Monetary Macroeconomics

Lecture 2

Aggregate demand:

Consumption and the Keynesian Cross

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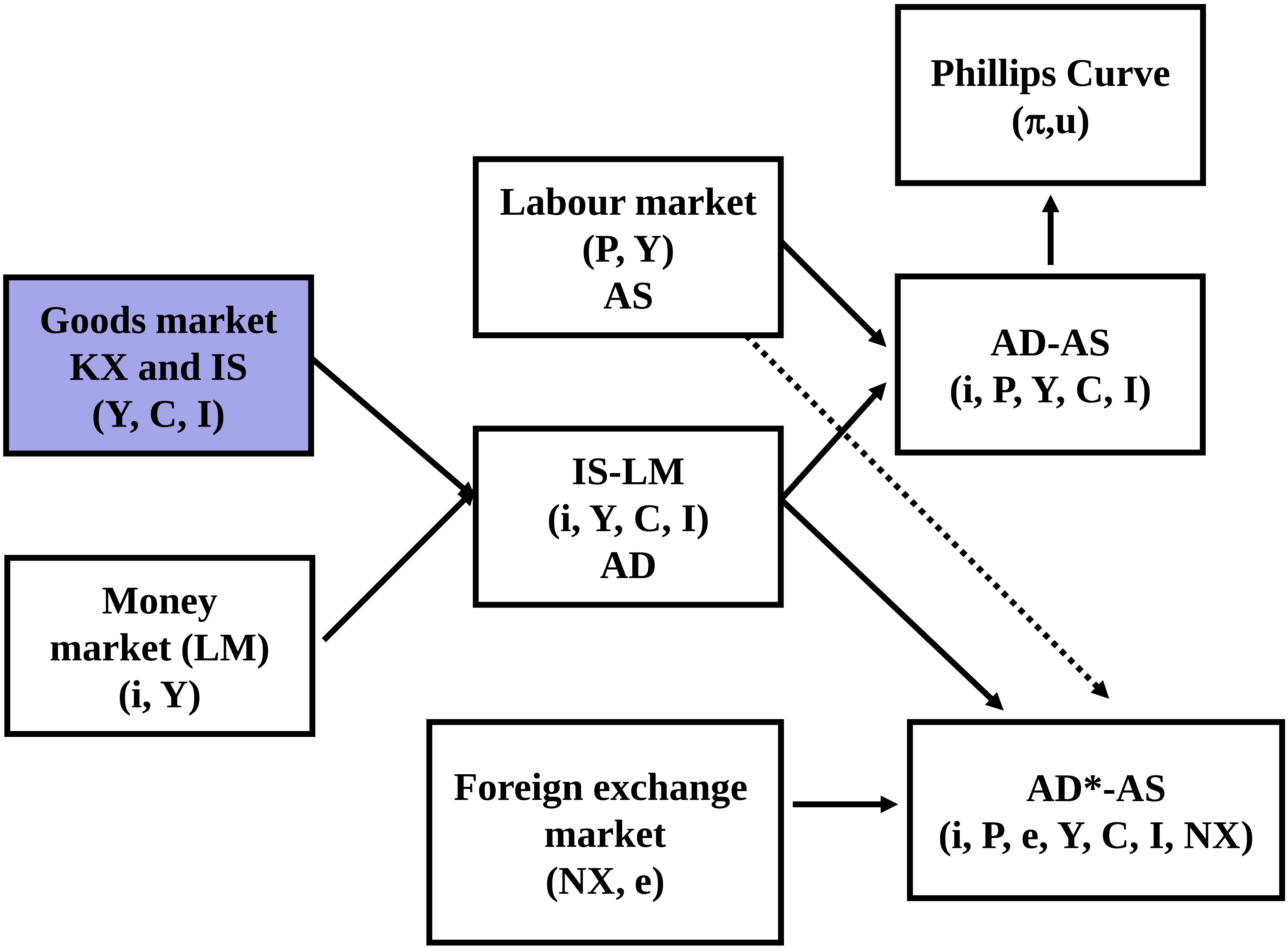
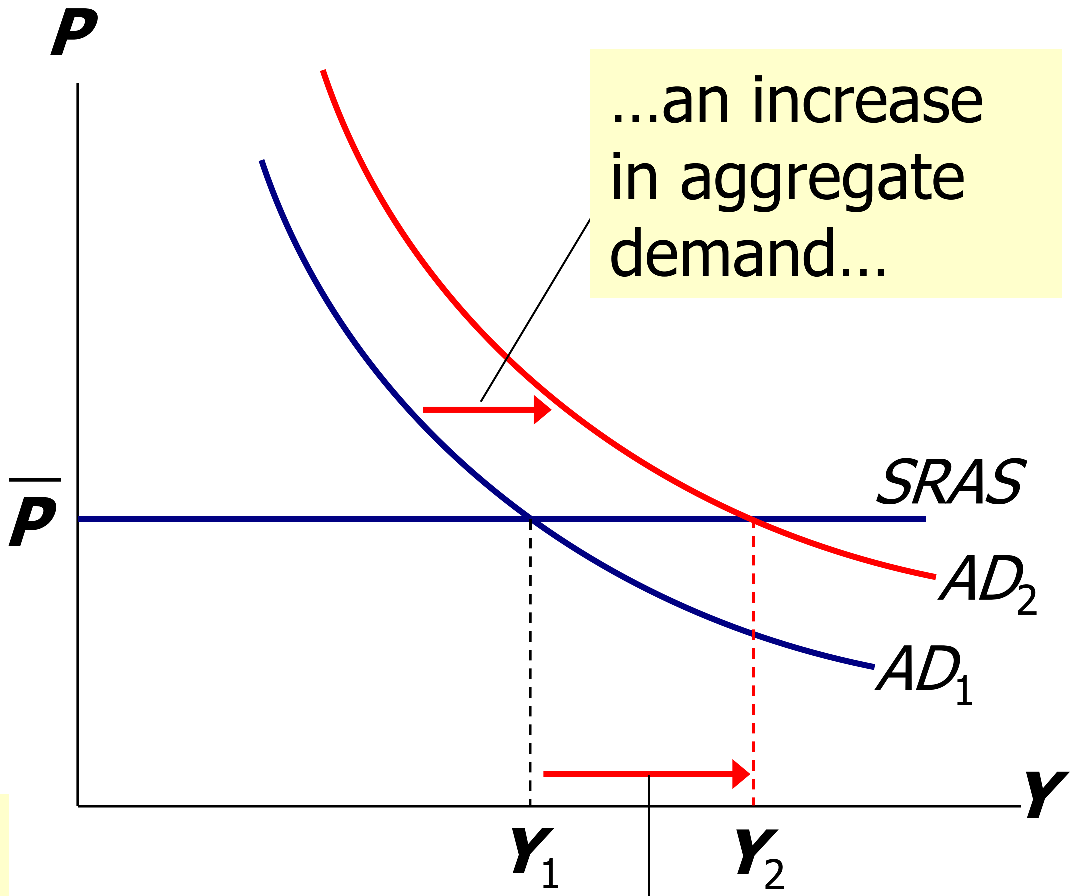
Outline

- Introduction
- Map of the AD-AS model


Phillips Curve
(π,u)
Labour market
(P, Y)
AS
Goods market
KX and IS
(Y, C, I)
AD-AS
(i, P, Y, C, I)
IS-LM
(i, Y, C, I)
AD
Money
market (LM)
(i, Y)
Foreign exchange
market
(NX, e)
AD*-AS
(i, P, e, Y, C, I, NX)

