Aggregate Market Model

- **Aggregate Demand** (AD) is derived from Snarrian aggregate expenditure by imposing the AE equilibrium ($Y = AE$) and then solving for PL.

$$AE = [W + Y_e - PL - r\ - mpc \cdot T + I + G + X\ ] + \{\ mpc - mpm\ \}Y$$

  AD is the relationship between the quantity of real GDP demanded and the price level when all other influences on

- Short-run Aggregate Supply (SRAS) is the relationship between the quantity of real GDP supplied and the price level in the short-run when

- Long-run Aggregate Supply (LRAS) is the value of

- AD and SRAS determine

- The difference between real GDP and potential GDP determines

Aggregate Demand

Snarrian Aggregate Demand is found by substituting

$$\mathbf{AE} = [W + Y_e - \mathbf{PL} - r\ - mpc \cdot T + I + G + X\ ] + \{\ mpc - mpm\ \}\mathbf{Y}$$

$$\mathbf{Y} = [W + Y_e - \mathbf{PL} - r\ - mpc \cdot T + I + G + X\ ] + \{\ mpc - mpm\ \}\mathbf{Y}$$

$$\mathbf{PL} = [W + Y_e - r\ - mpc \cdot T + I + G + X\ ] + \{\ mpc - mpm\ \}\mathbf{Y} - 1\ \mathbf{Y}$$

$$\mathbf{PL} = [W + Y_e - r\ - mpc \cdot T + I + G + X\ ] + \{\ mpc - mpm - 1\ \}\mathbf{Y}$$

$$\mathbf{PL} = [W + Y_e - r\ - mpc \cdot T + I + G + X\ ] - \{-mpc + mpm + 1\ \}\mathbf{Y}$$

$$\mathbf{PL} = [W + Y_e - r\ - mpc \cdot T + I + G + X\ ] - \{1 - mpc + mpm\ \}\mathbf{Y}$$

$$\mathbf{PL} = [W + Y_e - r\ - mpc \cdot T + I + G + X\ ] - \{mps + mpm\ \}\mathbf{Y}$$

Aggregate Demand

Snarrian Aggregate Demand

- **Example:** In addition to $W = 5$, $Y_e = 7$, $PL = 8$, $r = 2$, $mpc = 0.75$, and $T = 3$, assume, investment expenditures total \$1 trillion ($I = 1$), government expenditures total \$3.5 trillion ($G = 3.5$), exports total \$0.5 trillion ($X = 0.5$) with $mpm = 0.25$. Derive the AE equation.

First, ignore the fact that PL = 8 because AD is the relationship between real GDP and PL

$$PL = [W + Y_e - r - mpc \cdot T + I + G + X] - \{ mps + mpm \} \cdot Y$$

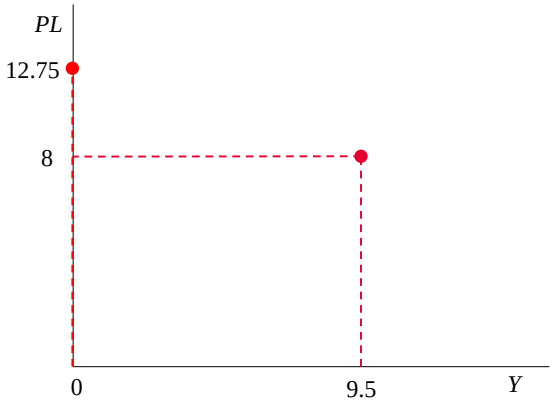
Aggregate Demand

Snarrian Aggregate Demand

- **Example:**

  $PL = 12.75 - 0.5\ Y$

- By assumption, aggregate planned expenditure equals real GDP ($Y = AE$).
- Recall that in the AE model, $Y = 9.5$ when $PL = 8$ at the Keynesian equilibrium point.

