

ECON 222A

Macroeconomic Theory I

Consumption, Saving, and Investment

Lecture 8

Last Lecture

- Consumption/Saving decisions
 - Choice by consumers yields demand for consumption and supply of savings C, S
 - These two depend on the interest rate $C(r), S(r)$

Today's Lecture

- Changes in Consumption
- Borrowers vs. Savers
- Role of Government in Saving
- Investment
- Goods Market Equilibrium

Effect of Changes in Wealth

- Consumption rises, saving falls if *wealth rises*
- Same idea as in the increase in future income
 - Ex. All of a sudden the value of your house goes up, because they announce they are going to close the prison nearby and convert it to an art museum.
- Don't need to save as much for future any more
- Real world: stock market movement has a huge effect in this regard

Right Here, Right Now!

Consumer spending loses steam

- *Government report shows American incomes rose 0.5% last month, but personal spending nearly ground to a halt. (money.cnn.com)*
- How do we explain it?

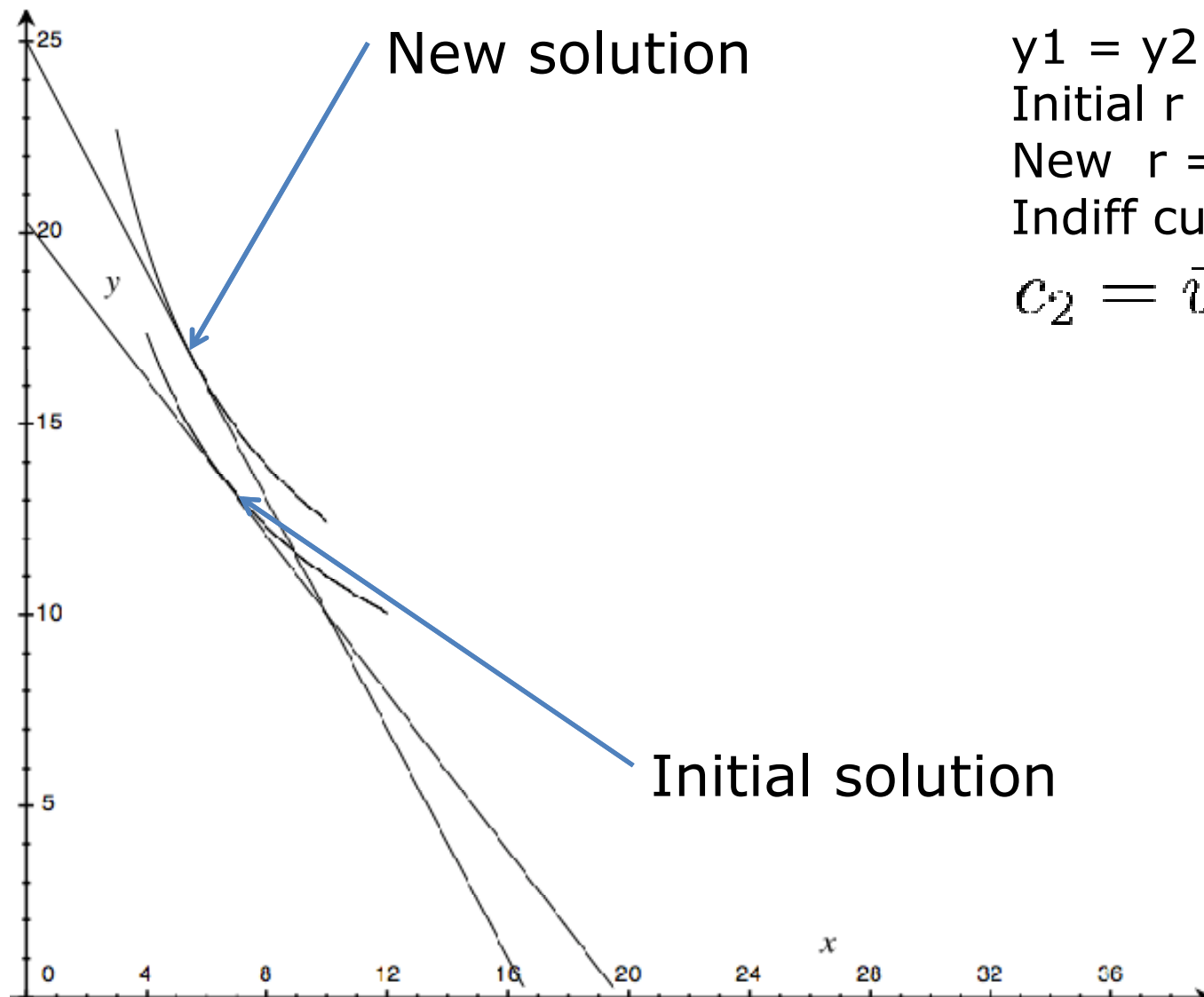
Effect of Change in Interest Rate (r)

- r = the price of current C in terms of future C
- Distinguish between savers and borrowers.
- For savers, an increase in r has two opposing effects:
 - Substitution effect: increase savings (try to earn some more interest, that is current consumption costs more)
 - Income effect: decrease savings (need less savings to achieve target)
- Total effect on current saving is unclear.

Effect of Change in Interest Rate (r)

- For borrowers, an increase in r has two reinforcing effects:
 - Substitution effect: increase savings (try to earn some more interest, that is current consumption costs more); same as before.
 - Income effect: increase savings (costs more to pay back loans)
- Total effect on current saving is clear: unambiguously save more (borrow less).

