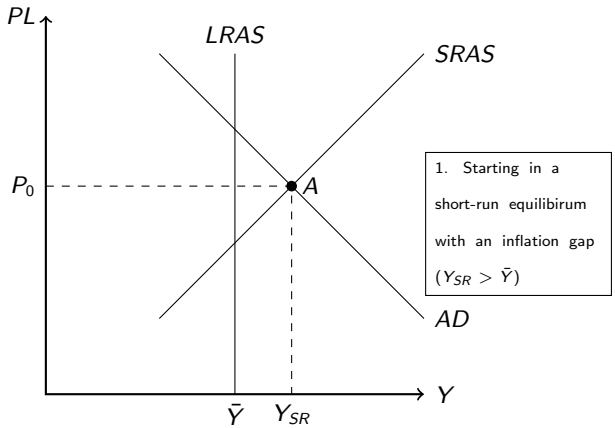
4. Price level falls compared to the initial short-run equilibirum and output returns to $\bar{Y}$

Long-Run Adjustment in an Inflationary Gap

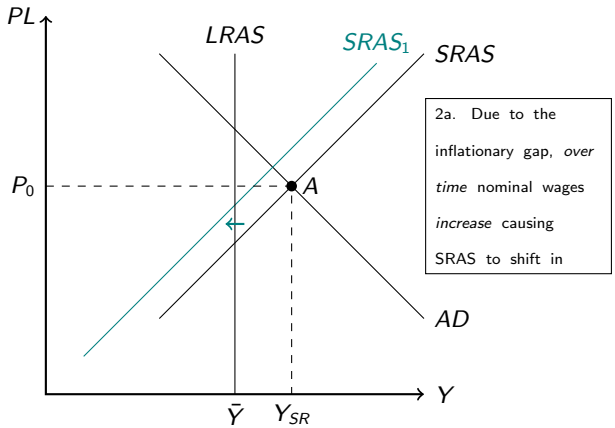
- Inflationary gap means *nominal wages* need to rise. Nominal wages increasing shifts in $SRAS$ to $SRAS_{LRA}$, this process can take months to years.



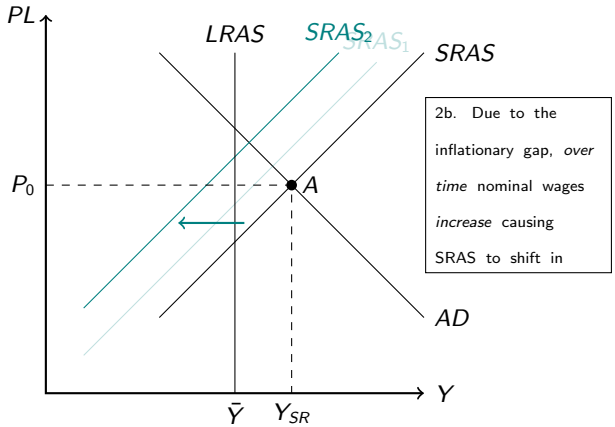
Long-Run Adjustment in an Inflationary Gap, i



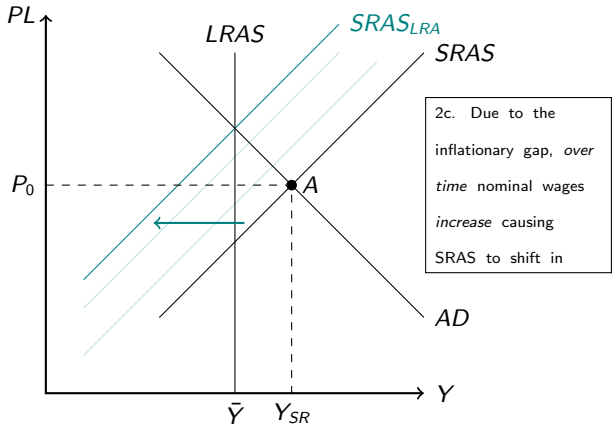
Long-Run Adjustment in an Inflationary Gap, iia



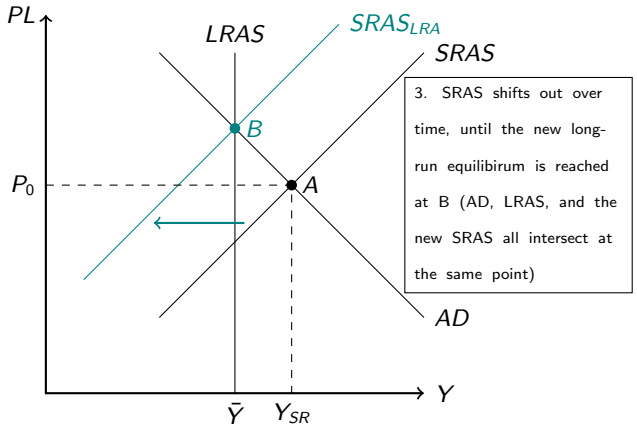
Long-Run Adjustment in an Inflationary Gap, iib