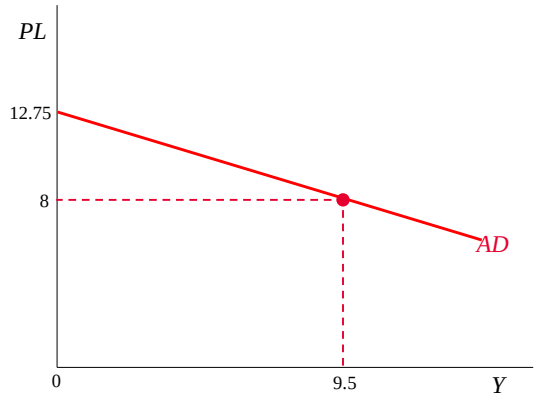


Aggregate Demand

Snarrian Aggregate Demand

- **Example:** What happens if government spending is increased by $0.5 trillion?

$$PL = [5 + 7 - 2 \ - 0.75 \cdot 3 + 1 + 3.5 + 0.5] - \{0.25 + 0.25\} \cdot Y$$

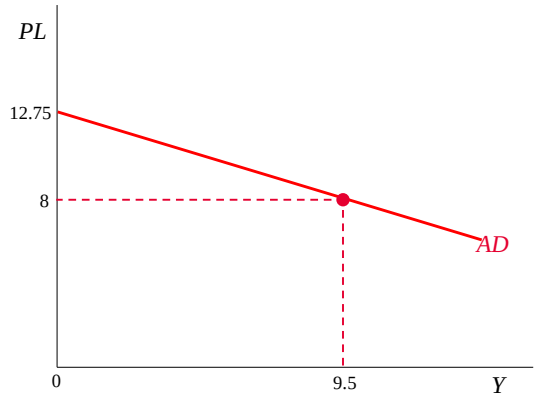


Aggregate Demand

Snarrian Aggregate Demand

- **Example:** What happens if taxes are lowered by $0.5 trillion instead?

$$PL = [5 + 7 - 2 \ - 0.75 \cdot 3 \ + 1 + 3.5 + 0.5] - \{0.25 + 0.25\} \cdot Y$$



Aggregate Demand

Snarrian Aggregate Demand

$$PL = [W + Y_e - r \ - mpc \cdot T + I + G + X\ ] - \{\ mps + mpm\ \} \cdot Y$$

- The Congress and President are in charge of fiscal policy.
  - Expansionary fiscal policy involves
  - Restrictive fiscal policy involves

- The Federal Reserve (our central bank) is in charge of monetary policy
  - Expansionary monetary policy involves
  - Restrictive monetary policy involves

Long Run Aggregate Supply

The Economy's Production Function

- **Example:** Suppose the economy's production function shows the volume of output that can be produced by its labor force of size L given levels of K units of capital, R units of resources and Z percent of the knowledge/talent that is contained in the universe.

  Suppose resources, capital, & technology/talent are currently at $R = 0.4$ (trillion dollars of land, oil, coal, natural gas…), $K = 2.5$ (trillion dollars of machines, roads, networks…) and $z = 1$ (percent of all knowledge in the universe is known on Earth).

  1. What is the economy's short-run production function?

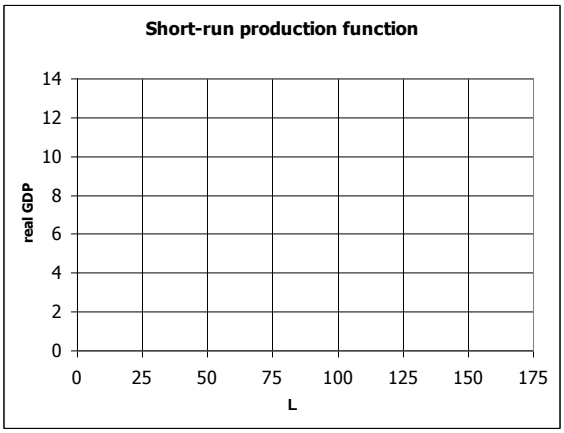
Long Run Aggregate Supply

The Economy's Production Function

- **Example *(continued)*:**
  2. Graph the economy's short-run production function.

