

# Output and aggregate demand

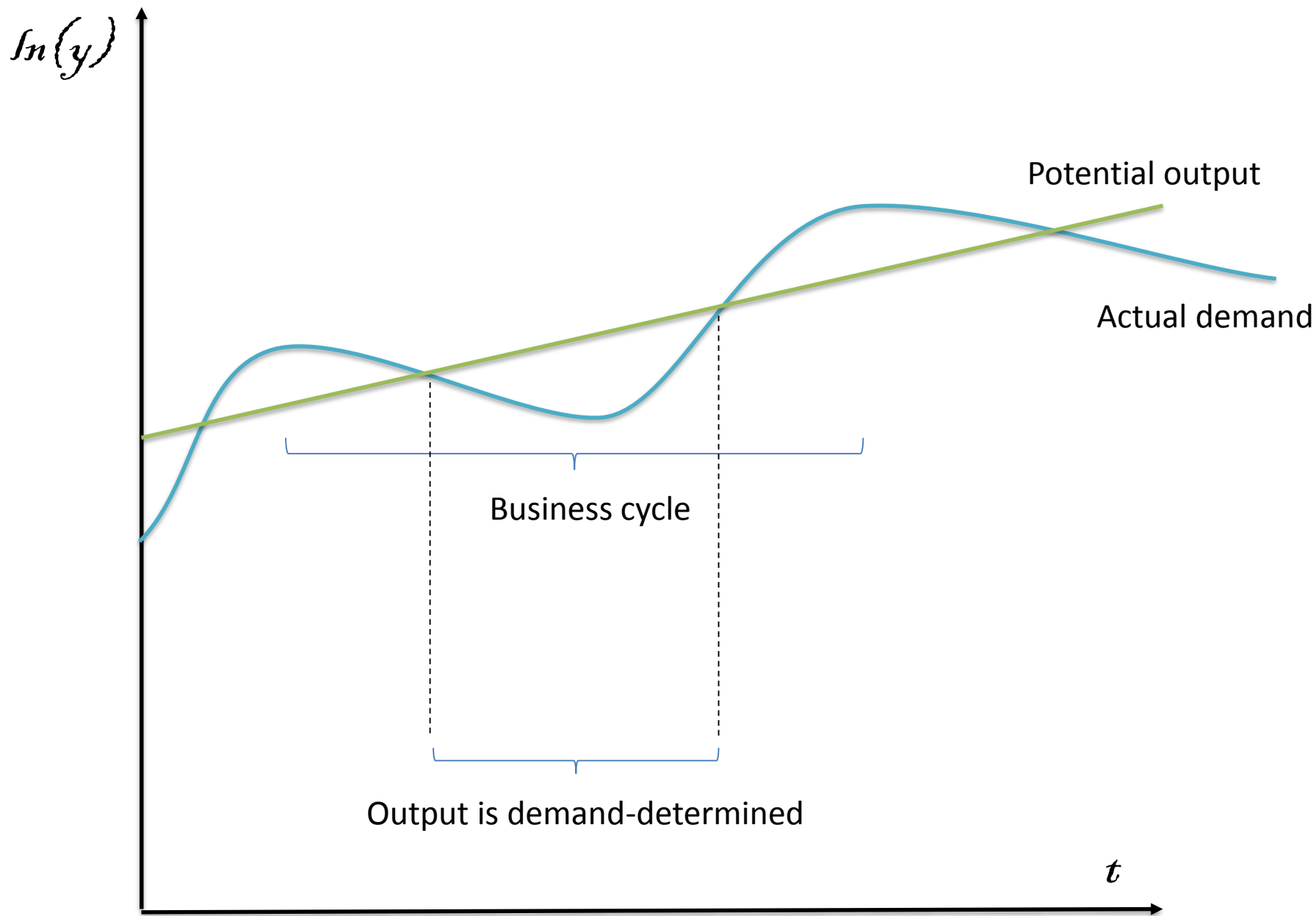
Macroeconomics

# Actual output and potential output

- Potential output is the economy's output when inputs (e.g. labour and capital) are fully employed. It is the output when every market in the economy is in long-run equilibrium.
- If actual output (=output actually produced) falls below potential output, some workers will be unemployed and firms will have idle machines or spare capacity.

