

# Principles of Macroeconomics

ECO 1019 Lecture 5

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## In this Lecture:

- Consumer's consumption/savings decision – responses of consumer to changes in income and interest rates.
- Government budget deficits and the Ricardian Equivalence Theorem.

# Intertemporal decisions

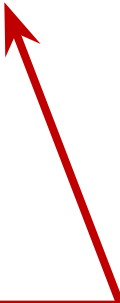
- They involve a **trade off across periods of time**: between current and future consumption, between current and future taxes, etc.
- In Solow model: arbitrary intertemporal decision rule, constant saving rate
- We use microeconomic principles to have a more detailed analysis

# Our model

- Two period model: today and tomorrow
- For simplicity: income is exogenous (no work/leisure decision). This helps us focus on the consumption-savings decision
- Lump sum taxes

# Budget Constraints

The consumer's current-period budget constraint:

$$c + s = y - t$$


We assume a credit market in which we trade a bond issued either by the consumers or the government

$s > 0$ : consumer is a **lender** on the credit market

$s < 0$ : consumer is a **borrower** on the credit market

# Budget Constraints

The consumer's future-period budget constraint:

$$c' = y' - t' + (1 + r)s$$

Interest rate



# Simplify

Solve the future-period budget constraint for  $s$ :

$$s = \frac{c' - y' + t'}{1 + r}$$

Next,

Substitute in the current-period budget constraint  
obtaining lifetime budget constraint:

$$c + \frac{c' - y' + t'}{1 + r} = y - t$$



# Consumer's Lifetime Budget Constraint

Substitute in the current-period budget constraint  
obtaining lifetime budget constraint:

$$c + \frac{c'}{1+r} = y - t + \frac{y' - t'}{1+r}$$

$we =$  **lifetime wealth**, i.e.  
quantity of resources that the  
consumer has available (in  
present value) to spend on  
consumption over his life time

