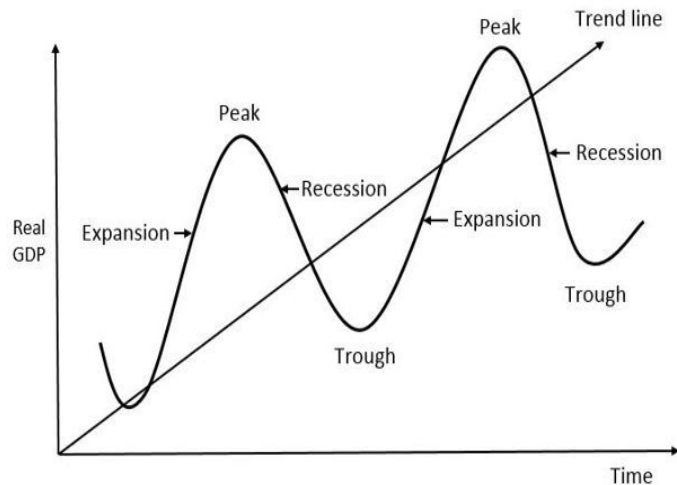# Lecture 6
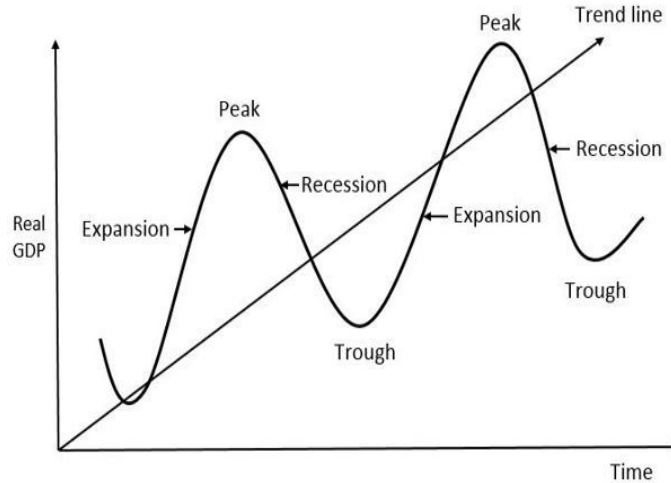# Stabilizing the Economy: Fiscal Policy

2

RECAP

Graph 1

- Short-term economic fluctuation
- Recession
  - Increase in cyclical unemployment
- Expansion
  - Inflation

3

RECAP

Graph 1

- **Managing** short-term economic fluctuation
- Use of macroeconomic policies to
  - Reduce duration and severity of recession; *expansionary policy*
  - Reduce inflation; *contractionary policy*
- **Fiscal** policy
- **Monetary** policy

Fiscal policy

- Policy tools: Government spending (G) and Government revenue (T)
- Recession: ↑G, ↓T
- Inflation:↓G, ↑T
- But
  - How does ↑G (or ↓T) increase GDP?
  - If we were to ↑G or ↓T by $1, how much would the increase in GDP be?
  - **Need a model to understand the relationship**
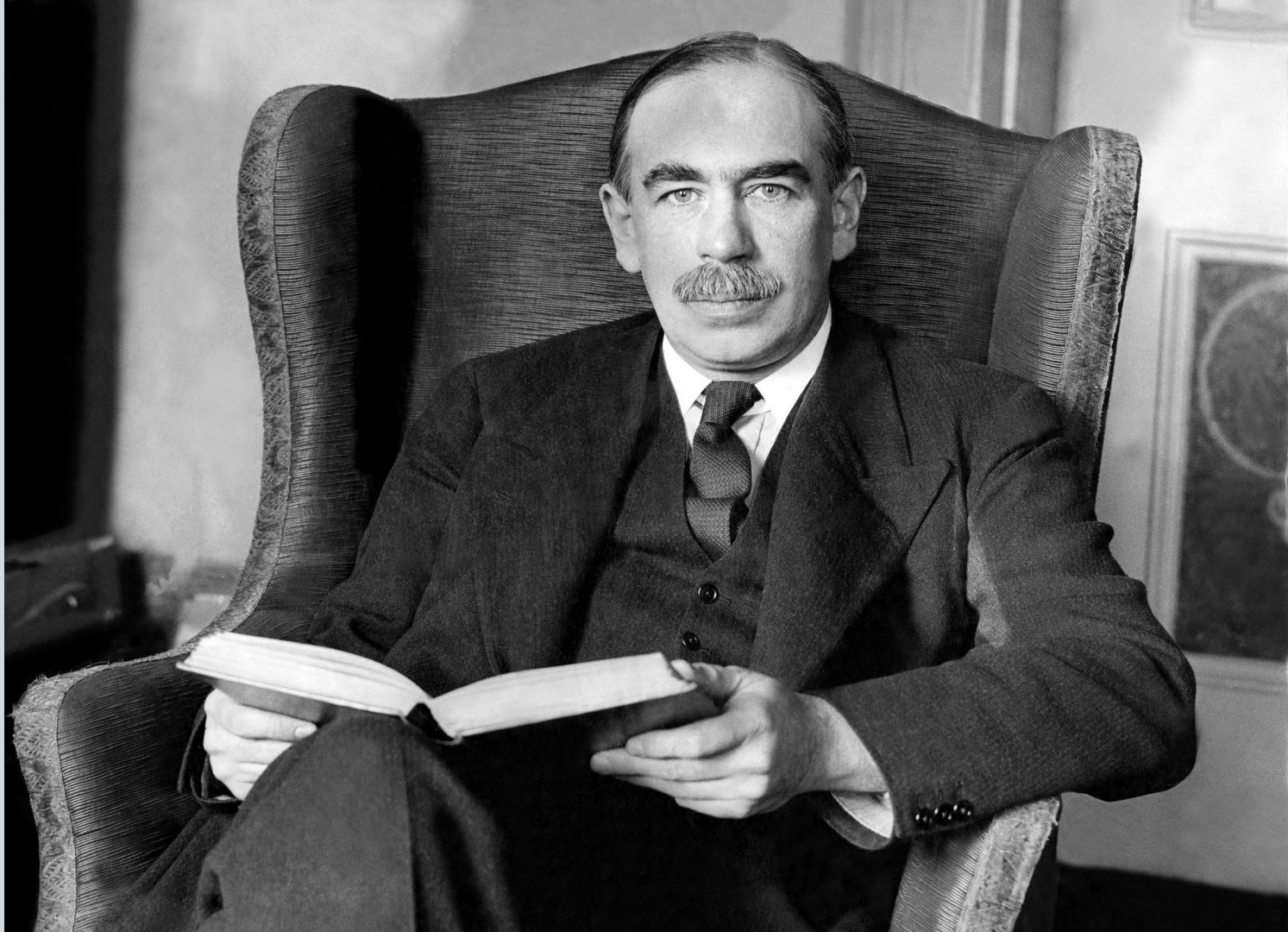
5