Graphically



$y_1 = y_2 = 10$
 Initial $r = 0.03$
 New $r = 0.5$
 Indiff curves :
 $c_2 = \bar{u}c_1^{-0.5}$

Effect of Change in r on Aggregate Savings

- Can't simply say “add up and it's the same”
- Opposing income/substitution effects of different size, since we have at same time some people who are borrowers and others that are savers
- Empirically, savings has a weak positive response to interest rate increase

Role of Taxes and Government

- Interest earnings can be taxed.
- The **expected after-tax real interest rate** (r_{a-t}) is the after-tax nominal interest rate minus the expected inflation rate.

$$r_{a-t} = (1 - t)i - \pi^e$$

- This rate is most practical because it uses expectations on inflation, and taxes
- Ex: If $i=6\%$, $\pi^e=2\%$, $t=50\%$ then $r_{a-t}=1\%$

Effect of a decrease in the interest tax

- As usual, two effects...
- By reducing the tax rate on interest the government increases the real return for savers which could increase saving

Fiscal Policy

- Gov't policy has big implications for consumption and savings: affects desired consumption through changes in current and expected future income.
- Let's make an assumption: aggregate output is given, it is not affected by the changes in fiscal policy.
- Fiscal policy has two major components: the government purchases G and taxes T .
- Expansionary Policy: $\uparrow G$ or $\downarrow T$ or both

Temporary Increases in G

- A) Temporary $\uparrow G$ (\$1B): Defense Spending
- 2 Options:
 - 1) Gov't pays for it now: $\uparrow T$ \$1B
 \downarrow current after-tax private disposable income
 (overall income unchanged, moved \$1B from people to gov't):
 People can smooth consumption by $\downarrow C^d$ and $\downarrow S^d$
 (by less than the hit on income, $0 < MPC < 1$)

$$S^d = Y - C^d - G$$

$$\downarrow \$0.4B \quad \text{fixed} \quad \downarrow \$0.6B \quad \uparrow \uparrow \$1B$$

Temporary Increases in G

- A) Temporary $\uparrow G$ (\$1B): Defense Spending
- 2) Gov't borrows \$1B and has to pay back \$1B + interest in future
- Future taxes will have to rise
 - Expected future after-tax income falls
 - \uparrow current savings and \downarrow current consumption (by less than full amount to smooth consumption)
 - Gov't savings fall by full amount of borrowing
 - If private savings don't increase to offset, then S^d falls

Temporary Decreases in T

- B) One-time Tax Cut, with no change in G
 1. \uparrow current private after-tax income,
 - $\uparrow C^d$ by a fraction of the tax cut.
 2. I'm better off now, but, I'll be worse off in the future
 - Raises expectations of higher taxes and lowers after-tax income in future: $\downarrow C^d$

Ricardian equivalence

- B) One-time Tax Cut, with no change in G
- When these two effects cancel out = Ricardian equivalence
- Ricardian Equivalence: if no change in G , tax cuts don't change C^d or S^d
- Tax now or tax in the future, if the Gov't spends the same regardless it won't matter!
- Will not hold if:
 - people aren't that forward-looking
 - are credit constrained (so spend it)
 - don't understand how today's T , G affect tomorrow's T

Investment

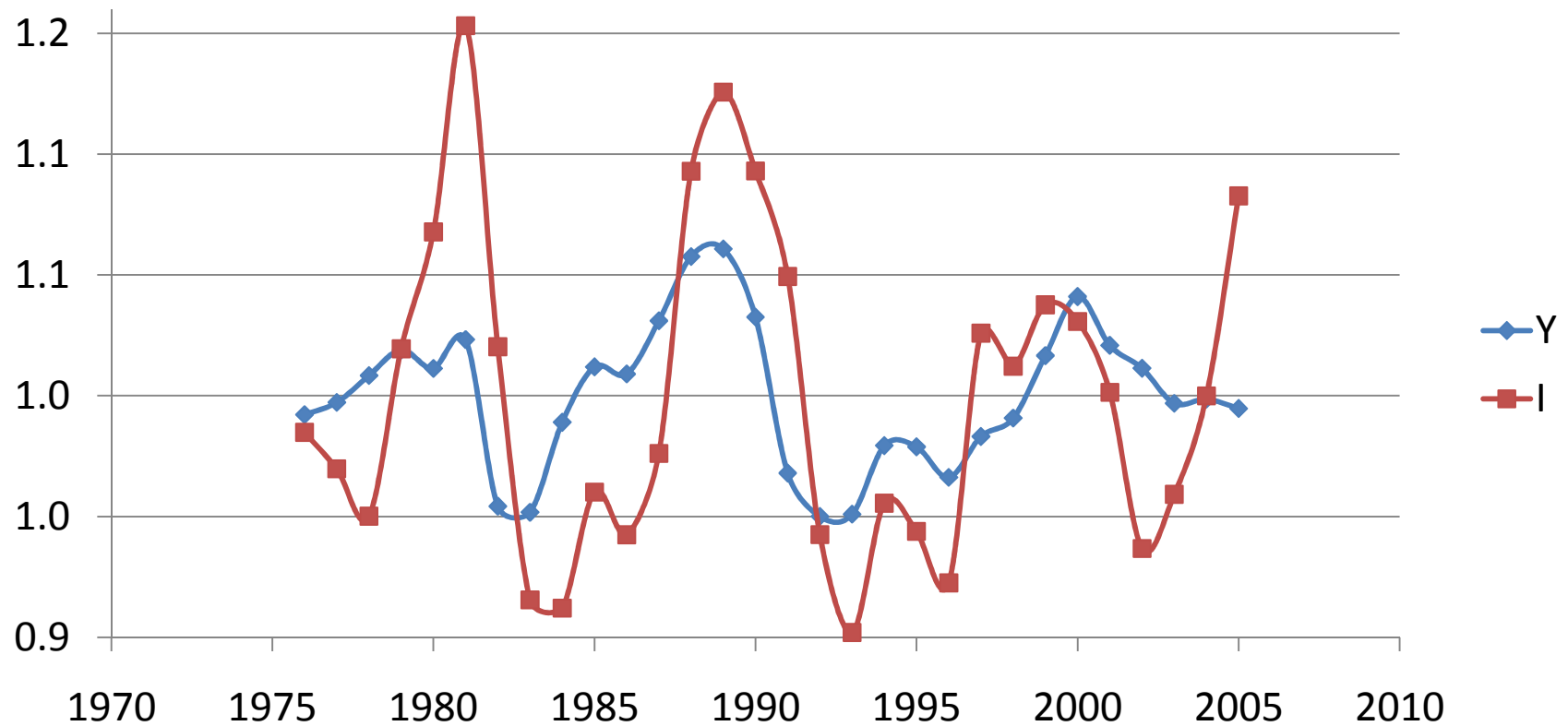
- So far, we've discussed savings – a supply of a pool of funds
- Investment is about what economic agents demand of these funds
- Firms make capital investments, in light of their expectations of future outcomes
- Last week Firms decided how much N to hire, now they decide how much K to buy
- Trade off: present vs. future profits

