

Context

- Chapter 9 introduced the model of aggregate demand and aggregate supply.
- Long run
 - prices flexible
 - output determined by factors of production & technology
 - unemployment equals its natural rate
- Short run
 - prices fixed
 - output determined by aggregate demand
 - unemployment is negatively related to output

Context

- This chapter develops the *IS-LM* model, the theory that yields the aggregate demand curve.
- We focus on the short run and assume the price level is fixed.

The Keynesian Cross

- A simple closed economy model in which income is determined by expenditure.
(due to J.M. Keynes)
- Notation:
 - I = planned investment
 - $E = C + I + G$ = planned expenditure
 - Y = real GDP = actual expenditure
- Difference between actual & planned expenditure: unplanned inventory investment

Elements of the Keynesian Cross

consumption function: $C = C(Y - T)$

govt policy variables: $G = \bar{G}, T = \bar{T}$

for now,

investment is exogenous: $I = \bar{I}$

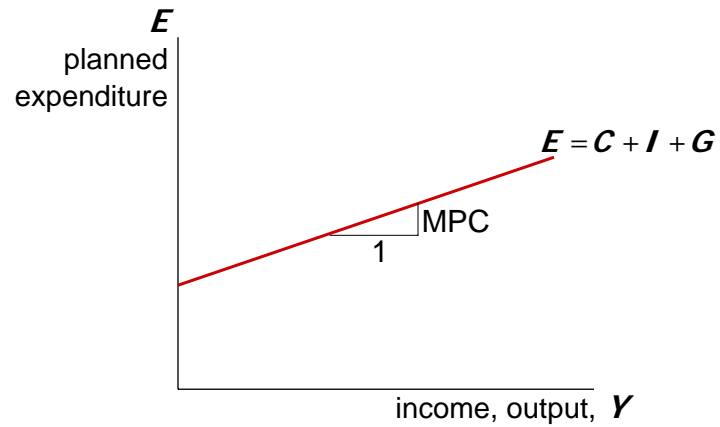
planned expenditure: $E = C(Y - \bar{T}) + \bar{I} + \bar{G}$

Equilibrium condition:

Actual expenditure = Planned expenditure

$$Y = E$$

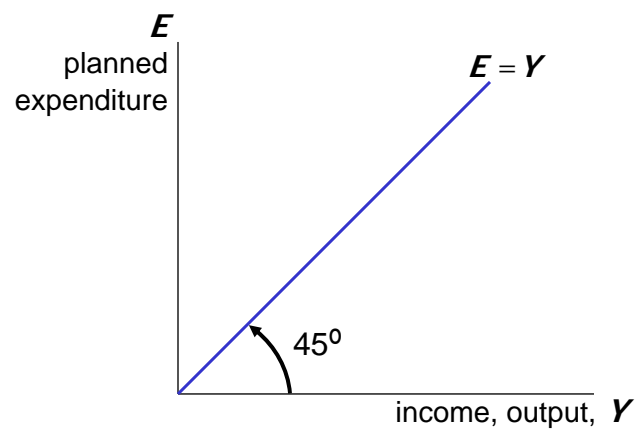
Graphing planned expenditure



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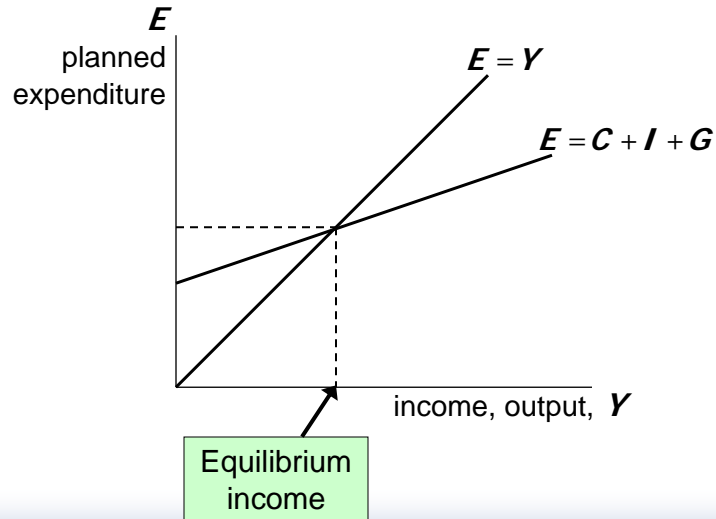
Graphing the equilibrium condition