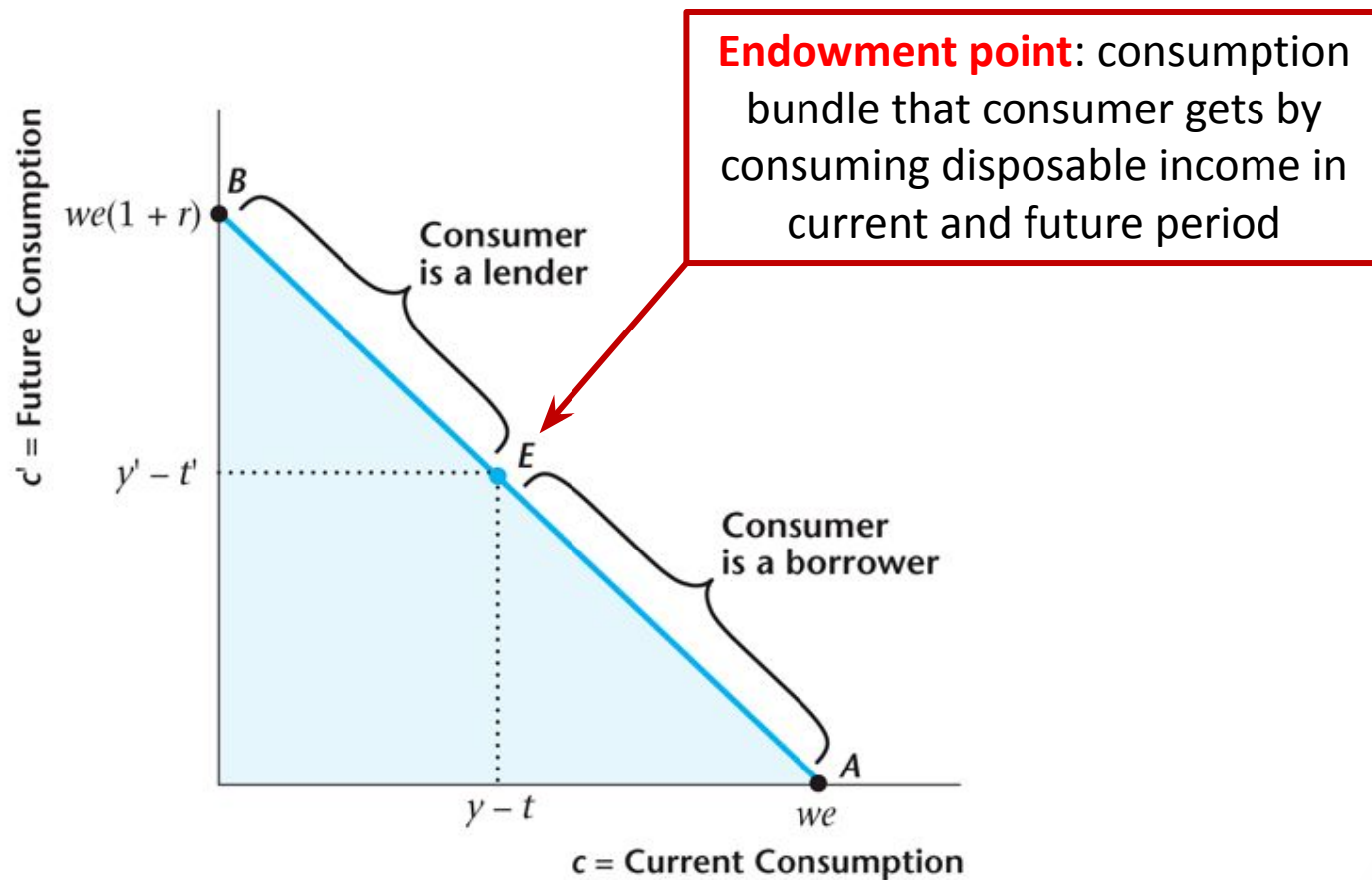
# Simplified Lifetime Budget Constraint

$$c + \frac{c'}{1+r} = we$$

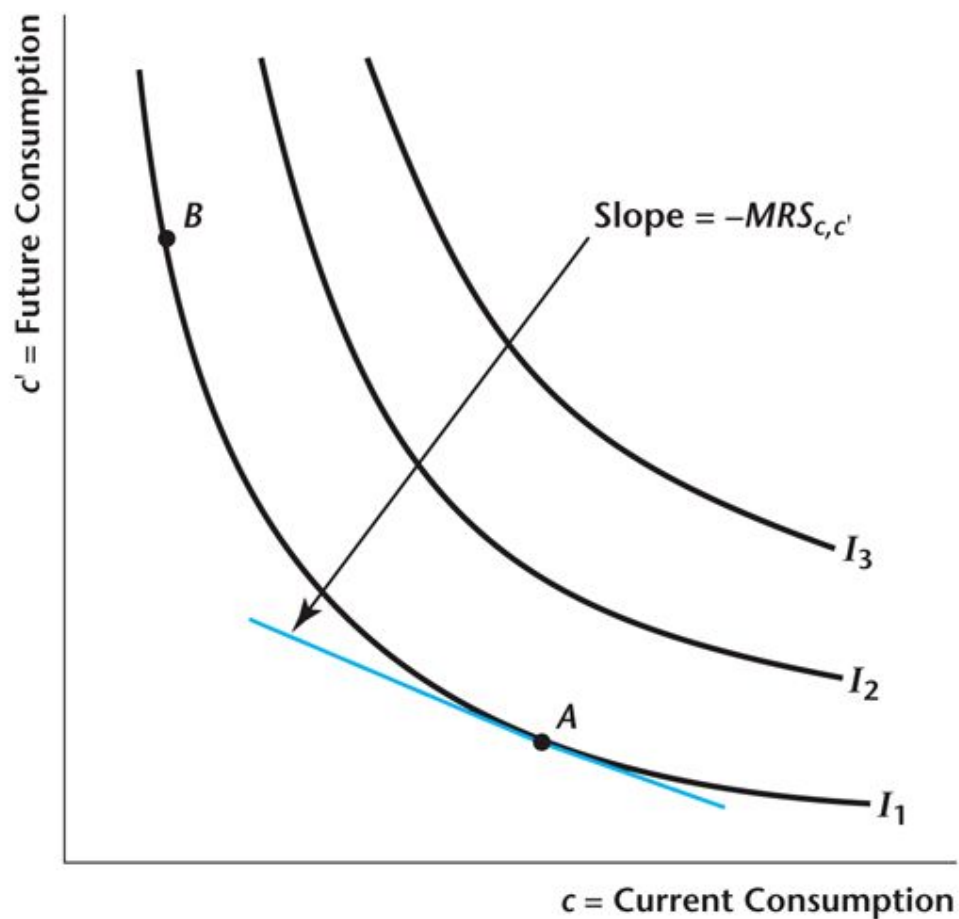
# Simplified Lifetime Budget Constraint: Slope-Intercept