Short-run effects of an increase in demand

In the short run when prices are sticky,…



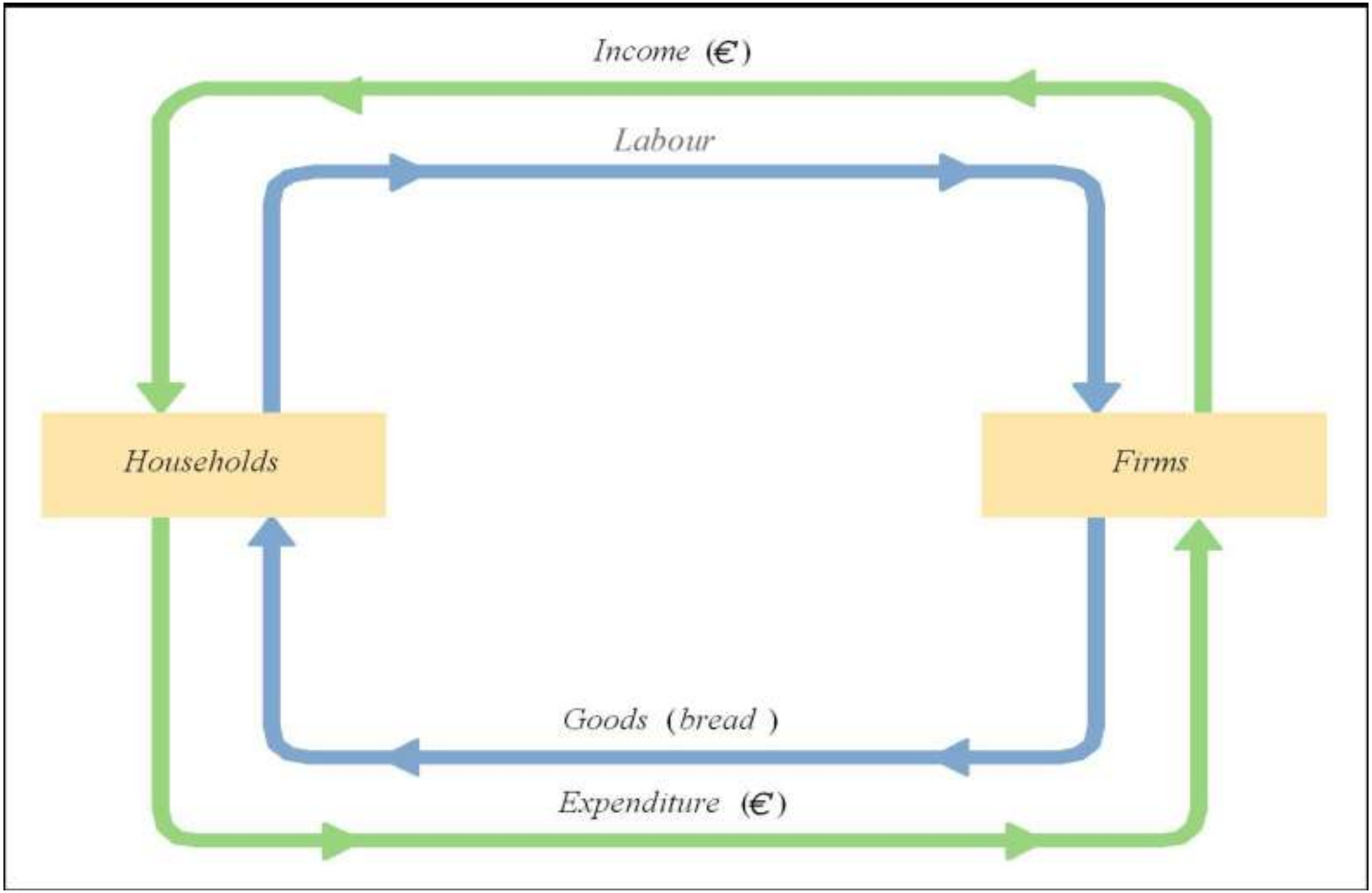
…an increase in aggregate demand…

…causes output to rise.

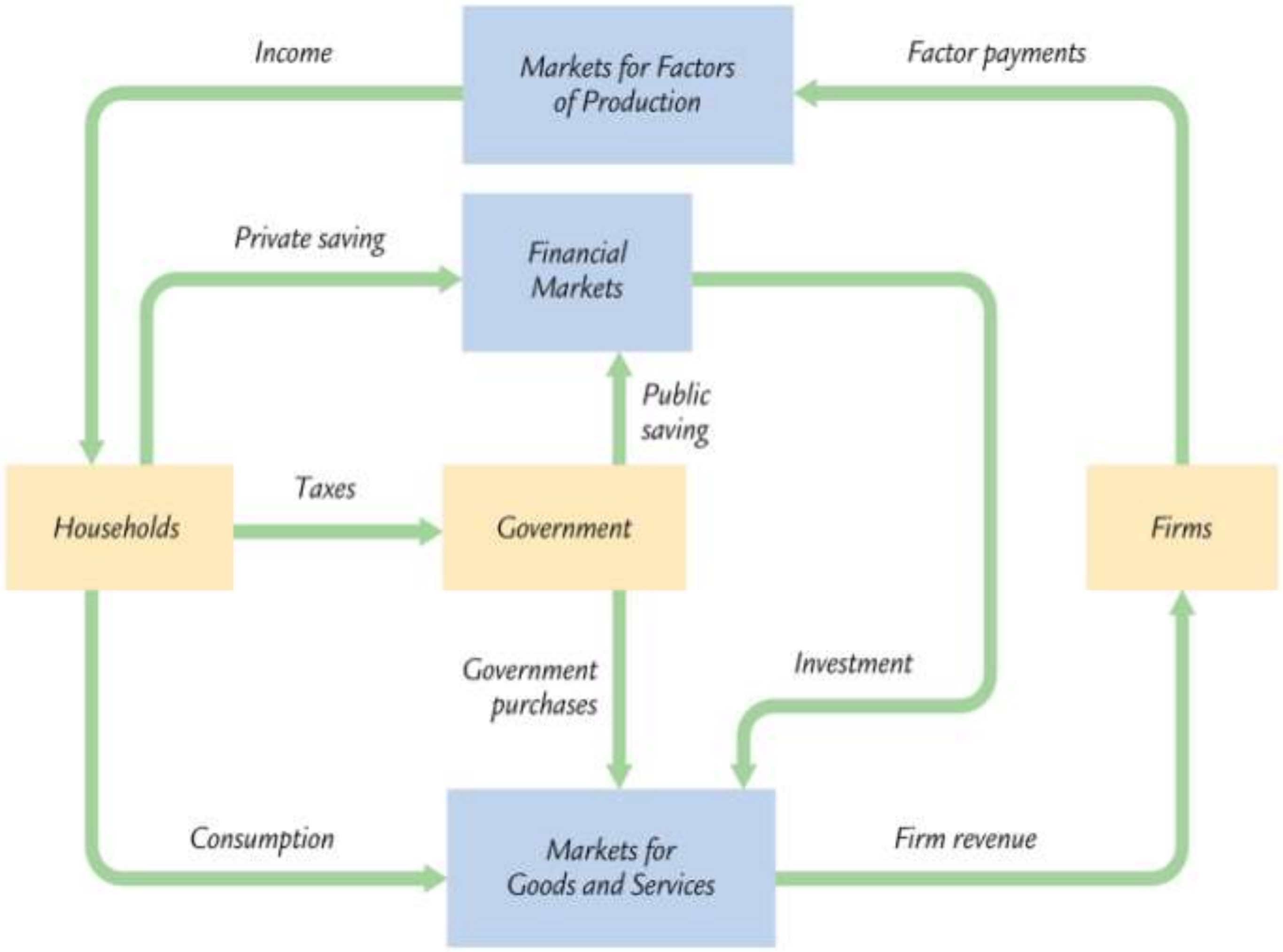
Outline

- Introduction
- Map of the AD-AS model
- This lecture, we begin explaining the AD curve
- Step 1: Equilibrium with variable income and consumption - the Keynesian Cross
- Various Multipliers