$$Y = \sqrt{L}$$

L	Y
0	
50	
100	
150	



Long Run Aggregate Supply

The Economy's Production Function

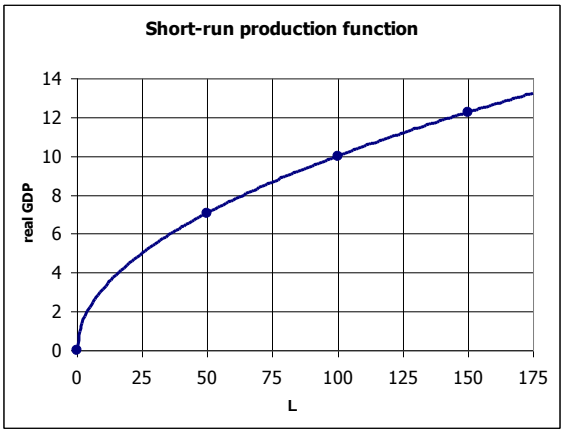
- **Example *(continued)*:**
  3. Suppose there are 9 million workers that are frictionally or structurally unemployed, and 135 million of the 144 million in the labor force are employed. Compute u, u_n, u_c, real GDP, and Y_p.

$$u_n = \frac{U_n}{L}$$

$$u = \frac{L - E}{L}$$

$$u_c = u - u_n$$

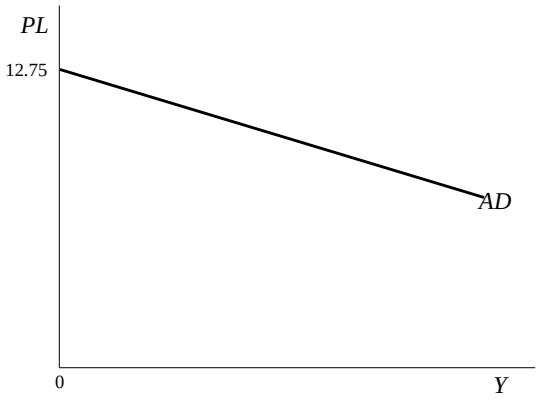
$$Y = \sqrt{E + U_n}$$



Long Run Aggregate Supply

The Economy's Production Function

- **Example *(continued)*:**
  4. Graph LRAS with AD.



Long Run Aggregate Supply

The Economy's Production Function

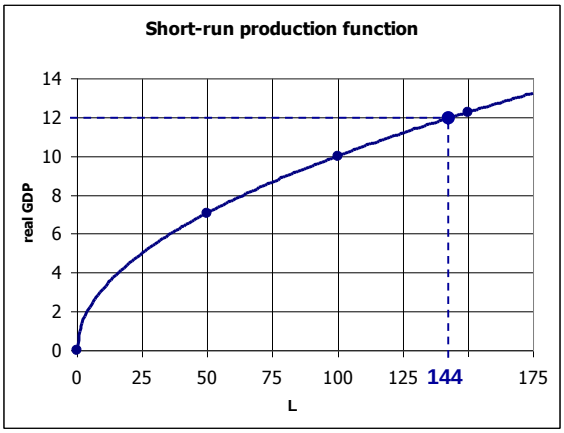
- **Example *(continued)*:**
  5. Suppose there are 9 million workers that are frictionally or structurally unemployed, and 112 million of the 144 million in the labor force are employed. Compute u, u_n, u_c, real GDP, and Y_p.

$$u_n = \frac{U_n}{L}$$

$$u = \frac{L - E}{L}$$

$$u_c = u - u_n$$

$$Y = \sqrt{E + U_n}$$



Long Run Aggregate Supply

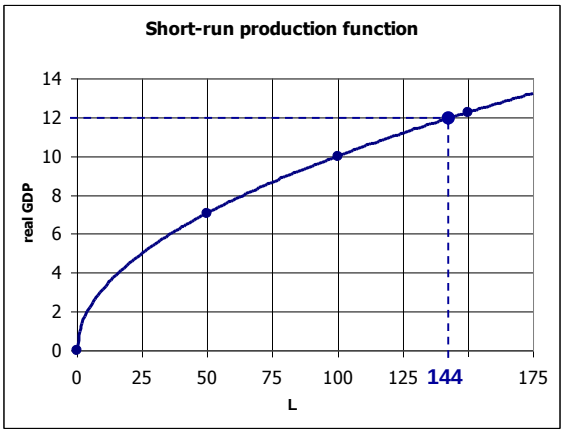
The Economy's Production Function

- **Example *(continued)*:**
  6. Suppose there are 9 million workers that are frictionally or structurally unemployed, and 135 million of the 144 million in the labor force are employed, with 50 million of them working 60 hours per week. Compute u, u_n, u_c, real GDP, and Y_p.

