

# Lecture 5: Aggregate Expenditure and Output in Short Run

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**Course:** Macroeconomics 201

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## The Road Ahead

1. Aggregate Expenditure Model
2. Determinants of Aggregate Expenditure
3. Graphing Goods Market Equilibrium
4. Multiplier Effect
5. Aggregate Demand Curve

## Aggregate Expenditure

- Keynes identified four categories of expenditures
  - **consumption (C)**: expenditure by consumers
  - **planned investment (I')**: expenditure by firms (NO unplanned changes in inventories)
  - **government purchases (G)**: expenditure by gov't, not including transfer payments
  - **net exports (NX)**: net expenditure by foreigners, exports (EX) -- imports (IM)
- **Goods market equilibrium/IS relation**

$$\underbrace{Y}_{\text{GDP}} = \underbrace{C + I' + G + NX}_{\text{aggregate expenditure (AE)}}$$

$\Leftrightarrow$  actual investment = planned investment

## Aggregate Expenditure Model

- A macro model that determines **short-run** output
  - relation between AE (total spending/demand) and GDP (total production/supply)
  - key assumptions: constant price level & no growth
- How AE model works
  - $AE > GDP \Rightarrow \text{inventories} \downarrow \Rightarrow (Y, N) \uparrow$
  - $AE < GDP \Rightarrow \text{inventories} \uparrow \Rightarrow (Y, N) \downarrow$
  - $AE = GDP \Rightarrow \text{inventories unchanged} \Rightarrow \text{goods market equilibrium}$
- GDP fluctuates due to changes in AE

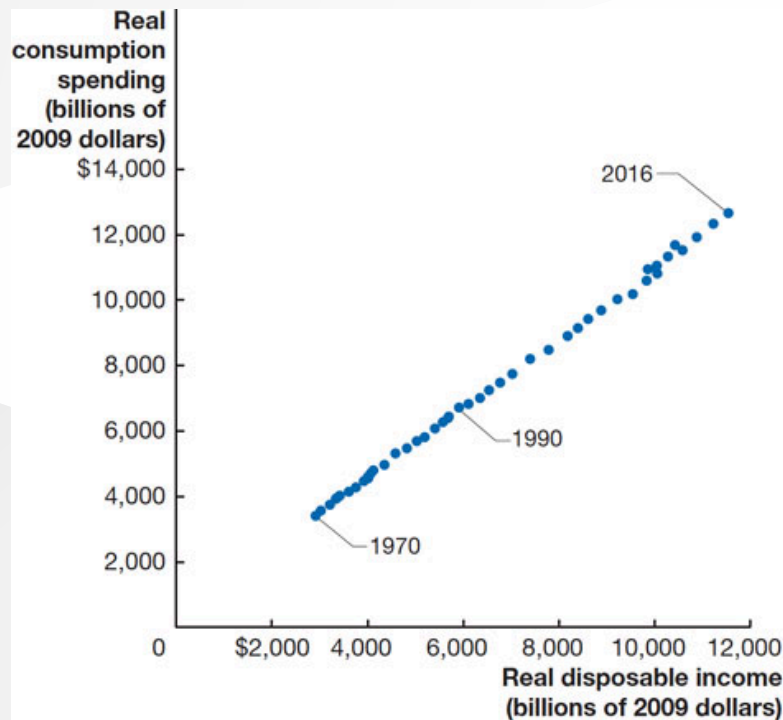
## Determinants of Consumption

### Consumption function

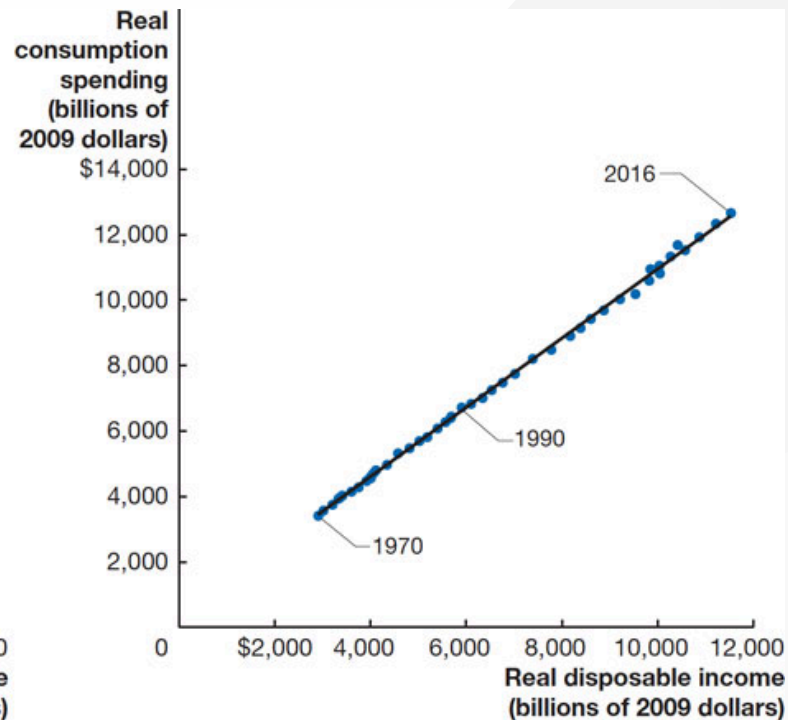
$$C = C(Y_D) = c_0 + c_1 Y_D, \quad Y_D = Y - T$$

- Some notations
  - $C$  = consumption
  - $T$  = net taxes (taxes net of transfers)
  - $Y_D$  = disposable income
  - $c_1$  = marginal propensity to consume (MPC)
  - $c_0$  = autonomous consumption
- Other determinants: wealth, expected future income, **real interest rate (price of consumption today relative to tomorrow)**, price level