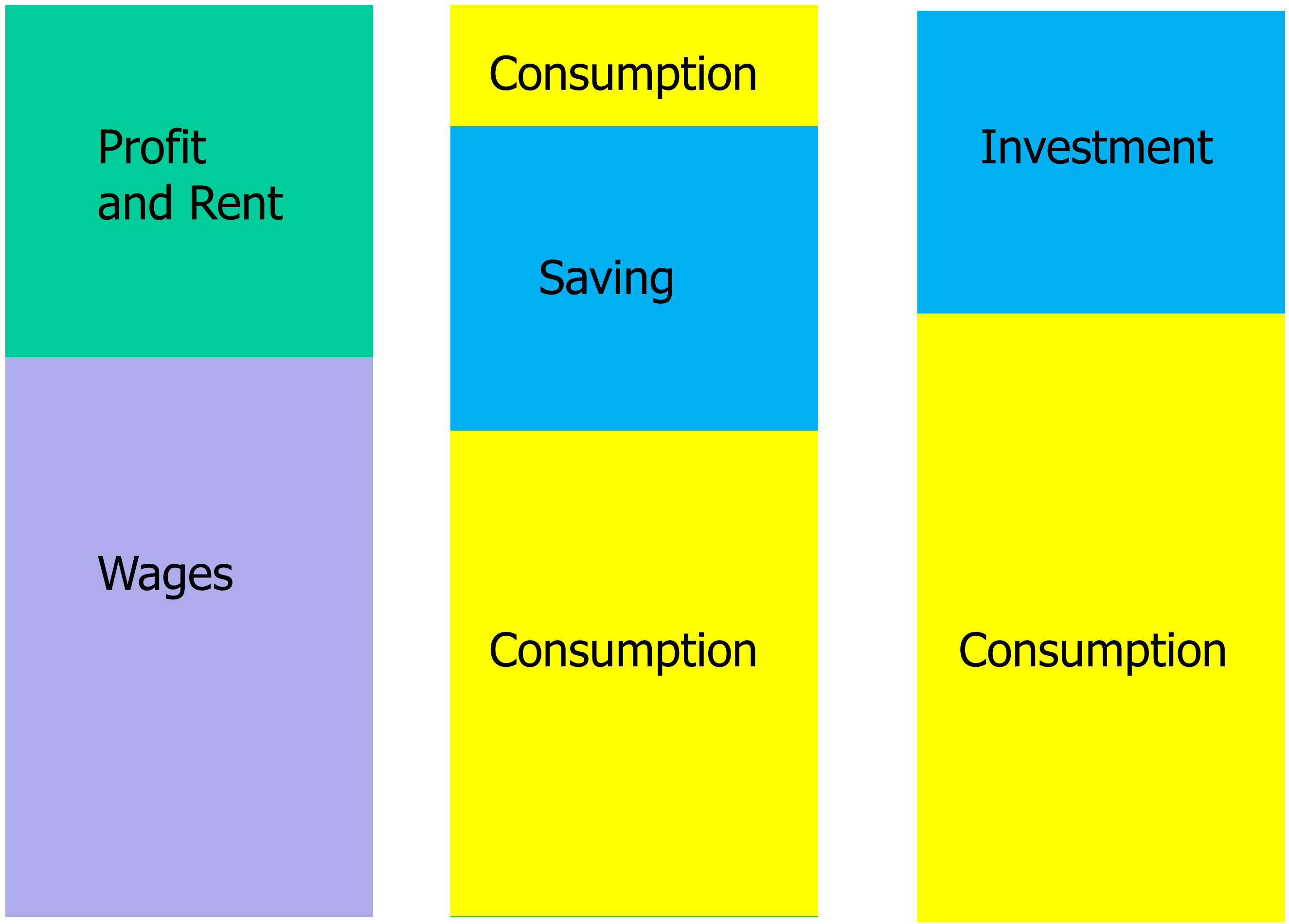
The Circular Flow I



The Circular Flow II



Income in Classical model



First step to AD - the Keynesian Cross

- A simple 'closed economy' model (***NX*** exogenous) in which private consumption (***C***) is the only element of demand which varies
- Notation:

  I = expected investment

  E = ***C*** + ***I*** + ***G*** = expected expenditure

  Y = real GDP = value of output

Elements of the Keynesian Cross

Consumption function: $C = c_1(Y - \bar{T})$

Government consumption and tax: $G = \bar{G}, \quad T = \bar{T}$

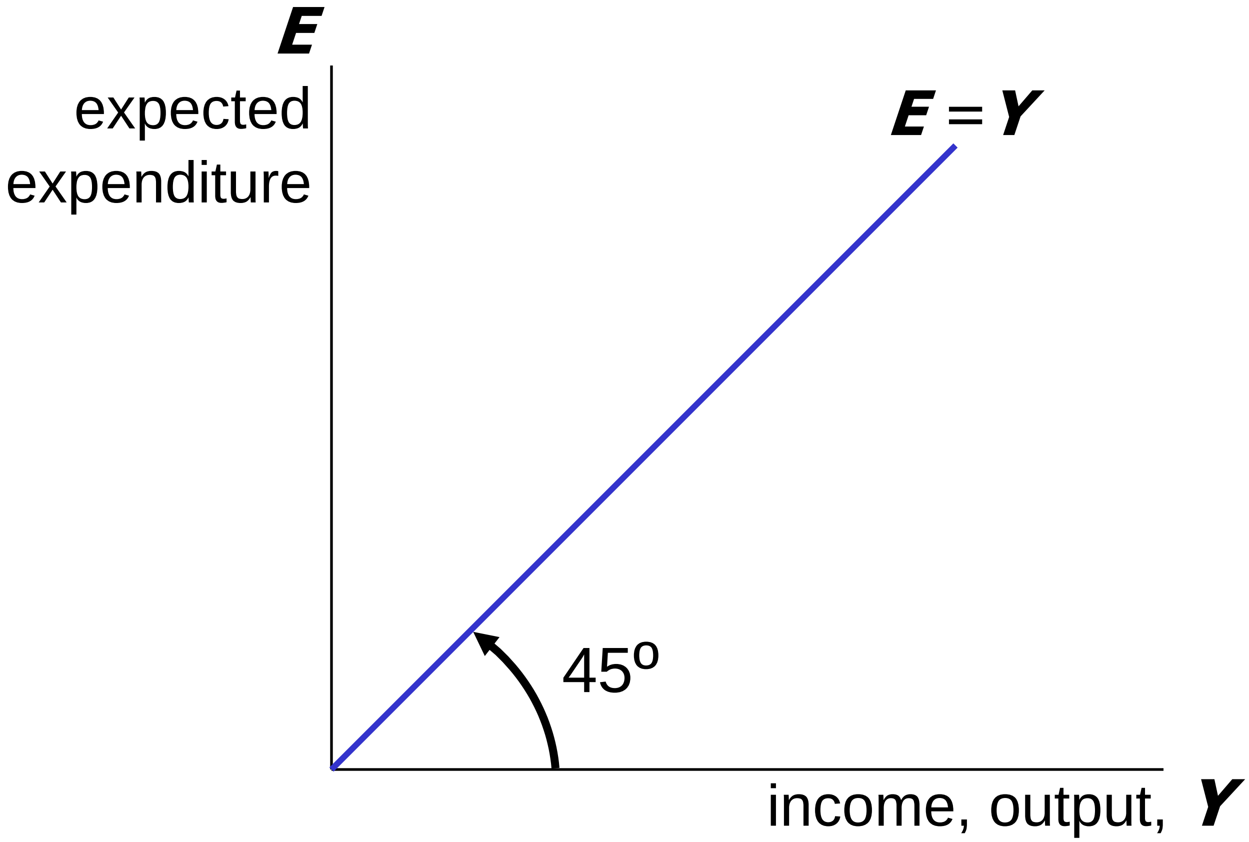
for now, investment is exogenous: $I = \bar{I}$

