

Macroeconomics: Principles & Applications

CHAPTER II



The Short-Run Macro Model

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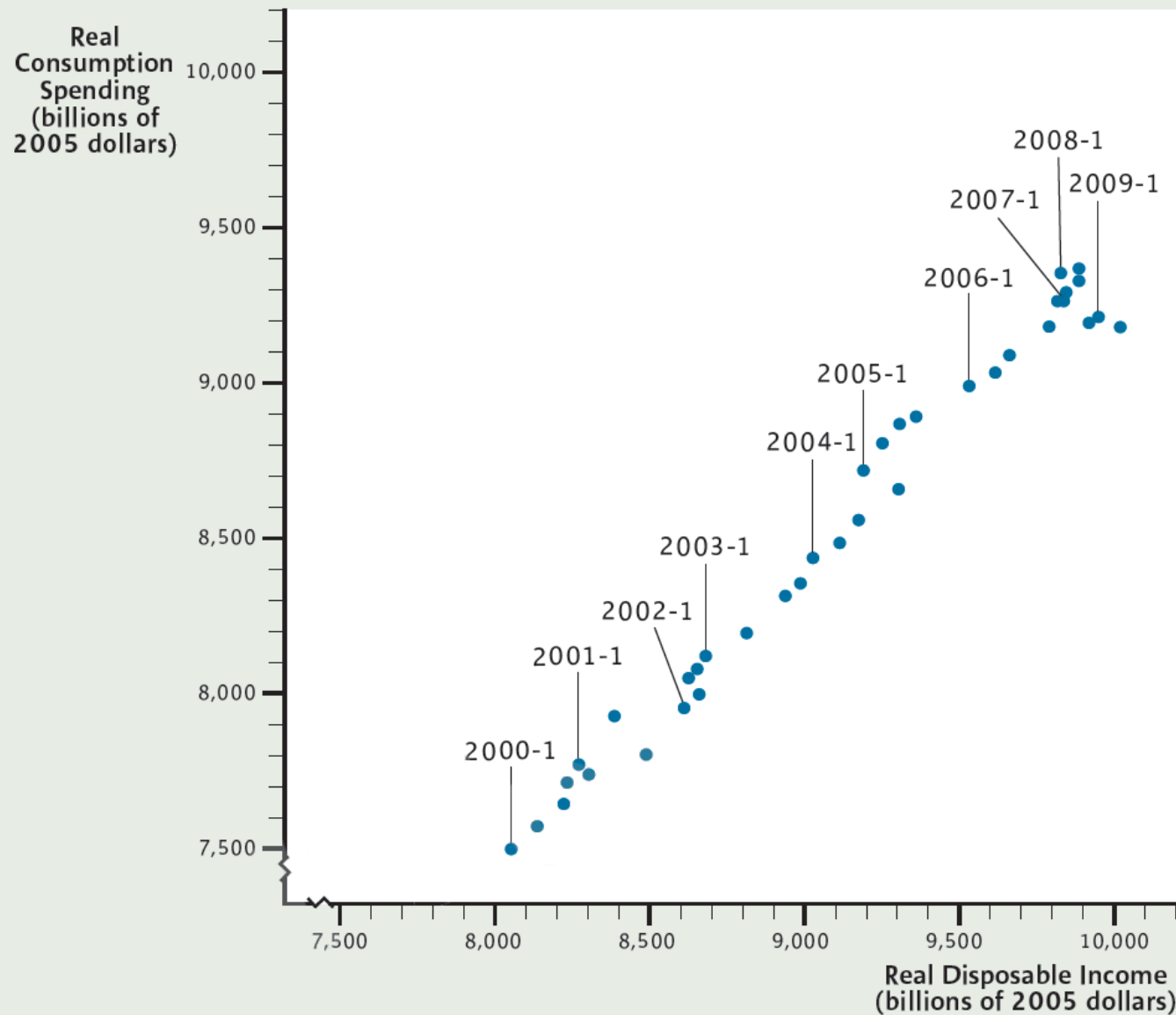
Short-Run Macro Model

- **Short-run macro model**
 - Macroeconomic model that explains how changes in spending can affect real GDP in the short run
- **In the short run:**
 - Spending depends on income
 - Income depends on spending

Consumption Spending

- Consumption spending increases when:
 - Disposable income rises
 - Wealth rises
 - The interest rate falls
 - Households become more optimistic about the future

Figure 1: Quarterly U.S. Consumption and Disposable Income, 2000–2009



When real consumption expenditure is plotted against real disposable income, the resulting relationship is very close to linear: As real disposable income rises, so does real consumption spending

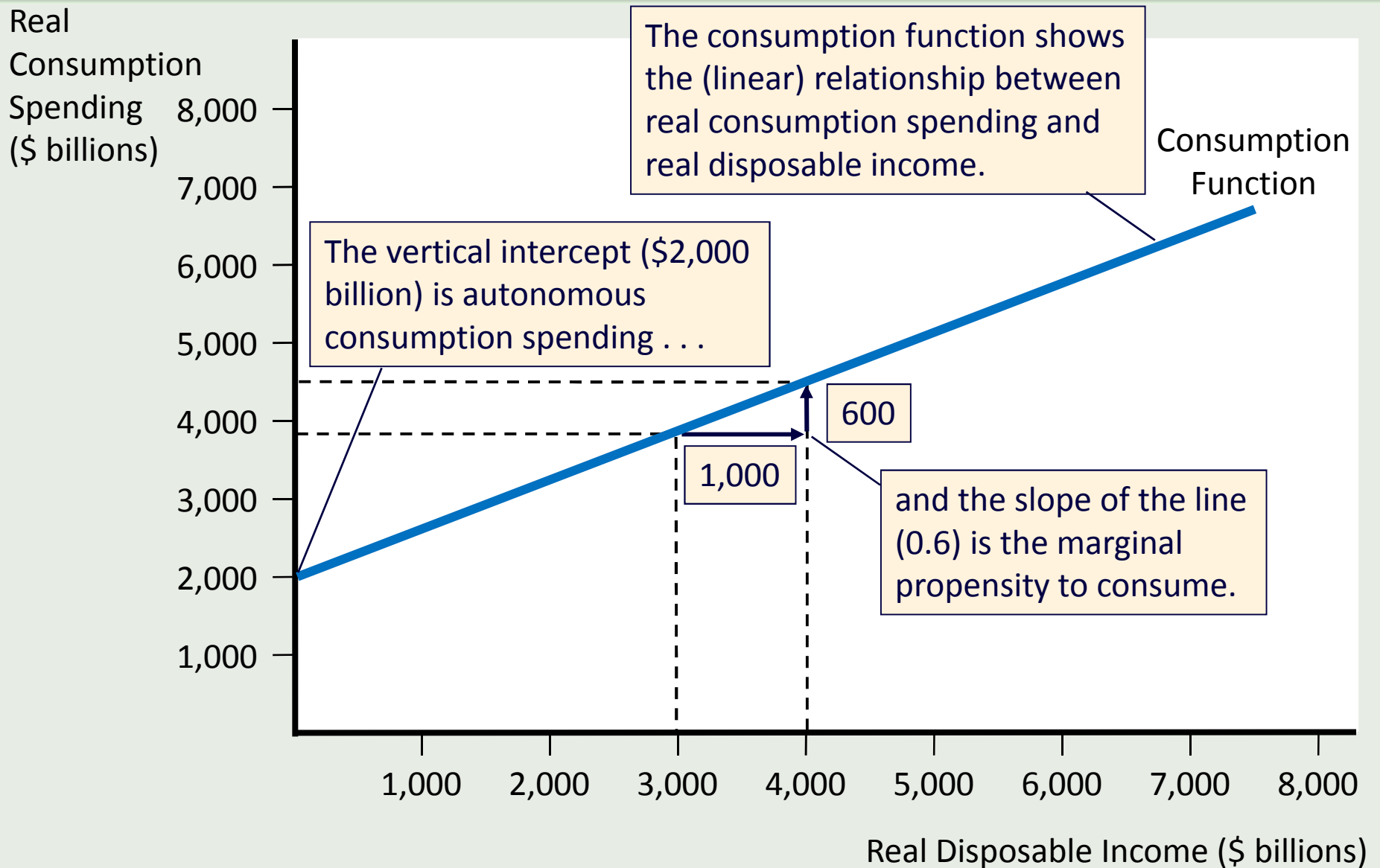
Consumption Spending

- **Consumption function**
 - Positively sloped relationship
 - Between real consumption spending and real disposable income
- **Autonomous consumption spending**
 - The part of consumption spending
 - That is independent of income
 - Vertical intercept of the consumption function

Table 1: Hypothetical Data on Disposable Income and Consumption

Real Disposable Income (billions of dollars per year)	Real Consumption Spending (billions of dollars per year)
0	2,000
1,000	2,600
2,000	3,200
3,000	3,800
4,000	4,400
5,000	5,000
6,000	5,600
7,000	6,200
8,000	6,800