## Consumption Function



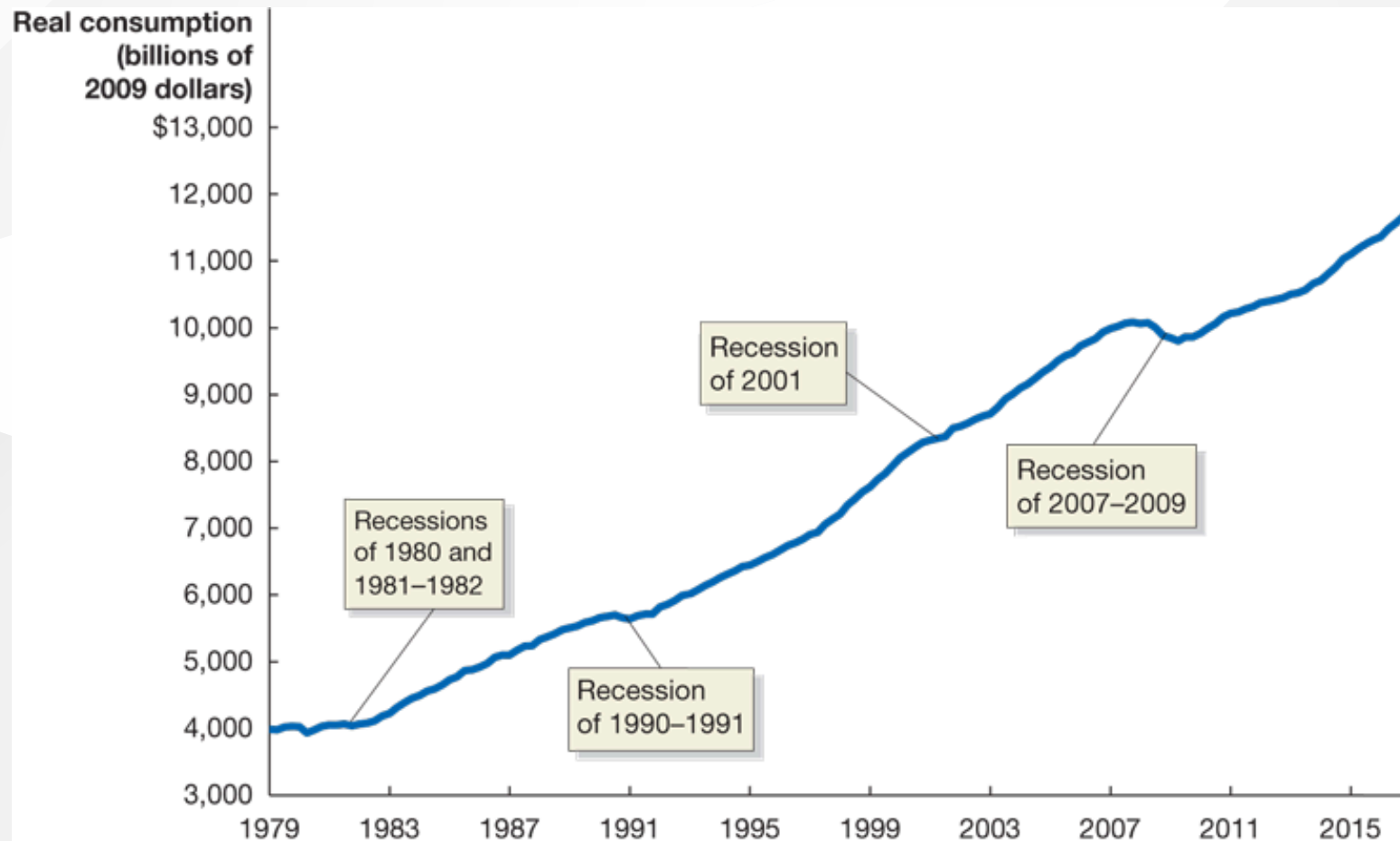
(a) Consumption and income, 1970–2016



(b) The consumption function

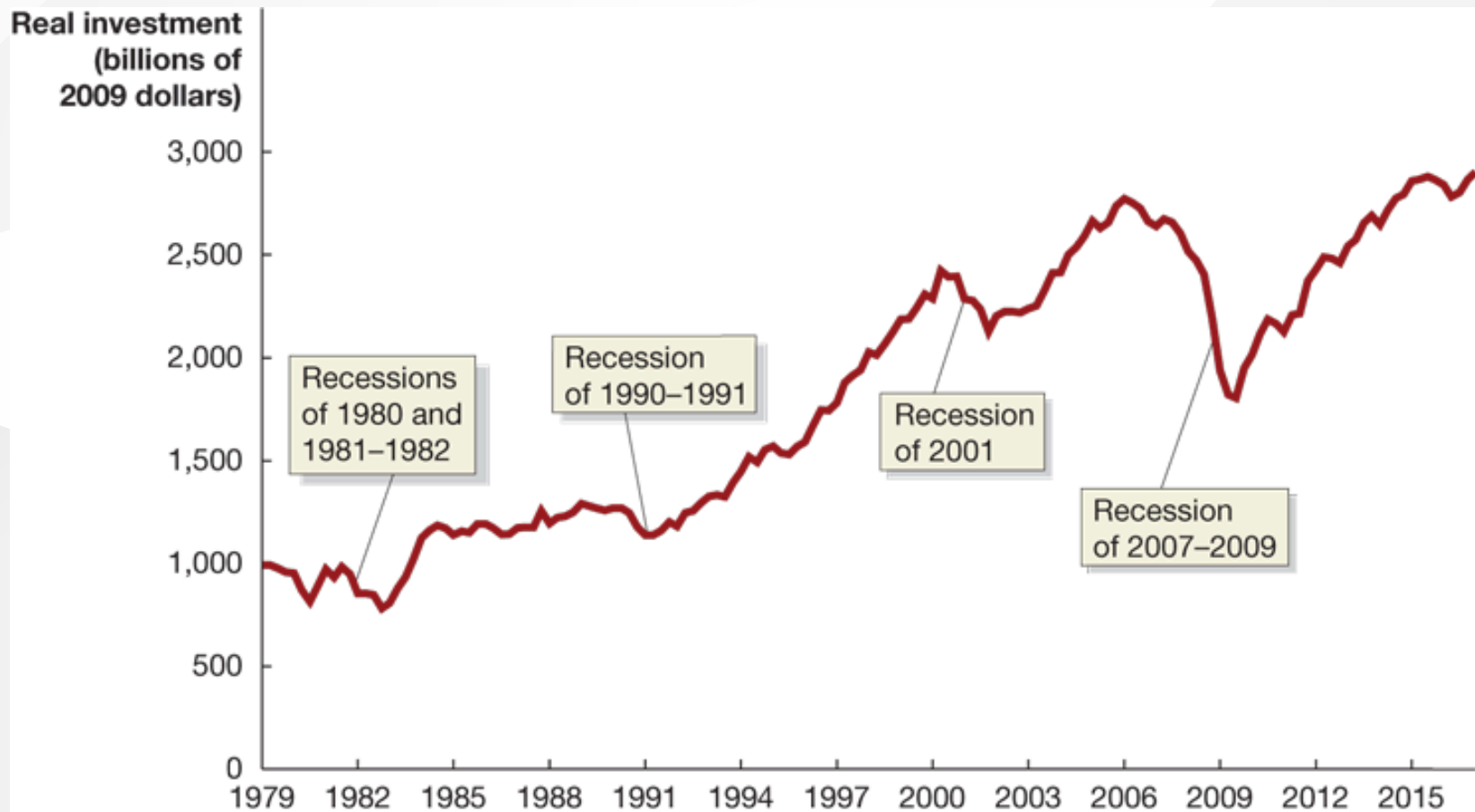
- Relation b/w consumption and income (source: BEA)
- $MPC = \text{slope of consumption function}$