Expected expenditure: $E = c_1(Y - \bar{T}) + \bar{I} + \bar{G}$

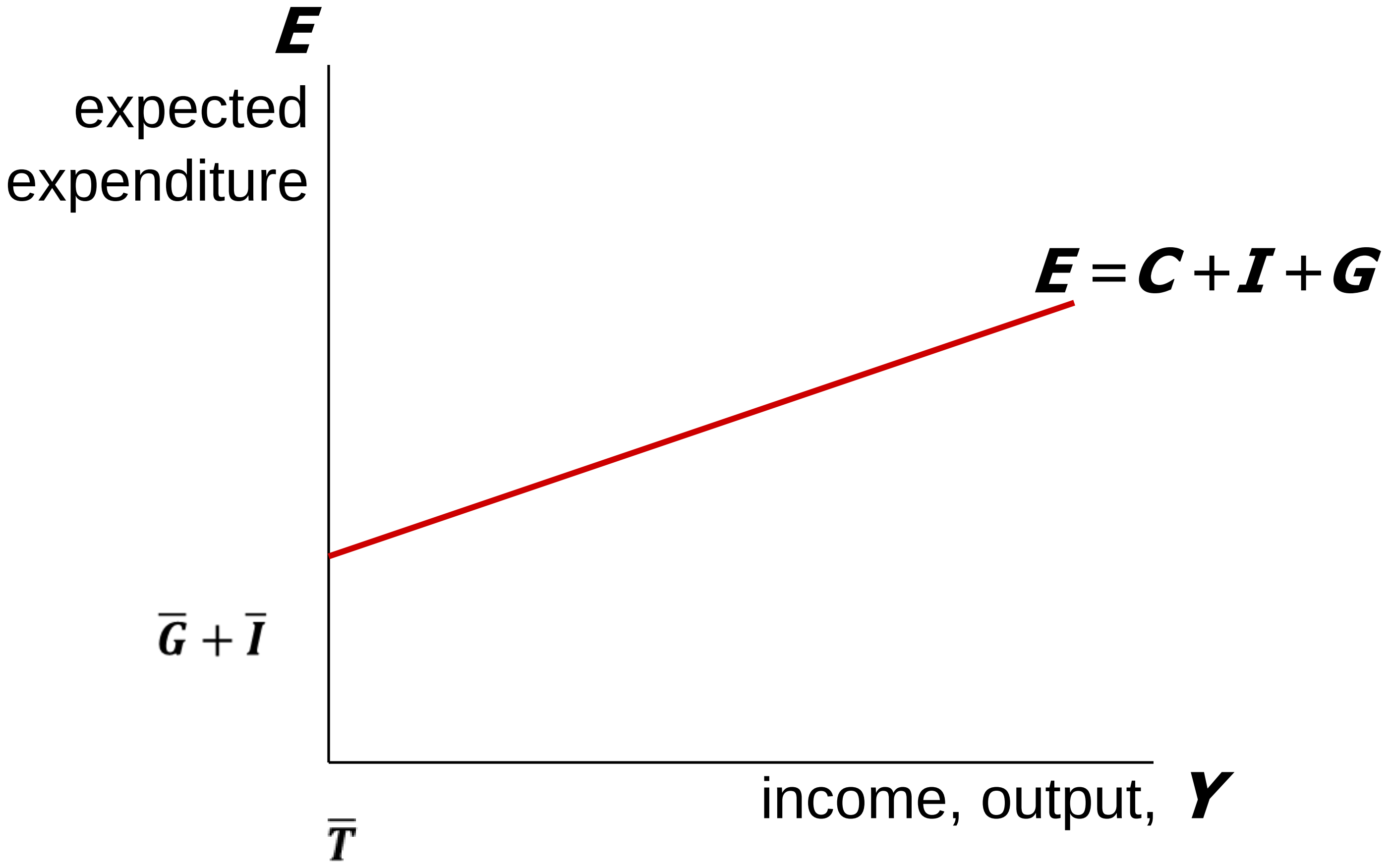
equilibrium condition: $Y = E$

Value of output = expected expenditure

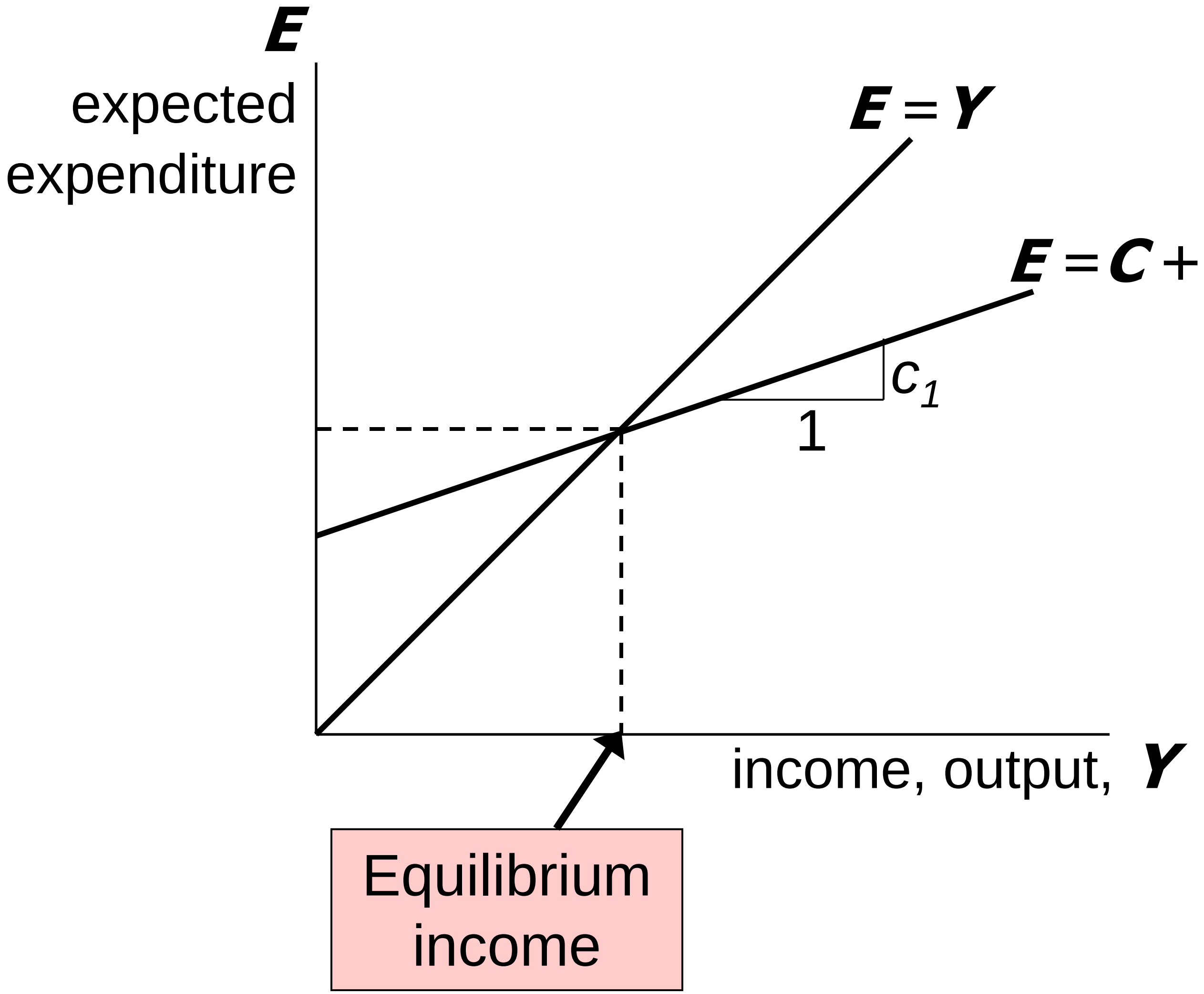
Plotting the equilibrium condition



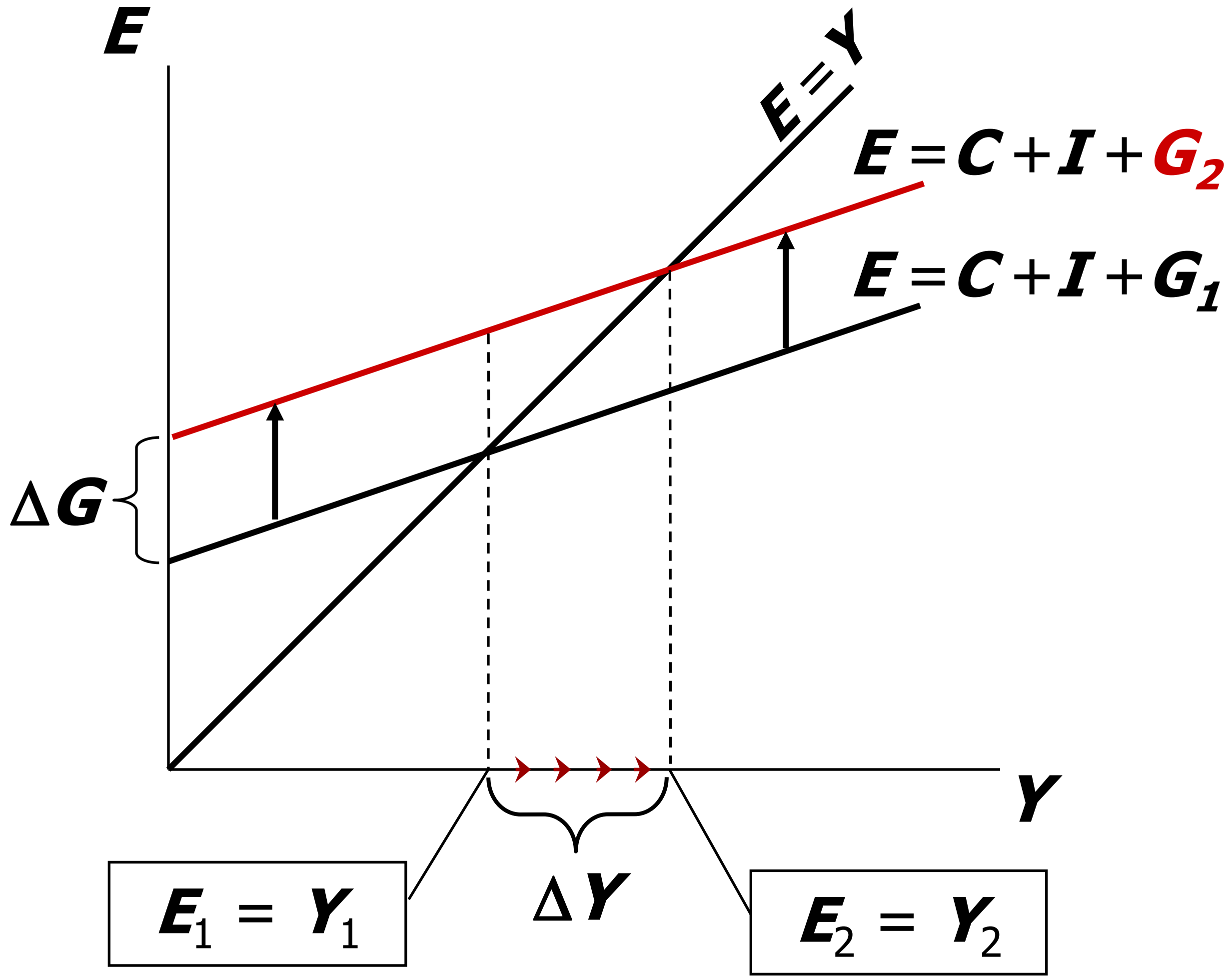
Plotting planned expenditure



The equilibrium value of income



An increase in autonomous consumption



The spending multiplier

Definition: the change in income resulting from a (small) change in autonomous expenditure such as ***G*** or ***I***.

(In the following slides MPC = c_1)

The multiplier as a partial derivative

$$\boldsymbol{Y} = \boldsymbol{C} + \boldsymbol{I} + \boldsymbol{G}$$ ***equilibrium*** condition

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

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

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

Collect terms with $\Delta \boldsymbol{Y}$ on the left side of the equals sign:

$$(1 - \text{MPC}) \times \Delta \boldsymbol{Y} = \Delta \boldsymbol{G}$$

Solve for $\Delta \boldsymbol{Y}$:

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

The spending multiplier

In this model, the spending multiplier equals

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

If MPC = 0.8

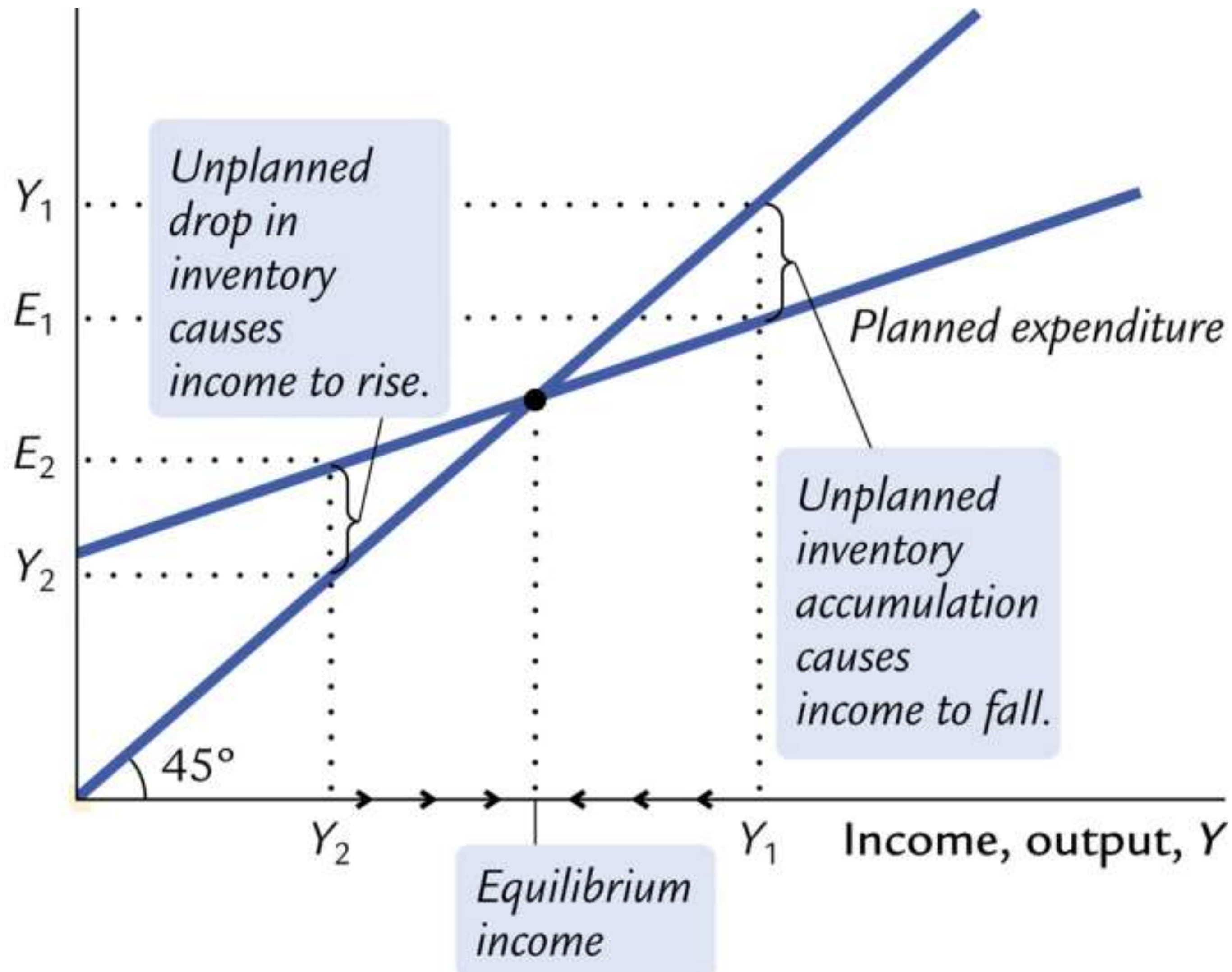
$$\frac{\Delta \boldsymbol{Y}}{\Delta \boldsymbol{G}} = \frac{1}{1 - 0.8} = 5$$

An increase in ***G*** causes income to increase 5 times as much!

Why the multiplier is greater than 1

- An increase in G represents 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. But not infinite, it converges.