Why Do We Care About I?

1. Remember: accounts for about 20% of GDP
2. Investment spending is very volatile over the business cycle:
 - falls in recession, rise in booms
3. Plays a major role in the productive capacity of the economy, i.e. plays a crucial role in economic growth

Volatility of I

Y and I: deviations from trend (normalized to 1)



Source : StatCan

How much to invest?

- Compare cost and benefit of investment.
- Benefit:
- Future marginal product of capital (MPK^f), firm's increase in future output from adding one unit of K
- Future because there is a lag – they have to purchase and then install the equipment

How much to invest?

- Cost: user cost of capital, the expected real cost of using a unit of capital for a specified period of time.
- User cost has two components:
 - i) capital depreciates,
 - ii) interest cost (if you borrow you have to pay back this much interest; if you use profits, you forego earning interest income from saving)

$$uc = rp_K + dp_K = (r + d) p_K \quad (4.3)$$

uc = user cost of capital; r = expected rate of interest

d = capital's depreciation rate (lost value as K wears out)

p_K = real price of capital goods

Desired Capital Stock

- Firm's best choice invests in K until benefit=cost
- If $MPK^f > uc$, add K ; If $MPK^f < uc$, sell K .

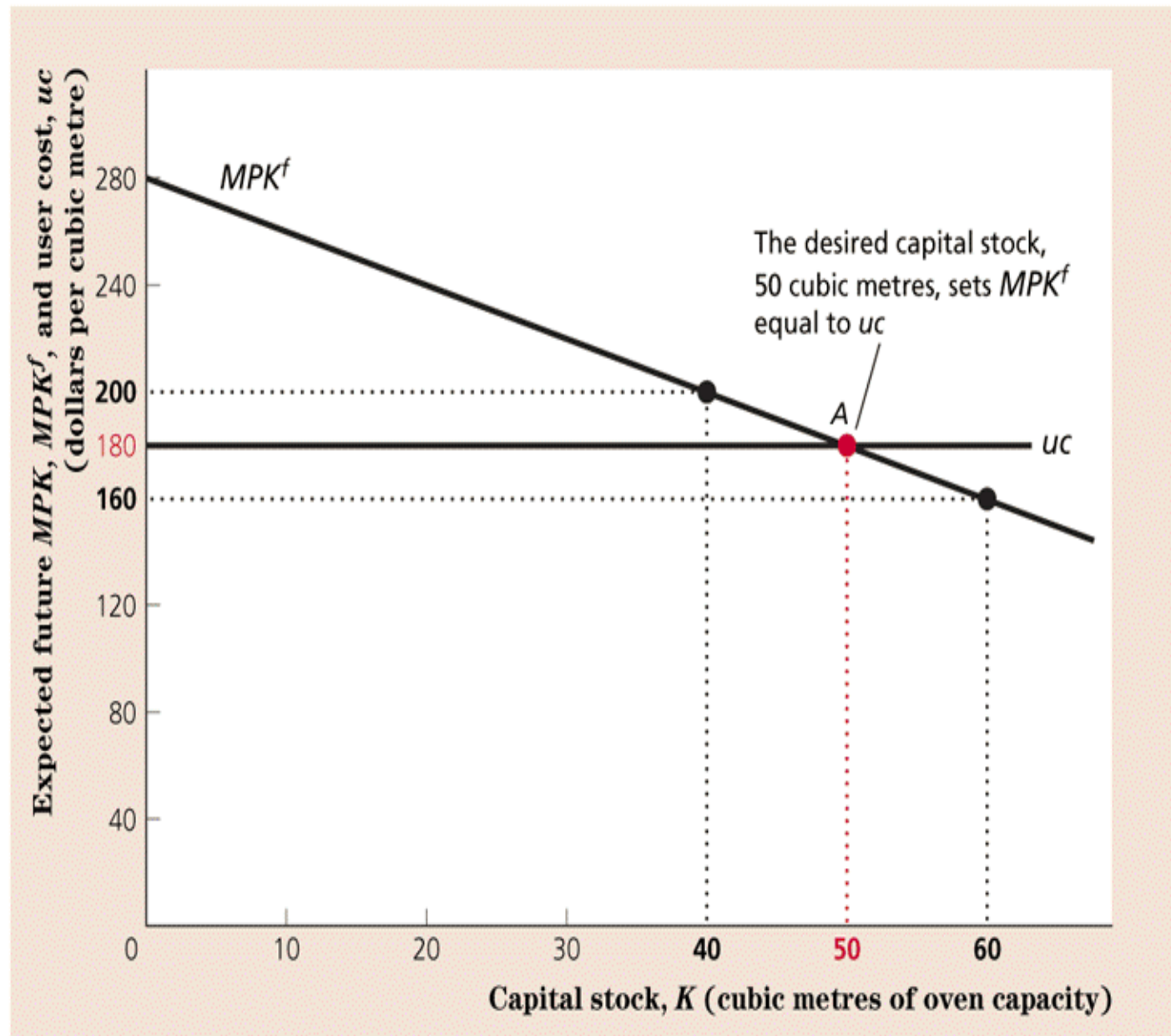
$$MPK^f = uc$$

- MPK^f (slopes down) falls as K rises due to diminishing marginal productivity
- uc independent of capital level: horizontal line.
- (banks/economy determines r , technology determines d : firms take them as given, like the wage)

FIGURE 4.3

DETERMINATION OF THE DESIRED CAPITAL STOCK

The desired capital stock (50 cubic metres of oven capacity in this example) is the capital stock that maximizes profits. When the capital stock is 50 cubic metres, the expected future marginal product of capital MPK^f is equal to the user cost of capital uc . If the MPK^f is larger than uc , as it is when the capital stock is 40 cubic metres, the benefit of extra capital exceeds the cost, and the firm should increase its capital stock. If the MPK^f is smaller than uc , as it is at 60 cubic metres, the cost of extra capital exceeds the benefit, and the firm should reduce its capital stock.



Changes in Desired Capital Stock

- Decrease in cost of capital (r, d, p_K), then K stock \uparrow
- Ex: r falls, the uc falls (shifts downward), then $MPK^f > uc$, and K rises.
- Same for a decrease in d or p_K (from eq'n 4.3).
- Increase benefit of capital (MPK^f), then K stock \uparrow
- Ex: technology improves MPK^f shifts upward, then $MPK^f > uc$, and K rises.

FIGURE 4.4

A DECLINE IN THE REAL INTEREST RATE RAISES THE DESIRED CAPITAL STOCK

For the Tony's Bakery example, a decline in the real interest rate from 8% to 6% reduces the user cost, uc , of a cubic metre of oven capacity from \$180 to \$160 per cubic metre and shifts the user cost line down from uc^1 to uc^2 . The desired capital stock rises from 50 (point A) to 60 (point C) cubic metres of oven capacity. At 60 cubic metres, the MPK^f and the user cost of capital again are equal, at \$160 per cubic metre.