## U.S. Consumption



- Real consumption, 1979-2017 (source: BEA)
- Consumption follows smooth, upward trend

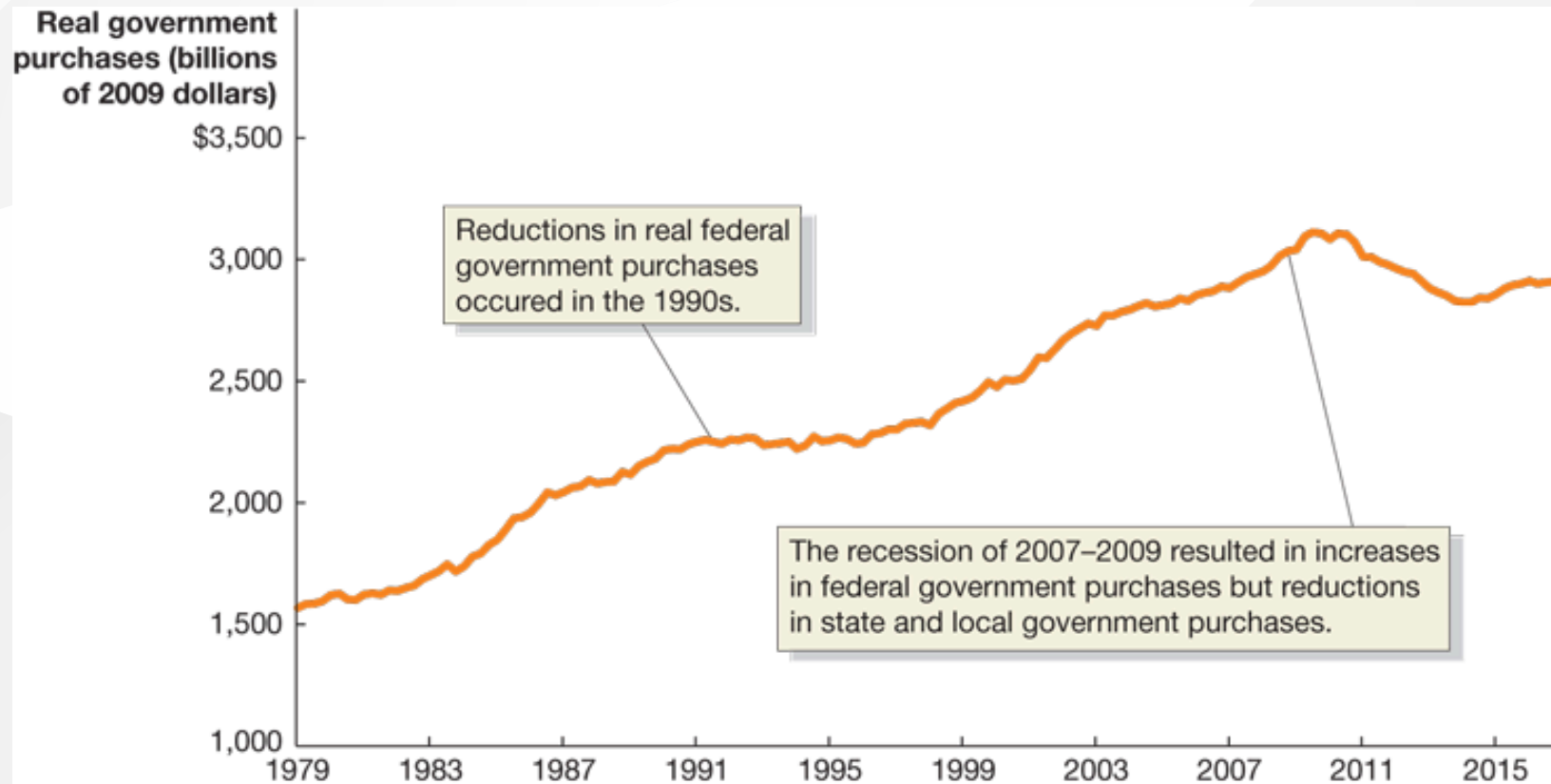
## U.S. Investment



- Real investment, 1979-2017 (source: BEA)
- Investment is subject to larger changes than consumption