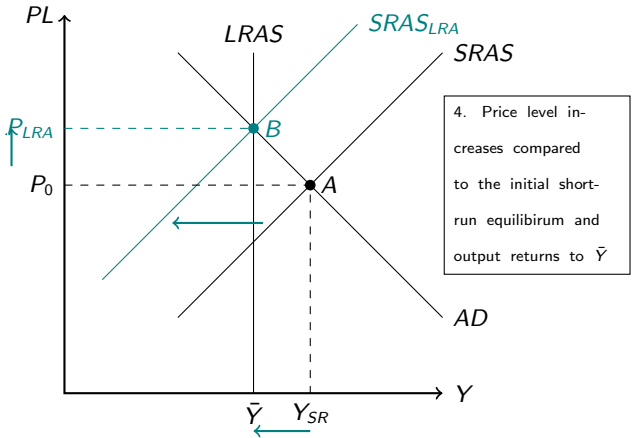
Long-Run Adjustment in an Inflationary Gap, iic



Long-Run Adjustment in an Inflationary Gap, iii



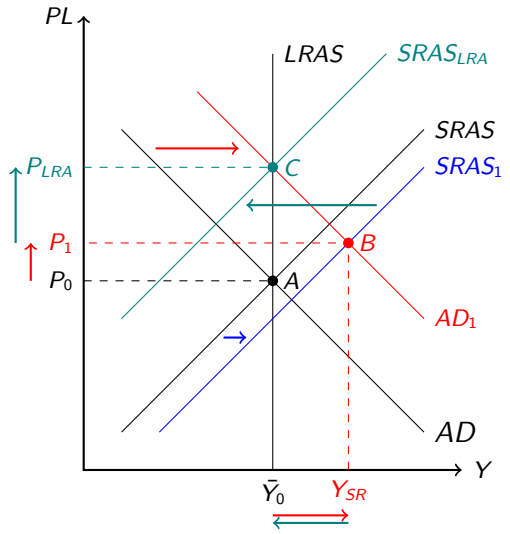
Long-Run Adjustment in an Inflationary Gap, iv



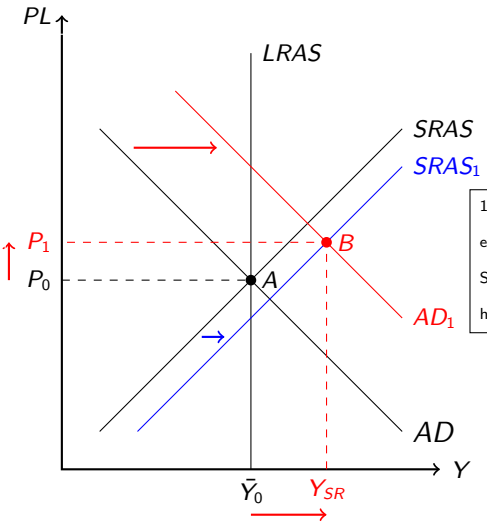
G up, Tech Up Temporarily. G up larger. Long-Run Adjustment

- Had an inflationary gap: $Y_{SR} > \bar{Y}_0$.
- Therefore nominal wages must increase.
- Nominal wages increasing shifts $SRAS$ in to $SRAS_{LRA}$.
- $SRAS$ shifts in to where AD_1 and $LRAS$ intersect: Long-run equilibrium is where $LRAS$, $SRAS$, and AD intersect at the same point.
- Move from short-run equilibrium (B) to new long-run equilibrium (C).
- GDP returns to initial long-run value ($\bar{Y}_0$), while price level increases even more (P_{LRA}).