Conventional explanation of convergence

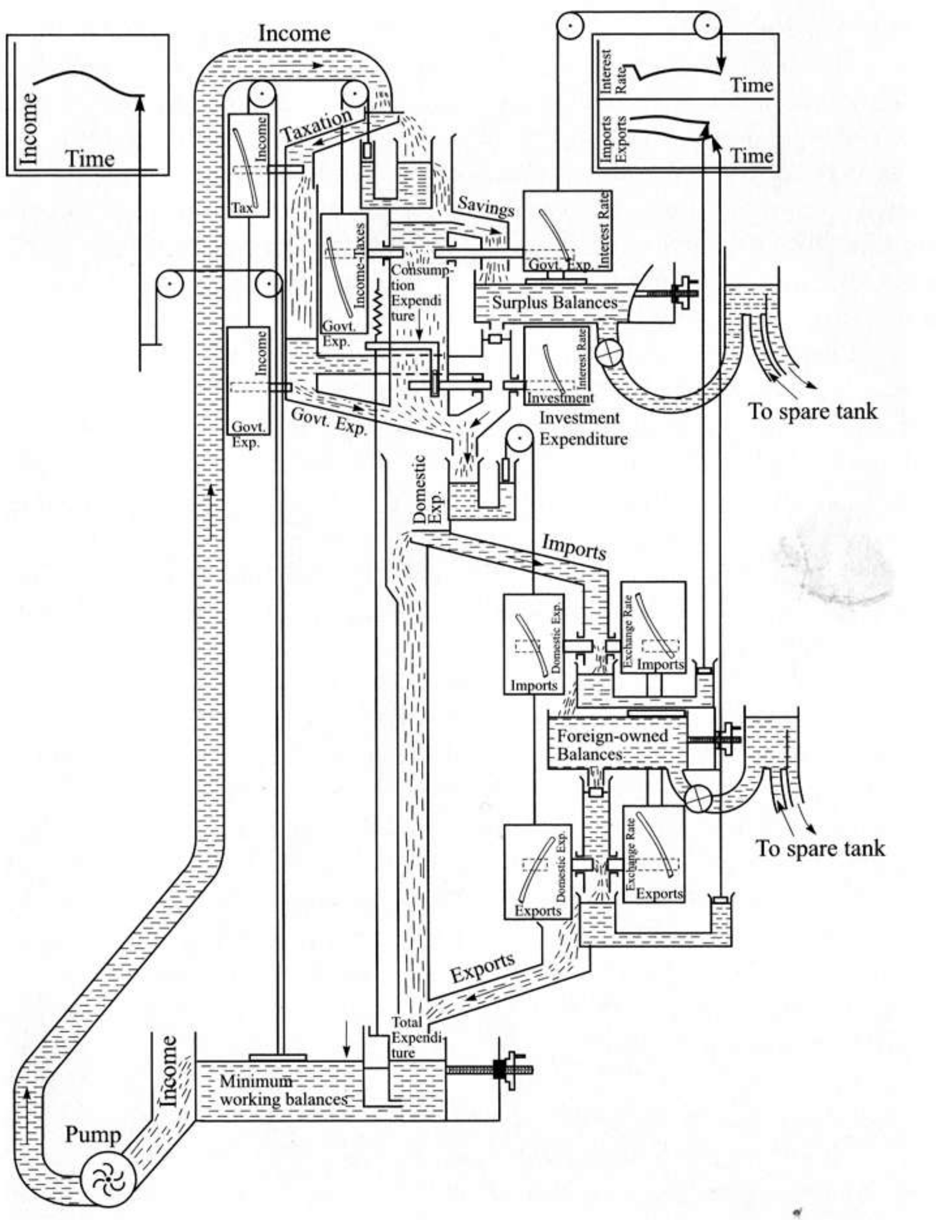


The Phillips Machine, 1949

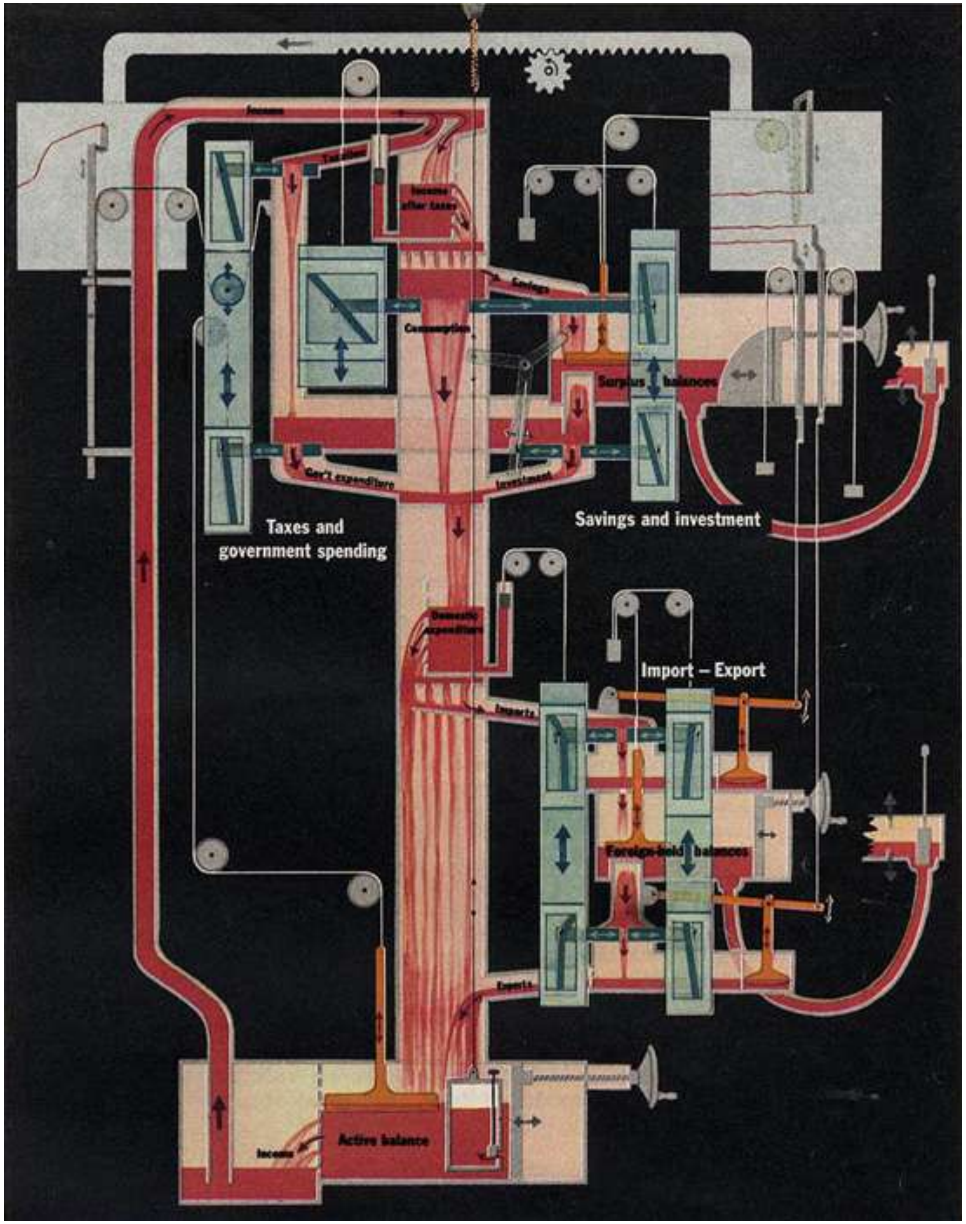
Invented by Bill Phillips at the LSE. A water-driven analogue computer used to demonstrate Keynesian economics