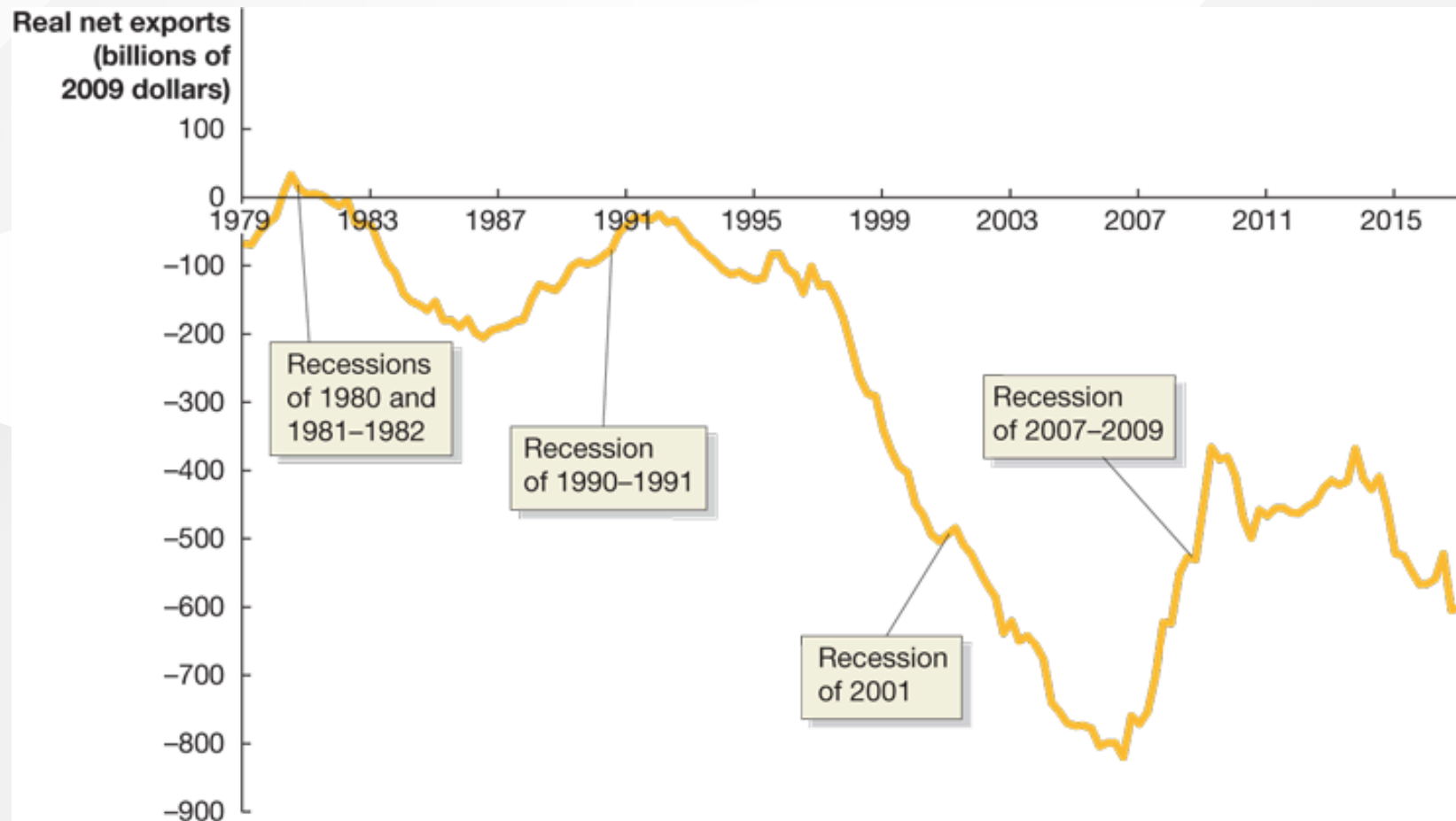


## U.S. Government Purchases



- Real government purchases, 1979-2017 (source: BEA)
- Government purchases grew steadily in most years

## U.S. Net Exports



- Real net exports, 1979-2017 (source: BEA)
- Net exports were negative in most years

## Income, Consumption, and Saving

### Marginal propensity to consume/save

$$\frac{\Delta Y_D}{\Delta Y_D} = \frac{\Delta C}{\Delta Y_D} + \frac{\Delta S}{\Delta Y_D} \Rightarrow 1 = \text{MPC} + \text{MPS}$$

- Some remarks
  - $\Delta$  means 'change in'
  - $\text{MPC} = \Delta C / \Delta Y_D = \Delta C / \Delta Y$
  - $\Delta S / \Delta Y_D =$  marginal propensity to save (MPS)
- Example: consumption increases from \$8,000 to \$8,600 as national income increases from \$9,000 to \$10,000

$$\text{MPC} = \frac{\$8,600 - \$8,000}{\$10,000 - \$9,000} = 0.6, \text{ MPS} = 1 - \text{MPC} = 0.4$$

## Solving for Equilibrium Output

### Equilibrium output

$$Y = c_0 + c_1(Y - T) + I + G + NX$$
$$\Rightarrow Y = \frac{1}{1 - c_1} [c_0 + I + G + NX - c_1 T]$$