Lecture Outline

- Keynesian Model
- Potential Output and Output Gaps
- Multipliers
- Fiscal Policy

Keynesian Model

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John Maynard Keynes

Keynesian Model

- It is a **short run** model
  - *Short run*: a period in which wages/prices do not respond to changes in economic conditions
  - *Long run*: a period in which wages and prices are flexible
- Key assumptions
  - No change in prices
    - *Menu costs*: cost of changing prices
  - **Firms meet the demand for their products at preset prices**
- Aka "Expenditure-output Model"

Keynesian Model

- In the simple Keynesian model, output is determined by the amount people want to spend – what we refer to as *planned* **aggregate expenditure**

- Aka "(Planned) Aggregate Expenditure Model"

- PAE is total planned spending on final goods and services

- Recall from Lecture 2, 4 categories of expenditure: *C + I + G + NX*

Planned vs Actual Spending

▸ Could *planned* spending differ from *actual* spending?
  ▹ **Yes**

▸

C	G	NX	I
Assume: actual spending = planned spending			I may not equal I^p

  ▹ A firm can sell either less or more of its product than expected
  ▹ Stocks of goods sitting in a firm's warehouse are **inventory investment** by firm

Planned vs Actual Spending

▸ Suppose a firm's actual sales are **less than** expected

    ▹ Part of what it had planned to sell remains in the warehouse

    ▹ The firm's actual investment (including the unexpected increases in its inventory investment) is greater than planned investment

    ▹ $I > I^p$

Planned vs Actual Spending

▸ Suppose a firm's actual sales are **more than** expected

  ▹ The firm will add less to its inventory than it planned

  ▹ The firm's actual investment (including the unexpected decrease in its inventory investment) is less than planned investment

  ▹ $I < I^p$

Planned vs Actual Spending

▶ Firms cannot control how much they sell → unplanned inventory investment → actual **I** may differ from planned **I**

▶ Actual spending = planned spending + unplanned inventory investment

Four Components of Planned Aggregate Expenditure

▶ The general equation for planned aggregate expenditures is

$$PAE = C + I^P + G + NX$$

PAE	Planned Aggregate Expenditure
C	Consumption Expenditure
I^P	Planned Investment Expenditure
G	Government Spending
NX	Net Exports

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Consumption Expenditure

▶ What do you think is the most important determinant of consumption?

▷ Preference? Income?

▶ **Income**

▶ Relationship between **consumption** and **income** is given by the **consumption function**

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U.S. Consumption, 1960-2019

Consumption Function
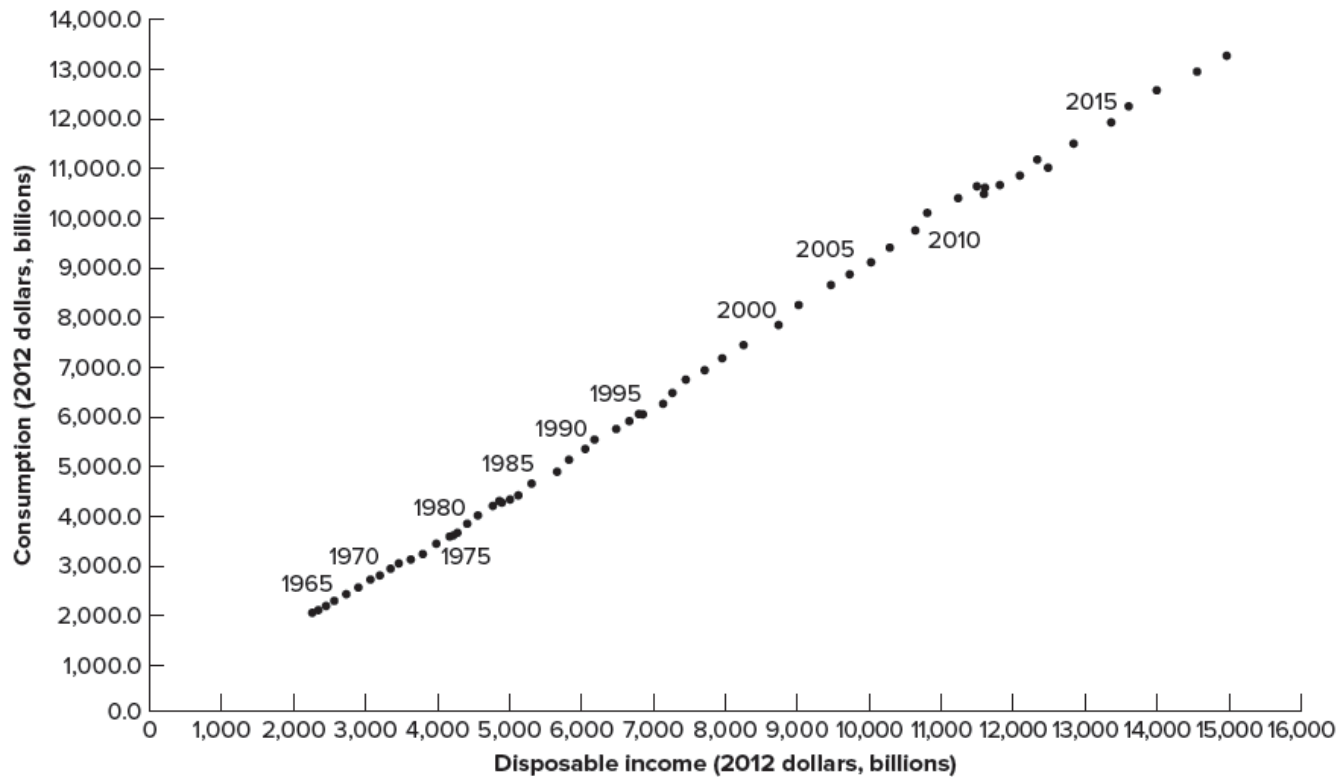
▶ **Consumption function** can be written as

$$C = \overline{C} + (mpc)Y_d$$

C	Consumption expenditure
$\overline{C}$	Autonomous consumption
mpc	Marginal propensity to consume
Y_d	Disposable income, i.e., income after tax ($Y - T$)

What is a function?