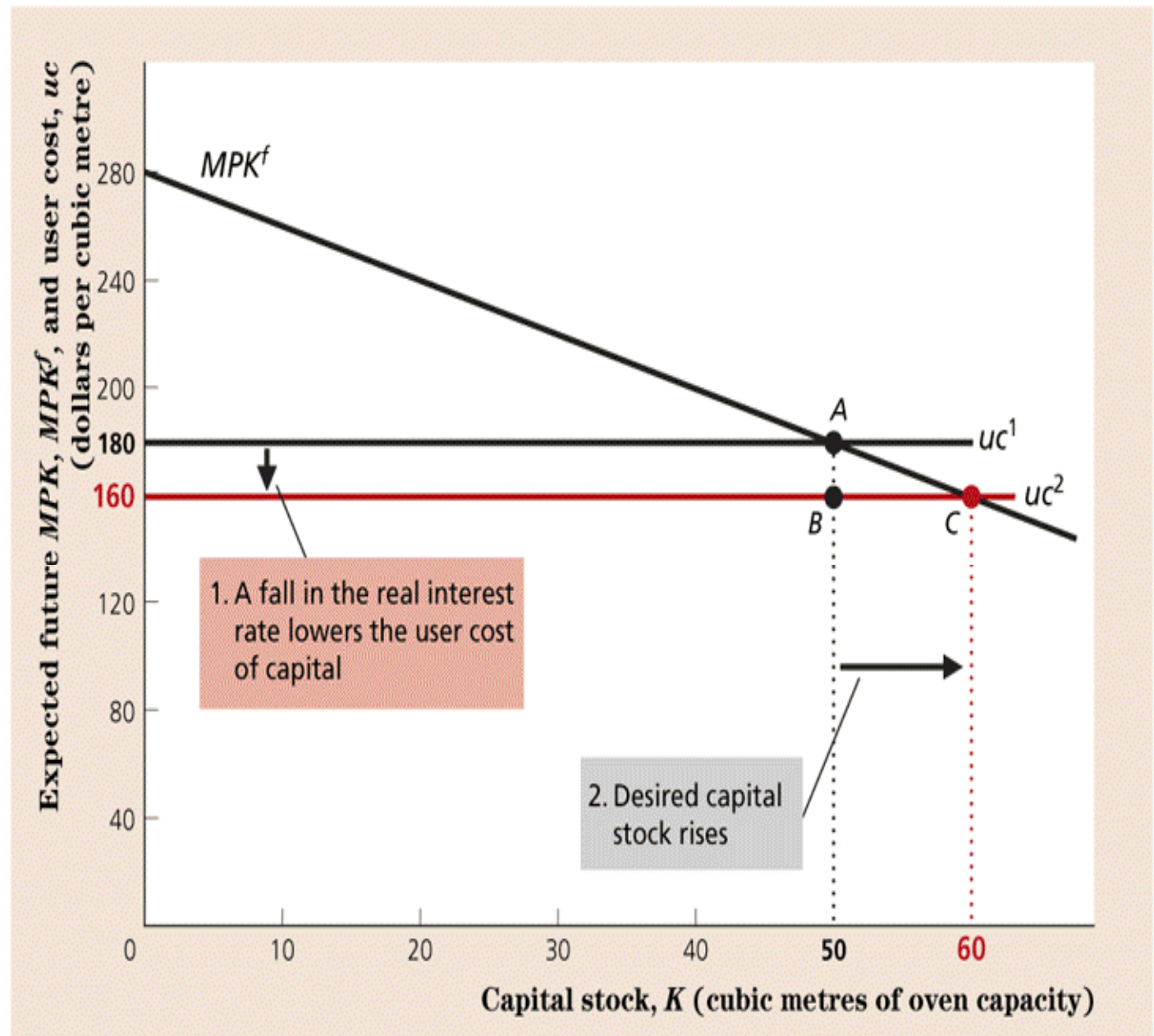
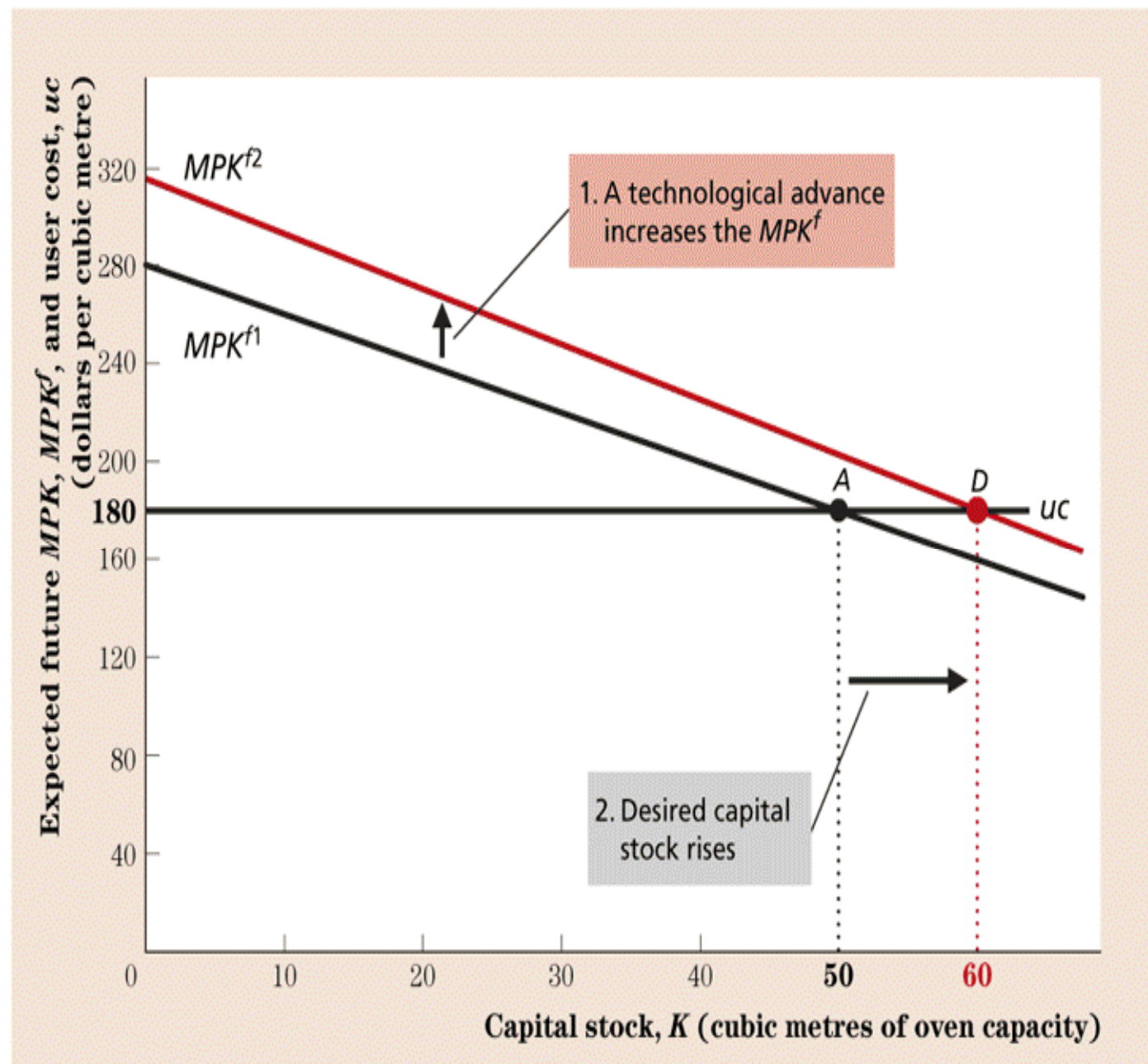


FIGURE 4.5

AN INCREASE IN THE
EXPECTED FUTURE MPK
RAISES THE DESIRED
CAPITAL STOCK

A technological advance raises the expected future marginal product of capital, MPK^f , shifting the MPK^f curve upward from MPK^{f1} to MPK^{f2} . The desired capital stock increases from 50 (point A) to 60 (point D) cubic metres of oven capacity. At 60 cubic metres, the MPK^f equals the user cost of capital uc at \$180 per cubic metre.