# Properties of the model

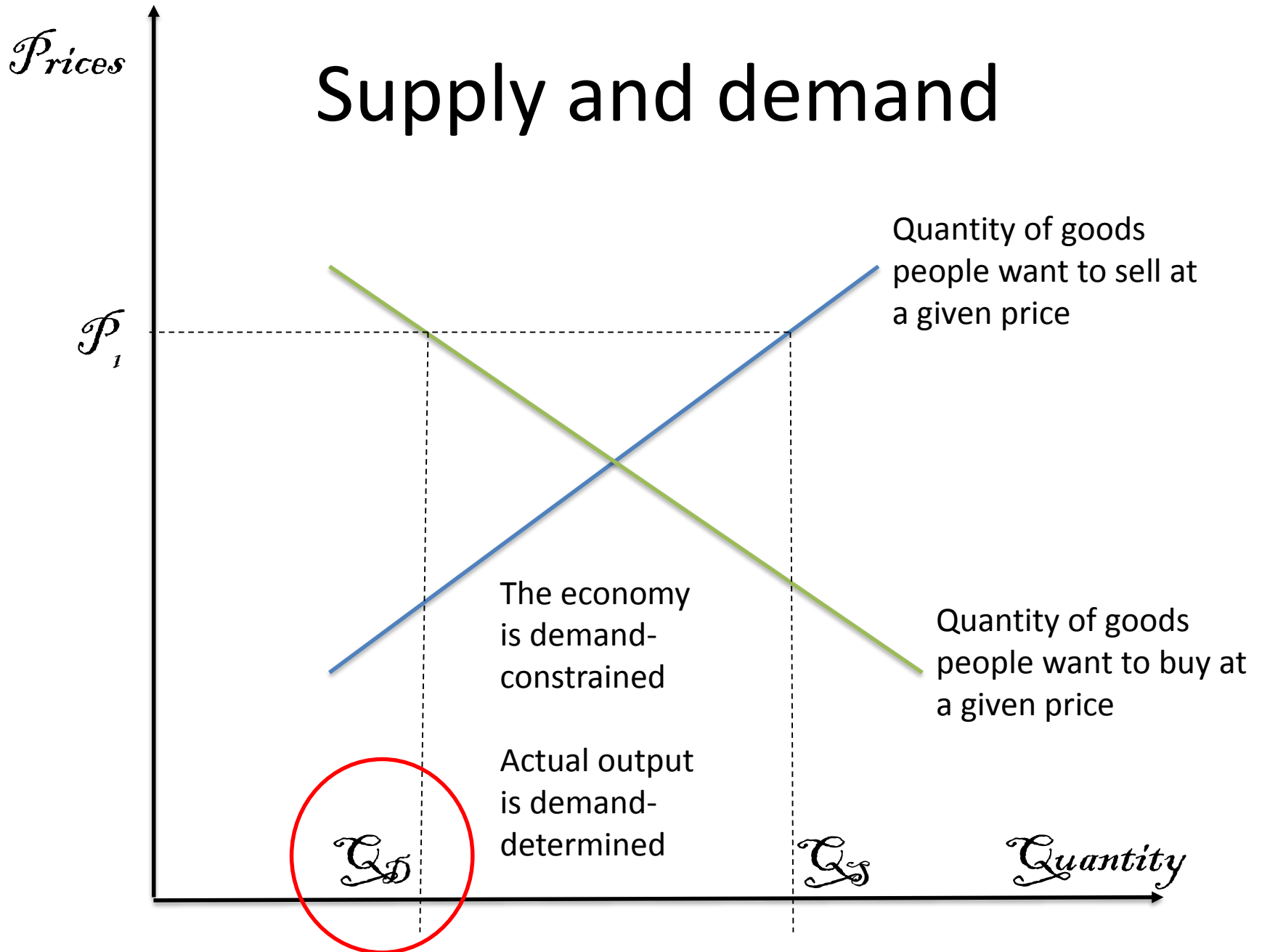
- Our initial model has two crucial properties:
  - All prices and wages are fixed at a given level
  - At these prices and wages, there are workers without a job who would like to work and firms with spare capacity they could profitably use.
- Consequences: Below potential output, firms happily supply whatever output is demanded. Total output is demand-determined.



# Consequences of fixed prices and wages

- Since markets trade the smaller of supply and demand, **output is demand-determined** when there is excess supply, and wages and prices have yet to adjust to restore long-run equilibrium (-> potential output).
- Output then depends only on aggregate demand.