Figure 2: The Consumption Function



Consumption Spending

- **Marginal propensity to consume (MPC) is**
 - The slope of the consumption function
 - The change in consumption divided by the change in disposable income
 - The amount by which consumption spending rises when disposable income rises by one dollar

$$0 < MPC < 1$$

Consumption Spending

- Straight line consumption function

$$C = a + b \text{ (Disposable income)}$$

- a – vertical intercept of the consumption function
- b – slope of the consumption function

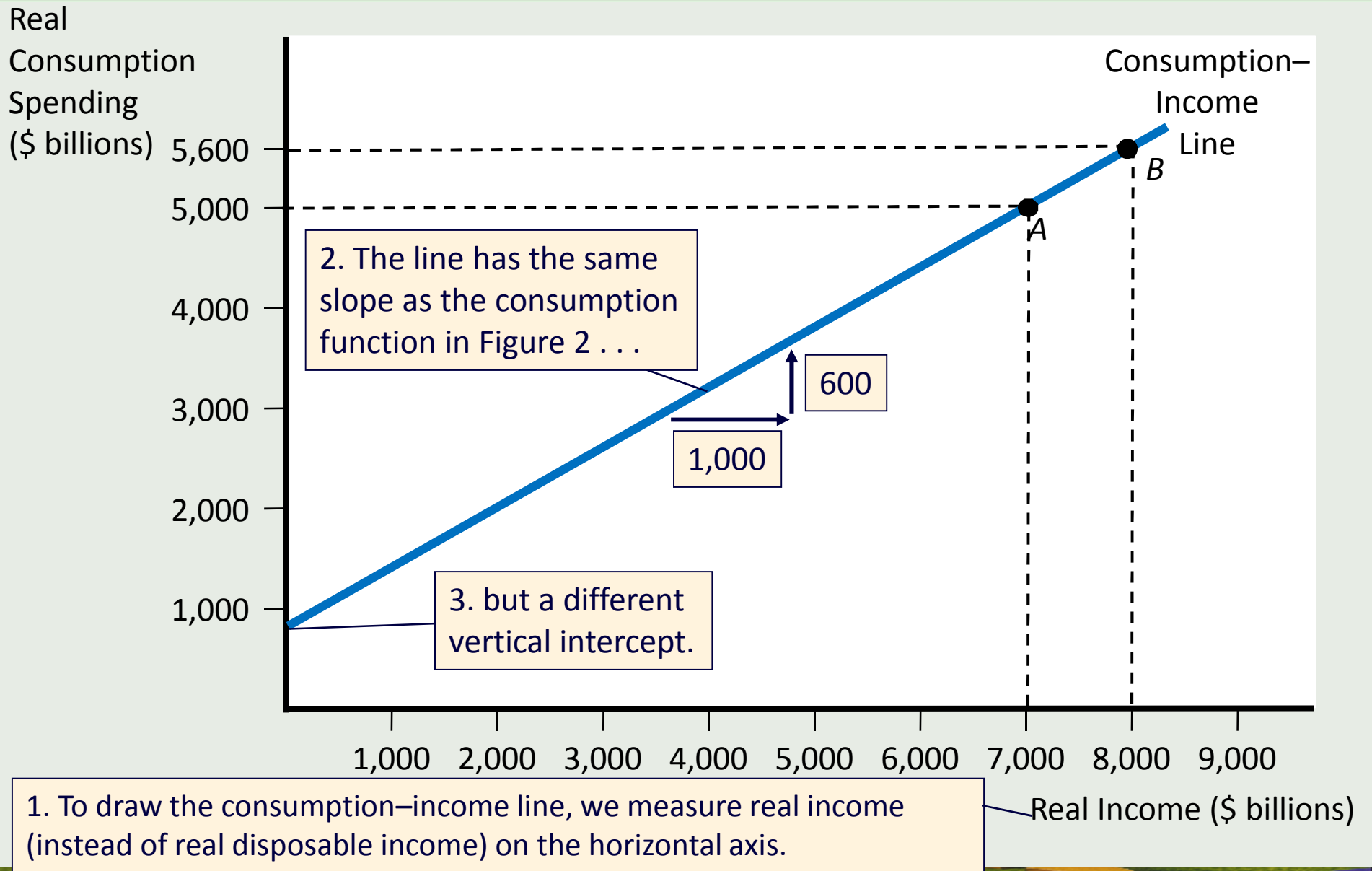
Consumption Spending

- **Consumption and income**
 - Assume net taxes = fixed amount
- **Consumption–income line**
 - A line showing aggregate consumption spending
 - At each level of income or GDP

Table 2: The Relationship between Consumption and Income

Income or GDP (billions of dollars per year)	Tax Collections (billions of dollars per year)	Disposable Income (billions of dollars per year)	Consumption Spending (billions of dollars per year)
2,000	2,000	0	2,000
3,000	2,000	1,000	2,600
4,000	2,000	2,000	3,200
5,000	2,000	3,000	3,800
6,000	2,000	4,000	4,400
7,000	2,000	5,000	5,000
8,000	2,000	6,000	5,600
9,000	2,000	7,000	6,200
10,000	2,000	8,000	6,800

Figure 3: The Consumption–Income Line



Consumption Spending

- **Fixed taxes**
 - Consumption-income line shifts downward
 - By the amount of the tax times the marginal propensity to consume (MPC)
 - The slope = MPC, unaffected by taxes

Consumption Spending

- **Income - increase**
 - With no change in taxes
 - Disposable income – increase
 - Consumption spending – increase
 - Movement rightward along the consumption-income line

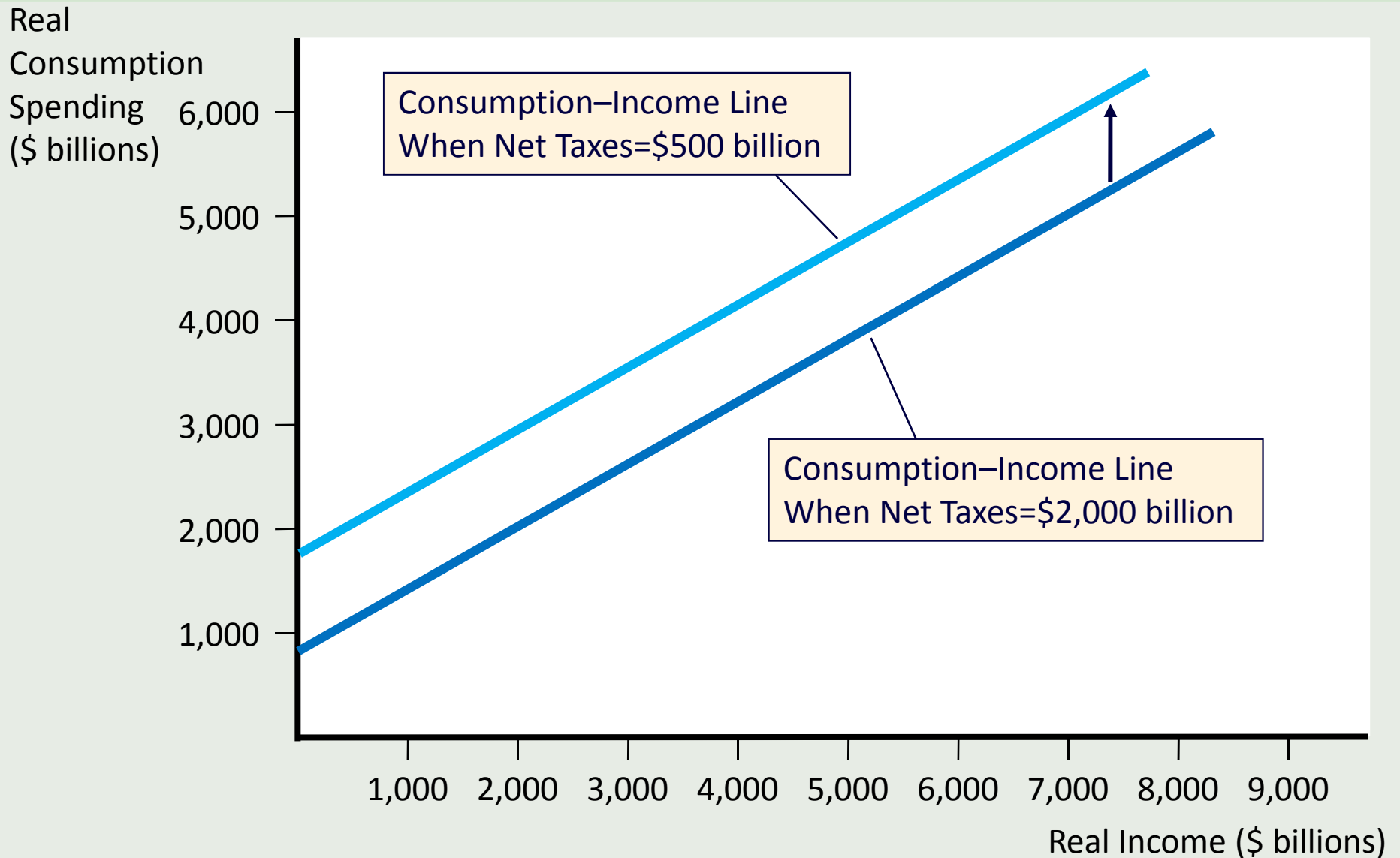
Consumption Spending

- **Net taxes – decrease**
 - Disposable income at each income level – increase
 - Consumption at each income level – increase
 - Shift upward of the consumption-income line