Taxes and the Desired Capital Stock

- After-tax $MPK^f = (1 - t)MPK^f$
= benefit after taxes
- Adjust firm's decision with taxes:

$$(1 - t)MPK^f = uc \quad (4.4)$$

- Effective tax rate: summarizes tax burden on capital

How K relates to Investment

- Gross investment: total purchases or construction of new K
- Depreciation: how much K wears out
- Net investment = Gross investment – Depreciation

$$K_{t+1} - K_t = I_t - dK_t \quad (4.5)$$

- I_t = gross investment in year t .
- K_t and K_{t+1} = K stock at beginning of year t and $t+1$

How K relates to Investment (2)

- Rearranging (4.5) shows a firm's gross investment during the year has two parts:

$$I_t = K_{t+1}^d - K_t + dK_t$$

- i) desired net increase in capital stock over the year ($K_{t+1}^d - K_t$)
- ii) replace depreciated capital (dK_t)

Goods Market Equilibrium

- Just as wages (w) adjusted to clear L mkt, now r (real interest rate) adjusts to clear goods mkt, i.e. to equate quantities of goods demanded and supplied.
- Prices coordinate decisions of: HH's demand for C^d and S^d , and firm's demand for I^d
- Goods market equilibrium condition: $I^d = S^d$
- Demand comes from people, firms and gov't: an equilibrium, is true only when prices have adjusted to clear mkts:

$$Y = C^d + I^d + G \quad (4.7)$$

Goods Market Equilibrium (2)

- In equilibrium, firm's desired production equals the economy's desired purchases
- Compare with income-expenditure identity– a definition, always true:

$$Y = C + I + G \quad (2.3)$$

- Recall that consumption/savings decision are the same thing.

Goods Market Equilibrium

- We can look at this in terms of savings and investment:
- Re-write (4.7) as: $I^d = Y - C^d - G$
- But this is precisely $S^d = Y - C^d - G$
- So another way to express equilibrium is:

$$S^d = I^d \quad (4.8)$$

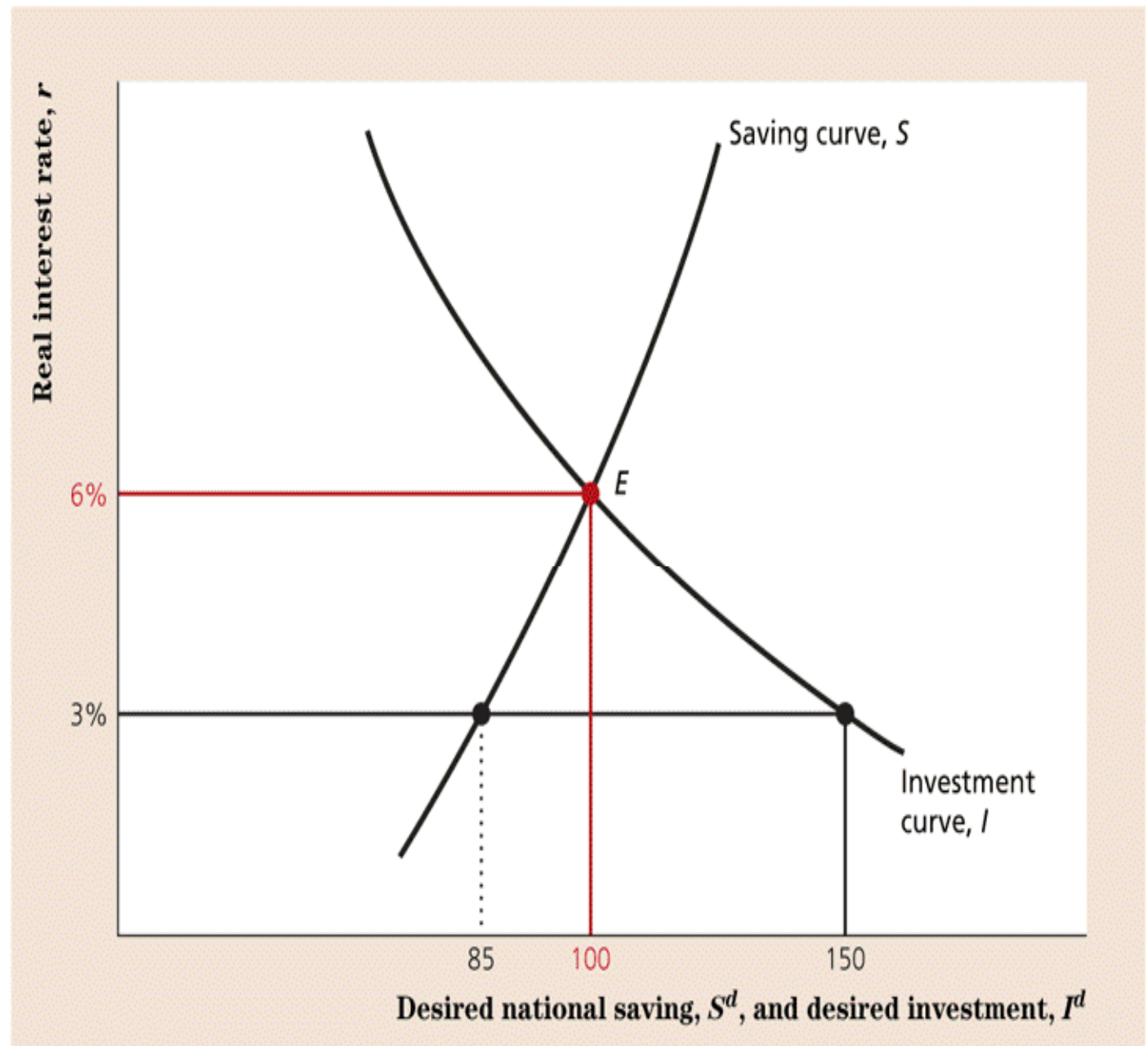
Saving-Investment Diagram

- From $S^d = Y - C^d - G$, the saving curve, S , is upward sloping. A higher real interest rate raises S^d
- The investment curve, I , is downward sloping. A higher interest rate increases user cost of capital and reduces I^d .
- Adjustments of r eliminate excess supply or demand for saving:
 1. If r 'too low', $S^d < I^d$, return to savings bid up by firms, r increases until the equilibrium is reached
 2. If r 'too high', $S^d > I^d$, return to savings falls, r decreases until the equilibrium is reached

FIGURE 4.7

GOODS MARKET EQUILIBRIUM

Goods market equilibrium occurs when desired national saving equals desired investment. In the figure, equilibrium occurs when the real interest