# Supply and demand



# A simple model with two sectors (households and firms)

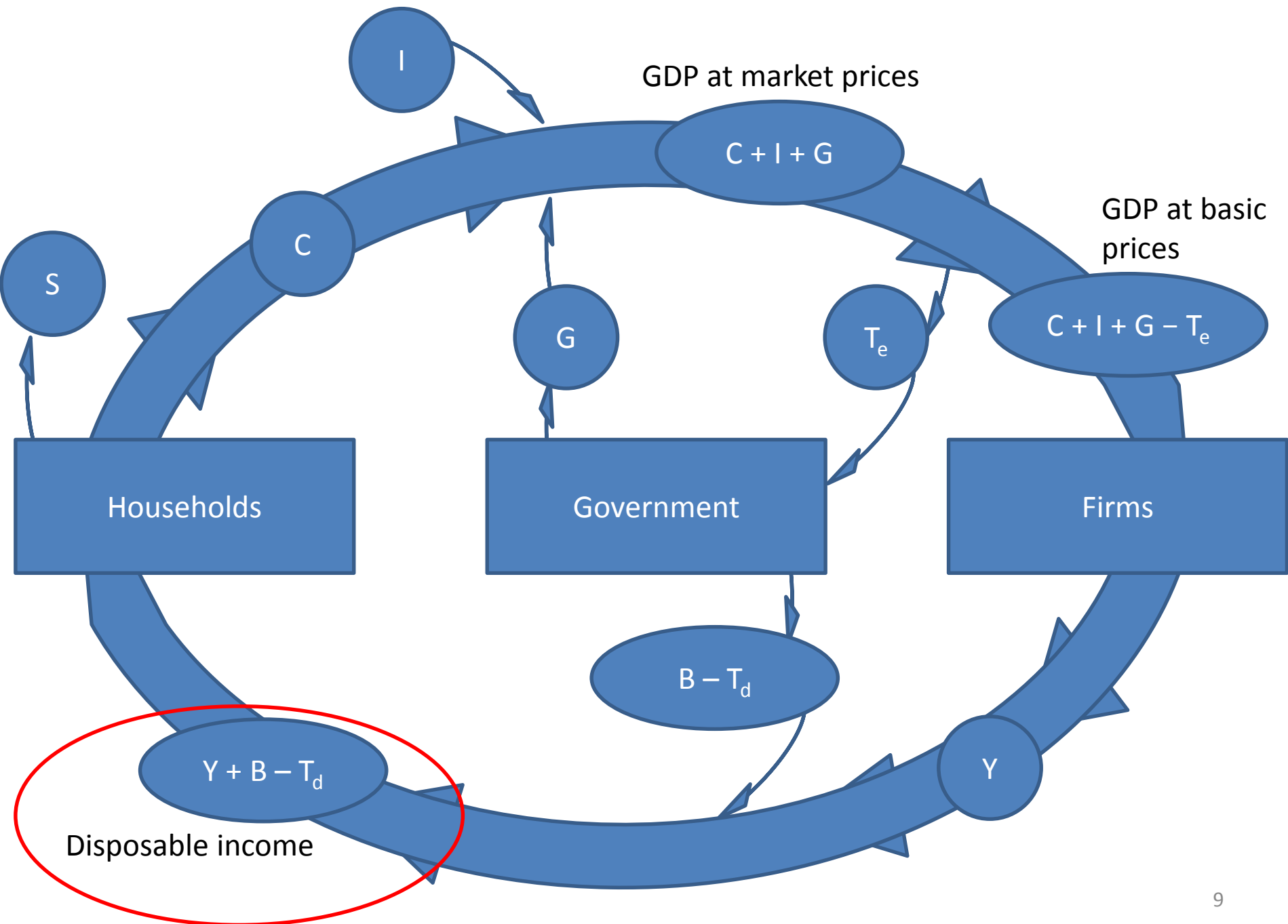
- Without a government or a foreign sector, there are two sources of demand: consumption demand by households (C), and investment demand (I) by firms.
- Using AD to denote aggregate demand:

$$AD = C + I$$

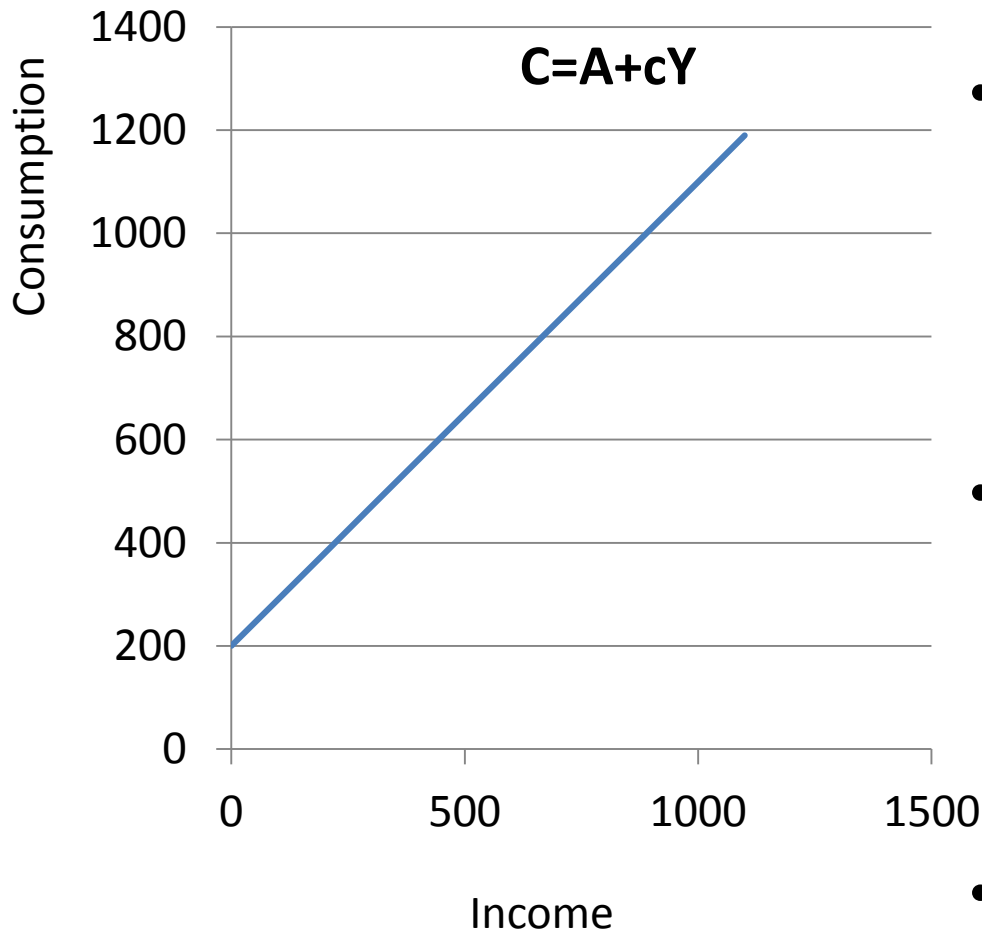
# The consumption function

- We assume that, in the aggregate, households' consumption demand is a linear function of aggregate personal disposable income.
- **Personal disposable income** is the income households receive from firms, plus transfer payments received from the government, minus direct taxes paid to the government. It is the net income households can spend or save.



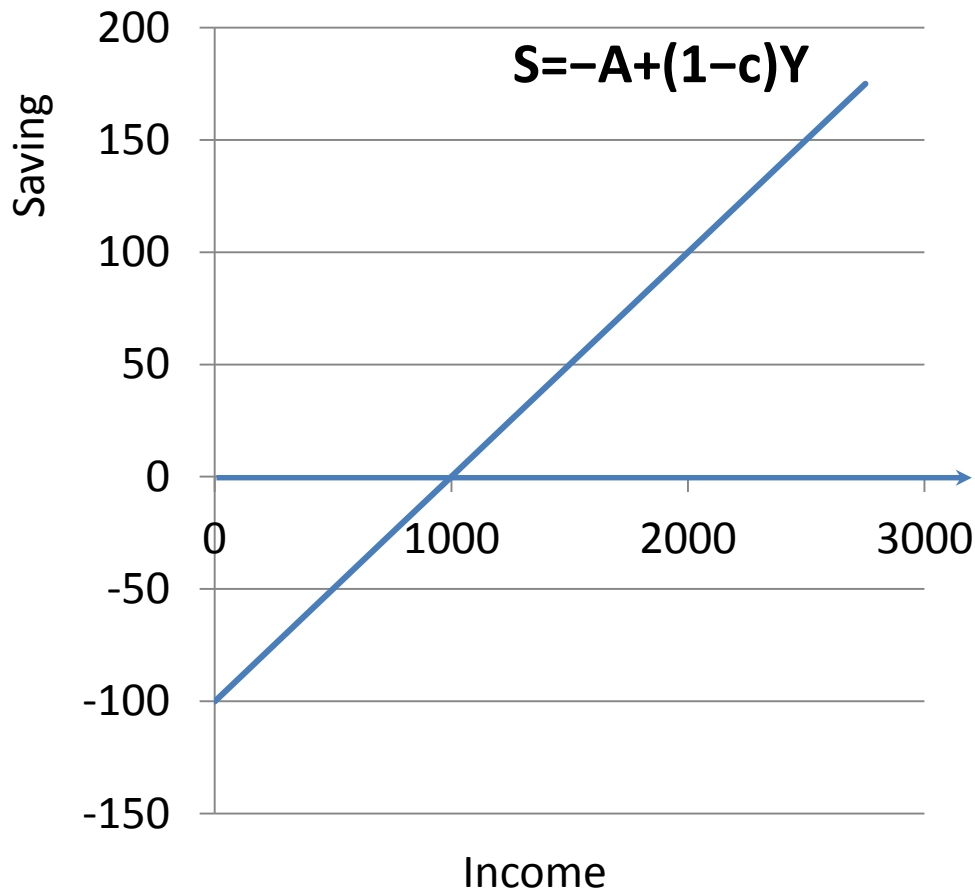


# The consumption function



- The consumption function shows aggregate consumption demand at each aggregate income.
- With zero income, **autonomous consumption** is **A**. (Households wish to consume **A** even if income **Y** is zero.)
- The marginal propensity to consume (MPC) **c** is the slope of the line, the fraction of each extra unit of income that households wish to spend.
- The remaining  $(1-c)$  they wish to save (MPS).