G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, Complete

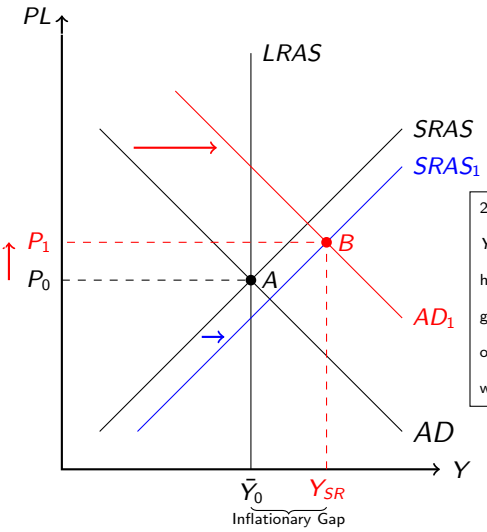


G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, i



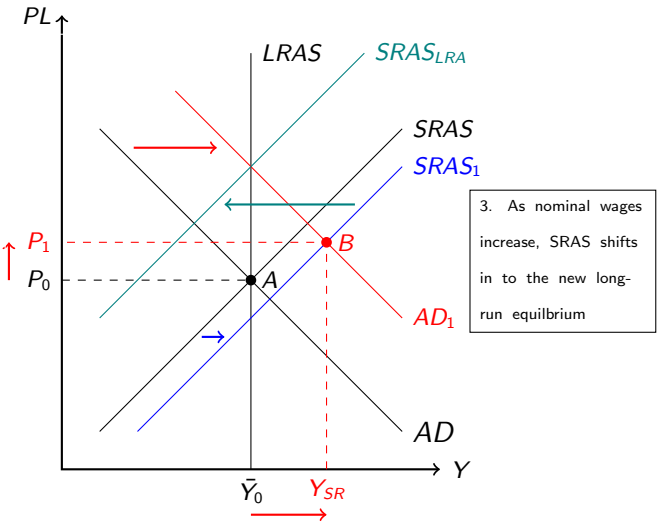
1. The short-run equilibirum at B (see Slides 38–42 to see how we got to B)

G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, ii

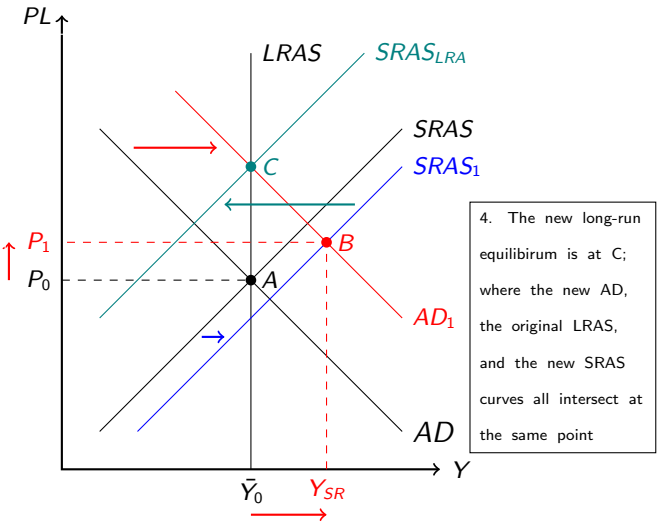


2. Given that $Y_{SR} > \bar{Y}_0$ we have an inflationary gap, meaning that over time nominal wages will increase

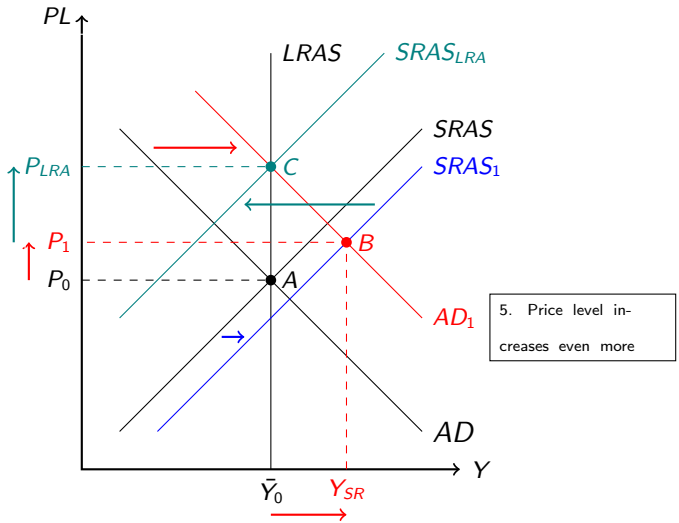
G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, iii



