INTERMEDIATE MACROECONOMICS

IS-LM MODEL OF BUSINESS CYCLES

8. IS SUBMODEL

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OVERVIEW

- IS submodel describes how expenditures on goods (Z) relates to income (Y) in the economy
  1. consumers' behavior: expenditure function
  2. accounting identity: income = expenditure
- in equilibrium, both conditions are satisfied

DEFINING THE EQUILIBRIUM

- first equilibrium condition: expenditure function
  - $Z = [c_0 + I + G - c_1 \times T] + c_1 \times Y$
- second equilibrium condition: expenditure = income
  - $Z = Y$
- 2 equations & 2 variables (Z,Y): equilibrium is well defined

EQUILIBRIUM INCOME

- to determine the equilibrium level of income Y^*, we jointly solve both equilibrium conditions

- $Z = [c_0 + I + G - c_1 \times T] + c_1 \times Y$ and $Z = Y$

- $Y = [c_0 + I + G - c_1 \times T] + c_1 \times Y$ [substituting Z out]

- $(1 - c_1) \times Y = c_0 + I + G - c_1 \times T$ [algebra]

- hence: $Y^* = (c_0 + I + G - c_1 \times T) / (1 - c_1)$

- in equilibrium: income Y^*= expenditure Z^* = GDP

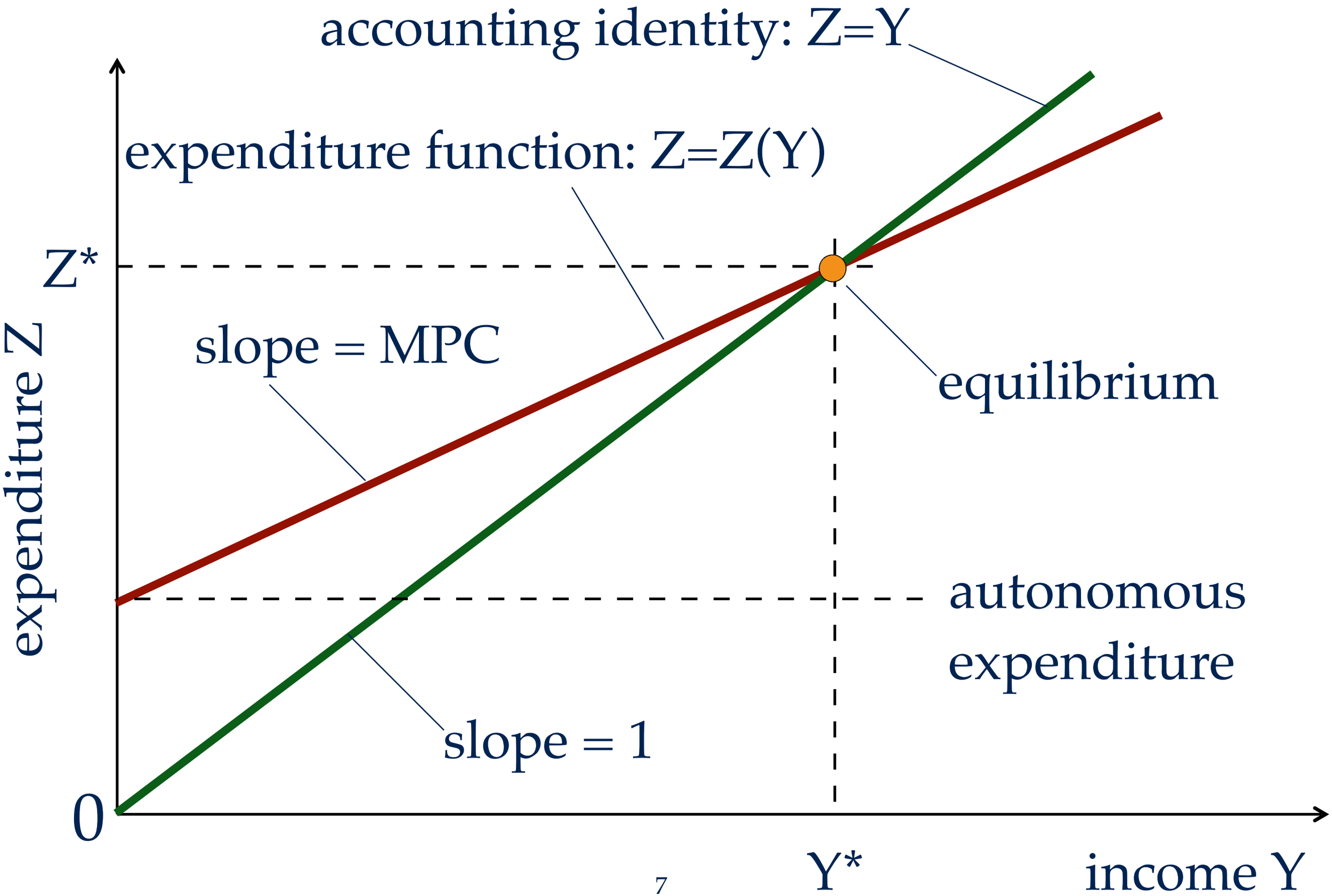
AUTONOMOUS EXPENDITURE

- $Y^* = (c_0 + I + G - c_1 \times T) / (1 - c_1)$
- $(c_0 + I + G - c_1 \times T)$: autonomous expenditure
  - it measures aggregate demand (AD): the level of demand in the economy, determined by the desire to spend of households (c_0), firms (I), and the government (G)
  - shocks to AD are key drivers of business cycles
  - changes in c_0 reflect changes in people's desire to spend: it is an especially important AD shock

SPENDING MULTIPLIER

- $Y^* = (c_0 + I + G - c_1 \times T) / (1 - c_1)$
- $1 / (1 - c_1)$: spending multiplier
  - it "multiplies" autonomous expenditure to get equilibrium expenditure: it how $1 of autonomous expenditure translates into GDP
  - if $c_1 = 0.6$, multiplier is $1/(1 - 0.6) = 2.5$: an increase in autonomous spending by $1 increases GDP by $2.5
  - the multiplier is different for different consumption and investment functions