# The saving function



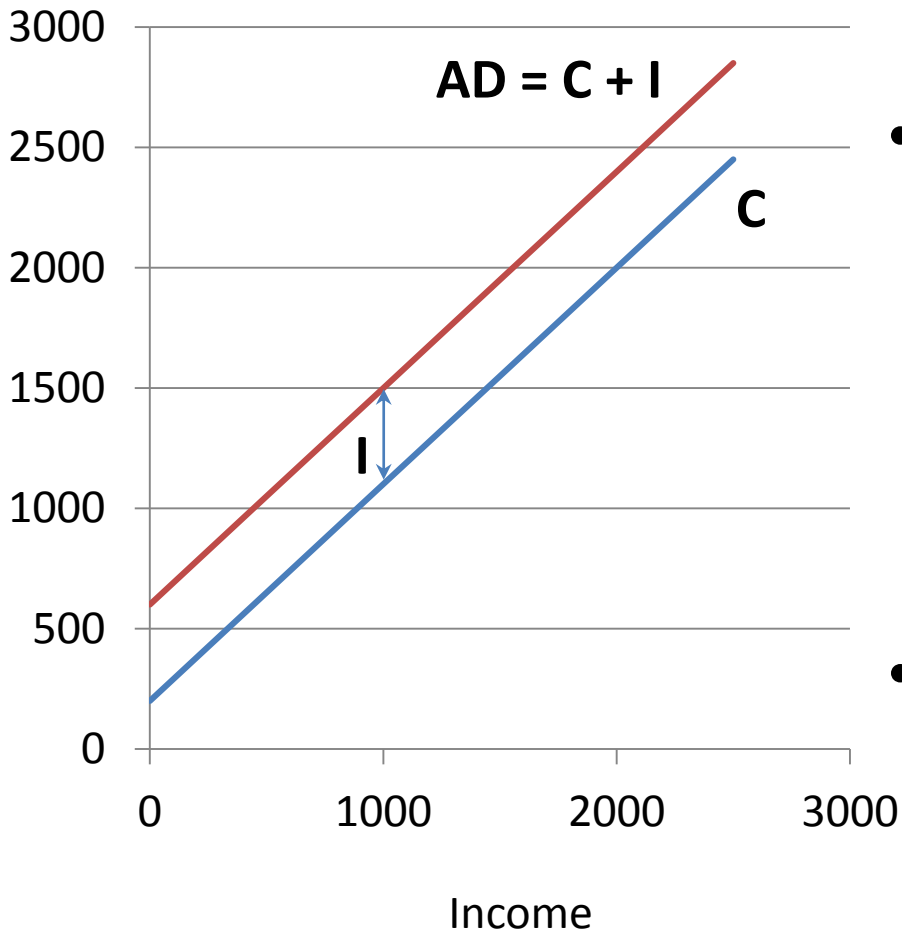
The saving function shows desired saving at each income level. Since all income is saved or spent on consumption, the saving function can be derived from the consumption function or vice versa.

$$Y \equiv C + S$$

# Investment spending

- Investment demand is firms' desired or planned additions to physical capital (factories and machines) and to inventories.
- Firms' investment demand depends chiefly on firms' current guesses about how fast the demand for their output will increase.
- For now, we will assume that desired investment  $I$  is constant, independent of current output and income.