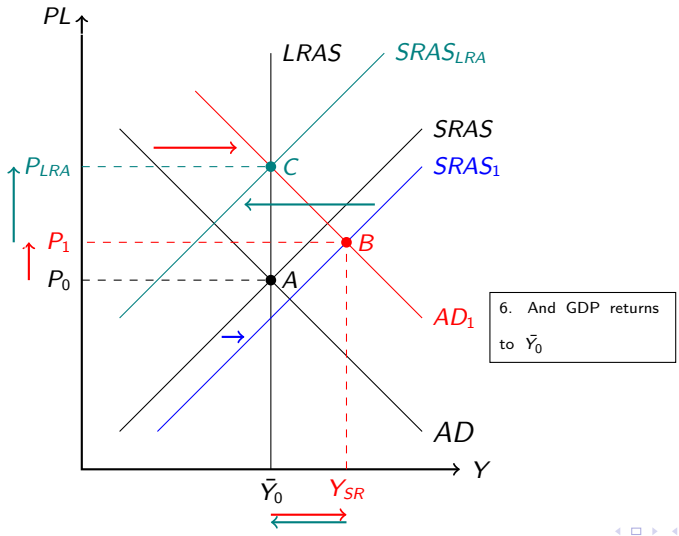
G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, iv



G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, v



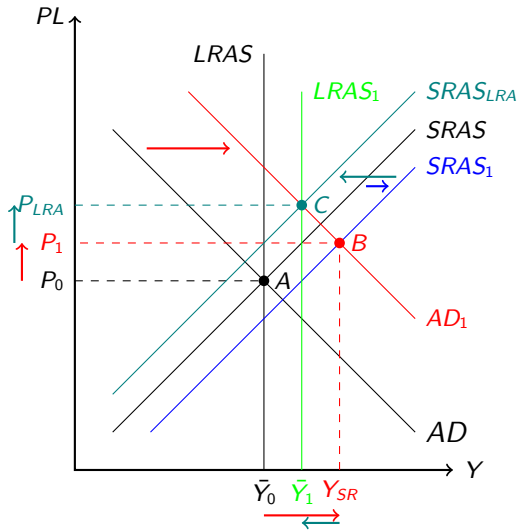
G up, Tech Up Temporarily. G up larger. Long-Run Adjustment, vi



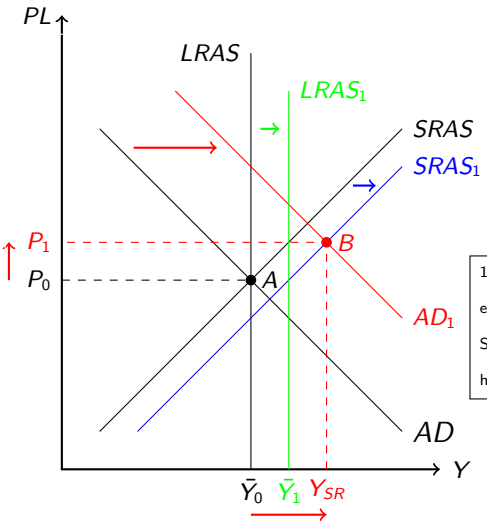
G up, Tech Up Permanently. G up larger. Long-Run Adjustment

- Had an inflationary gap: $Y_{SR} > \bar{Y}_1$. *Notice there is a new value for Long-run GDP.*
- Therefore nominal wages must increase.
- Nominal wages increasing shifts $SRAS$ in to $SRAS_{LRA}$.
- $SRAS$ shifts in to where AD_1 and $LRAS_1$ intersect: Long-run equilibrium is where $LRAS$, $SRAS$, and AD intersect at the same point. *However there is a new* $LRAS$.
- Move from short-run equilibrium (B) to new long-run equilibrium (C).
- GDP goes to the new long-run value ($\bar{Y}_1$), while price level increases even more (P_{LRA}).