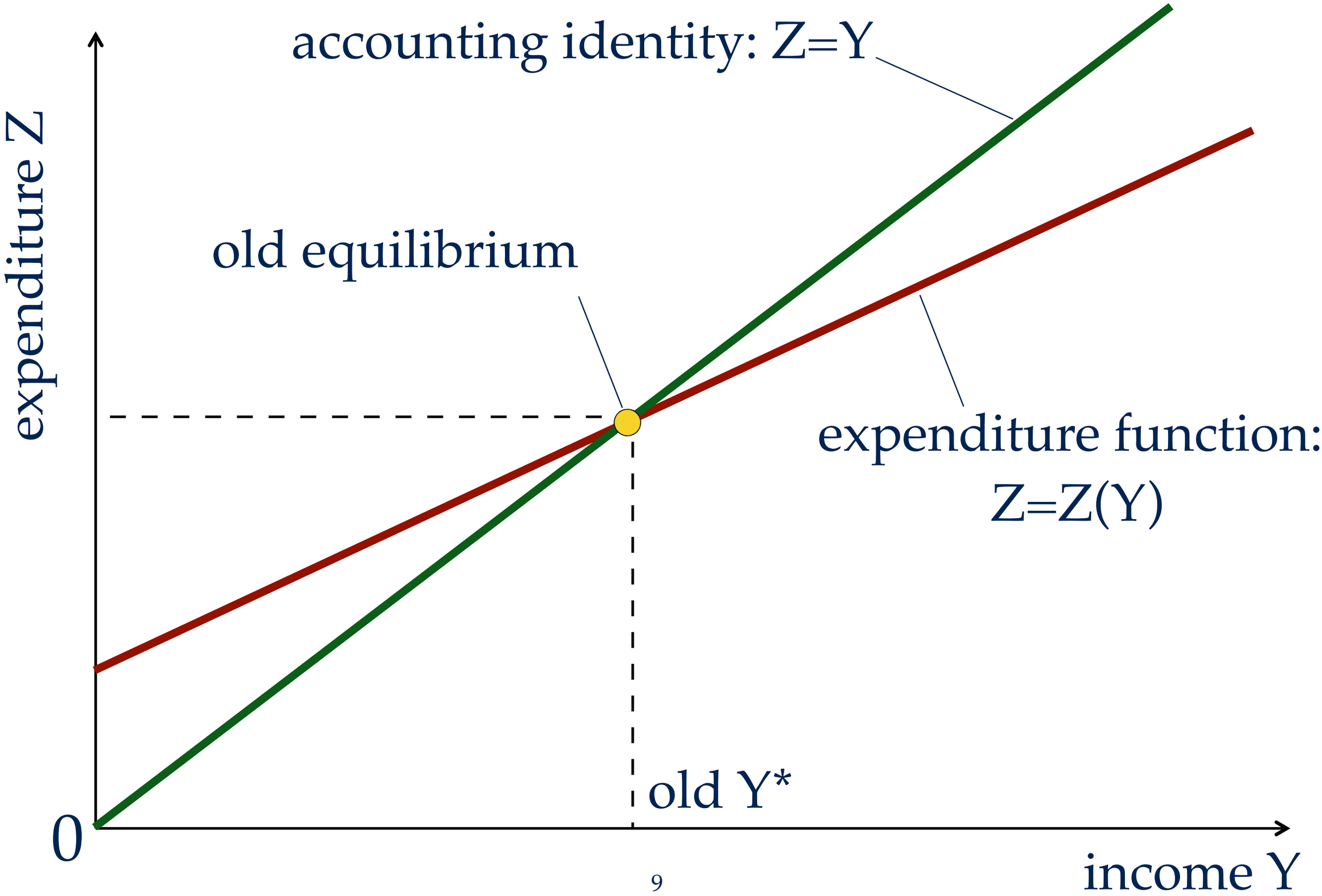
IS EQUILIBRIUM DIAGRAM



EFFECT OF AD SHOCKS

- a positive AD shock is an increase in autonomous expenditure
  - an increase in the level c_0 of the consumption function
  - an increase in government spending G
  - an increase in investment I
  - a reduction in taxes / an increase in transfers (decrease in T)
- through the multiplier, an increase in autonomous expenditure has a greater than one-for-one effect on equilibrium income Y*