The flaw is that he used water, taking us back to a Classical corn model

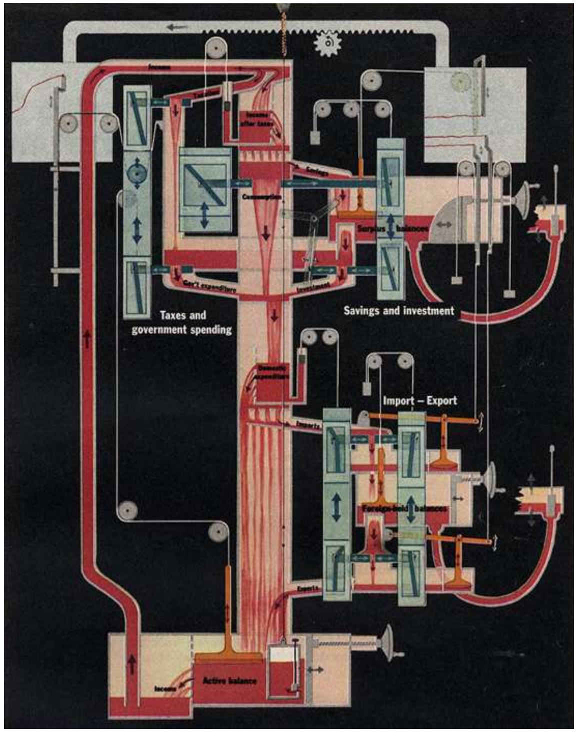
The Phillips Machine, 1949



The Phillips Machine, 1949



The Phillips Machine, 1949



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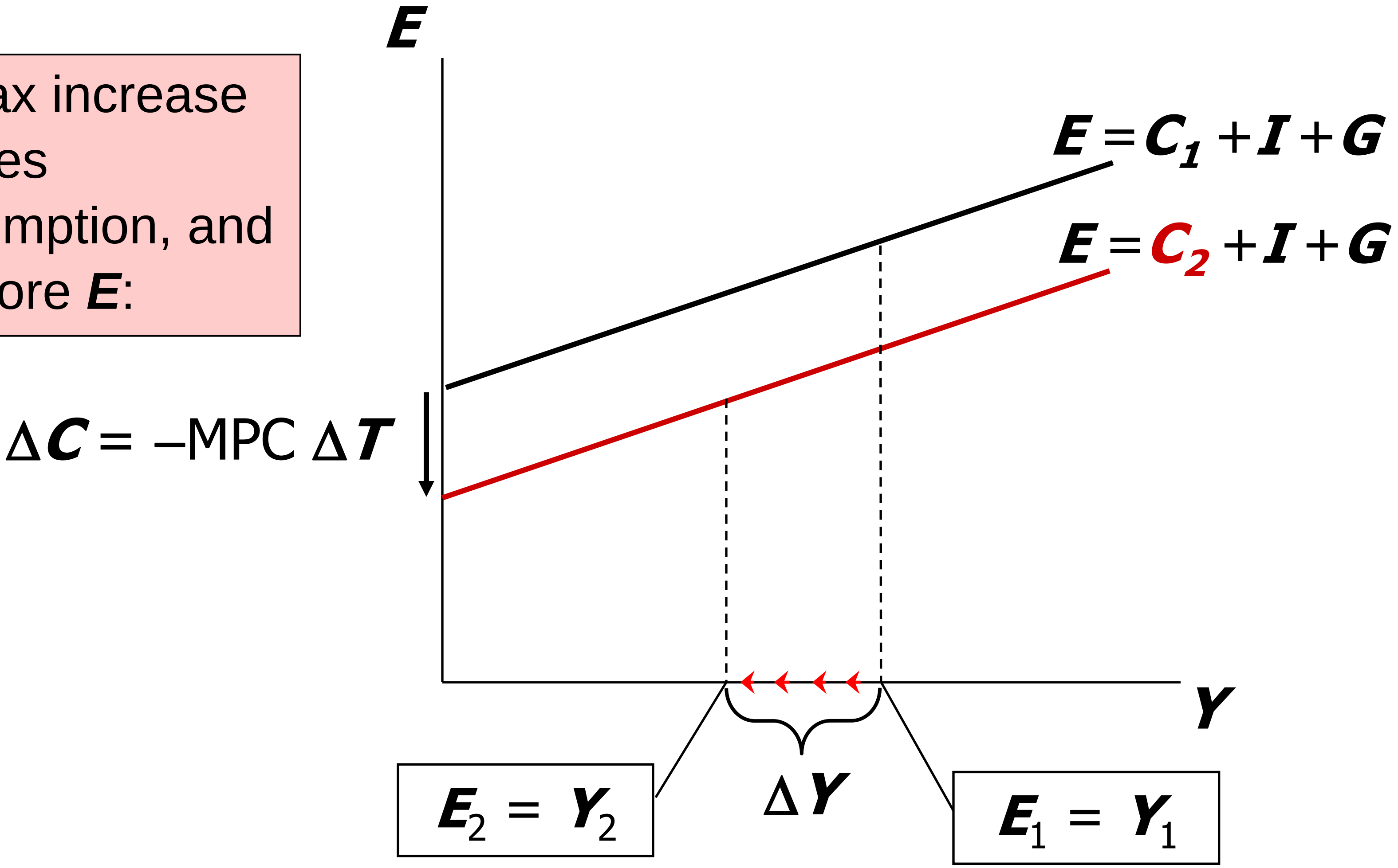
An increase in taxes