rate is 6% and both desired national saving and desired investment equal 100. If the real interest rate were, say, 3%, desired investment (150) would not equal desired national saving (85), and the goods market would not be in equilibrium. Competition among borrowers for funds would then cause the real interest rate to rise until it reaches 6%.



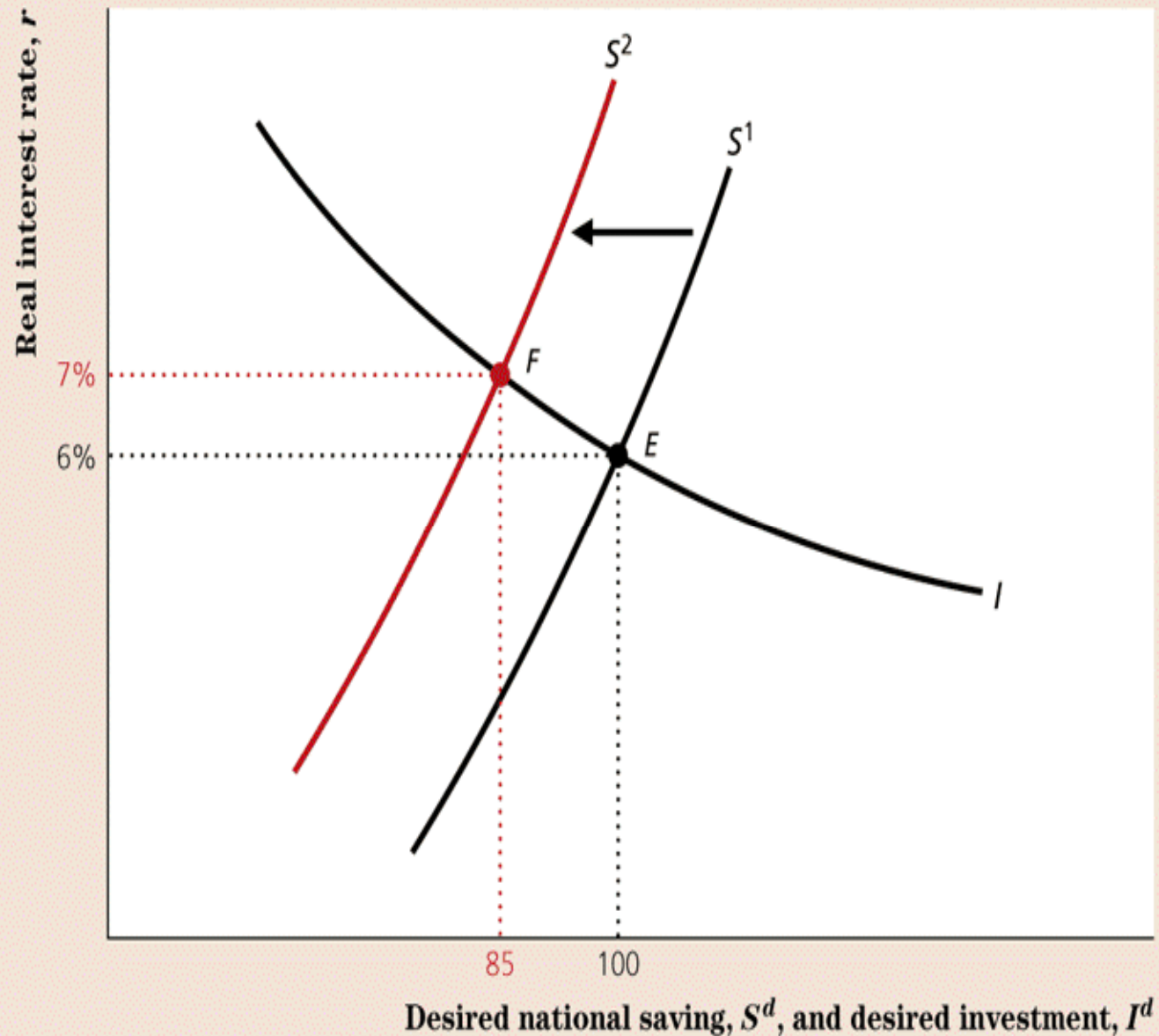
Shifts of Saving Curve

- Saving curve shifts right (increases) if there is:
 - increase in current income (save some to smooth C)
 - decrease in expected future income
 - decrease in wealth
- Ex.: Temporary increase in Gov't spending crowds out investment:
 - increase in G causes a decrease S^d ;
 - S^d curve shifts to left;
 - increase equilibrium r ;
 - I^d falls because of higher uc .