- Some remarks

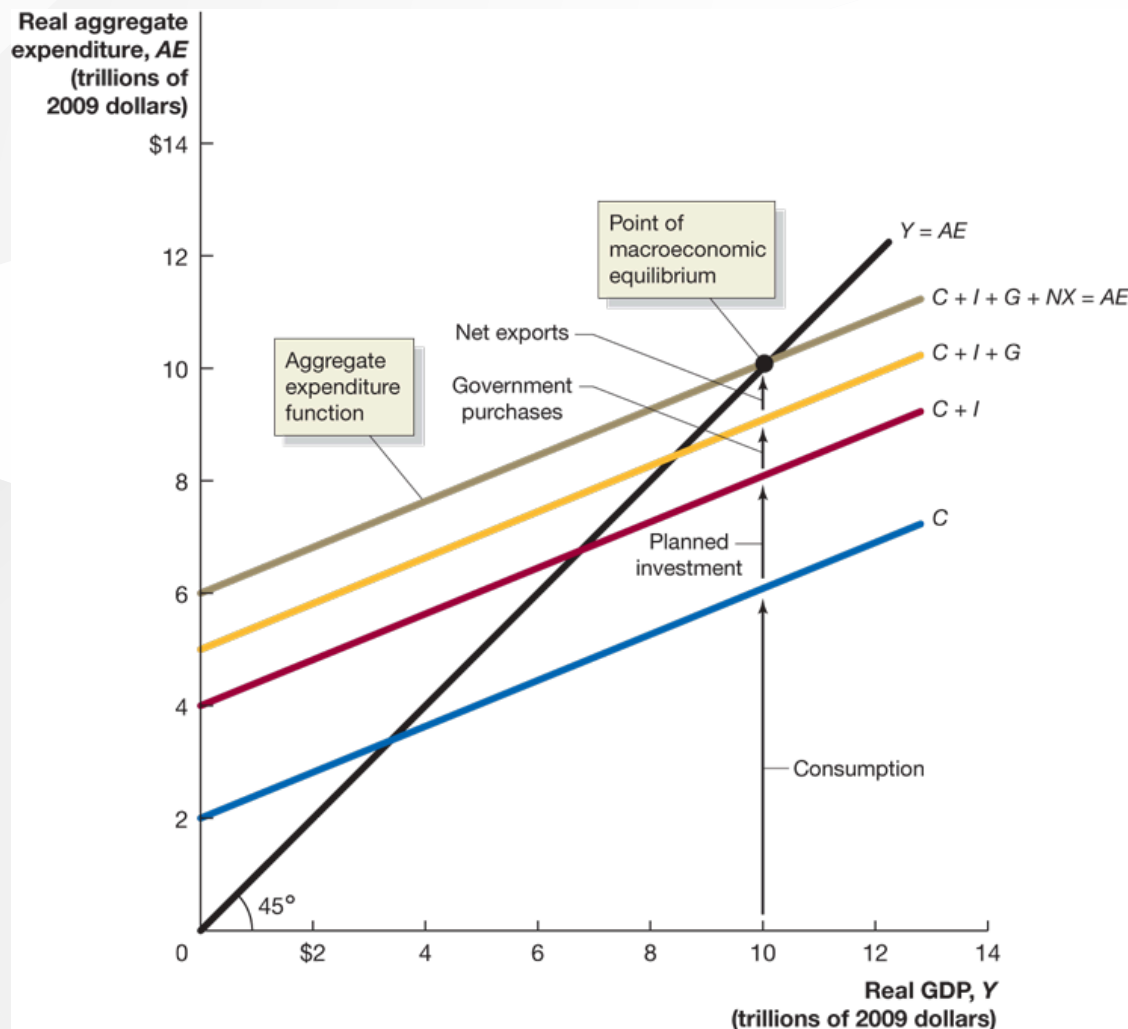
- autonomous spending:  $c_0 + I + G + NX - c_1 T$
- multiplier:  $1/(1 - c_1) > 1$  ( $0 < c_1 < 1$ )

**autonomous spending  $\uparrow \Rightarrow Y \uparrow$  more than one for one**

- Example:  $C = 500 + .5Y_D$ ,  $Y_D = Y - T$ ,  $T = 600$ ,  $I = 300$ ,  $G = 2000$ , and  $NX = 0$

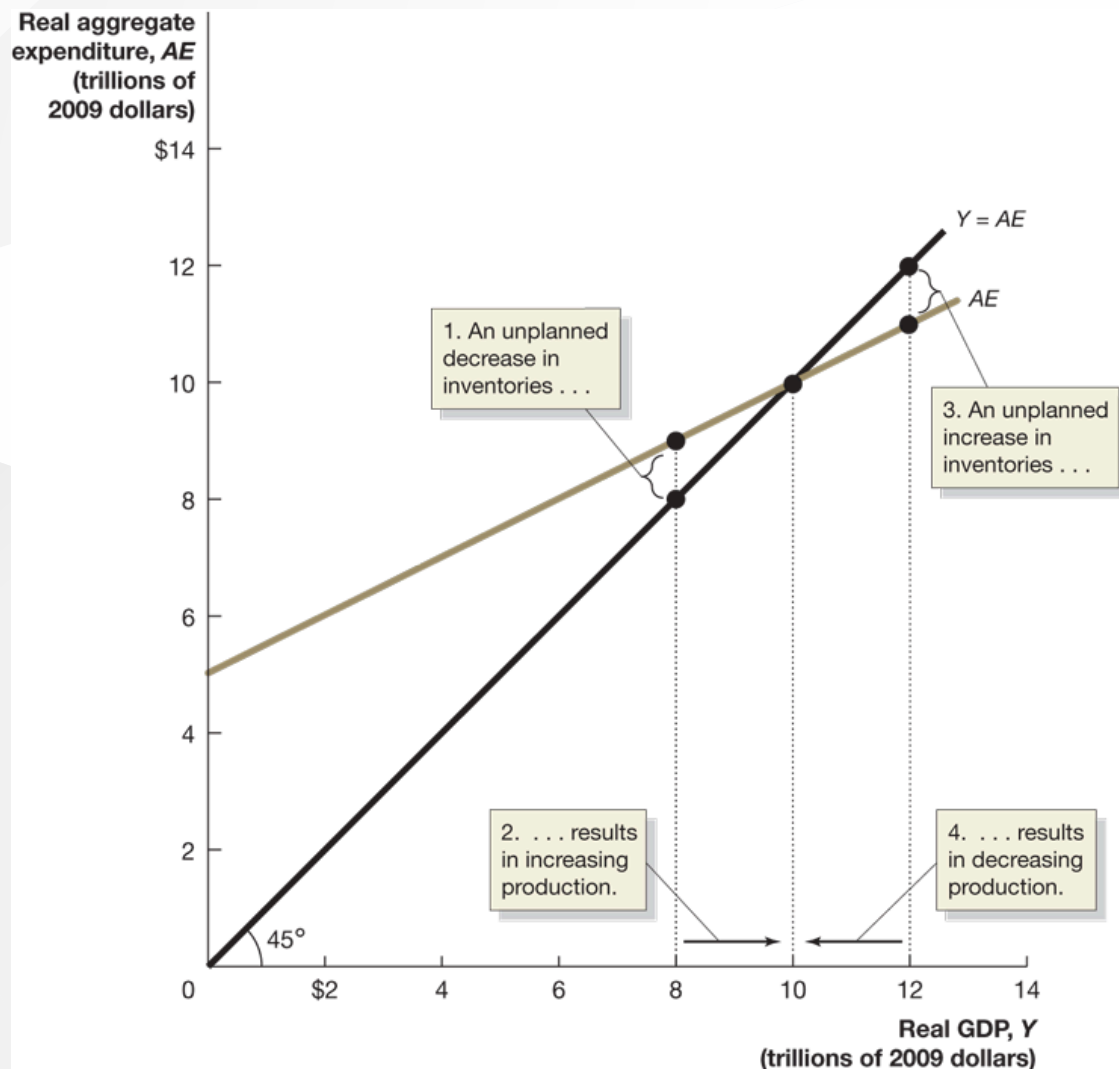
$$Y = 5000, \quad \text{multiplier} = 2$$