G up, Tech Up Permanently. G up larger. Long-Run Adjustment, Full

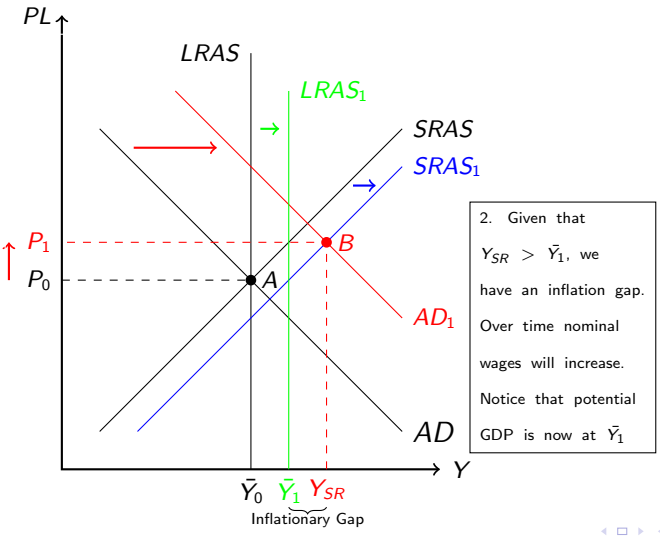


G up, Tech Up Permanently. G up larger. Long-Run Adjustment, i

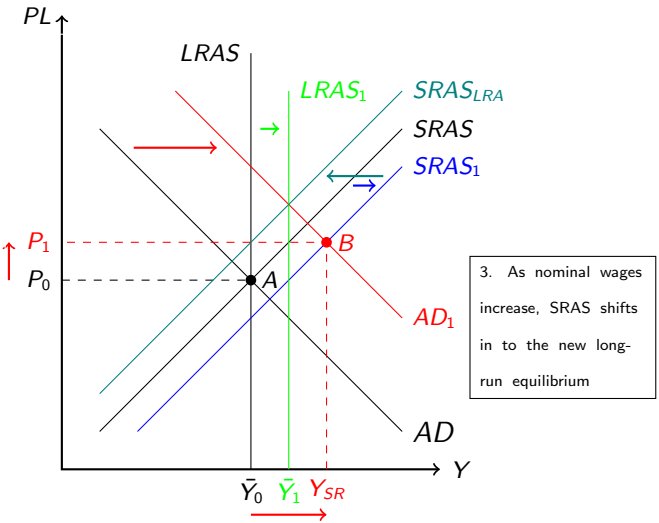


1. The short-run equilibirum at B (see Slides 44–48 to see how we got to B).

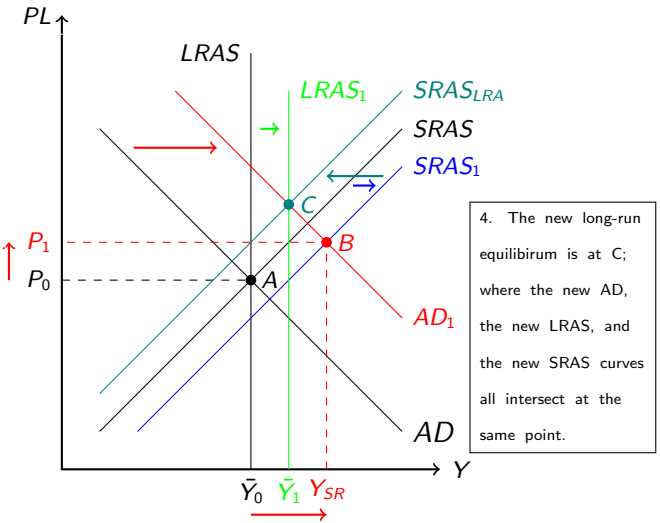
G up, Tech Up Permanently. G up larger. Long-Run Adjustment, ii