- A function is a mathematical expression that defines a relationship between two (or more) variables

- Example of a function:
  - Variable 1, *M*: marks for final exam
  - Variable 2, *T*: time (in hours) spent revising for final exam
  - *M* = *f*(*T*)
  - Assuming a linear function:
    M = *a* + *bT,* where *a* and *b* are constant, and *a* ≥ 0, *b* > 0
  - Say, *M* = 20 + 5*T*
  - 20? Marks you get even when you do not do any revision
  - 5? For every additional hour you spend on revision, you will get 5 more marks
    - $\frac{\Delta M}{\Delta T} = 5$
  - If you spend 2 hours revising, *T* = 2, and you get a total of 30 marks
  - If you spend 10 hours revising, *T* = 10, and you get a total of 70 marks

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Consumption Function

$$C = \overline{C} + (mpc)Y_d$$

Intercept   slope

C

Consumption spending (C)

$\overline{C}$

ΔC

ΔY_d

slope = $\frac{\Delta C}{\Delta Y_d}$

Disposable income (Y_d)

Consumption Function
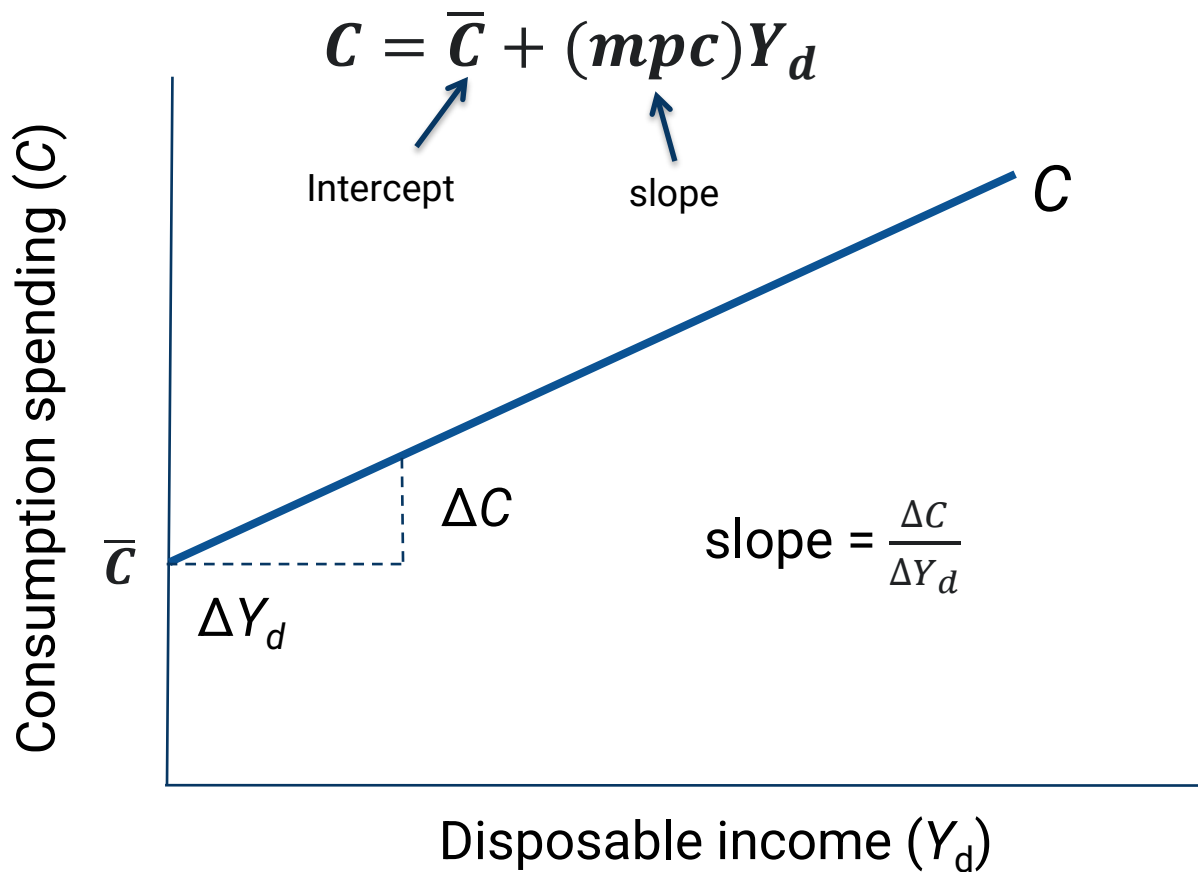
$$C = \overline{C} + (mpc)Y_d$$

▶ **Autonomous consumption**, $\overline{C}$, is spending not related to the level of disposable income

$$Y_d = 0 \text{ and } C = \overline{C}$$

▶ $\overline{C}$ is affected by
  ▹ Consumers' optimism
  ▹ Prices of assets such as property and stocks; wealth effect
  ▹ Interest rates

▶ A change in $\overline{C}$ shifts the consumption function

Consumption Function

$$C = \overline{C} + (mpc)Y_d$$

▶ *mpc*, **marginal propensity to consume,** is the increase in consumption when disposable income rises by $1

▶ $mpc = \dfrac{\Delta C}{\Delta Y_d}$

▶ 0 < *mpc* < 1

▶ If people receive an extra $1 in income, they consume part of the dollar (*mpc*) and save the rest (*mps*)

▶ A change in *mpc* changes the slope of the consumption function

Planned Aggregate Expenditure

▶ $PAE = C + I^P + G + NX$

▶ $C = \bar{C} + mpc\,(Y - T)$

▶ $PAE = \bar{C} + mpc\,(Y - T) + I^P + G + NX$

$= \bar{C} + I^P + G + NX - mpc\,T + mpc\,Y$

Part of PAE not dependent on output, **autonomous expenditure**

Part of PAE dependent on output, **induced expenditure**

▶ $PAE = A + mpc\,Y$

Planned Aggregate Expenditure, numerical example

▶ $PAE = \bar{C} + mpc(Y - T) + I^P + G + NX$

▶ Suppose:

$\bar{C}$ = 620	mpc = 0.8	T = 250
I^P = 220	G = 300	NX = 20

▶ $PAE = 620 + 0.8(Y - 250) + 220 + 330 + 20$

▶ **$PAE = 960 + 0.8Y$**
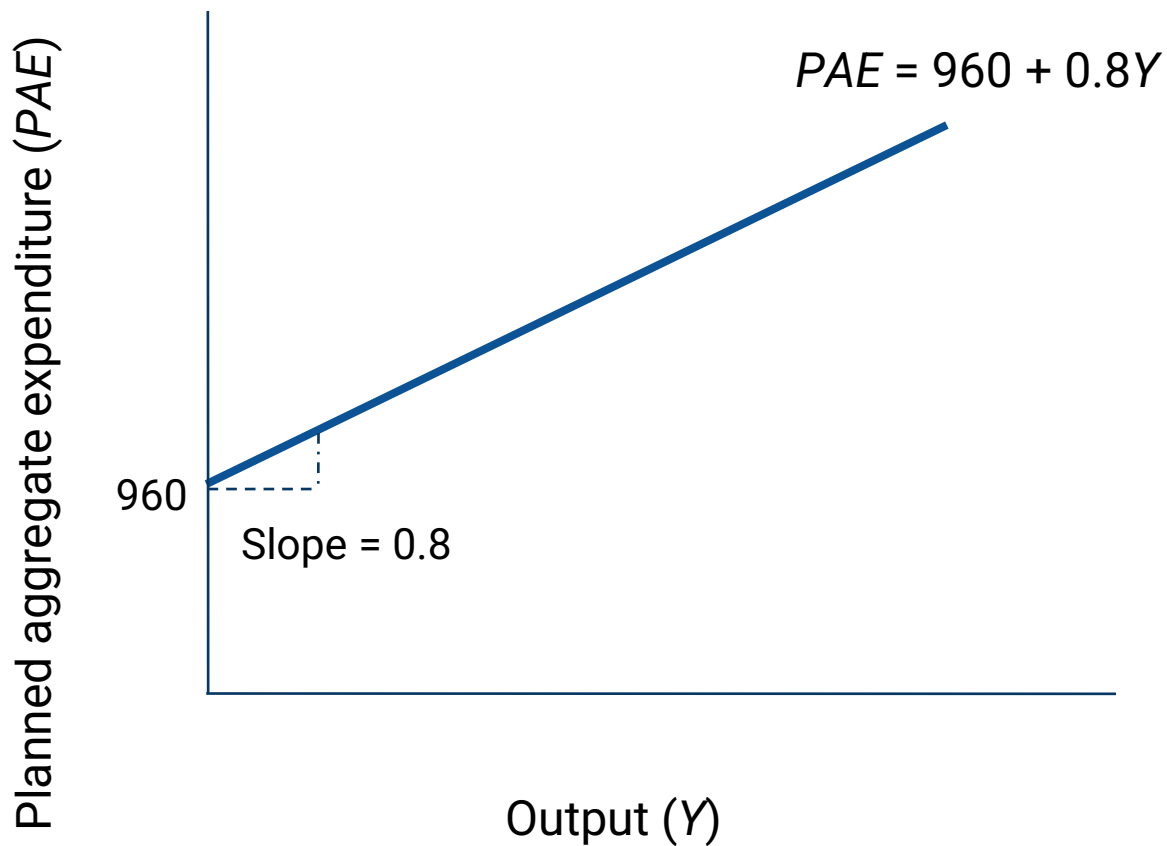
Autonomous expenditure

Induced expenditure, where 0.8 = mpc

▶ If Y increases by $1
  ▹ C increases by $0.80
  ▹ PAE increases by $0.80

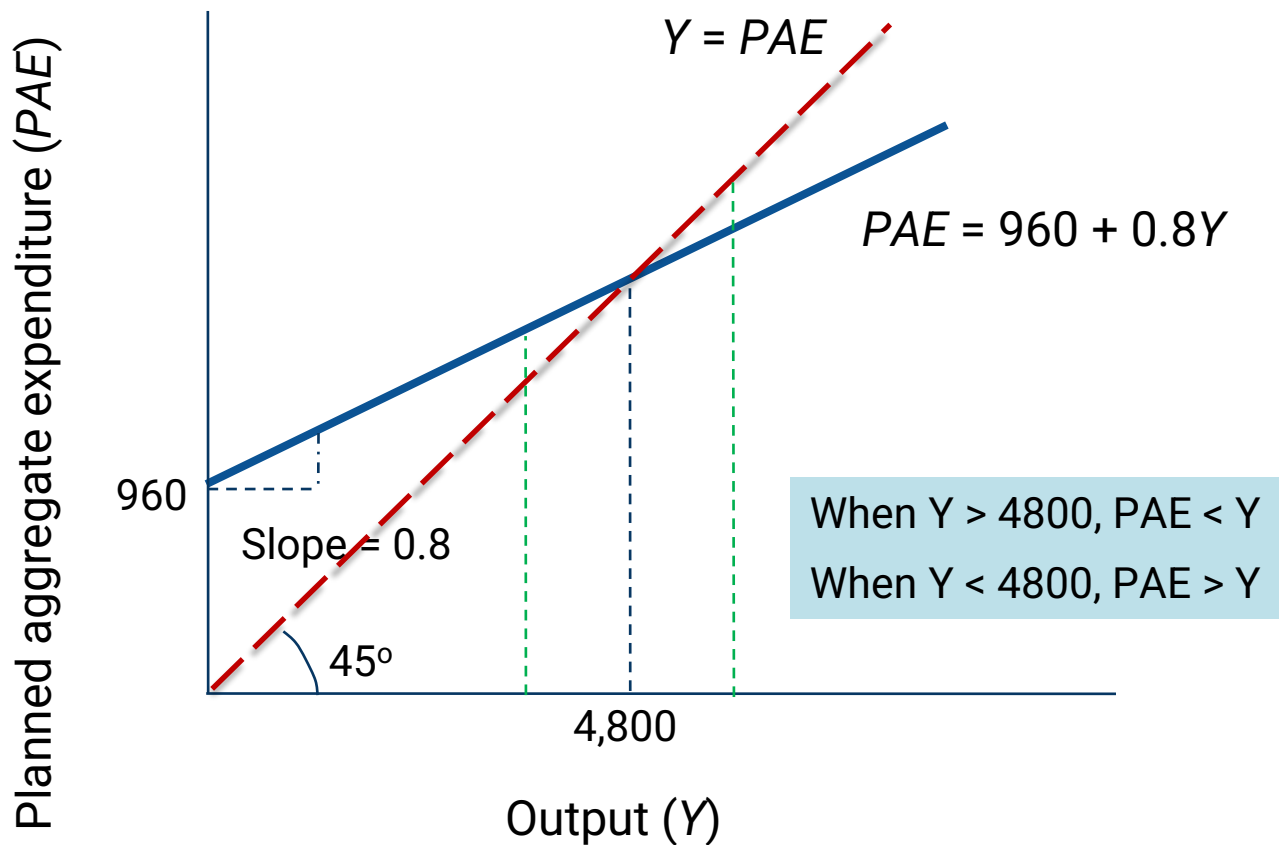**Planned Aggregate Expenditure in a graph**

$PAE = 960 + 0.8Y$

Planned aggregate expenditure (PAE)
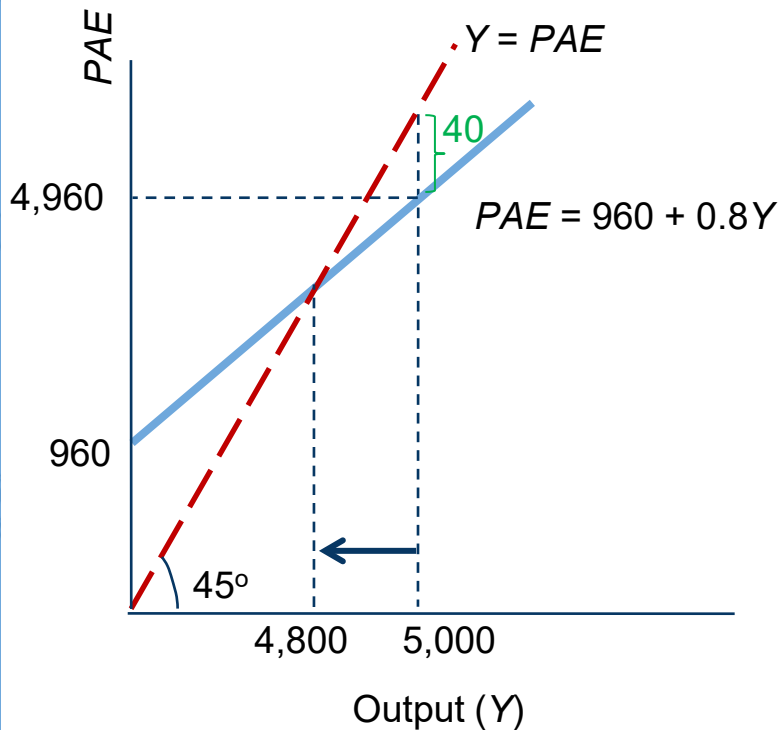
960

Slope = 0.8

Output (Y)