$$u_n = \frac{U_n}{L}$$

$$u = \frac{L - E}{L}$$

$$u_c = u - u_n$$

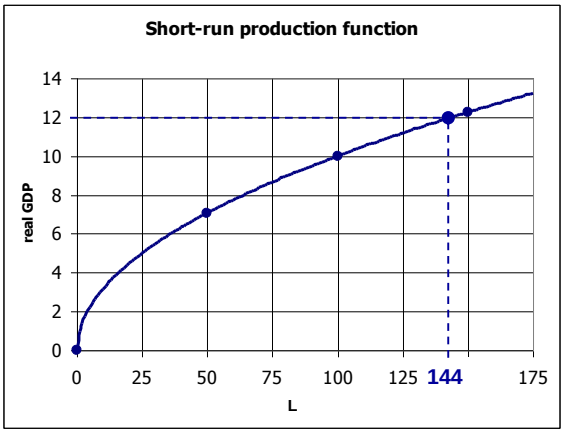


Long Run Aggregate Supply

The Economy's Production Function

- **Example *(continued)*:**
  7. Suppose technology rises to 1.1 percent. Re-graph the economy's production function, and re-compute full-employment output.

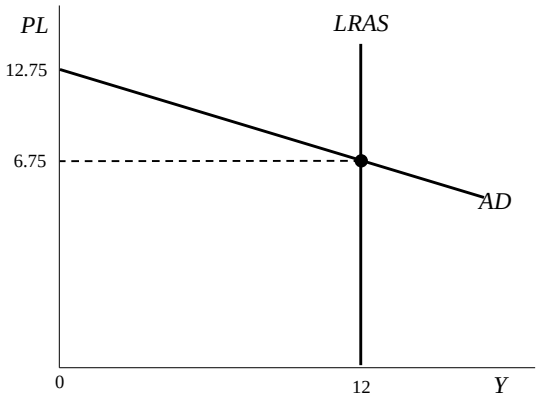
$$Y = \mathbf{1.1}\sqrt{0.4 \cdot 2.5 \cdot L}$$



Long Run Aggregate Supply

The Economy's Production Function

- **Example *(continued)*:**
  8. Graph the initial LRAS with AD and



Short Run Aggregate Supply

SRAS is the relationship between the quantity of real GDP supplied and *PL* when all other influences on production plans remain the same

- As $Y - Y_p$ gets increasingly positive,
  - $u - u_n$ gets increasingly negative
  - prices generally rise
  - Thus, the output gap is positively related to the price level

$$PL = [B - bY_p] + bY$$

- For simulation purposes, let *B* be the sum of the following
  - *w* be the money **wage** rate
  - *p* be the money **prices of other resources**
  - *t* be supply-side **taxation** (includes regulations)

Short Run Aggregate Supply

Snarrian SRAS

- **Example:** In addition to $R = 0.4$ (trillion dollars of land…), $K = 2.5$ (trillion dollars of machines…), $Z = 1$ (percent of all knowledge is known to man), $U_n = 9$ (million frictionally or structurally unemployed workers), $E = 135$ (million), and $L = 144$ (million), suppose nominal wages are 2.25 (thousand dollars per month), the nominal price of other production factors is 0.75 (thousand dollars per month), and the supply-side tax rate is 5 (percent).
  1. Graph the potential GDP you computed in part (3) with AD