DIAGRAM FOR POSITIVE AD SHOCK



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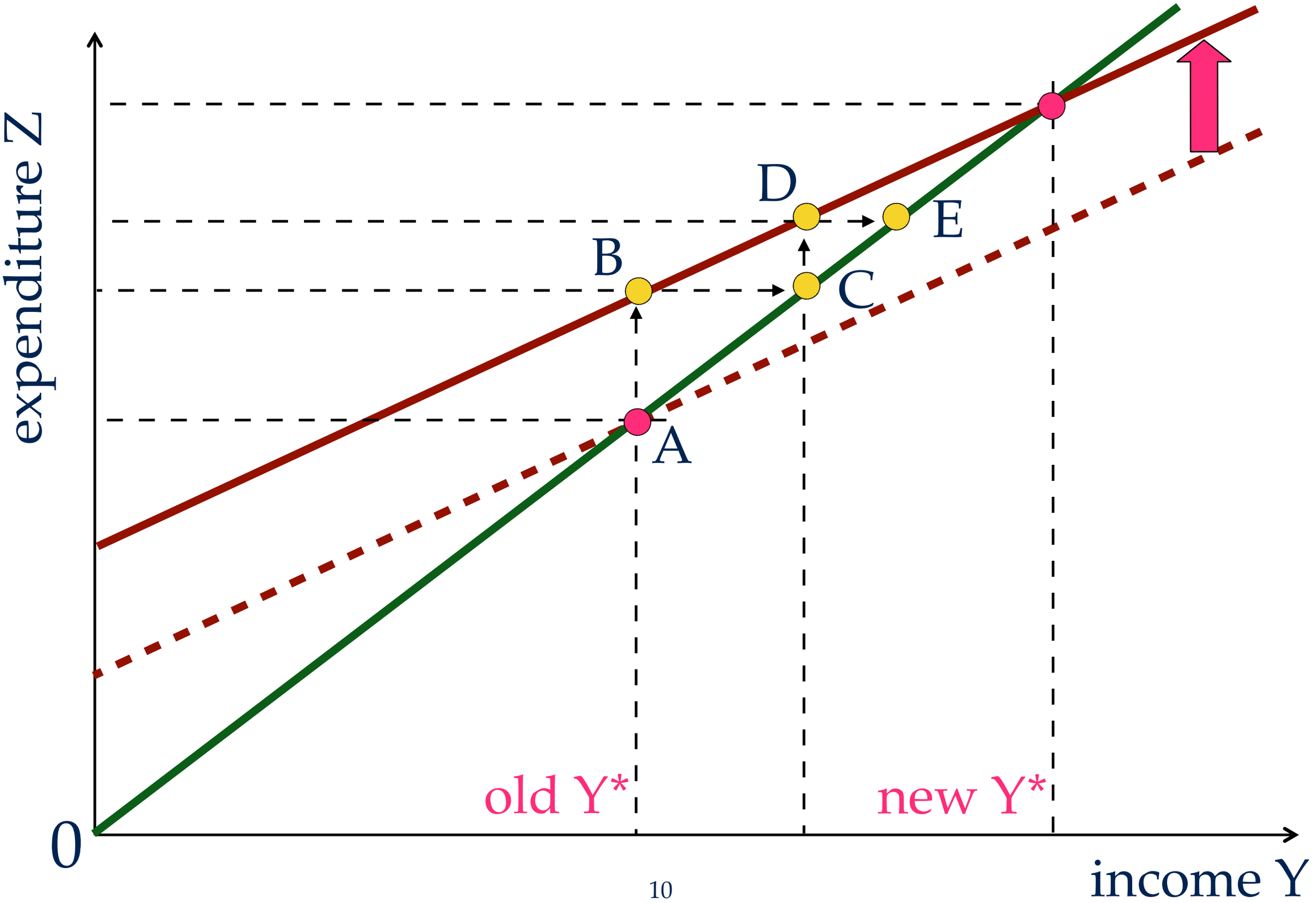