Short-Run Equilibrium

- **Short-run equilibrium** is the level of output at which planned spending is equal to output
  - Equilibrium: balance, stable
- Short-run equilibrium condition:

  $Y = PAE$

- Finding SR equilibrium using PAE equation:

  $PAE = 960 + 0.8Y$

  At SR equilibrium: $Y = PAE$

  $Y = 960 + 0.8Y$

  $0.2Y = 960$

  $Y = 4,800$

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Finding Short-Run Equilibrium using Graphical Approach

Planned aggregate expenditure (*PAE*)

$Y = PAE$

$PAE = 960 + 0.8Y$

960

Slope = 0.8

45°

4,800

Output (*Y*)

When Y > 4800, PAE < Y

When Y < 4800, PAE > Y

# Adjustment Mechanism of the Keynesian Model – Inventory Investment

- Suppose actual output > eq^m output
- E.g. Y = 5,000
- PAE = 4,960 < actual output
- Increase in unsold goods
- Unplanned increase in inventory investment
- Firms reduce production (in the next period) to take into account unplanned increase in inventory investment

In the figure:

$Y = PAE$

$PAE = 960 + 0.8Y$

40

4,960

960

45°

4,800   5,000

Output (Y)

PAE

Adjustment Mechanism of the Keynesian Model – Inventory Investment
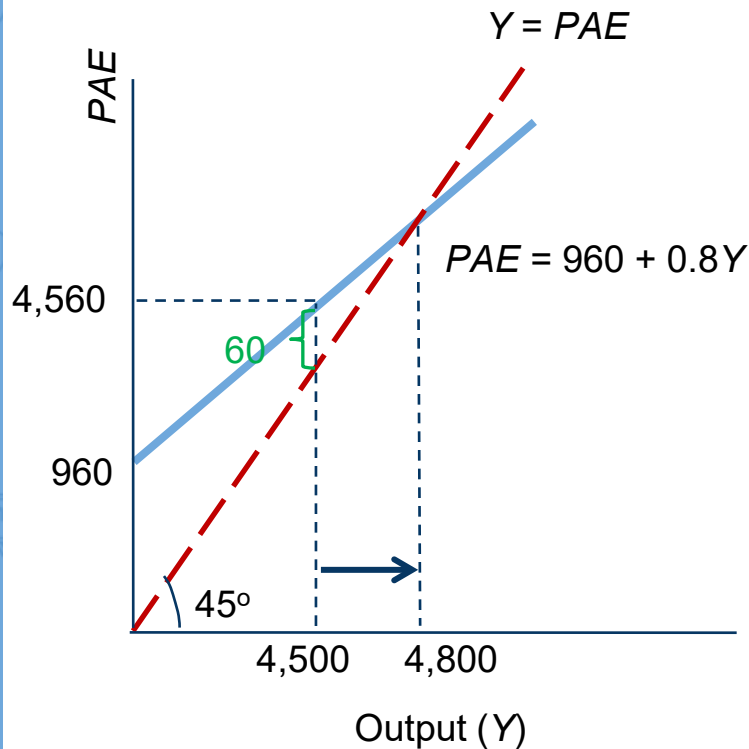
- Suppose actual output < eq^m output

- E.g. Y = 4,500

- PAE = 4,560 > actual output

- Depletion of goods in the warehouses

- Unplanned decrease in inventory investment

- Firms increase production (in the next period) to take into account unplanned decrease in inventory investment

Figure labels: $Y = PAE$; $PAE = 960 + 0.8Y$; PAE; 4,560; 960; 60; 45°; Output (Y); 4,500; 4,800

Potential Output and Output Gaps

Potential Output

- **Potential output**, *Y**, is the maximum sustainable amount of output that an economy can produce
  - ▷ Also called full-employment output
  - ▷ Utilisation of resources such as capital and labour at normal rates
- Potential output grows over time
  - ▷ Increase in amounts of available capital and labour and their productivity
- Actual output grows at a variable rate
  1. Reflects growth rate of potential output
  2. Actual output does not always equal potential output
     - ■ Under- or over-utilisation of resources

Output Gap

▶ The **output gap** is the difference between the economy's actual output and its potential output, relative to potential output, at a point in time

$$\text{Output gap (in percent)} = \frac{Y - Y^*}{Y^*} \times 100$$
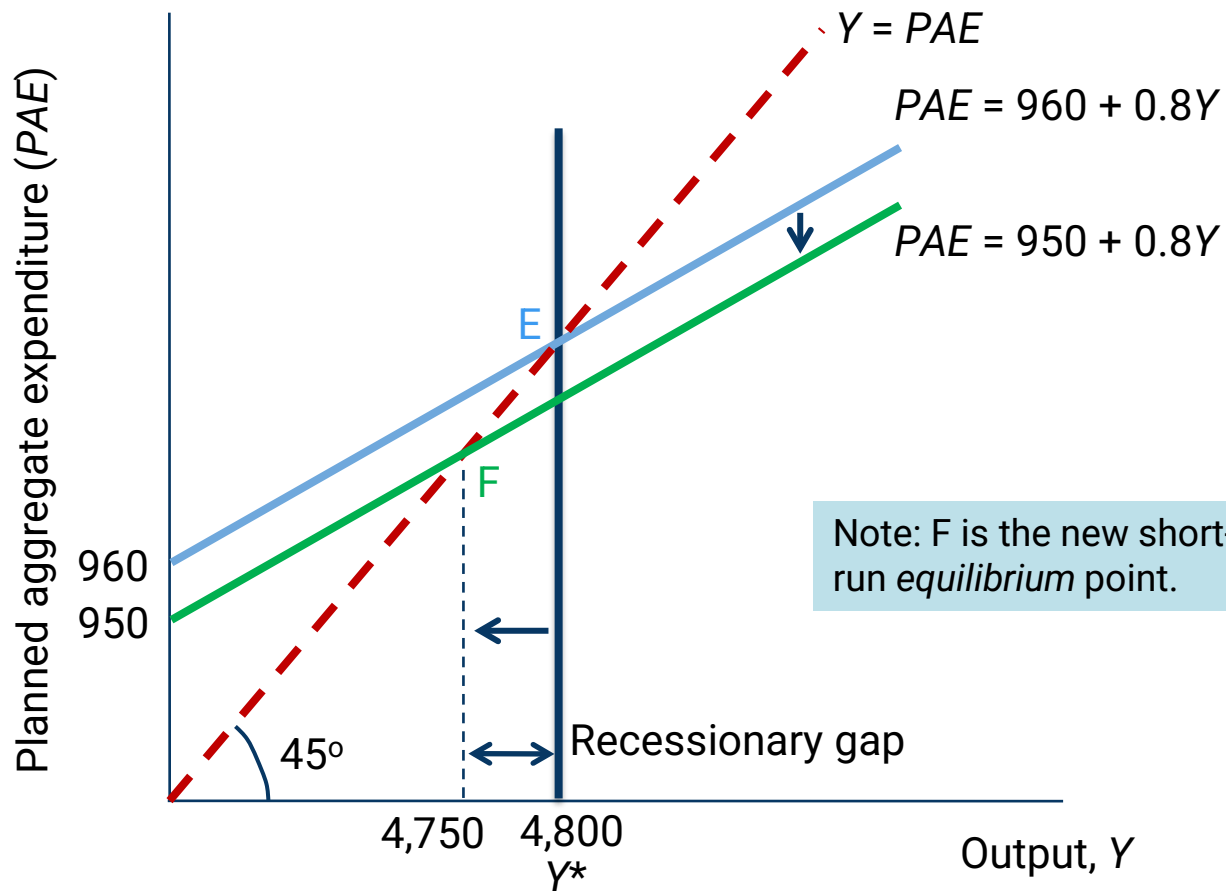
▷ **Recessionary gap** is a negative output gap; Y* > Y