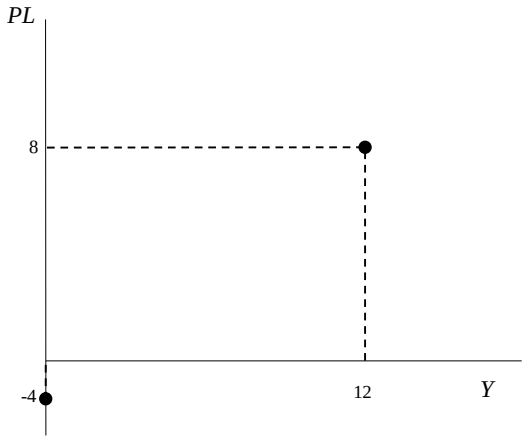
$$Y_p = 12$$

$$PL = [\, w + p + t - bY_p \,] + bY$$

Short Run Aggregate Supply

Snarrian SRAS

- **Example *(continued)*:**
  2. Graph SRAS: $PL = -4 + Y$

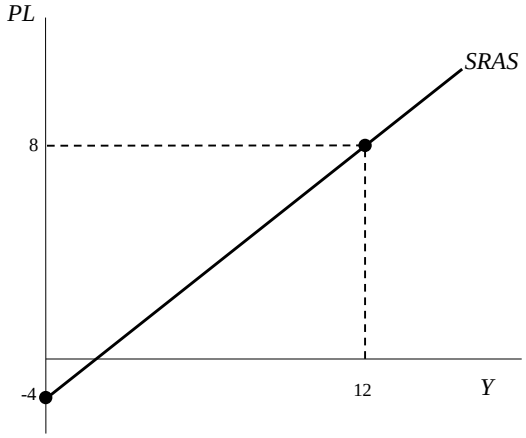


Short Run Aggregate Supply

Snarrian SRAS

- **Example *(continued)*:**
  3. What happens if government cuts supply-side taxes by 1 percentage point?

$$PL = [\ 2.25 + 0.75 + 5 - 12\ ] + Y$$



Short Run Aggregate Supply

Snarrian SRAS

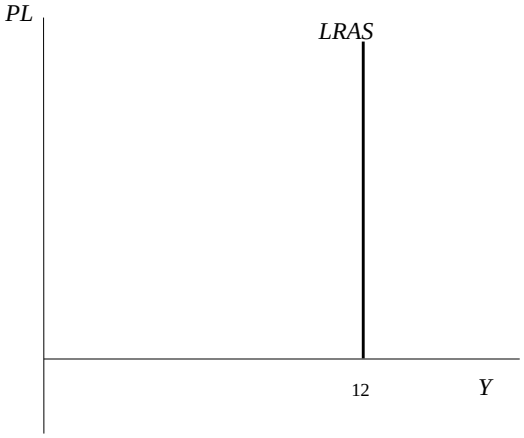
$$PL = [w + p + t - b \cdot Y_p\ ] + b \cdot Y_{AS}$$

- The Congress and President are in charge of **fiscal policy**.
  - Expansionary supply-side fiscal policy involves
  - Restrictive supply-side fiscal policy involves
- The Federal Reserve (our central bank) is in charge of **monetary policy**
  - Expansionary monetary policy lowers
  - Restrictive monetary policy raises

Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  4. Graph LRAS with SRAS: $Y_p = 12$

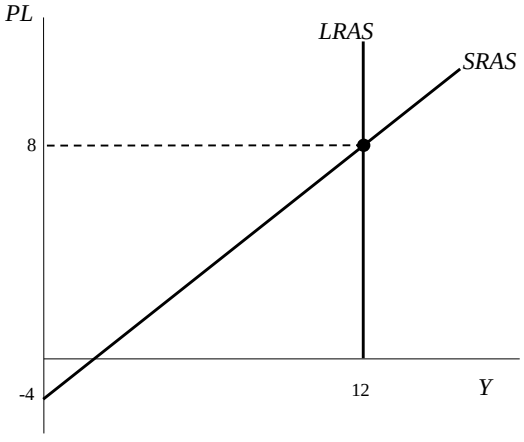


Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  5. Suppose technology/talent increases by 0.1 percentage points. Show the effect of this on LRAS and SRAS.