## Goods Market Equilibrium

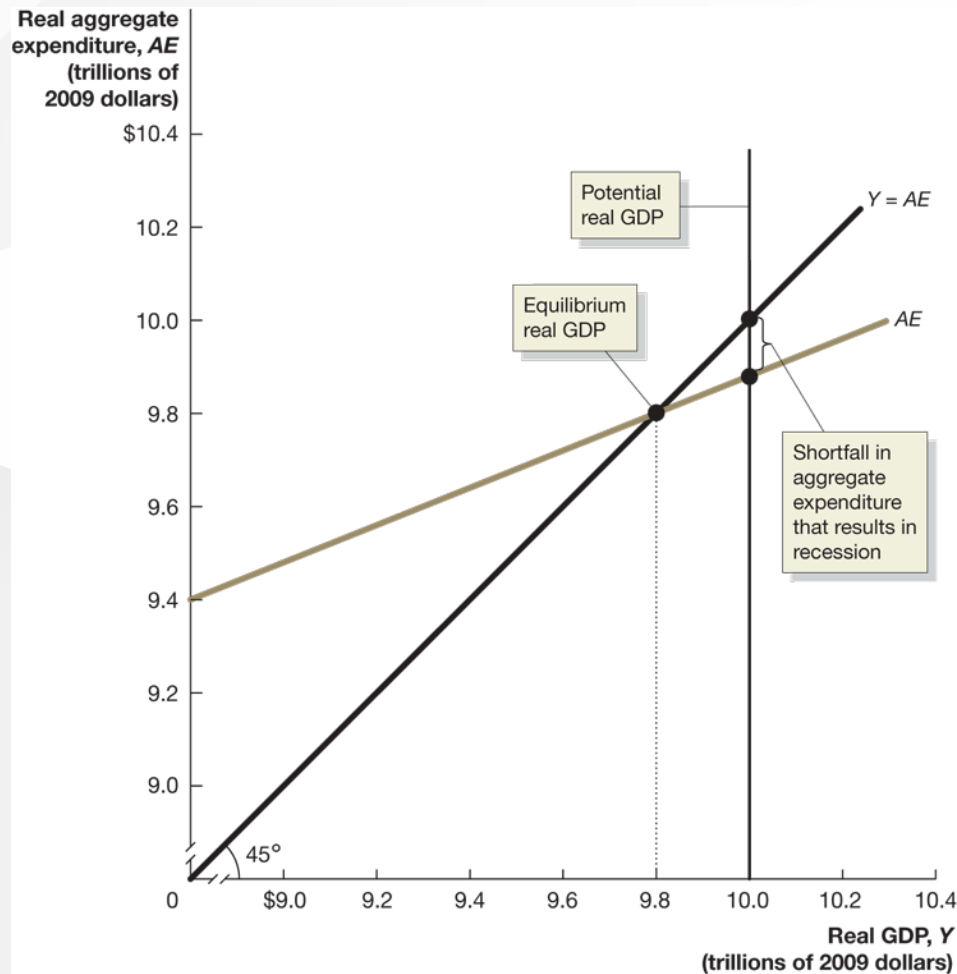


- 45°-line diagram or Keynesian cross

## Goods Market Equilibrium (Cont'd)

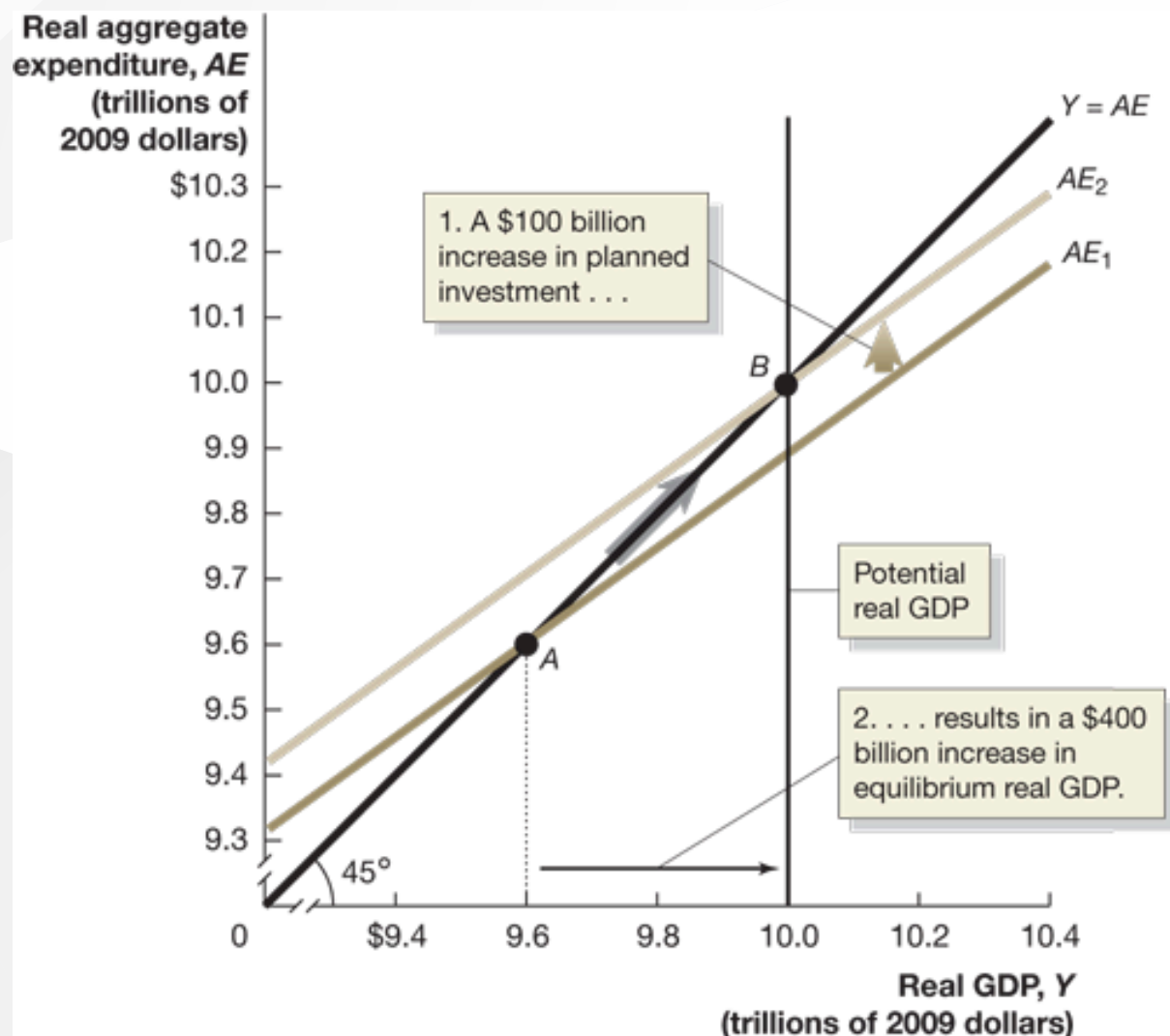


## Graphing Economic Recession



- Paradox of thrift: short-run vs. long-run