▷ **Expansionary gap** is a positive output gap; Y* < Y

- $PAE = 960 + 0.8Y$
- Autonomous consumption, $\bar{C}$, decreases by 10
  - $PAE = 950 + 0.8Y$
  - PAE curve shifts downward
  - The economy adjusts to a new lower level of equilibrium spending and output, 4,750
- Suppose that the original equilibrium level, 4,800, represented potential output, $Y*$
  - A recessionary gap develops
  - Size of the recessionary gap is 4,800 − 4,750 = 50
- **Same process applies to a decrease in I^P, G, or NX**

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Example: A Fall in Planned Spending Leads to a Recessionary Gap

Planned aggregate expenditure (*PAE*)

$Y = PAE$

$PAE = 960 + 0.8Y$

$PAE = 950 + 0.8Y$

E

F

960

950

45°

Recessionary gap

4,750   4,800
Y*

Output, *Y*

Note: F is the new short-run *equilibrium* point.

- Unemployment rates increase when there are recessionary gaps

- Frictional, structural and cyclical unemployment

- The **natural rate of unemployment**, *u**, is the sum of frictional and structural unemployment
  - Unemployment rate when cyclical unemployment is 0
  - Occurs when Y is at Y*

- Cyclical unemployment is the difference between total unemployment, u, and u*
  - Recessionary gaps have u > u*
  - Expansionary gaps have u < u*

- **Okun's law** relates cyclical unemployment changes to changes in the output gap
  - One percentage point increase in cyclical unemployment means a 2 percent widening of a negative output gap, measured in relation to potential output
  - **Output gap = -2 × (u − u^*)**
  - Suppose the economy begins with 1% cyclical unemployment and a recessionary gap of -2% of potential GDP
    - If cyclical unemployment increases to 2%, the recessionary gap increases to -4% of potential GDP
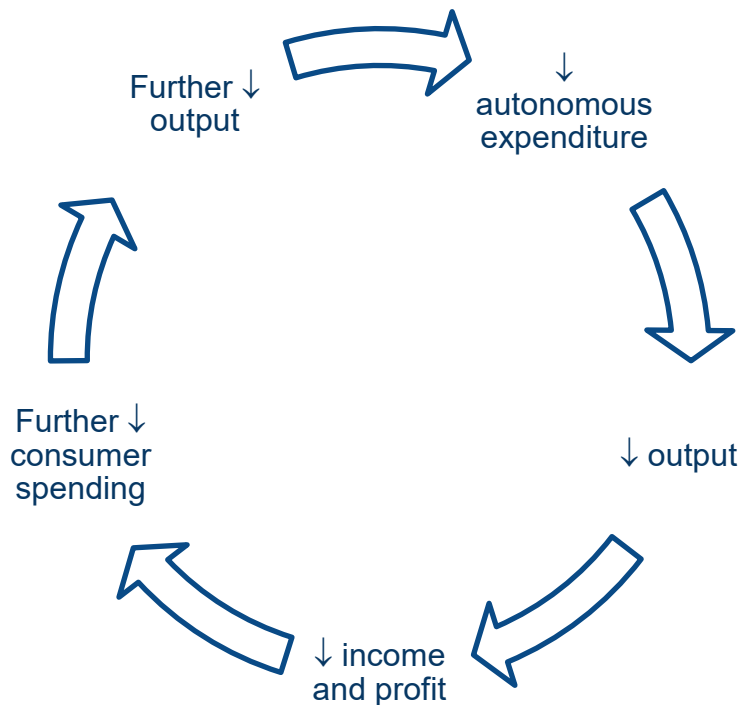
Multipliers

Expenditure Multiplier

- In our earlier example, a fall of autonomous expenditure ($\bar{C}$, I^P, G, or NX) of $10 resulted in a fall of output of $50, a multiple of 5

- The **expenditure multiplier** shows the effect of a one-unit increase in autonomous expenditure on short-run equilibrium output, $\frac{\Delta Y}{\Delta A}$, where A stands for autonomous expenditure

- ▶ Recall PAE function:

  $$PAE = A + mpcY$$

- ▶ In SR equilibrium: $Y = PAE$

  $$Y = A + mpcY$$

  $$Y(1 - mpc) = A$$

  $$Y = \frac{A}{1 - mpc}$$

- ▶ Differentiate the equation wrt A

  $$\frac{\Delta Y}{\Delta A} = \frac{1}{1 - mpc} = \text{expenditure multiplier}$$