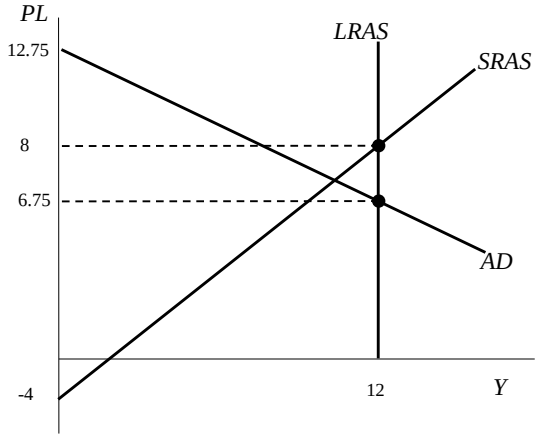
$Y = 1\sqrt{0.4 \cdot 2.5 \cdot L}$



Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  6. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 12.75 - 0.5\,Y$ $PL = -4 + Y$

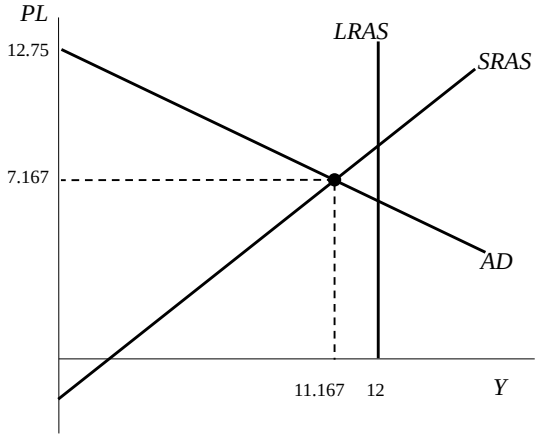


Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  6. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 12.75 - 0.5\,Y$ $PL = -4 + Y$

Recessionary gap



Aggregate Market Model

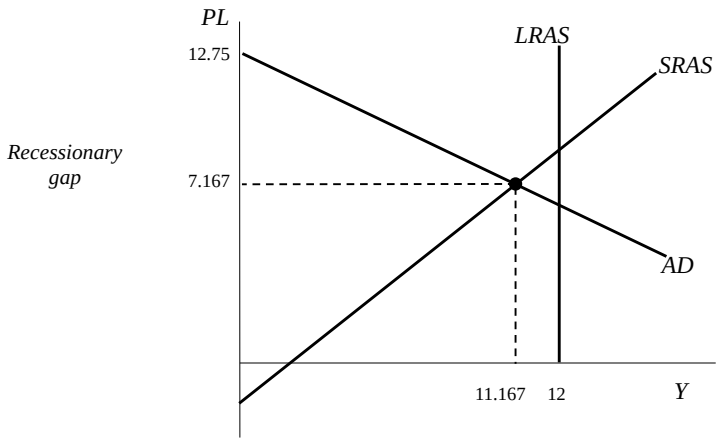
Equilibrium

- **Example *(continued)*:**

6. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 12.75 - 0.5\,Y$ $PL = -4 + Y$

$PL = [5 + 7 - 2 - 0.75 \cdot 3 + 1 + 3.5 + 0.5] - \{0.25 + 0.25\} \cdot Y$

Raising G by \$1.25t, *shifts AD, and closes the recessionary gap.*



Recessionary gap

Aggregate Market Model

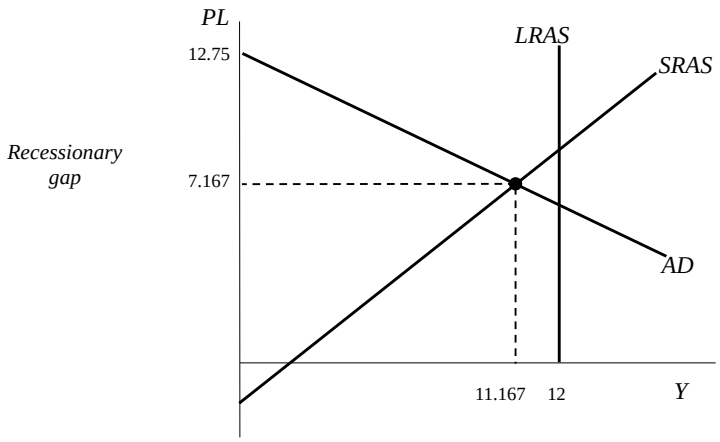
Equilibrium

- **Example *(continued)*:**

6. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 12.75 - 0.5\,Y$ $PL = -4 + Y$