# Aggregate demand

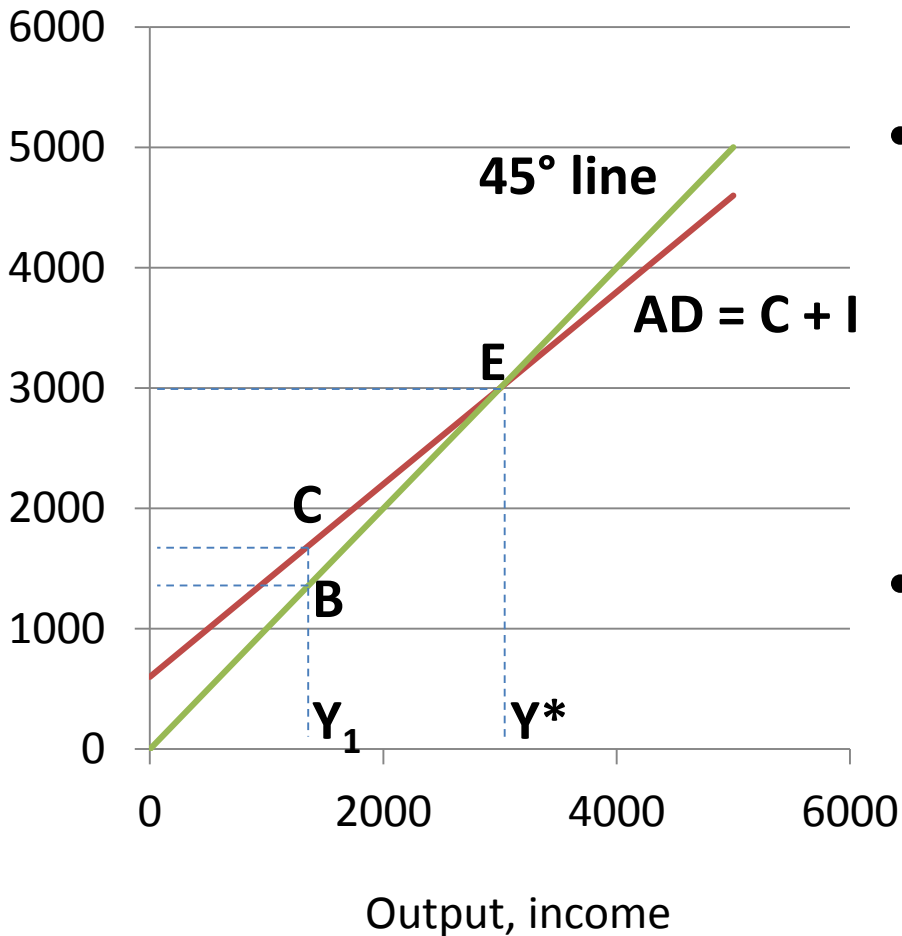


- Aggregate demand is what households plan to spend on consumption and firms plan to spend on investment.
- Since we assume that investment demand is constant, consumption is the only part of aggregate demand that increases with income.
- Vertically adding constant investment demand to the consumption function C gives the aggregate demand schedule AD.

# Short-run equilibrium output

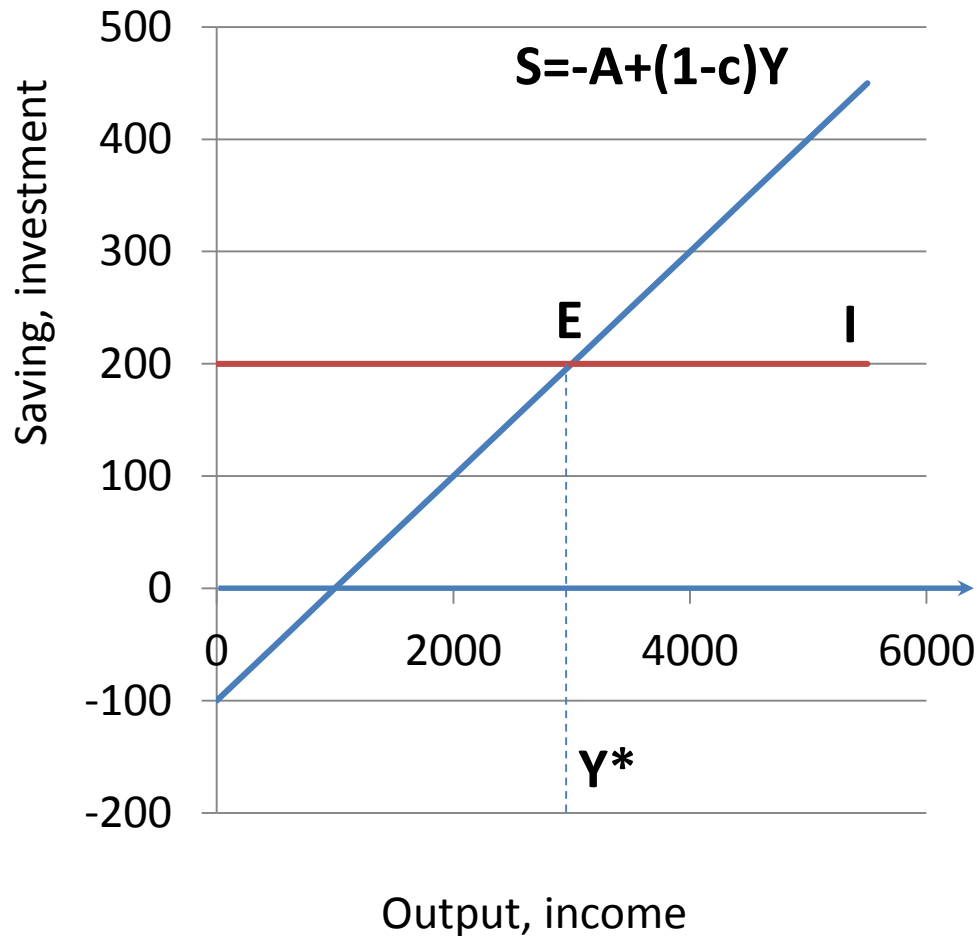
- If aggregate demand falls below potential output, firms cannot sell as much as they would like. There is involuntary excess capacity. Workers cannot work as much as they would like. There is involuntary unemployment.
- When prices and wages are fixed, at short-run equilibrium output aggregate demand or planned spending equals the output actually produced.