G up, Tech Up Permanently. G up larger. Long-Run Adjustment, iii

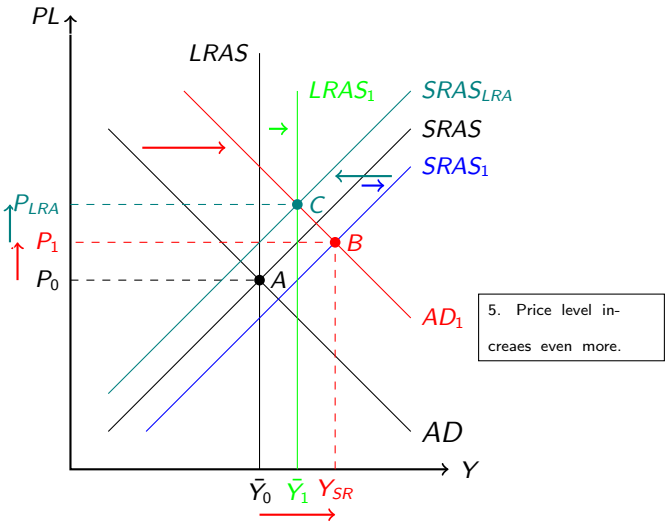


G up, Tech Up Permanently. G up larger. Long-Run Adjustment, iv

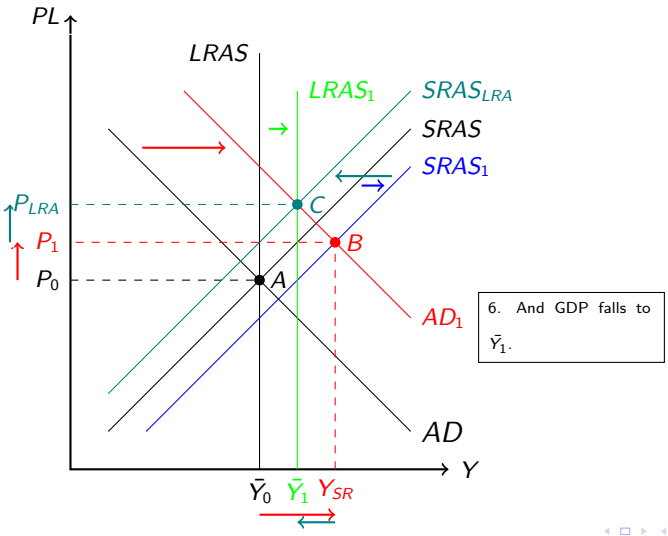


4. The new long-run equilibirum is at C; where the new AD, the new LRAS, and the new SRAS curves all intersect at the same point.

G up, Tech Up Permanently. G up larger. Long-Run Adjustment, v



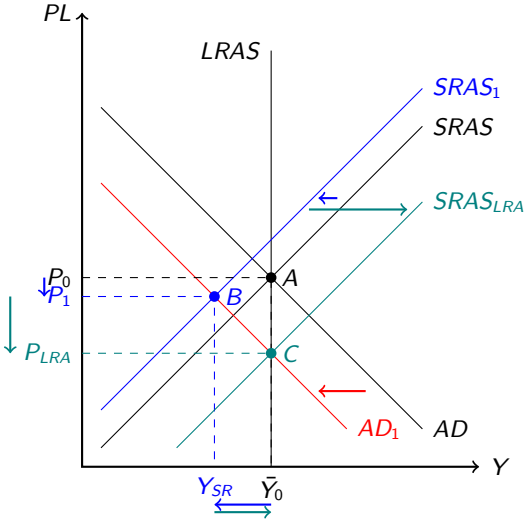
G up, Tech Up Permanently. G up larger. Long-Run Adjustment, vi



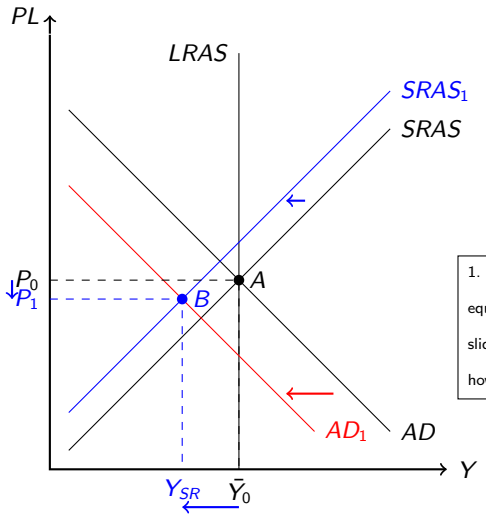
T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment

- Had a recessionary gap: $Y_{SR} < \bar{Y}_0$.
- Therefore nominal wages must decrease.
- Nominal wages increasing shifts $SRAS$ out to $SRAS_{LRA}$.
- $SRAS$ shifts out to where AD_1 and $LRAS$ intersect: Long-run equilibrium is where $LRAS$, $SRAS$, and AD intersect at the same point.
- Move from short-run equilibrium (B) to new long-run equilibrium (C).
- GDP goes back to the initial long-run value ($\bar{Y}_0$), while price level falls even more (P_{LRA}).