Consumption Spending

- **Household wealth – increase**
 - Autonomous consumption – increase
 - Consumption at each level of disposable income – increase
 - Consumption spending at each level of income – increase
 - Shift upward of the consumption-income line

Figure 4: A Shift in the Consumption–Income Line



Consumption Spending

- **Move along the consumption–income line**
 - When a change in income causes consumption spending to change
- **Shift in the consumption-income line**
 - When a change in anything else besides income causes consumption spending to change

Table 3: Shifts in the Consumption–Income Line

Consumption–Income Line Shifts Upward When:

Net taxes ↓	{	Transfers ↑ Taxes ↓
Autonomous consumption (a) ↑	{	Household wealth ↑ Interest rate ↓ Greater optimism

Consumption–Income Line Shifts Downward When:

Net Taxes ↑	{	Transfers ↓ Taxes ↑
Autonomous Consumption (a) ↓	{	Household wealth ↓ Interest rate ↑ Greater pessimism

Getting to Total Spending

- Investment spending (I^p)
 - Plant and equipment purchases by business firms and new home construction
 - Inventory investment
 - Unintentional and undesired
 - Excluded from investment spending
 - A given value
 - Determined by forces outside of our model

Getting to Total Spending

- **Government purchases**
 - A given value – determined by forces outside of our model
- **Net exports (NX)**
 - = Total Exports – Total Imports
 - A given value – determined by forces outside of our model

Getting to Total Spending

- **Aggregate expenditure (AE)**
 - Sum of spending by
 - Households, business firms, the government, and foreigners
 - On final goods and services produced in the United States
- **Aggregate expenditure = $C + I^P + G + NX$**
- **Increase in income by ΔGDP**
 - AE increases by: $\Delta AE = MPC \times \Delta GDP$

Table 4: The relationship between income and aggregate expenditure

(1) Income or GDP (billions of dollars per year)	(2) Consumption Spending (billions of dollars per year)	(3) Investment Spending (billions of dollars per year)	(4) Government Purchases (billions of dollars per year)	(5) Net Exports (billions of dollars per year)	(6) Aggregate Expenditure (AE) (billions of dollars per year)	(7) Change in Inventories (billions of dollars per year)
4,000	3,200	800	1,000	600	5,600	-1,600
5,000	3,800	800	1,000	600	6,200	-1,200
6,000	4,400	800	1,000	600	6,800	-800
7,000	5,000	800	1,000	600	7,400	-400
8,000	5,600	800	1,000	600	8,000	0
9,000	6,200	800	1,000	600	8,600	400
10,000	6,800	800	1,000	600	9,200	800
11,000	7,400	800	1,000	600	9,800	1,200
12,000	8,000	800	1,000	600	10,400	1,600

Equilibrium GDP

- When aggregate expenditure $<$ GDP
 - Output will decline in the future
- When aggregate expenditure $>$ GDP
 - Output will rise in the future
- Equilibrium GDP
 - In the short run
 - The level of output at which output and aggregate expenditure are equal

Equilibrium GDP

- Change in inventories
 - During any period
 - Will always equal output minus aggregate expenditure

$$\Delta \text{ Inventories} = \text{GDP} - \text{AE}$$

$AE < GDP \Rightarrow \Delta \text{Inventories} > 0 \Rightarrow GDP \downarrow$ in future periods

$AE > GDP \Rightarrow \Delta \text{Inventories} < 0 \Rightarrow GDP \uparrow$ in future periods

$AE = GDP \Rightarrow \Delta \text{Inventories} = 0 \Rightarrow$ No change in GDP

Equilibrium GDP

- **AE line**
 - C, consumption-income line
 - $C+I^P$ at each level of income
 - $C+I^P+G$ at each level of income
 - AE line: $C+I^P+G+NX$ at each level of income
 - Slope = MPC
- **A 45° line = translator line**
 - It allows us to measure any horizontal distance as a vertical distance instead

Figure 5: Deriving the Aggregate Expenditure Line

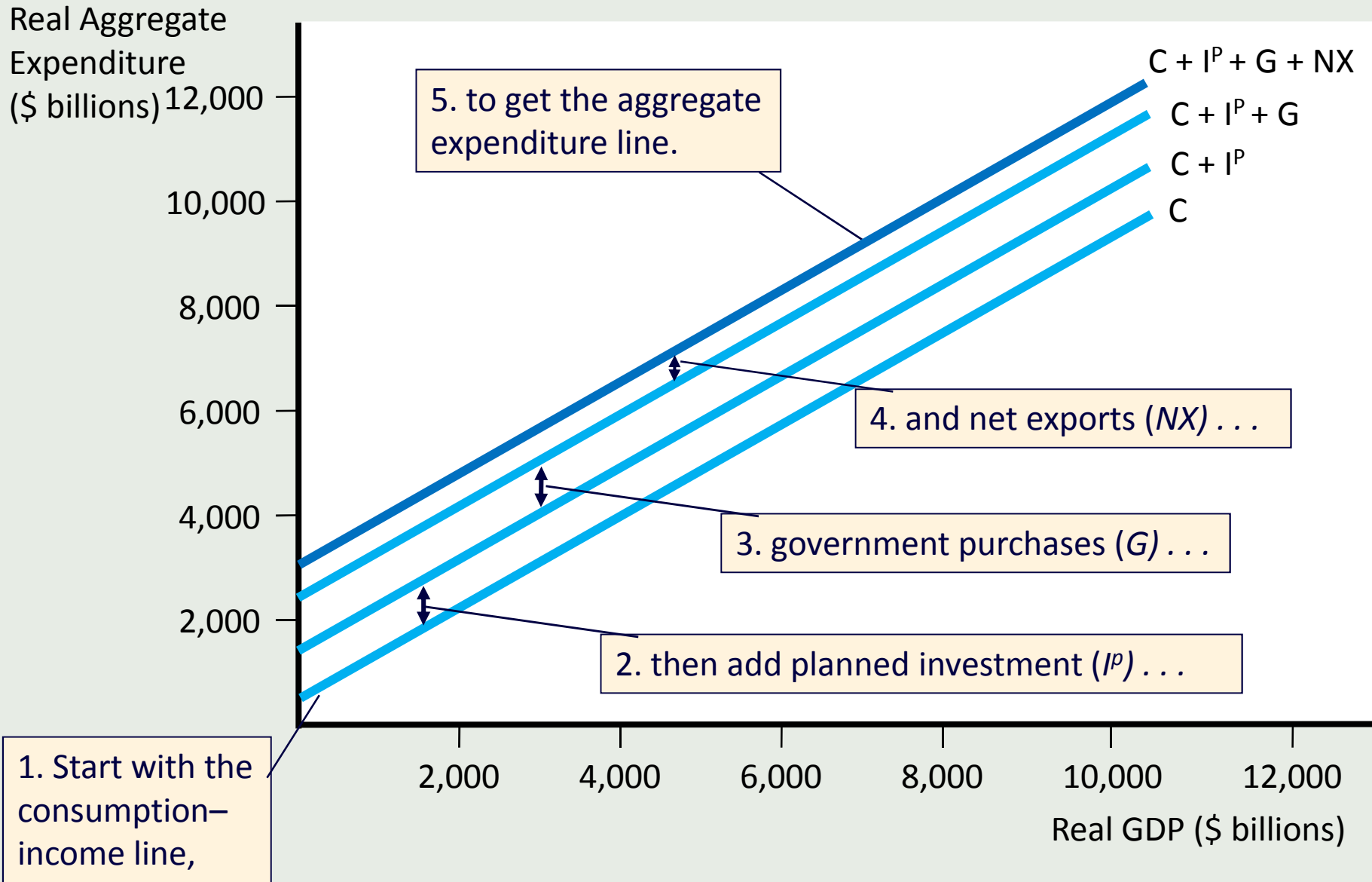
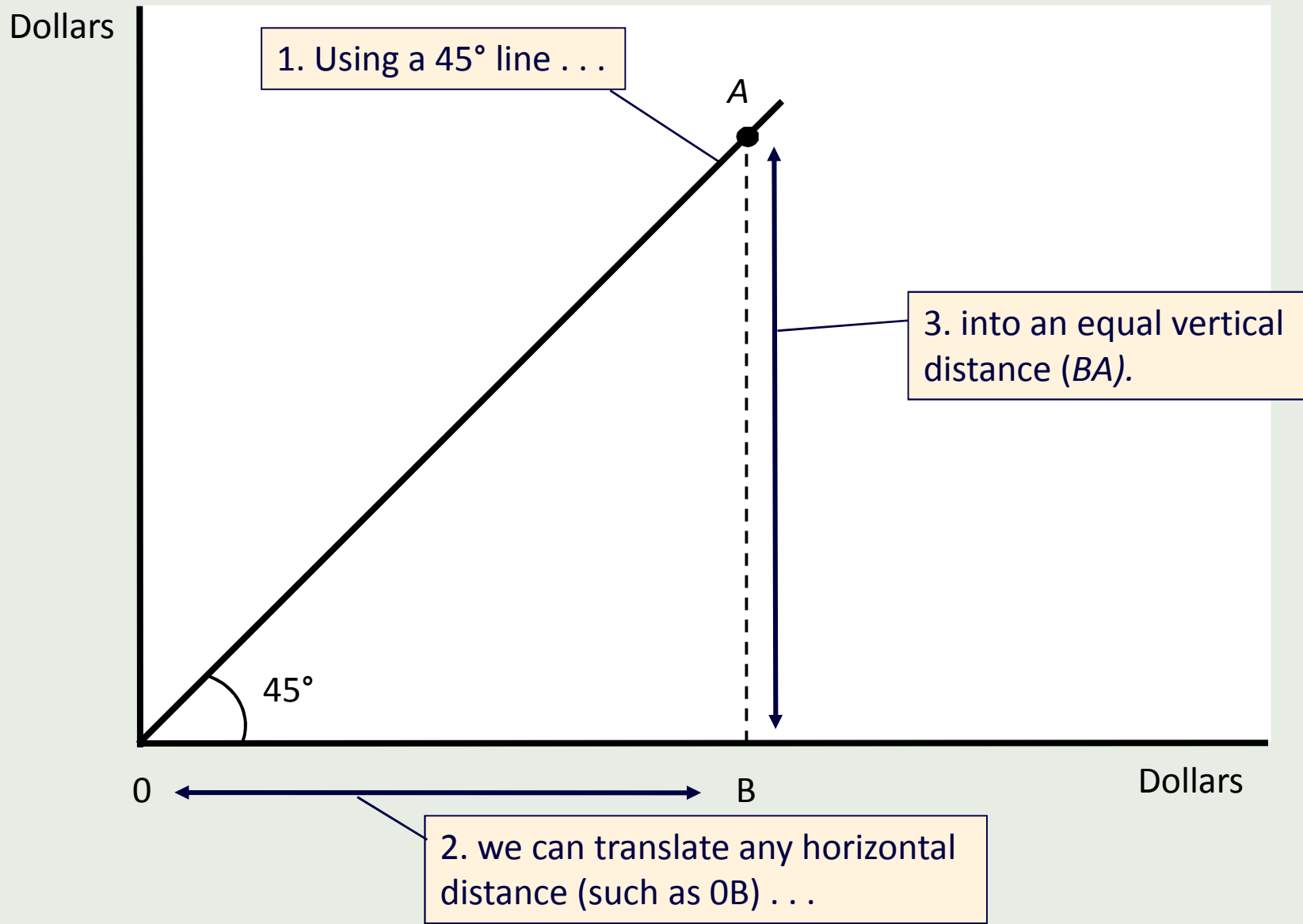