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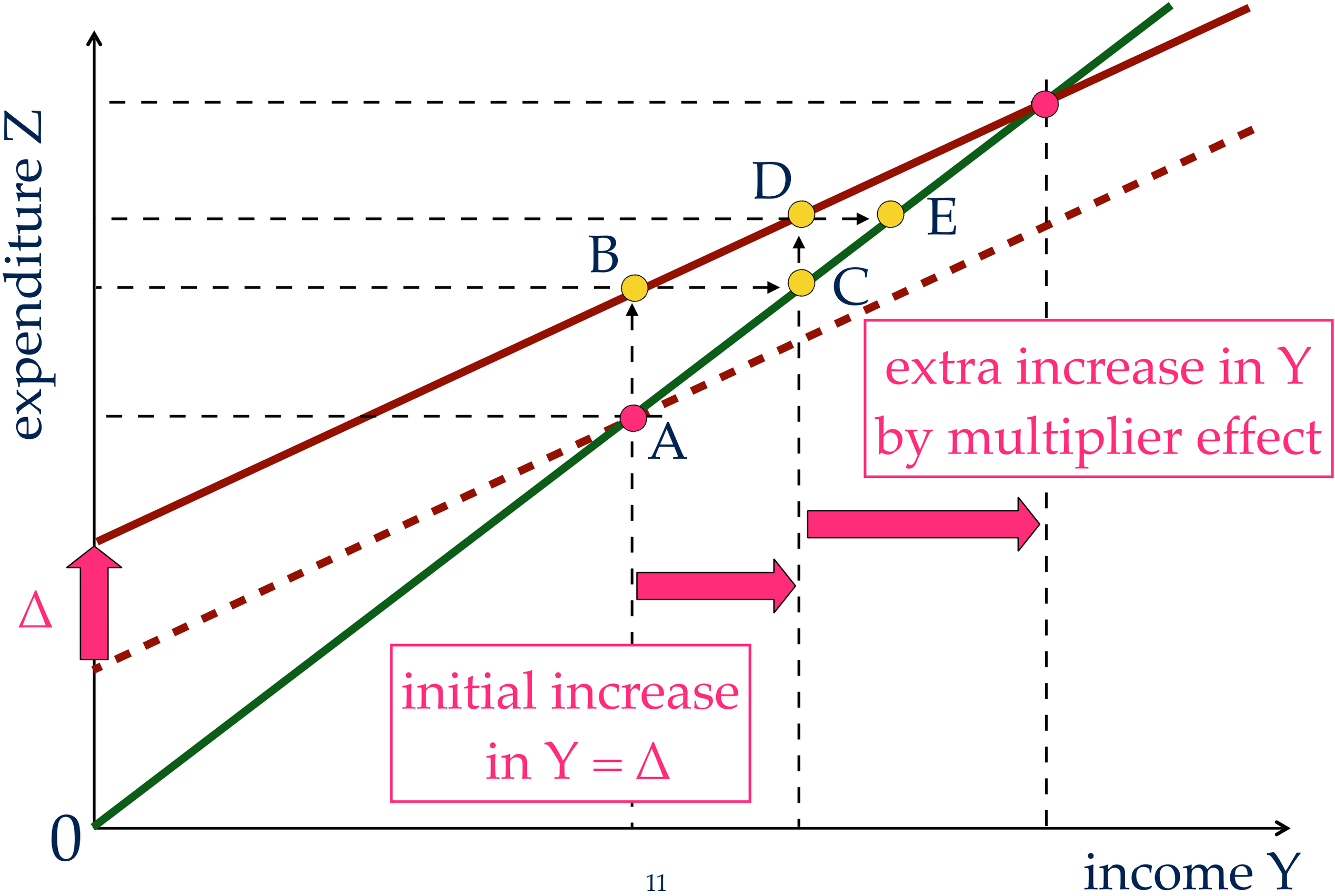