T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, Complete

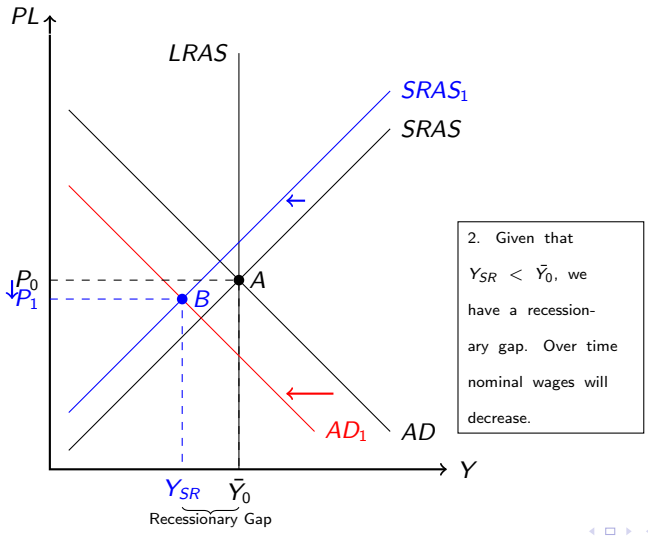


T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, i



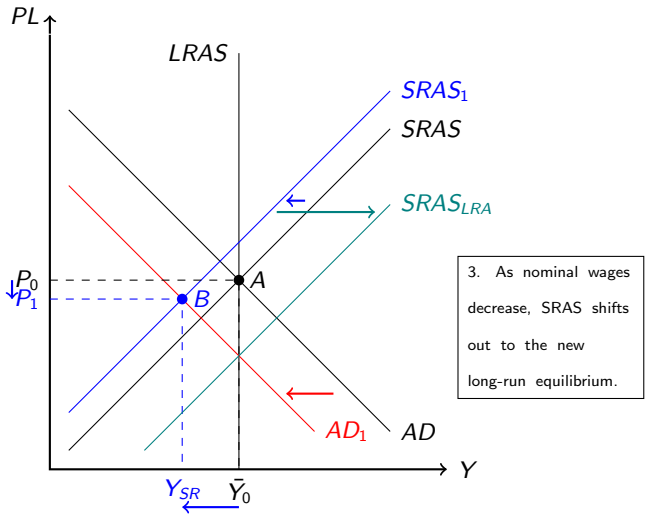
1. The short-run equilibirum at B (see slides 58–62 to see how we got to B).

T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, ii

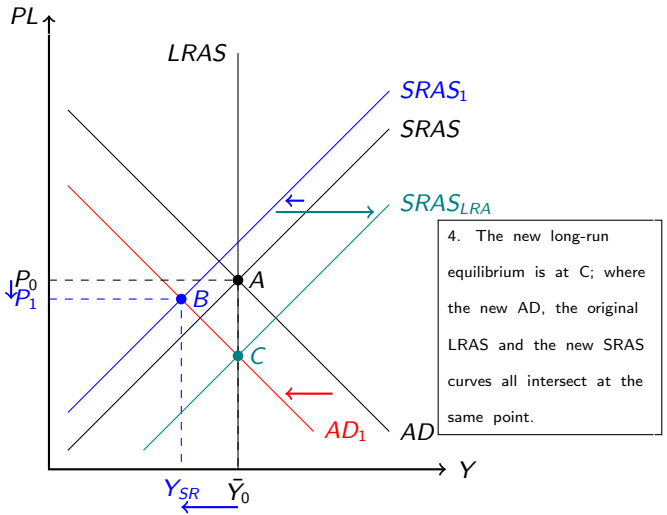


2. Given that $Y_{SR} < \bar{Y}_0$, we have a recessionary gap. Over time nominal wages will decrease.

T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, iii

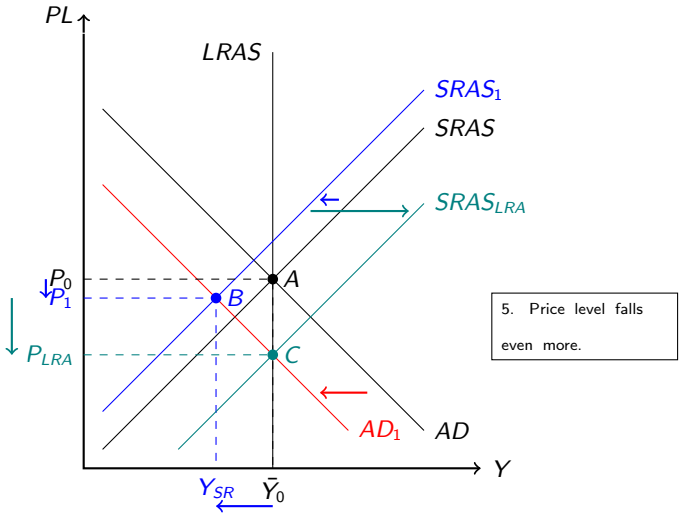


T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, iv

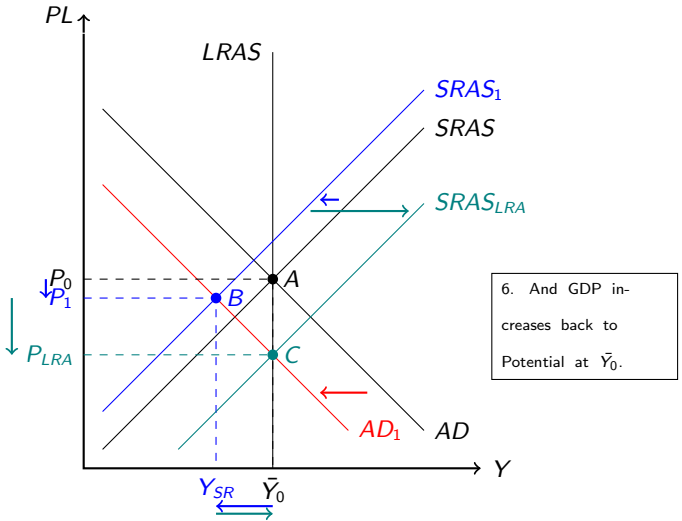


4. The new long-run equilibrium is at C; where the new AD, the original LRAS and the new SRAS curves all intersect at the same point.