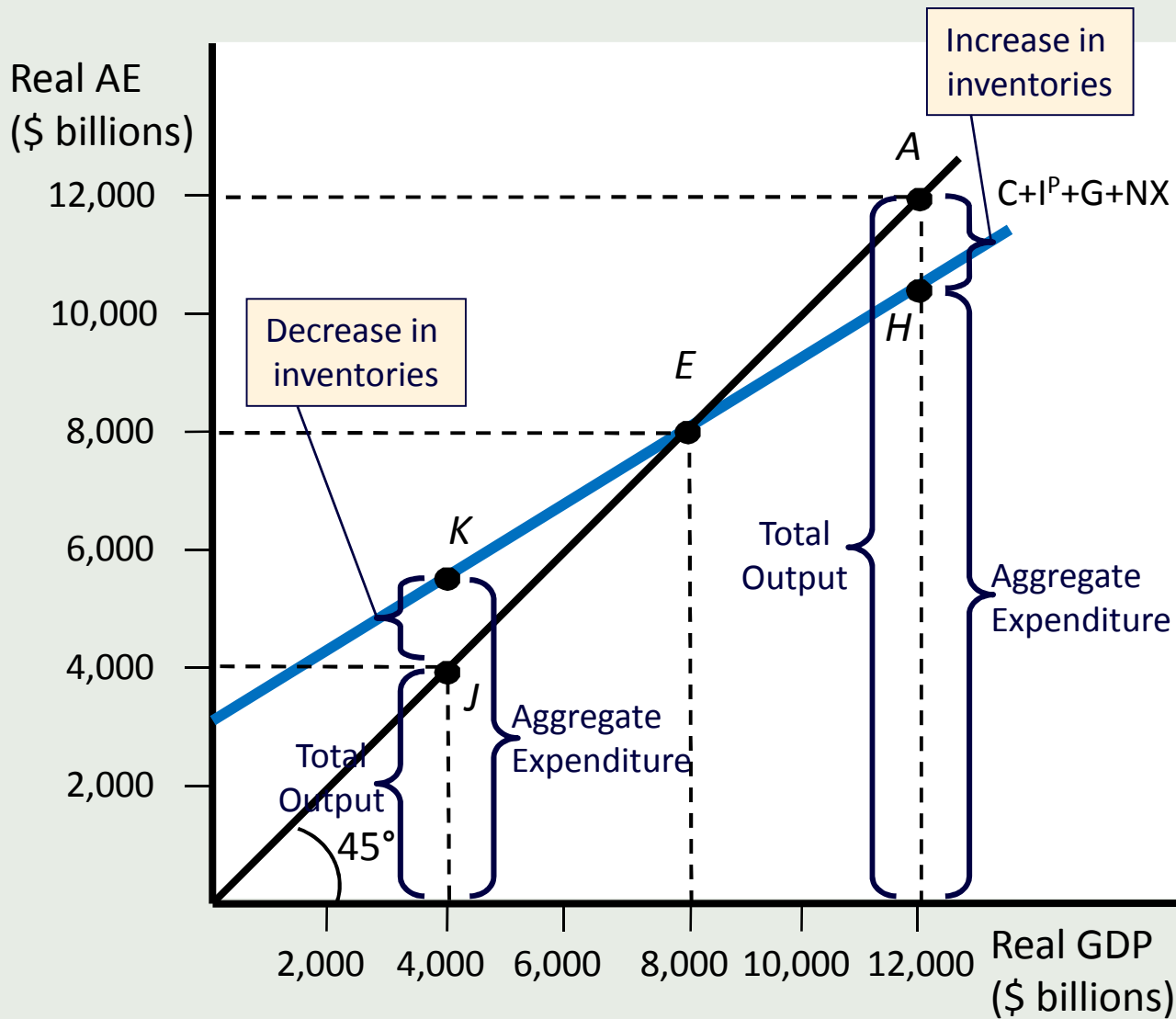
Figure 6: Using a 45° Line to Translate Distances



Equilibrium GDP

- **AE line below 45° line**
 - $AE < GDP$
 - Inventories will grow
 - Reduce output in the future
- **AE line above 45° line**
 - $AE > GDP$
 - Inventories will decline
 - Increase their output in the future

Figure 7: Determining Equilibrium Real GDP



At point E, where the aggregate expenditure line crosses the 45° line, the economy is in short-run equilibrium. With real GDP equal to \$8,000 billion, aggregate expenditure equals real GDP. At higher levels of real GDP—such as \$12,000 billion—total production exceeds aggregate expenditures, and firms will be unable to sell all they produce. Unplanned inventory increases equal to HA will lead them to reduce production. At lower levels of real GDP—such as \$4,000 billion—aggregate expenditure exceeds total production. Firms find their inventories falling, and they will respond by increasing production.