# Equilibrium output



- The 45° line reflects any value on the horizontal axis onto the same value on the vertical axis.
- The point E, at which the AD schedule crosses the 45° line, is the only point at which the aggregate demand AD is equal to income.
- Hence E is the equilibrium point at which planned spending equals actual output and actual income.

# Planned investment equals planned saving



At equilibrium output  $Y^*$ , planned investment  $I$  equals planned saving  $S = -A + (1-c)Y$ . Hence equilibrium output  $Y^* = (I + A)/(1-c)$ .

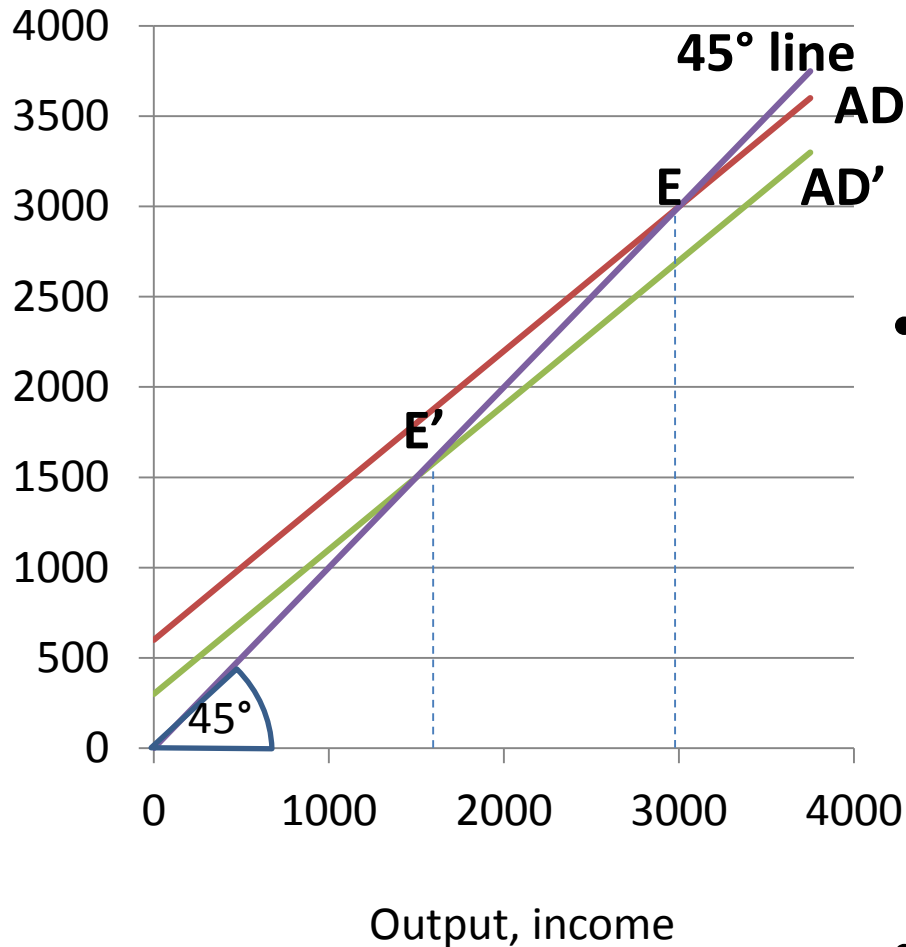
The two methods of calculating equilibrium income are equivalent.



# Excess demand and supply

- When aggregate demand exceeds actual output there is either unplanned disinvestment (inventory reductions) or unplanned saving (frustrated customers).
- Actual investment always equals actual savings, as a matter of definition.
- Unplanned inventory reductions or frustrated customers act as a signal to firms to raise output when aggregate demand exceeds actual output.
- Similarly, unplanned additions to stocks occur when aggregate demand is below output.

# A fall in investment demand



- When investment demand falls, the aggregate demand schedule shifts down from AD to AD' and equilibrium output falls by a larger amount.
- The multiplier is the ratio of the change in equilibrium output to the change in autonomous spending that caused the change.
- Multiplier =  $1/(1 - c)$

# Adjustment to a shift in investment demand

|         | Y     | I  | $C=10+0.9Y$ | $AD=C+I$ | $Y - AD$ | Unplanned stocks | Output   |
|---------|-------|----|-------------|----------|----------|------------------|----------|
| Step 1  | 200   | 10 | 190         | 200      | 0        | Zero             | Constant |
| Step 2  | 200   | 5  | 190         | 195      | 5        | Rising           | Falling  |
| Step 3  | 195   | 5  | 185.5       | 190.5    | 4.5      | Rising           | Falling  |
| Step 4  | 190.5 | 5  | 181.5       | 186.57   | ~4       | Rising           | Falling  |
| ...     |       |    |             |          |          |                  |          |
| New eq. | 150   | 5  | 145         | 150      | 0        | Zero             | Constant |