## Graphing Multiplier Effect





## Example: Multiplier Effect

Round	Change in $I$	Change in $C$	Change in $Y$
1	\$100	\$0	\$100
2	\$0	\$75	\$75
3	\$0	\$56	\$56
⋮	⋮	⋮	⋮

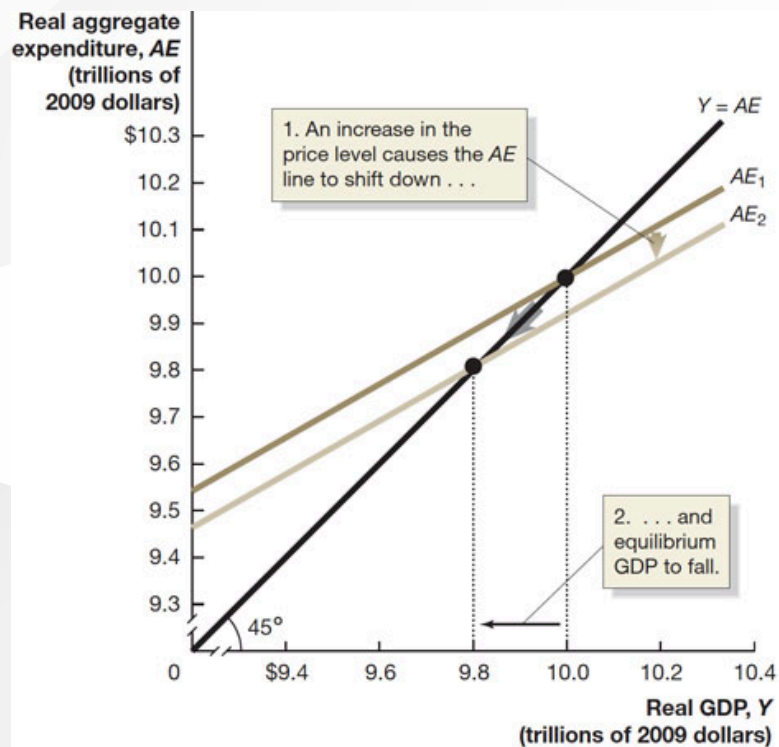
- Example:  $MPC = 0.75$ ,  $I \uparrow$  by \$100
- Calculate multiplier