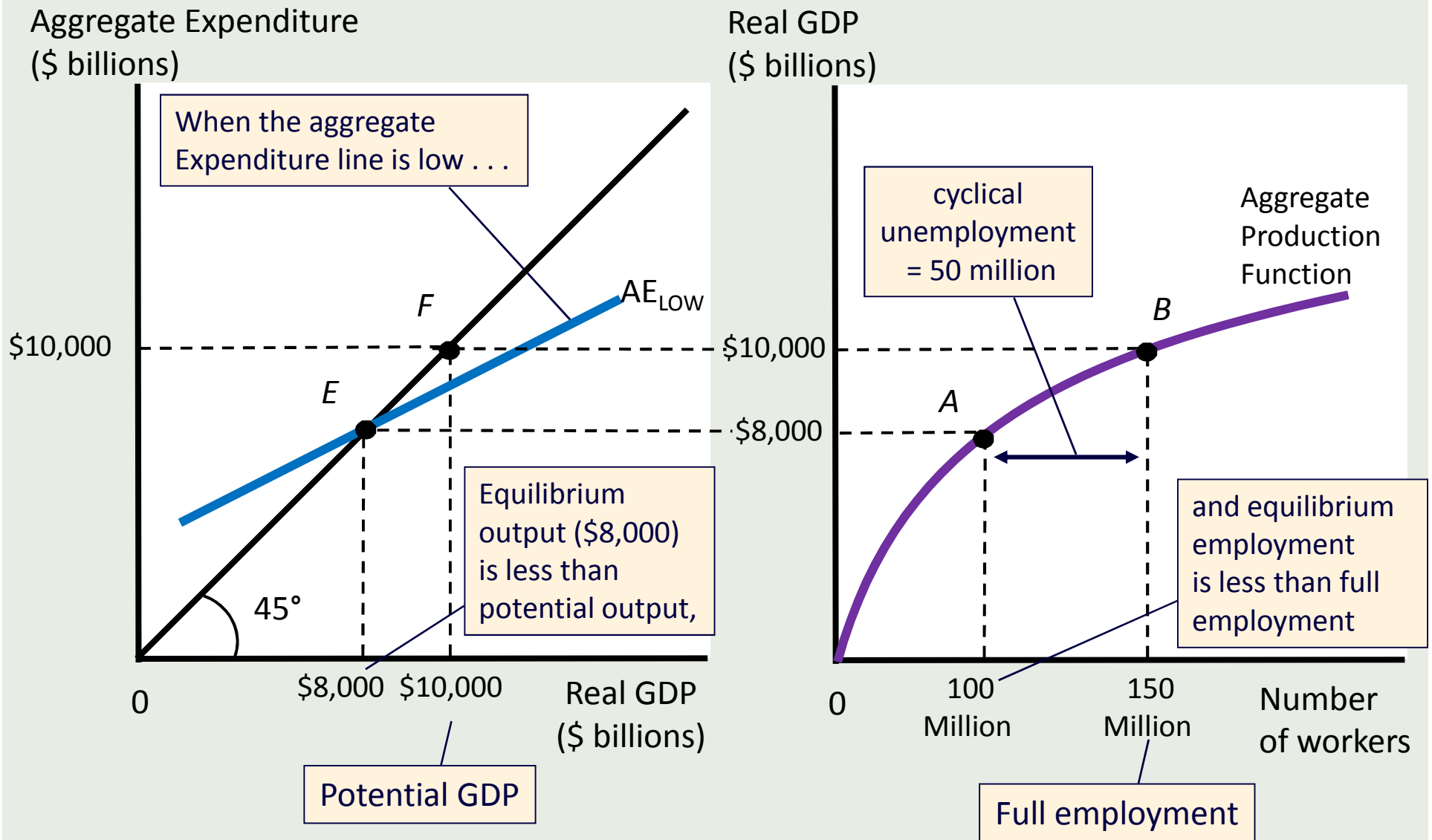
Equilibrium GDP

- **Equilibrium GDP**
 - AE line intersects the 45° line
 - No change in inventories
 - No change in output in the future

Equilibrium GDP

- **Short-run equilibrium**
 - And yet have abnormally high unemployment
 - Aggregate expenditure line is too low to create an intersection at full-employment output
 - Cyclical unemployment is caused by insufficient spending
 - As long as spending remains low
 - Production will remain low
 - Unemployment will remain high

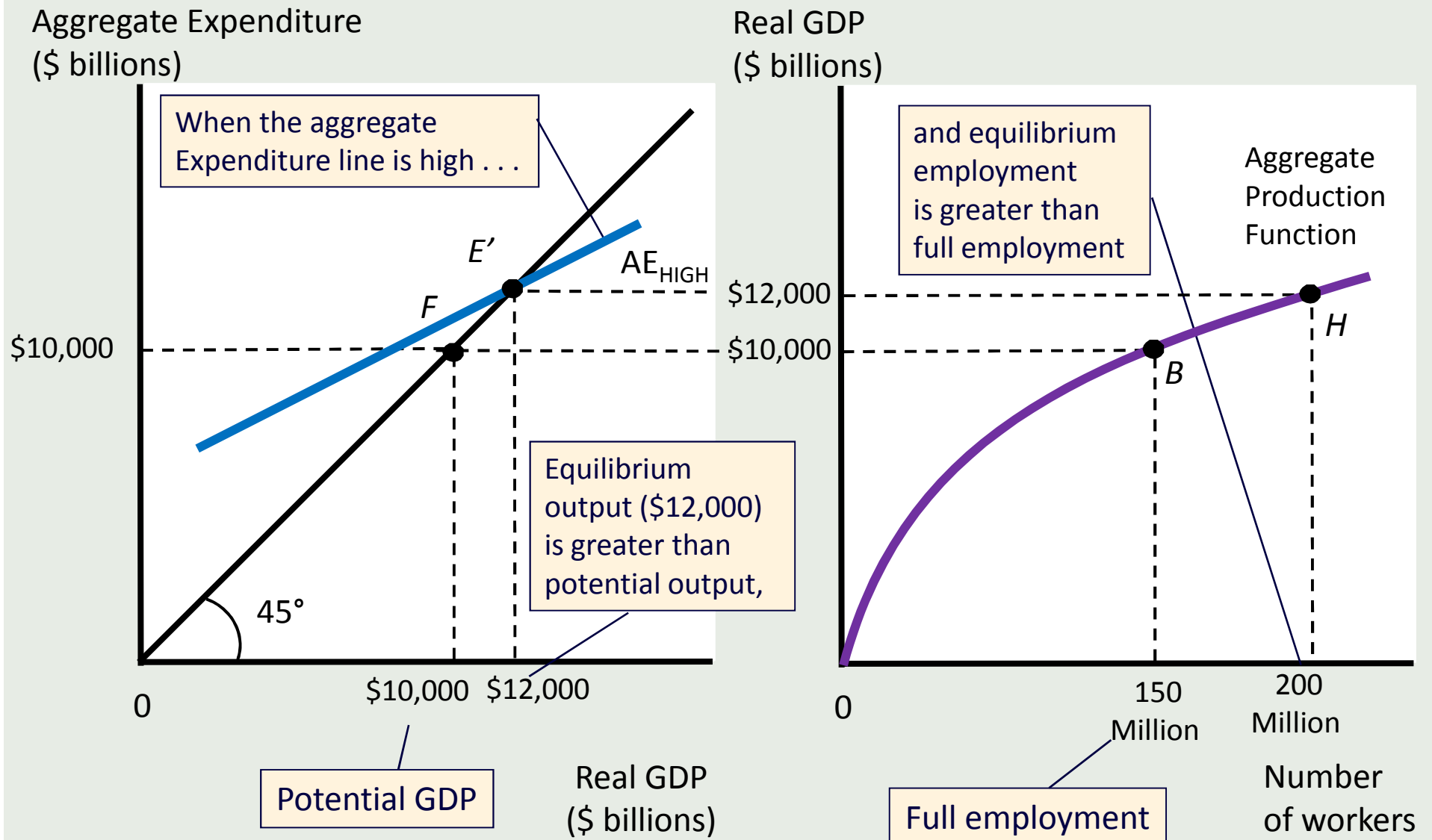
Figure 8: Equilibrium GDP Can Be Less than Full-Employment GDP



Equilibrium GDP

- **Short-run equilibrium**
 - And abnormally high employment and abnormally low unemployment
 - Economy can overheat because spending is too high
 - As long as spending remains high
 - Production will exceed potential output
 - Unemployment will be unusually low

Figure 9: Equilibrium GDP Can Be Greater than Full-Employment GDP



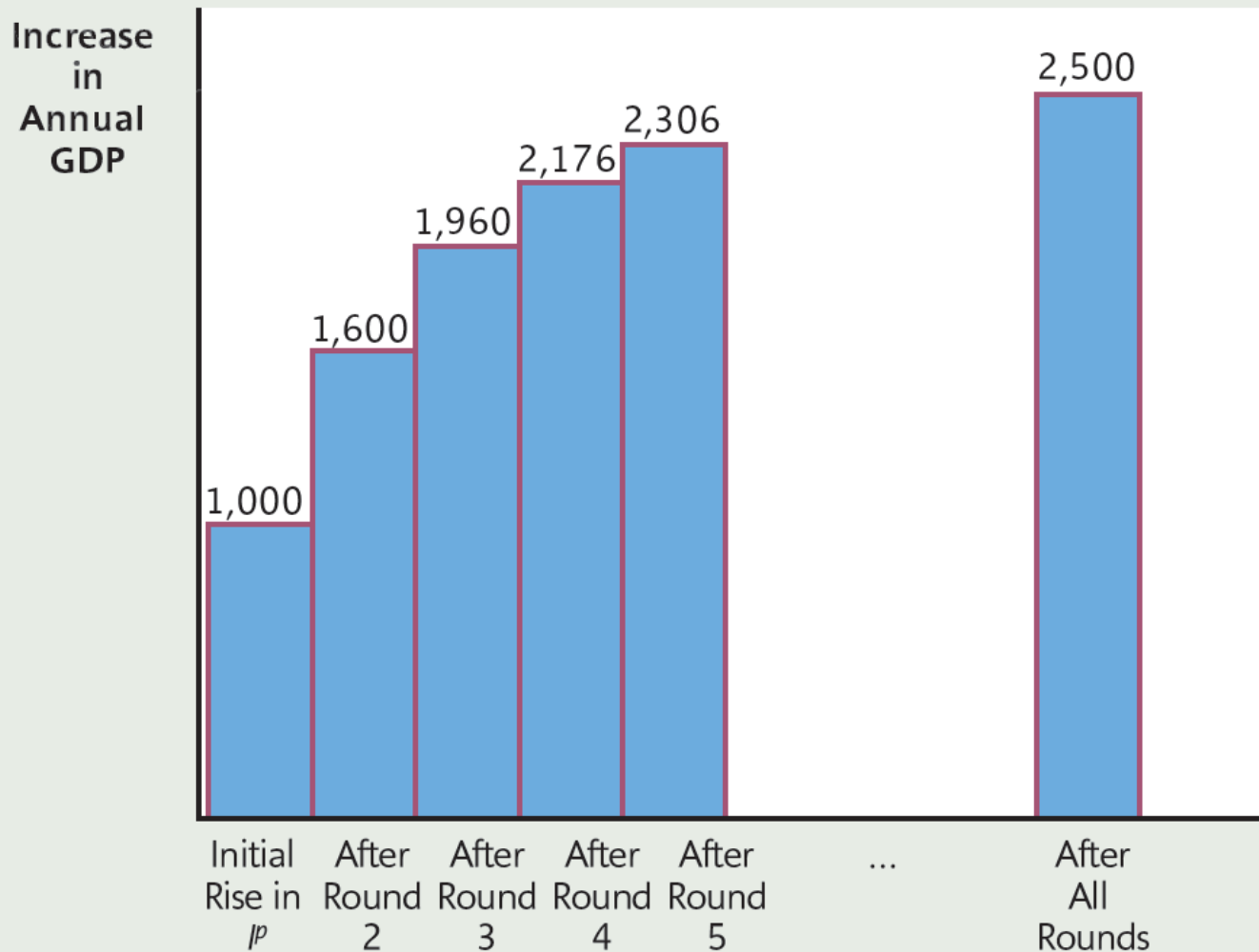
What Happens When Things Change?