$PL = [5 + 7 - 2 - 0.75 \cdot 3 + 1 + 3.5 + 0.5] - \{0.25 + 0.25\} \cdot Y$

Cutting T by \$1.667t, *shifts AD, and closes the recessionary gap.*

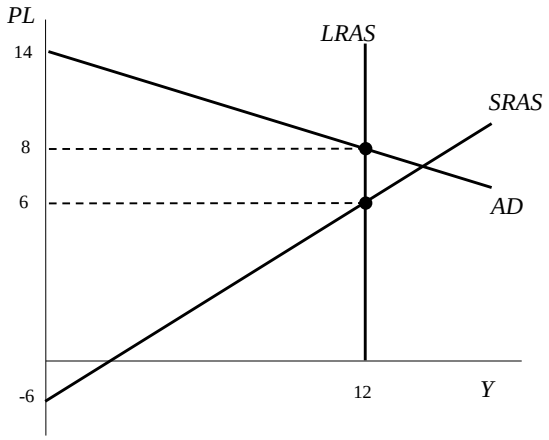


Recessionary gap

Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  7. Graph LRAS, AD & SRAS: $Y_p = 12$

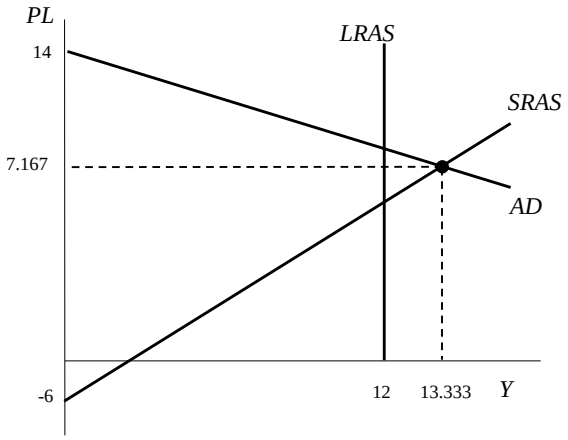


Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  7. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 14 - 0.5\,Y$ $PL = -6 + Y$

Workers work overtime and/or more than one job, and firms compete for scarce labor.



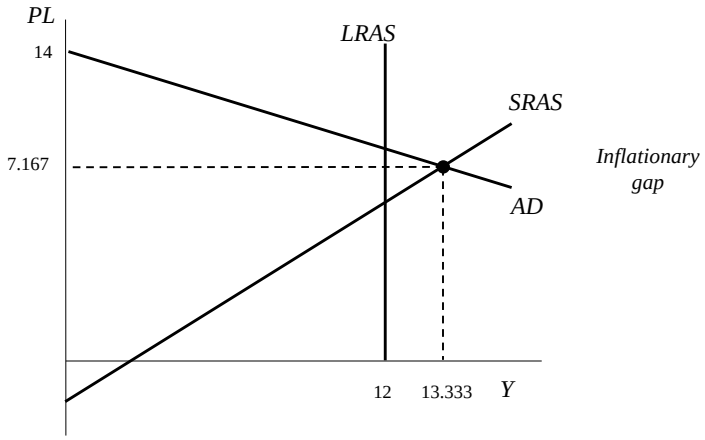
Inflationary gap

Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  7. Graph LRAS, AD & SRAS: $Y_p = 12$ $PL = 14 - 0.5\,Y$ $PL = -6 + Y$

*Over the long run, **laissez faire** permits innovation.*



Aggregate Market Model

Equilibrium

- **Example *(continued)*:**
  8. Graph LRAS, AD & SRAS: $Y_p = 12$

$$PL = [W + Y_e - r - mpc \cdot T + I + G + X] - \{0.25 + 0.25\} \cdot Y$$