Calculating the multiplier (changes induced by a 1-unit increase in investment demand)

| Change in | Step 1 | Step 2 | Step 3  | Step 4  | Step 5  | ... | Step n      | ... |
|-----------|--------|--------|---------|---------|---------|-----|-------------|-----|
| I         | 1      | 0      | 0       | 0       | 0       | ... | 0           | ... |
| Y         | 0      | 1      | 0.9     | $0.9^2$ | $0.9^3$ | ... | $0.9^{n-2}$ | ... |
| C         | 0      | 0.9    | $0.9^2$ | $0.9^3$ | $0.9^4$ | ... | $0.9^{n-1}$ | ... |

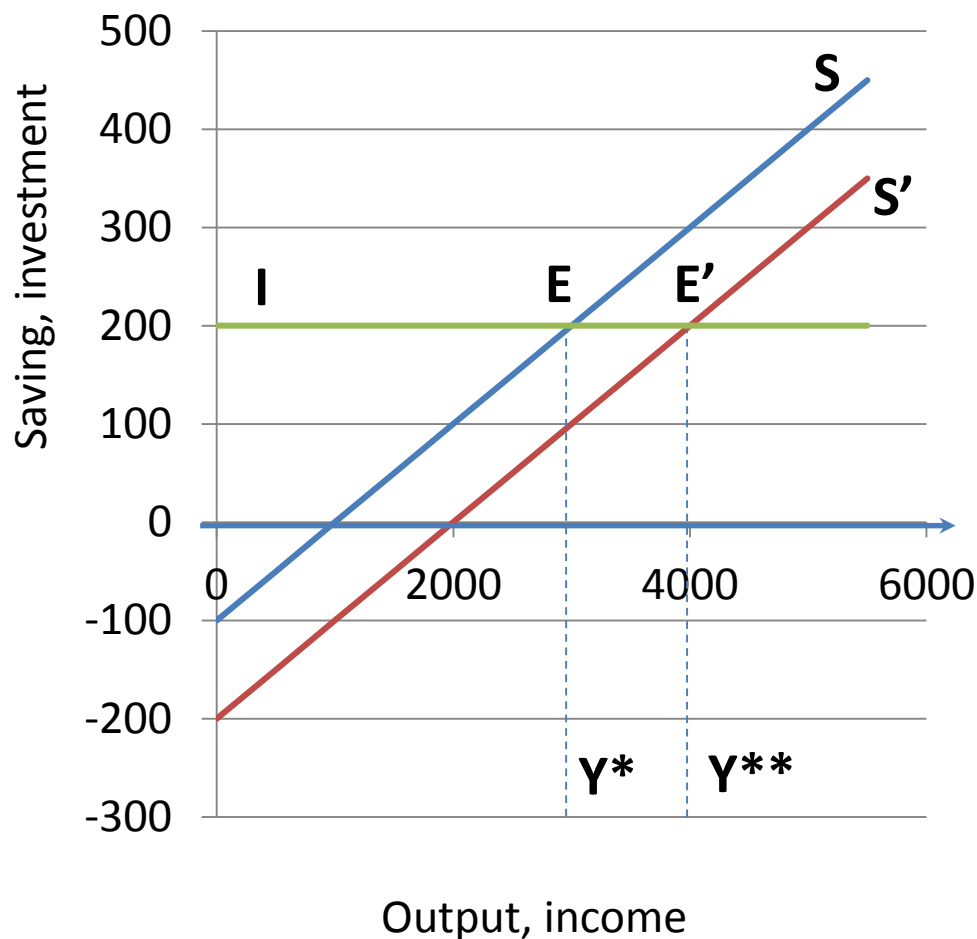
# The multiplier (if $c=0.9$ )

- Multiplier =  $1 + 0.9 + 0.9^2 + 0.9^3 + 0.9^4 + 0.9^5 + \dots$

The right-hand side of the equation is called a geometric series.

- $x = 1 + 0.9 + 0.9^2 + 0.9^3 + 0.9^4 + 0.9^5 + \dots$
- $0.9x = 0.9 + 0.9^2 + 0.9^3 + 0.9^4 + 0.9^5 + \dots$
- $x(1-0.9) = 1$  thus:  $1/(1-0.9) = 1 + 0.9 + 0.9^2 + \dots$
- In a general case (for  $0 < c < 1$ ):
- $1/(1-c) = 1 + c + c^2 + c^3 + c^4 + c^5 + \dots$

# The paradox of thrift



In equilibrium planned saving equals planned investment. A fall in the desire to save induces a rise in equilibrium output to keep planned saving equal to planned investment.

A change in the amount households wish to save at each income leads to a change in equilibrium income, but no change in equilibrium saving, which must still equal planned investment. This is the paradox of thrift.