- **Increases in investment by $\$x$**
 - $\$x$ additional sales revenue
 - $\$x$ additional income
 - $\$x$ additional disposable income
 - MPC $\$x$ additional consumption spending
 - MPC $\$x$ additional sales revenue
 - ...
 - ...
 - **Equilibrium GDP rises by a multiple of $\$x$**

Table 5: Increases in spending after investment spending rises by \$1,000 billion per year

Round	Additional Spending in Each Round (billions of dollars per year)	Total Additional Spending (billions of dollars per year)
Initial increase in investment spending	1,000	1,000
Round 2	600	1,600
Round 3	360	1,960
Round 4	216	2,176
Round 5	130	2,306
Round 6	78	2,384
Round 7	47	2,431
Round 8	28	2,459
Round 9	17	2,476
Round 10	10	2,486
...
Round 20	0.06	Very close to 2,500

Figure 10: The Effect of a Change in Investment Spending



An increase in investment spending sets off a chain reaction, leading to successive rounds of increased spending and income. As shown here, a \$1,000 billion increase in investment spending first causes real GDP to increase by \$1,000 billion. Then, with higher incomes, households increase consumption spending by the MPC times the change in disposable income.

In round 2, spending and GDP increase by another \$600 billion. In succeeding rounds, increases in income lead to further changes in spending, but in each round the increases in income and spending are smaller than in the preceding round.

What Happens When Things Change?

- $\Delta \text{GDP} = \text{Expenditure multiplier} \times \Delta I^P$
- Expenditure multiplier
 - The amount by which equilibrium real GDP changes
 - As a result of a one-dollar change in:
 - Autonomous consumption,
 - Investment spending,
 - Government purchases,
 - Or net exports

What Happens When Things Change?

- Expenditure multiplier = $1 / (1 - MPC)$
- Increase in investment
 - Equilibrium GDP rises by a multiple of the change in spending
- Decrease in investment spending
 - Equilibrium GDP falls by a multiple of the change in spending

$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta I^P$$

What Happens When Things Change?

$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta I^P$$

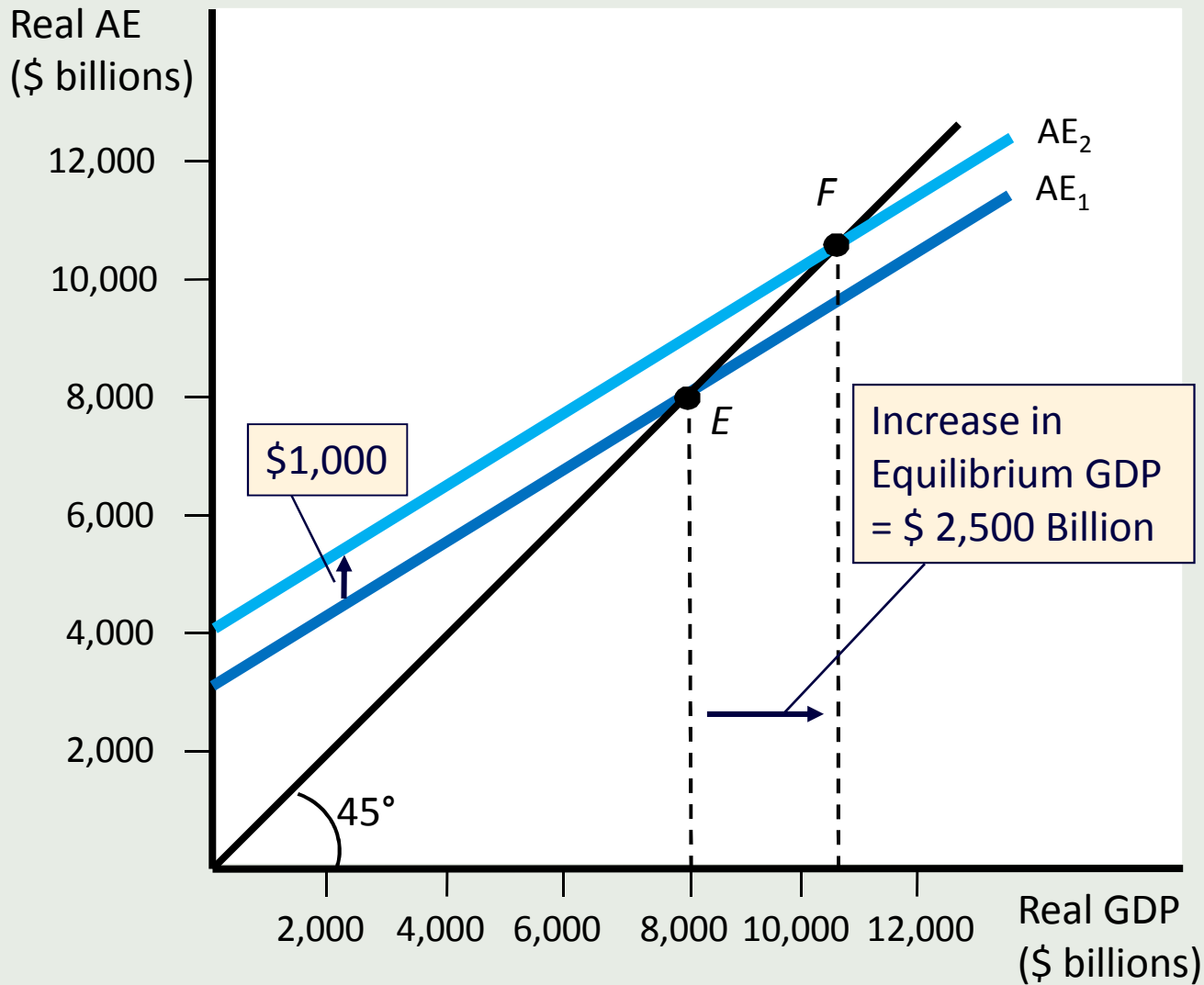
$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta G$$

$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta C$$

$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta NX$$

$$\Delta GDP = \left[\frac{1}{(1 - MPC)} \right] \times \Delta Spending$$

Figure 11: A Graphical View of the Multiplier



The economy starts off at point E with equilibrium real GDP of \$8,000 billion. A \$1,000 billion increase in spending shifts the aggregate expenditure line upward by \$1,000 billion, triggering the multiplier process. Eventually, the economy will reach a new equilibrium at point F, where the new, higher aggregate expenditure line crosses the 45° line. At F, real GDP is \$10,500 billion, an increase of \$2,500 billion.

What Happens When Things Change?