$$\Delta Y = \$100 \times (1 + MPC + MPC^2 + MPC^3 + \dots)$$

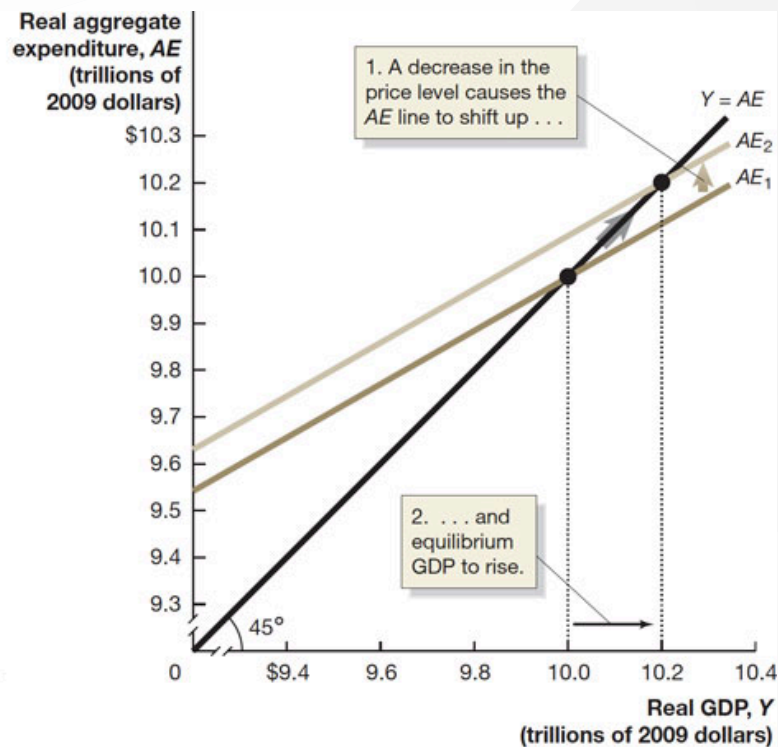
$$\Rightarrow \text{multiplier} = \frac{\Delta Y}{\Delta I} = \frac{1}{1 - MPC} = 4 \quad (\text{why?})$$

- Higher MPC leads to higher multiplier

## Effect of Price Level Change



(a) The effect of a higher price level on real GDP

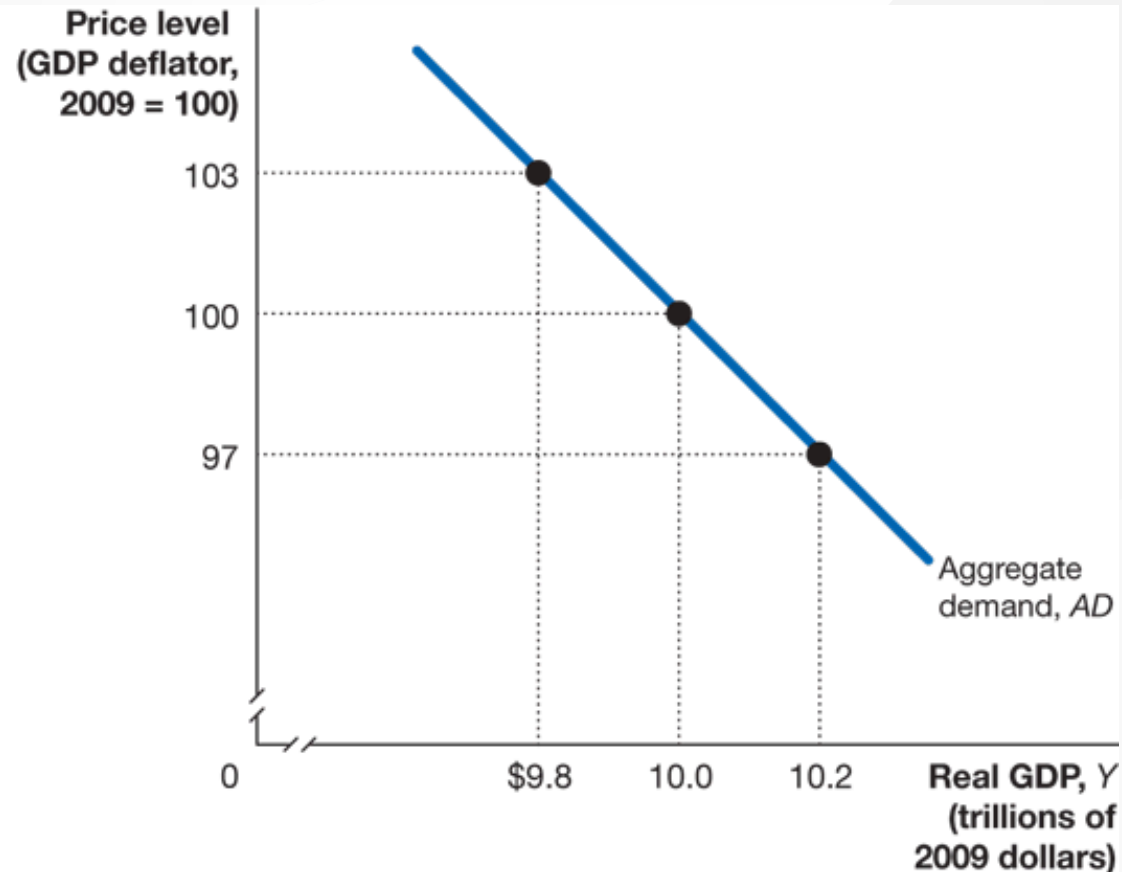


(b) The effect of a lower price level on real GDP

- $P \uparrow (\downarrow) \Rightarrow \text{real value of wealth} \downarrow (\uparrow) \Rightarrow C \downarrow (\uparrow)$
- $P \uparrow (\downarrow) \Rightarrow \text{exports} \downarrow (\uparrow), \text{imports} \uparrow (\downarrow) \Rightarrow NX \downarrow (\uparrow)$
- $P \uparrow (\downarrow) \text{ with unchanged money supply} \Rightarrow i \uparrow (\downarrow) \Rightarrow I \downarrow (\uparrow)$

## Aggregate Demand Curve: First Pass

Price Level	Equilibrium Real GDP
97	\$10.2 trillion
100	10.0 trillion
103	9.8 trillion



- Inverse relation between price level and real GDP, known as aggregate demand curve

## Readings & Exercises

- Readings
  - HO: chapter 12
  - BJ: lecture 2 (sec. 1, 2, 3) (supplementary)
- Exercises
  - HO: problem 1.4, 2.11, 3.12, 4.9, 4.13, D12.1