- ▶ The larger the mpc, the greater the multiplier

▶ $PAE = 960 + 0.8Y$

▶ Expenditure multiplier

$$= \frac{\Delta Y}{\Delta A} = \frac{1}{1-mpc}$$

$$= \frac{1}{1-0.8} = \frac{1}{0.2} = 5$$
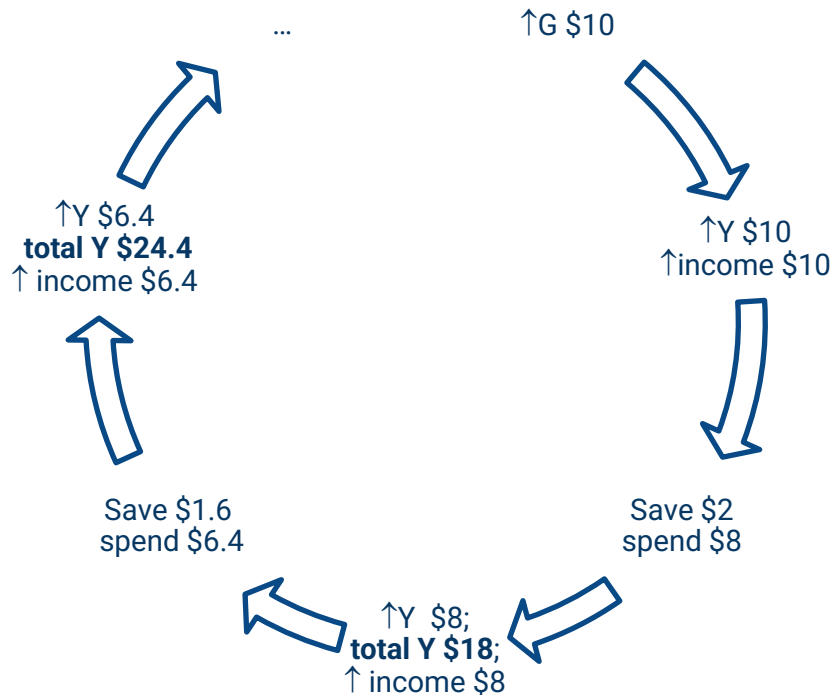
▶ If $mpc = 0.5$, expenditure multiplier

$$= \frac{\Delta Y}{\Delta A} = \frac{1}{1-mpc}$$

$$= \frac{1}{1-0.5} = \frac{1}{0.5} = 2$$

Why did a $10 increase in G result in a $50 increase in output?

▶ Virtuous cycle of increased expenditure

...

↑G $10

↑Y $10
↑income $10

Save $2
spend $8

↑Y $8;
total Y $18;
↑ income $8

Save $1.6
spend $6.4

↑Y $6.4
total Y $24.4
↑ income $6.4

Deriving the Tax Multiplier

▶ $$PAE = \bar{C} + (mpc)(Y - T) + I^P + G + NX$$

$$PAE = \boxed{\bar{C} + I^P + G + NX} - mpcT + mpcY$$

$$PAE = A_1 - mpcT + mpcY$$

▶ In SR equilibrium: $Y = PAE$

$$Y = A_1 - mpcT + mpcY$$

$$Y(1 - mpc) = A_1 - mpcT$$

$$Y = \frac{1}{1-mpc}A_1 - \frac{mpc}{1-mpc}T$$

▶ Differentiate the equation wrt T

$$\frac{\Delta Y}{\Delta T} = \frac{-mpc}{1-mpc} = \text{tax multiplier}$$

▶ Tax multiplier is negatively signed, and is smaller than expenditure multiplier

- *PAE* = 960 + 0.8*Y*
- Expenditure multiplier

$$= \frac{\Delta Y}{\Delta A} = \frac{1}{1-mpc} = \frac{1}{1-0.8} = \frac{1}{0.2} = 5$$

- Tax multiplier

$$= \frac{\Delta Y}{\Delta T} = \frac{-mpc}{1-mpc} = \frac{-0.8}{1-0.8} = \frac{-0.8}{0.2} = -4$$

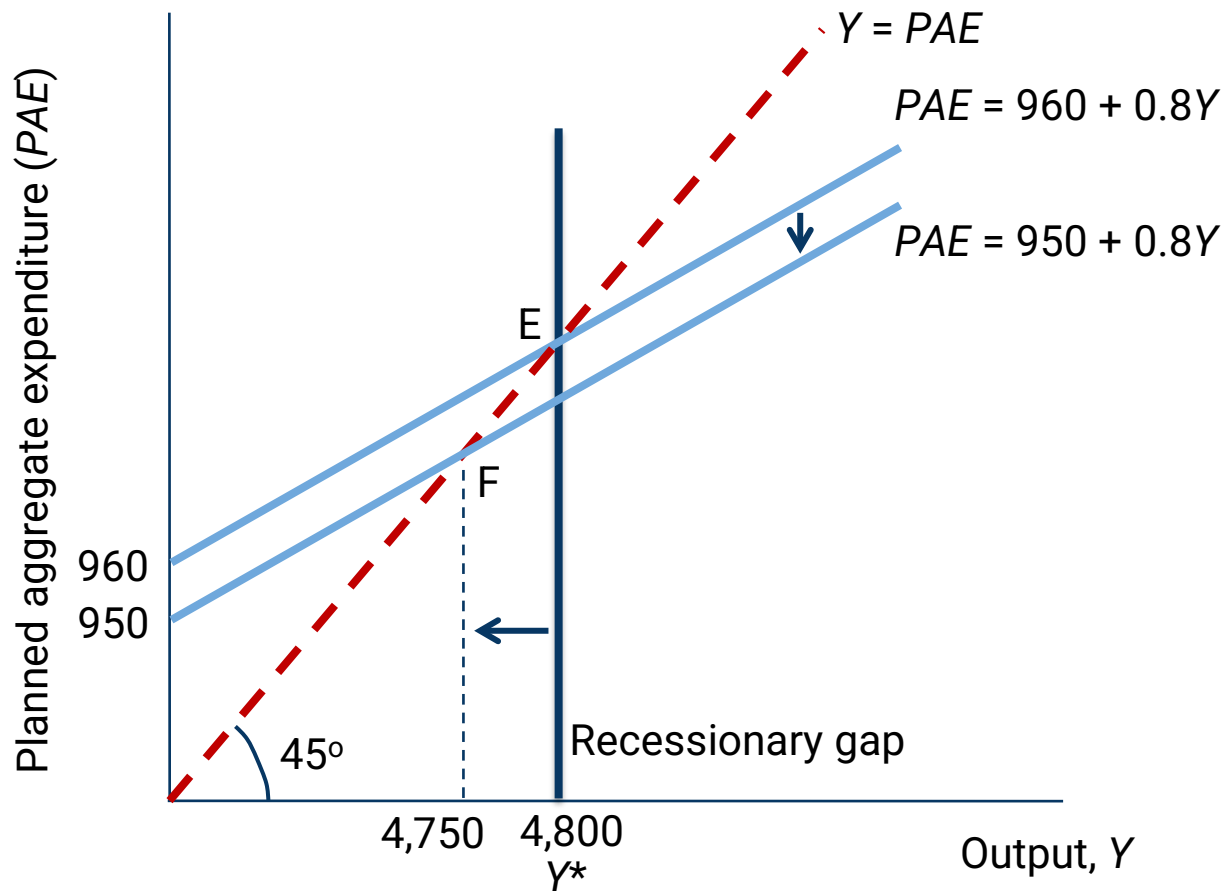# Fiscal Policy

Stabilization Policy

- **Stabilization policies** are government policies that are used to manage short-run economic fluctuations
  - ▷ Recessionary gap: expansionary policies to increase PAE
  - ▷ Expansionary gap: contractionary policies to decrease PAE
- **Fiscal policy** uses changes in
  - ▷ Government spending, *G*
  - ▷ Taxes and/or transfers, *T*
    - Net tax (T) = total taxes − transfer payments − government interest payments