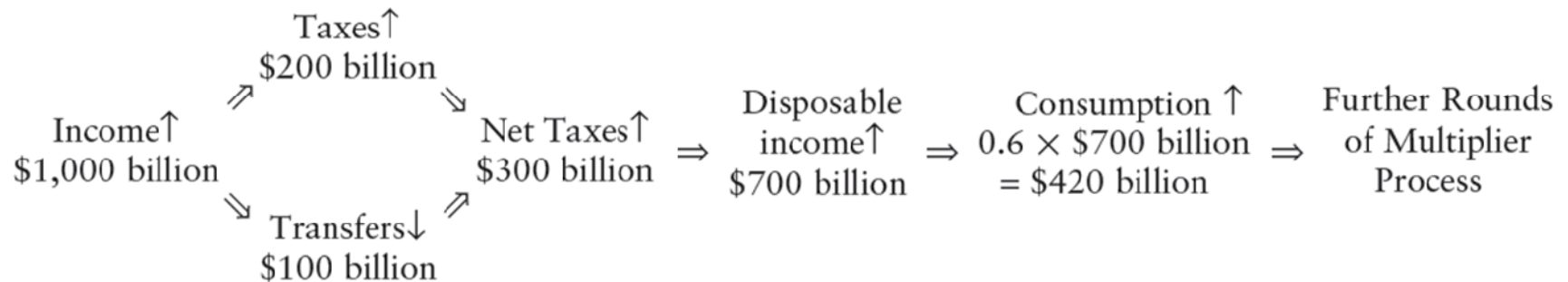
- An increase in:
 - Autonomous consumption spending, investment spending, government purchases, or net exports
 - Will shift the aggregate expenditure line upward
 - By the initial increase in spending
 - Equilibrium GDP will rise
 - By the initial increase in spending times the expenditure multiplier

The Multiplier Process and Economic Stability

- **The larger the multiplier**
 - The more unstable the economy
 - All else equal
- **Automatic stabilizer**
 - Feature of the economy
 - Reduces the size of the expenditure multiplier
 - Diminishes the impact of spending changes on real GDP
 - Reduce fluctuations in GDP and employment
 - Makes the economy more stable in the short run

The Multiplier Process and Economic Stability

- Taxes and transfers depend on income
 - Increase in income
 - Higher taxes
 - Lower transfers
 - Less spending each round
 - Smaller multiplier



The Multiplier Process and Economic Stability

- Imports depend on income
 - Increase in income
 - Increase spending on imports
 - Smaller spending on domestic output
 - Each round
- People - economic fluctuations as temporary
 - Spending - less sensitive to changes in income
 - Smaller spending changes
 - Each round

The Multiplier Process and Economic Stability

- **Automatic de-stabilizers**
 - Feature of the economy
 - Increases the size of the expenditure multiplier
 - And enlarges the impact of spending changes on real GDP
 - Enlarge fluctuations in GDP and employment
 - Makes the economy less stable in the short run

The Multiplier Process and Economic Stability

- **Household wealth**
 - Changes with income
 - Rising income
 - Rising wealth
 - Rising consumption spending
 - Larger multiplier effect on GDP

The Multiplier Process and Economic Stability

- **Investment spending**
 - Changes during the multiplier process
 - GDP rises
 - Increase investment
 - Larger multiplier effect on GDP

The Multiplier Process and Economic Stability

- In the long run
 - Given the growth of potential GDP
 - The value of the expenditure multiplier is zero
 - No matter what the change in spending
 - Economy will ultimately return to its potential GDP—just as it would have without the spending change

The recession of 2008–2009

- Recession in U.S., causes
 1. 2007, spike in oil prices
 - Decrease spending in automobiles
 - Laid-off workers
 2. 2007, collapse of the housing bubble
 - Rapid fall in home prices
 - Decline in wealth
 - Decline in autonomous consumption spending
 - AE line shifted downward
 - Investment spending fell
 - AE line shifted downward

The recession of 2008–2009

- Recession in U.S., causes:
 3. 2008, financial crisis
 - Defaults on mortgage payments
 - Decrease in lending throughout the economy
 - Fear and gloom about the economy's future
 - Households - cut back dramatically on spending
 - Corporate profits - falling
 - Share prices - began to plummet
 - Major hit to household wealth

The recession of 2008–2009

- **Automatic de-stabilizers:**
 - Falling output caused falling asset prices
 - Homes and stocks
 - Falling asset prices led to further decreases in spending and output
 - By the end of the process
 - Wealth of U.S. households declined by \$14 trillion in a little over a year

Figure 12a: Consumption and investment 2006-2009

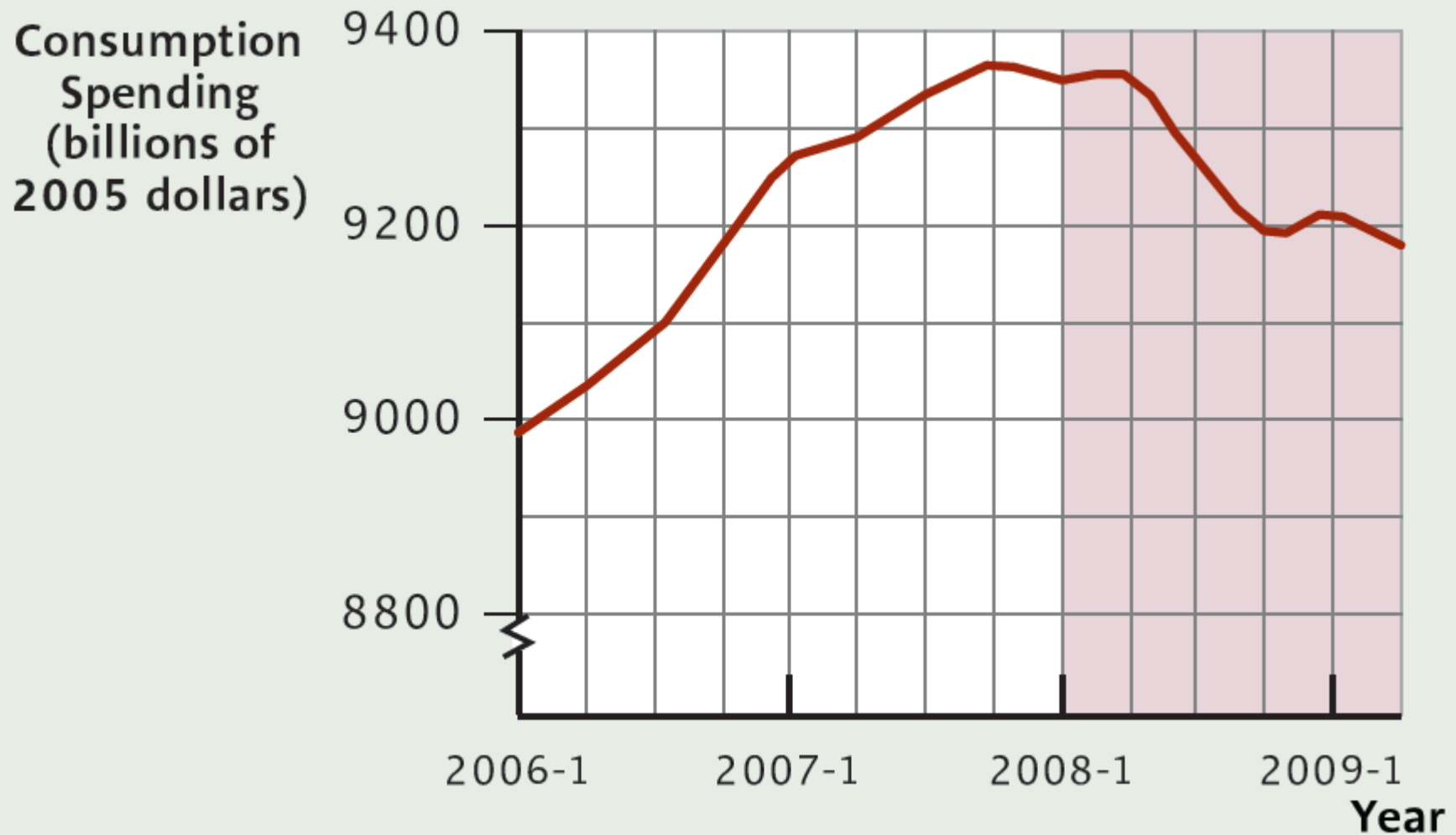
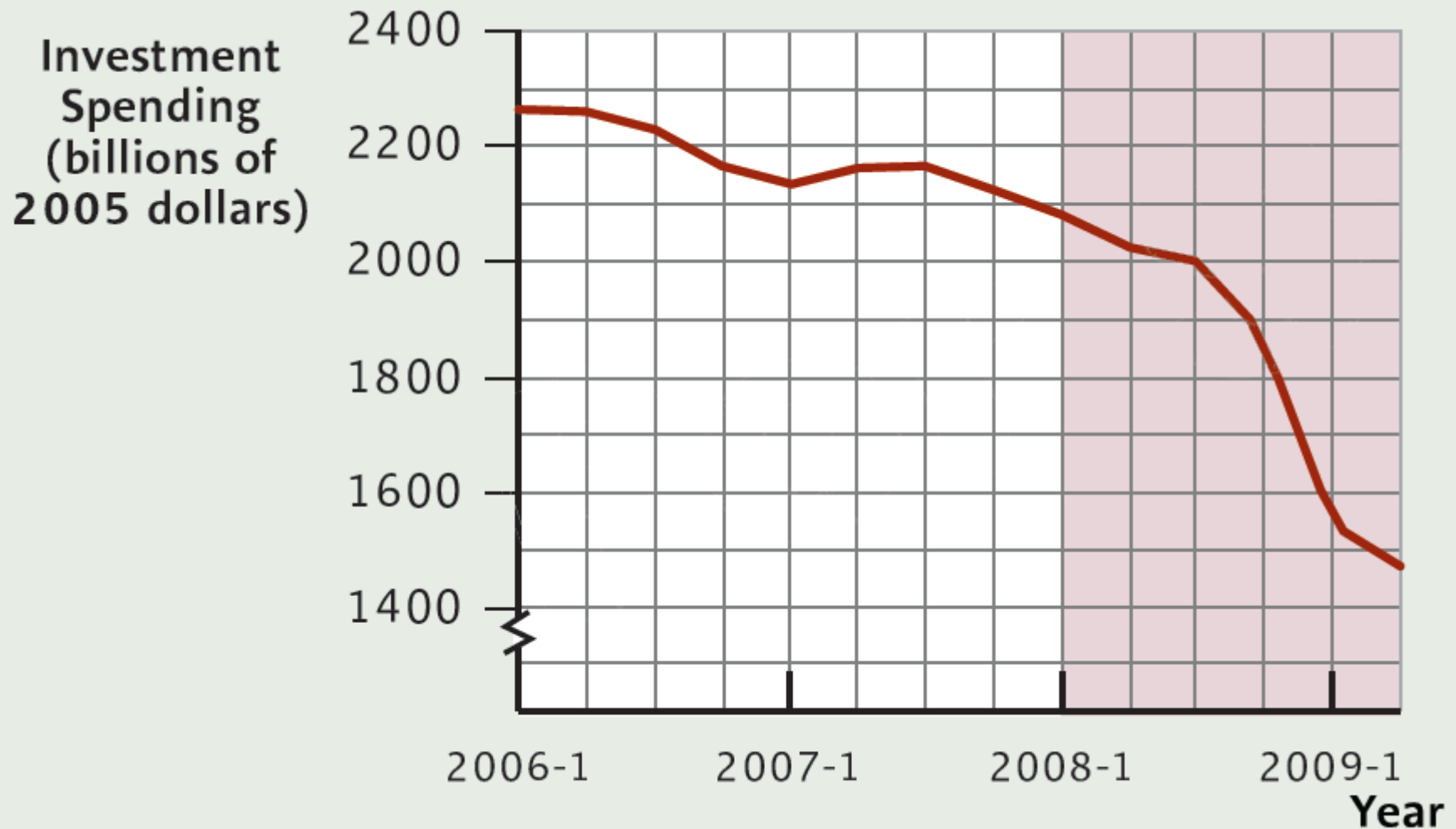