T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, v



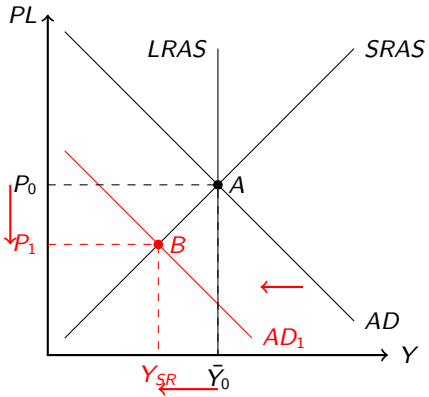
T up, Oil Prices Up, Tax Shock Larger. Long-run Adjustment, vi



To go from a short-run equilibrium to the new long-run equilibrium ONLY SRAS SHIFTS

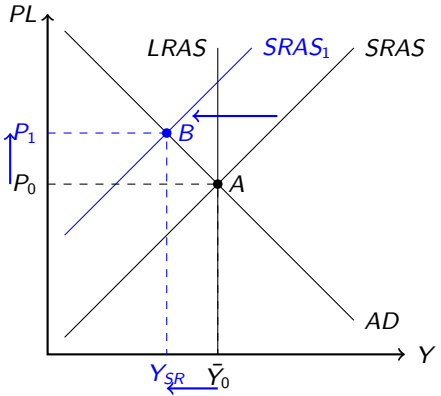
AS/AD and the Great Depression and/or the Great Recession

- Starting in long-run equilibrium, assume Investment goes down, find the new short-run equilibrium.



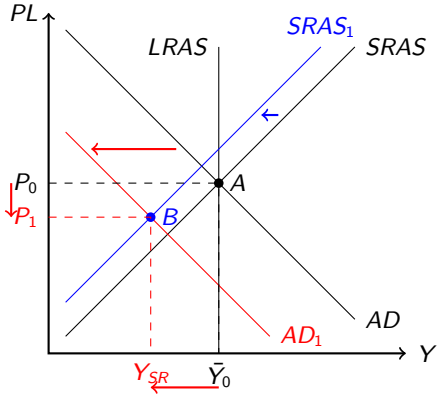
AS/AD and the Oil Embargo

- Starting in long-run equilibrium, assume oil prices unexpectedly go up, find the new short-run equilibrium. This result is often called **stagflation**: a negative supply shock that causes a recessionary gap and inflation.



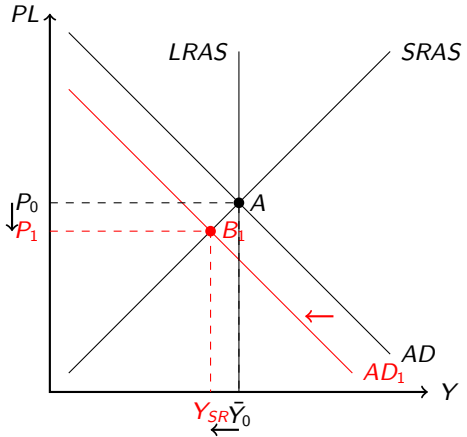
AS/AD and the Covid Recession

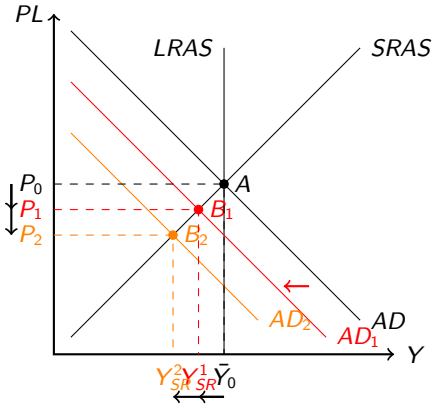
- Starting in long-run equilibrium, assume productivity temporarily falls and consumption spending also falls. The fall in consumption spending has a larger effect. Find the new short-run equilibrium.



Deflationary Spiral

- Starting in long-run equilibrium, assume consumers expect prices to decrease, find the new short-run equilibrium.



Deflationary Spiral

- What if consumers update their expectations on prices due to the new change; what would be the next short-run equilibrium? What about fisher equation making borrowers worse off? What happens to Investment?