AD SHOCK EXAMPLE: GOVERNMENT SPENDING

- an increase in government spending G leads to an increase in income, which in turn leads to an increase in expenditure: thus government spending is "multiplied"

- the equilibrium increase in income is larger than the initial increase in spending, by a factor equal to the spending multiplier: $1/(1 - MPC) > 1$

- the government multiplier depends on the marginal propensity to consume (MPC), which can be estimated using econometric methods

INVESTMENT = SAVING

- an alternative formulation of the condition expenditure = income (Z=Y) is investment = saving

- this is the original formulation proposed by John Maynard Keynes in the “General Theory of Employment, Interest and Money” in 1936

- it explains the name “IS curve”

PRIVATE AND PUBLIC SAVING

- private saving (S) is disposable income less consumption expenditure: $S = D - C = Y - T - C$

- public saving is revenue from taxes less spending on transfers less spending on goods & services:

- public saving = T - G

- public saving > 0: budget surplus

- public saving < 0: budget deficit

EQUIVALENCE BETWEEN INCOME = EXPENDITURE AND INVESTMENT = SAVING

- income = expenditure: $Y = C + I + G$
- $Y - T - C = I + (G - T)$ [substract T]
- $S = I + (G - T)$ [definition of private saving]
- $I = S + (T - G)$
- hence, investment = private saving + public saving
- or, investment= total saving

MARGINAL PROPENSITY TO SAVE

- private saving is disposable income – consumption
  - $S = D - C$
- consumption function yields $S = D - c_0 - c_1 \times D$
  - $S = -c_0 + (1 - c_1) \times D$
- $-c_0 < 0$: dis-saving when $D = 0$
- $1 - c_1 > 0$: marginal propensity to save (MPS)
  - when D increases by \$1, saving increases by MPS

PROPENSITY TO SAVE IN THE US

TABLE 13.2

Saving Rates by Income Quintile

Income Quintile	Median Saving Rate
1 (Lowest)	8.6%
2	12.9%
3	16.3%
4	18.0%
5 (Highest)	23.0%

- richer households save a larger share of their income
- poorer households save a smaller share of their income
- for this reason, government transfers are often targeted to poorer households: this will create larger multipliers