Figure 12b: Consumption and investment 2006-2009



The recession of 2008–2009

- **Automatic stabilizers:**
 - Government's tax revenues fell and transfer payments rose
 - Helping to cushion the decline in disposable income and maintain spending
 - Imports declined
 - Shifting some of the impact of lower spending to firms in other countries

Figure 13a, b: The Recession of 2008–2009

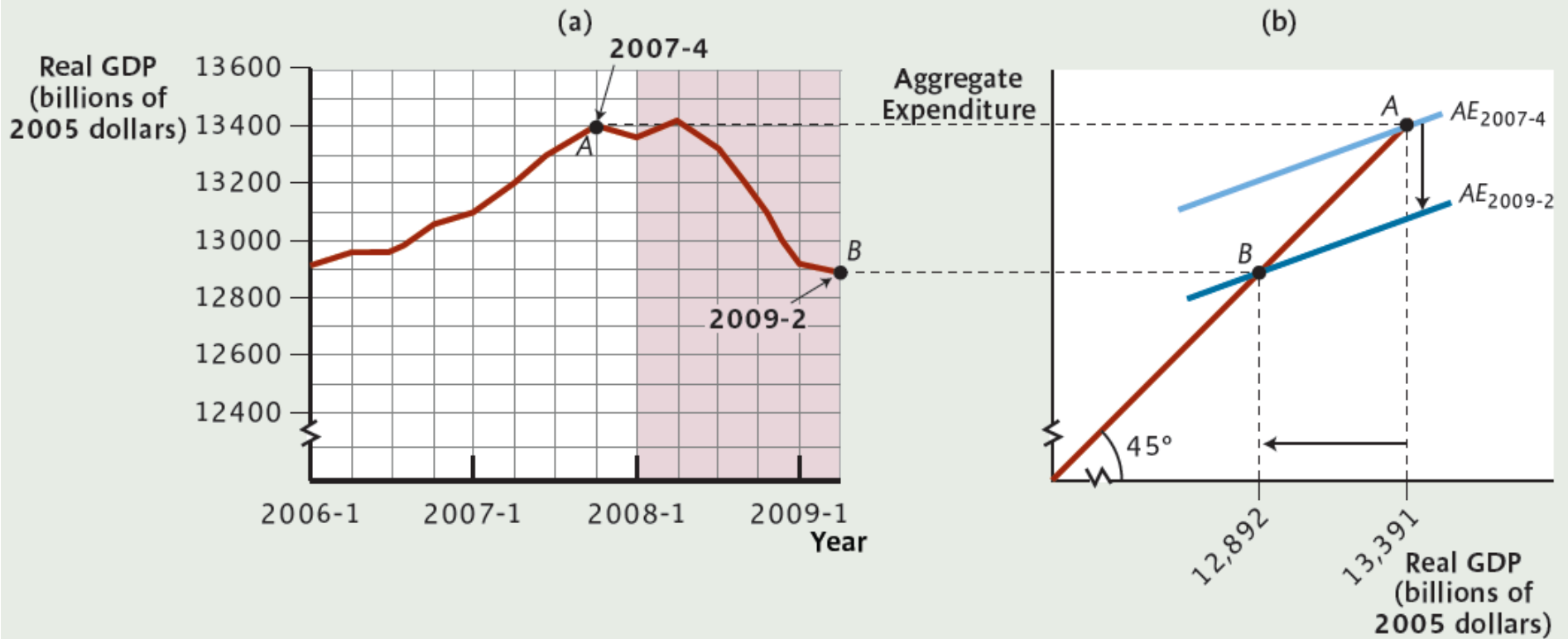
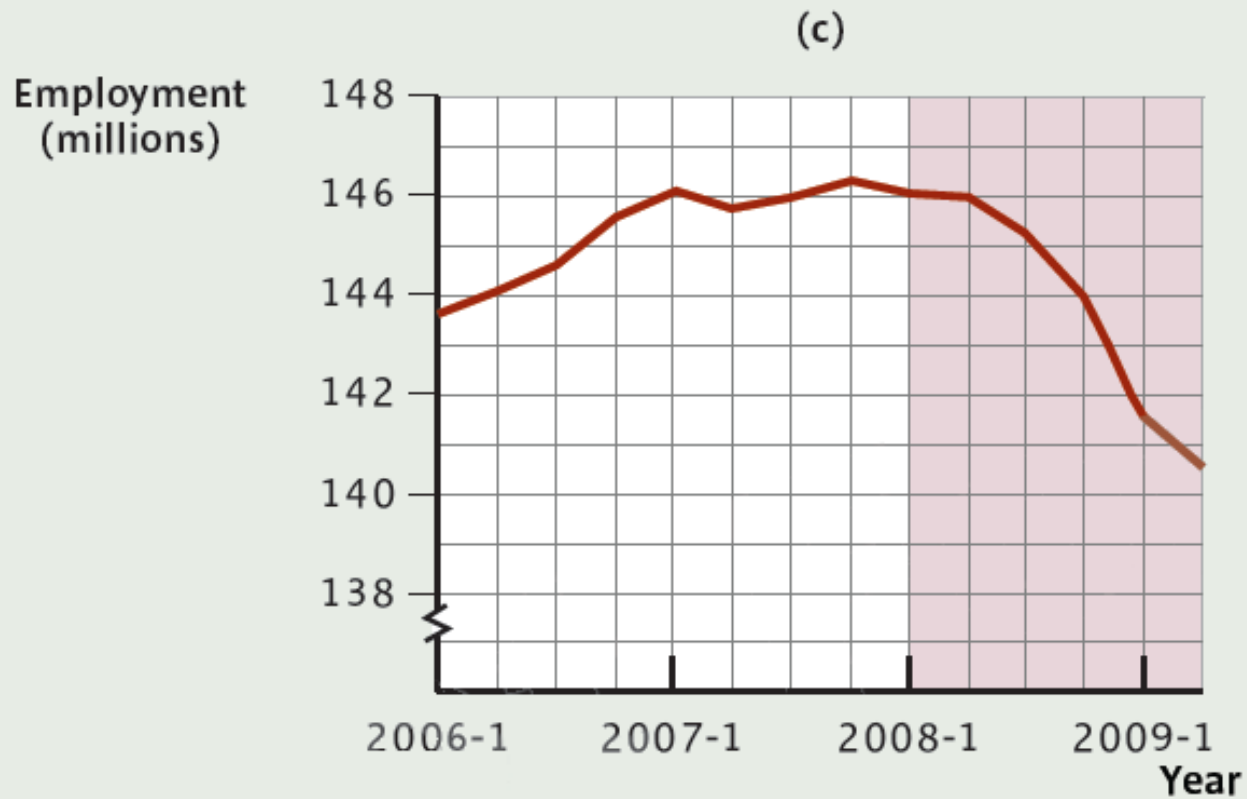


Figure 13c: The Recession of 2008–2009



The recession of 2008–2009

- **Recession in other countries**
 - Global recession, closely synchronized
 - Other countries – housing boom and bust
 - At the same time
 - Lengthy period of low interest rates around the globe
 - Leverage and speculation
 - Financial crisis

The recession of 2008–2009

- Recession in other countries
 - Germany and Japan
 - Did *not* have housing bubbles
 - Very strong growth in exports
 - Especially severe downturns
 - Because of net exports

Figure 14: The Recession of 2008–2009 in Selected Countries