FIGURE 4.8

A DECLINE IN DESIRED SAVING

A change that reduces desired national saving, such as a temporary increase in current government purchases, shifts the saving curve to the left, from S^1 to S^2 . The goods market equilibrium point moves from E to F . The decline in desired saving raises the real interest rate, from 6% to 7%, and lowers saving and investment, from 100 to 85.



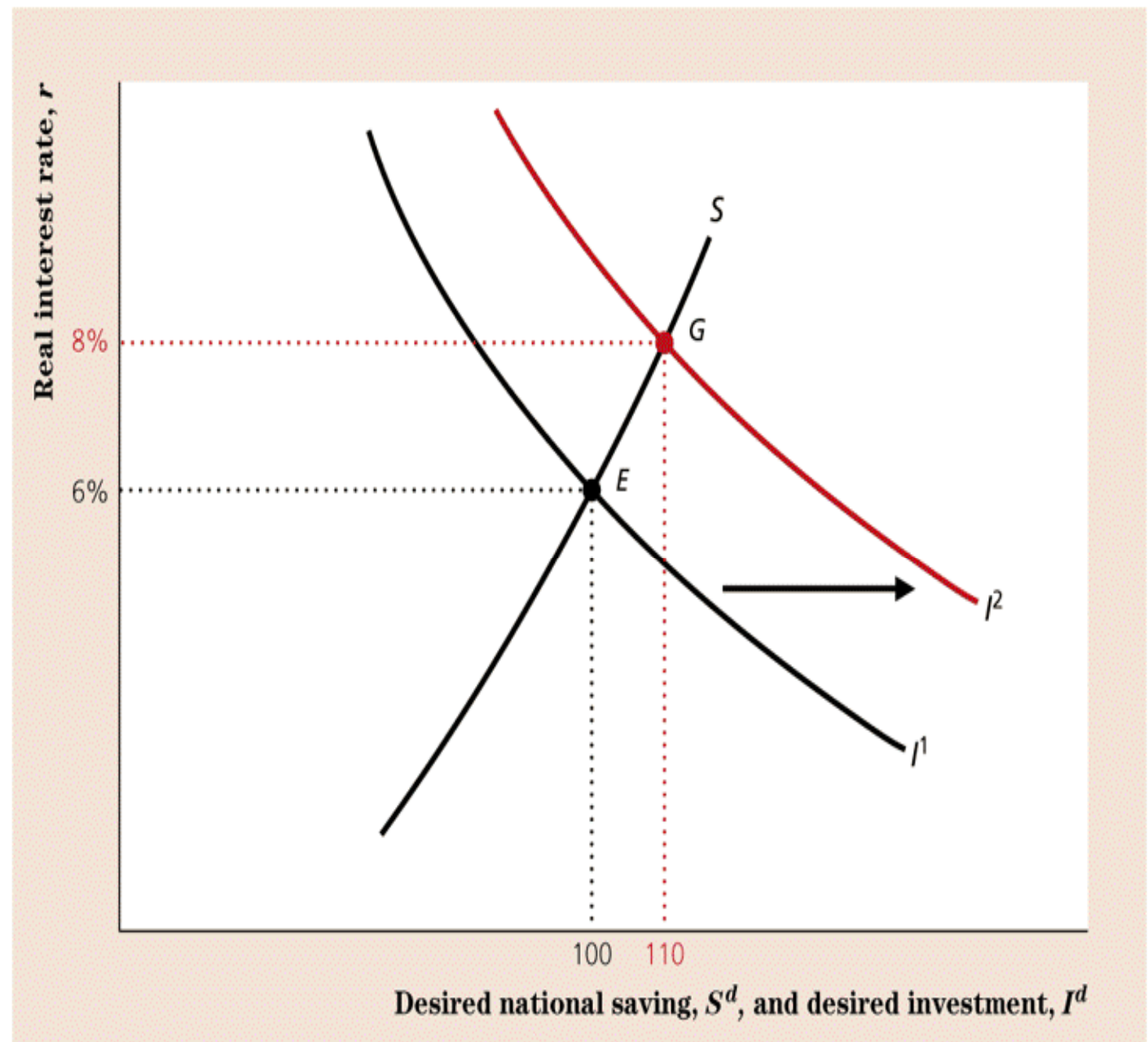
Shifts of Investment Curve

- Investment Increases shifts to the right if:
 - Increase productivity raises MPK^f (higher benefit/return from given Investment).
 - Fall in effective tax rate (lowers cost of given Investment):
- I^d shifts right: r rises, and S also increases.

FIGURE 4.9

AN INCREASE IN DESIRED INVESTMENT

A change in the economy that increases desired investment, such as an invention that raises the expected future MPK , shifts the investment curve to the right, from I^1 to I^2 . The goods market equilibrium point moves from E to G . The real interest rate rises from 6% to 8%, and saving and investment also rise, from 100 to 110.



Summary

All else equal, An increase in	Causes desired National Savings to	Reason
Y	Raise	Smooth over for consumption in the next period
Future Y (think of y_2)	Fall	Smooth over for consumption in the current period
Wealth (like y_2)	Fall	Extra wealth compensate for future savings
Expected future r	Raise	Our assumption that consumer are net savers, making savings more attractive.
G	Fall	$S = Y - C - G$
taxes	Fall/Constant	Not Ricardian/Ricardian