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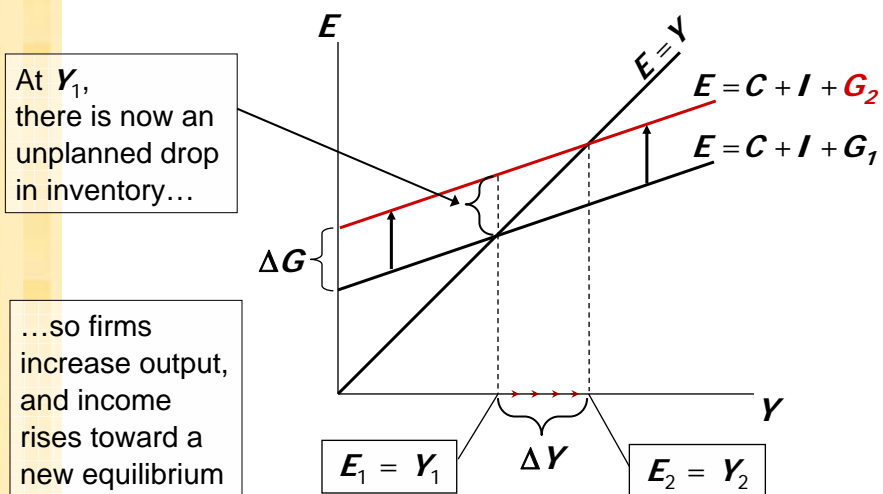
The equilibrium value of income



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An increase in government purchases



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Solving for ΔY

$$Y = C + I + G \quad \text{equilibrium condition}$$

$$\Delta Y = \Delta C + \Delta I + \Delta G \quad \text{in changes}$$

$$= \Delta C + \Delta G \quad \text{because } I \text{ exogenous}$$

$$= MPC \times \Delta Y + \Delta G \quad \text{because } \Delta C = MPC \Delta Y$$

Collect terms with ΔY
on the left side of the
equals sign:

$$(1 - MPC) \times \Delta Y = \Delta G$$

Finally, solve for ΔY :

$$\Delta Y = \left(\frac{1}{1 - MPC} \right) \times \Delta G$$

The government purchases multiplier

Example: $MPC = 0.8$

$$\Delta Y = \frac{1}{1 - MPC} \Delta G$$

$$= \frac{1}{1 - 0.8} \Delta G = \frac{1}{0.2} \Delta G = 5 \Delta G$$

The increase in G causes income to increase
by 5 times as much!

The government purchases multiplier

Definition: the increase in income resulting from a \$1 increase in G .

In this model, the G multiplier equals

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{MPC}}$$

In the example with $\text{MPC} = 0.8$,

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - 0.8} = 5$$

Why the multiplier is greater than 1

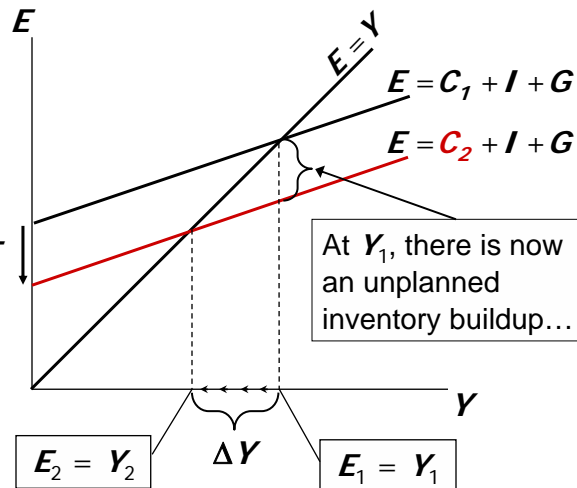
- Initially, the increase in G causes an equal increase in Y : $\Delta Y = \Delta G$.
- But $\uparrow Y \Rightarrow \uparrow C$
 - \Rightarrow further $\uparrow Y$
 - \Rightarrow further $\uparrow C$
 - \Rightarrow further $\uparrow Y$
- So the final impact on income is much bigger than the initial ΔG .

An increase in taxes

Initially, the tax increase reduces consumption, and therefore E :

$$\Delta C = -MPC \Delta T$$

...so firms reduce output, and income falls toward a new equilibrium



At Y_1 , there is now an unplanned inventory buildup...

Solving for ΔY

$$\begin{aligned} \Delta Y &= \Delta C + \Delta I + \Delta G && \text{eq'm condition in changes} \\ &= \Delta C && I \text{ and } G \text{ exogenous} \\ &= MPC \times (\Delta Y - \Delta T) \end{aligned}$$

$$\text{Solving for } \Delta Y: \quad (1 - MPC) \times \Delta Y = -MPC \times \Delta T$$

Final result:

$$\Delta Y = \left(\frac{-MPC}{1 - MPC} \right) \times \Delta T$$

The Tax Multiplier

def: the change in income resulting from a \$1 increase in T :

$$\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - MPC}$$

If $MPC = 0.8$, then the tax multiplier equals

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

The Tax Multiplier

...is *negative*:

An increase in taxes reduces consumer spending, which reduces equilibrium income.

...is *greater than one* (in absolute value):

A change in taxes has a multiplier effect on income.

...is *smaller than the govt spending multiplier*:

Consumers save the fraction $(1-MPC)$ of a tax cut, so the initial boost in spending from a tax cut is smaller than from an equal increase in G .

Exercise:

- Use a graph of the Keynesian Cross to show the impact of an increase in investment on the equilibrium level of income/output.