The tax increase reduces consumption, and therefore ***E***:



The tax multiplier

Definition: the change in income resulting from a (small) change in ***T***

The tax multiplier as a partial derivative

$$\Delta \boldsymbol{Y} = \Delta \boldsymbol{C} + \Delta \boldsymbol{I} + \Delta \boldsymbol{G}$$

equilibrium condition in changes

$$= \Delta \boldsymbol{C}$$

$\boldsymbol{I}$ and $\boldsymbol{G}$ exogenous

$$= \text{MPC} \times \left(\Delta \boldsymbol{Y} - \Delta \boldsymbol{T} \right)$$

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

Final result:

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

The tax multiplier

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

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

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

The tax multiplier

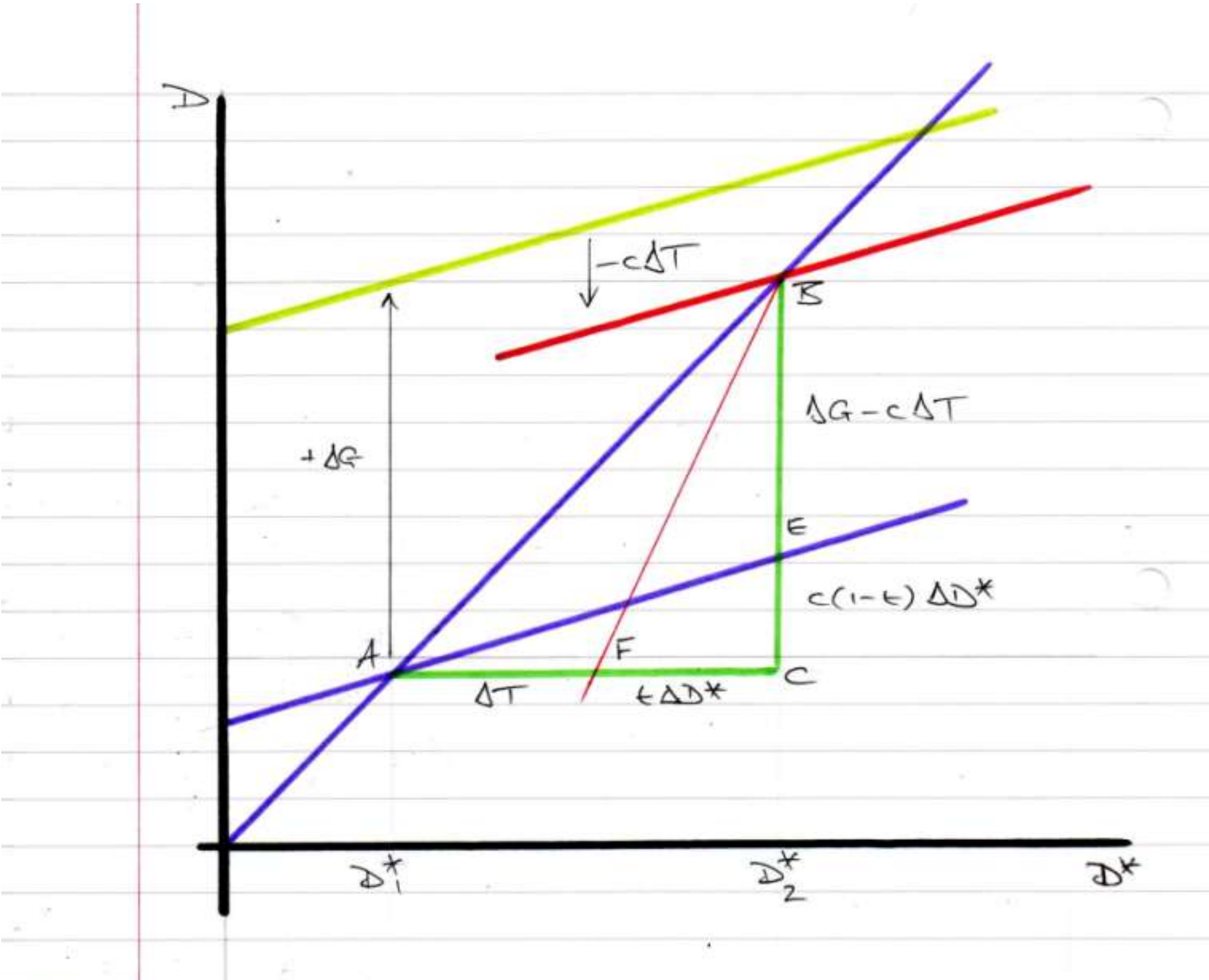
…is *negative:*
A tax increase reduces ***C***, which reduces income.

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

A change in taxes has a multiplier effect on income.

…is *smaller than the 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***.

The balanced budget multiplier



The balanced budget multiplier

By definition:

$$\Delta G = \Delta T + t\Delta Y$$

Equilibrium Condition:

$$\Delta Y = c_1[(1-t)\Delta Y - \Delta T] + \Delta G$$

$$\Delta Y = (1-t)c_1\Delta Y - c_1(\Delta G - t\Delta Y) + \Delta G$$

$$\Delta Y(1 - c_1 + tc_1 - tc_1) = (1-c_1)\Delta G$$

$$\left.\frac{\Delta Y}{\Delta G}\right|_{BB} = \frac{1-c_1}{1-c_1} = 1$$

Summary

- Keynesian cross: equilibrium income determined with income and consumption variable
- Shows how the direction of causation between saving and investment is reversed from the Classical model
- The multiplier as comparative statics
  - Spending, tax and balanced budget multipliers
  - Comparing two equilibrium positions does not explain the dynamic process linking them

Next time

- Step 2 of building the AD curve
- Finding equilibrium when income, consumption and investment can all move
- the IS-LM model