Using our earlier example of an economy with a recessionary gap of $50

Planned aggregate expenditure (*PAE*)

$Y = PAE$

$PAE = 960 + 0.8Y$

$PAE = 950 + 0.8Y$

E

F

960

950

45°

Recessionary gap

4,750   4,800
$Y*$

Output, Y

Govt Spending

- How does an increase in G help to close the output gap?
- Government spending is part of PAE
  - Changes in G will directly affect PAE
  - $1 increase in G increase PAE by $1
- Given the recessionary gap is $50, by how much does government need to increase its spending to restore the economy to Y* at $4,800?
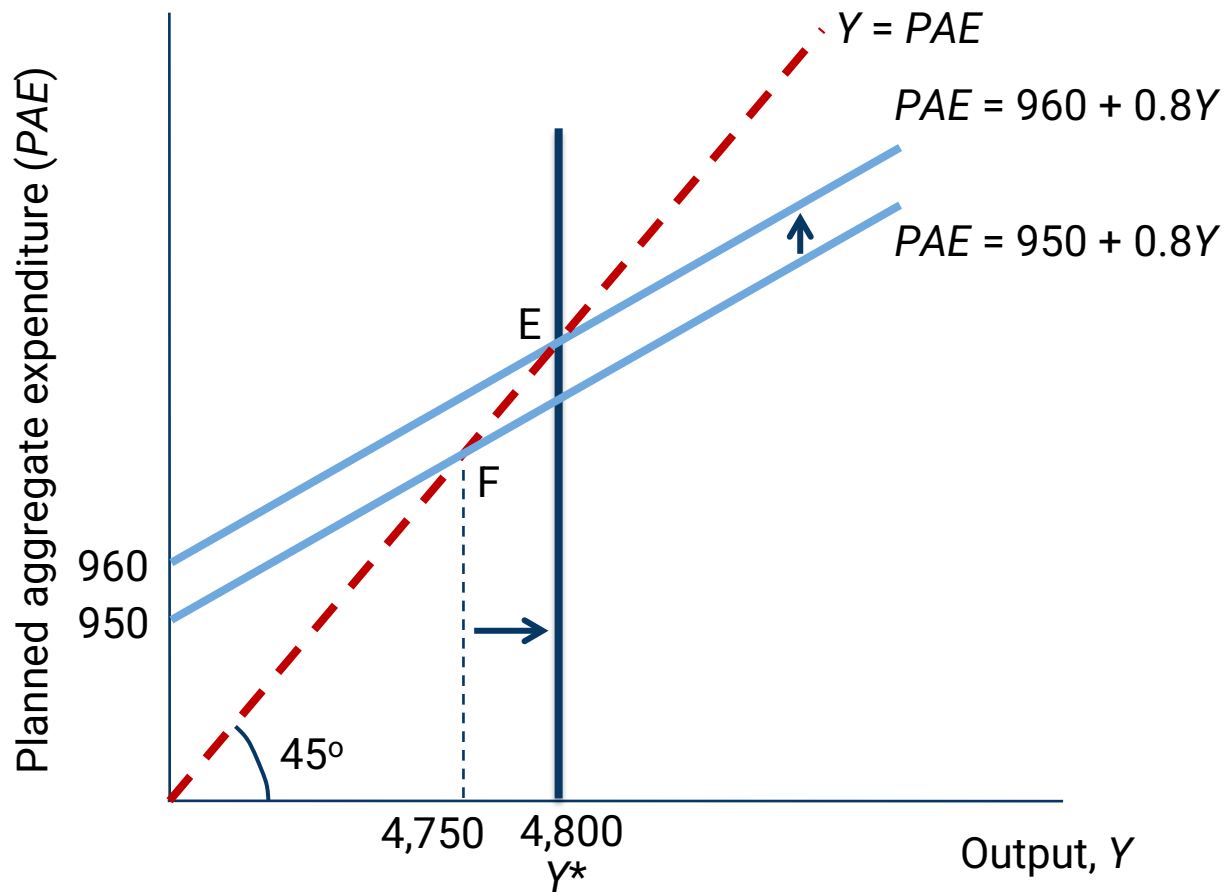- Answer: increase G by $10

- Govt spending multiplier = $\frac{\Delta Y}{\Delta G} = \frac{1}{1-mpc}$

- Given PAE = 950 + 0.8Y; mpc = 0.8

- Govt spending multiplier = $\frac{1}{1-0.8} = \frac{1}{0.2} = 5$

- An increase of G by $1, increase output by $5

- To close an output gap of $50,

$$\Delta G = \frac{\Delta Y}{multiplier} = \frac{50}{5} = 10$$

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$10 Fiscal Stimulus

Net Tax

- ▶ How does a decrease in *T* help to close the output gap?
- ▶ PAE is influenced by changes in taxes and transfers
  - ▷ The effect is indirect, channeled through the effects on disposable income, $(Y - T)$
    - ■ $PAE = \bar{C} + (mpc)(Y - T) + I^P + G + NX$
  - ▷ Lower taxes or higher transfers increase disposable income
  - ▷ Increases in disposable income lead to higher *C*
  - ▷ $1 decrease in *T* increase PAE by less than $1

Net Tax

▶ Given the recessionary gap is $50, by how much does government need to decrease its tax to restore the economy to Y* at $4,800?

▶ Tax multiplier = $\frac{\Delta Y}{\Delta T} = \frac{-mpc}{1-mpc}$

$$= \frac{-0.8}{1-0.8} = \frac{-0.8}{0.2} = -4$$

▶ A **decrease** of *T* by $1, increase output by $4

▶ To close an output gap of $50,

$$\Delta T = \frac{\Delta Y}{tax\ multiplier} = \frac{50}{-4} = -12.5$$

1. Fiscal policy may affect potential output (supply side) as well as potential spending (demand side)

   ▷ Investment in infrastructure increases $Y*$

   ▷ Taxes and transfers affect incentives and can change potential output, $Y*$

Fiscal Policy as a Stabilization Tool

2. Expansionary fiscal policy could lead to large and persistent budget deficits
   ▷ Reduce national saving → less investment which means less growth
   ▷ Managing the impact of the deficit limits the government's ability to use fiscal policy as a stimulus
   ▷ Political considerations make it difficult to use contractionary fiscal policy

3. Fiscal policy may not be flexible enough to be useful for stabilization
   ▷ The legislative process requires time; change in fiscal policy may be slow
   ▷ Competing political objectives
     ■ E.g. need to strengthen national defense and need to contain aggregate expenditure

Fiscal Policy Can Be Effective

- Automatic stabilizers increase government spending or decrease taxes when real output declines
  - Built into laws so no decision is required
  - E.g. unemployment benefits, progressive income tax
- Fiscal policy may be useful to address prolonged periods of recession

THANKS!

Any questions?

You can find me at

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