$$c' = -(1+r)c + we(1+r)$$

# Consumer's Lifetime Budget Constraint



# A Consumer's Indifference Curves



# Sara's Desire for Consumption Smoothing

**Table 8.1** Sara's Desire for Consumption Smoothing

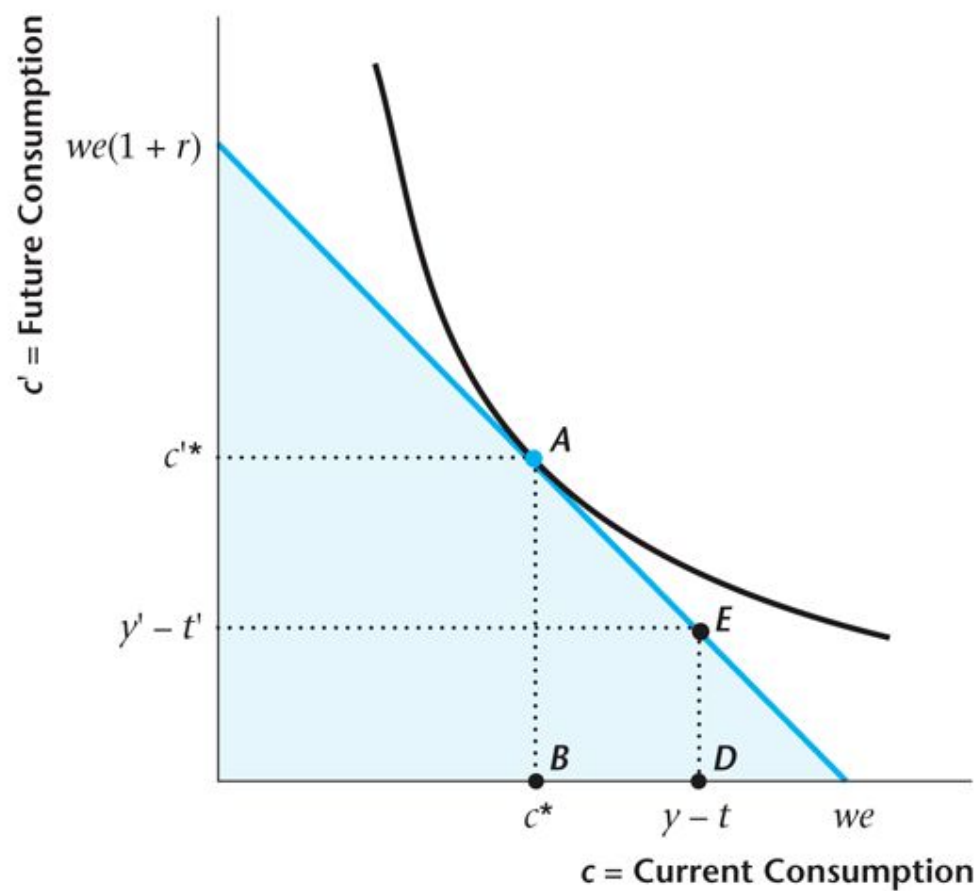
	Week 1 Coconuts	Week 2 Coconuts	Total Consumption
Bundle 1	5	15	20
Bundle 2	17	3	20
Preferred Bundle	11	9	20

# Optimization

Marginal condition that holds when the consumer is optimizing:

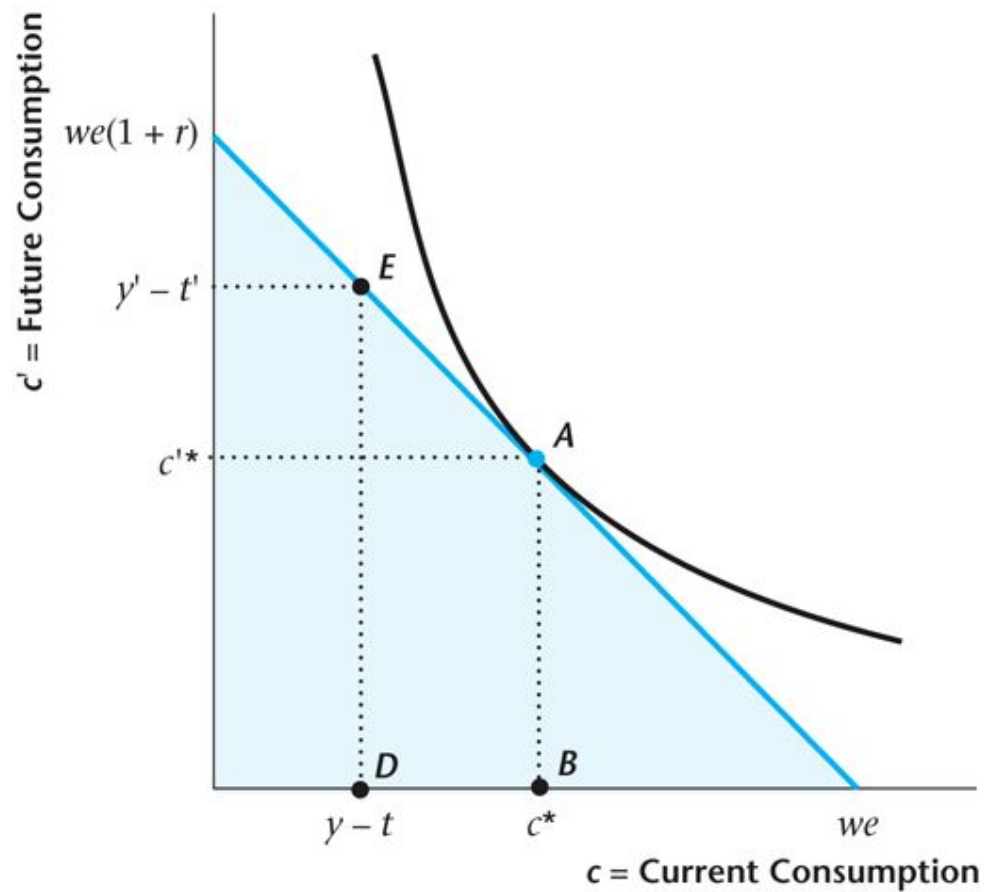
$$MRS_{c,c'} = 1 + r$$

# A Consumer Who Is a Lender





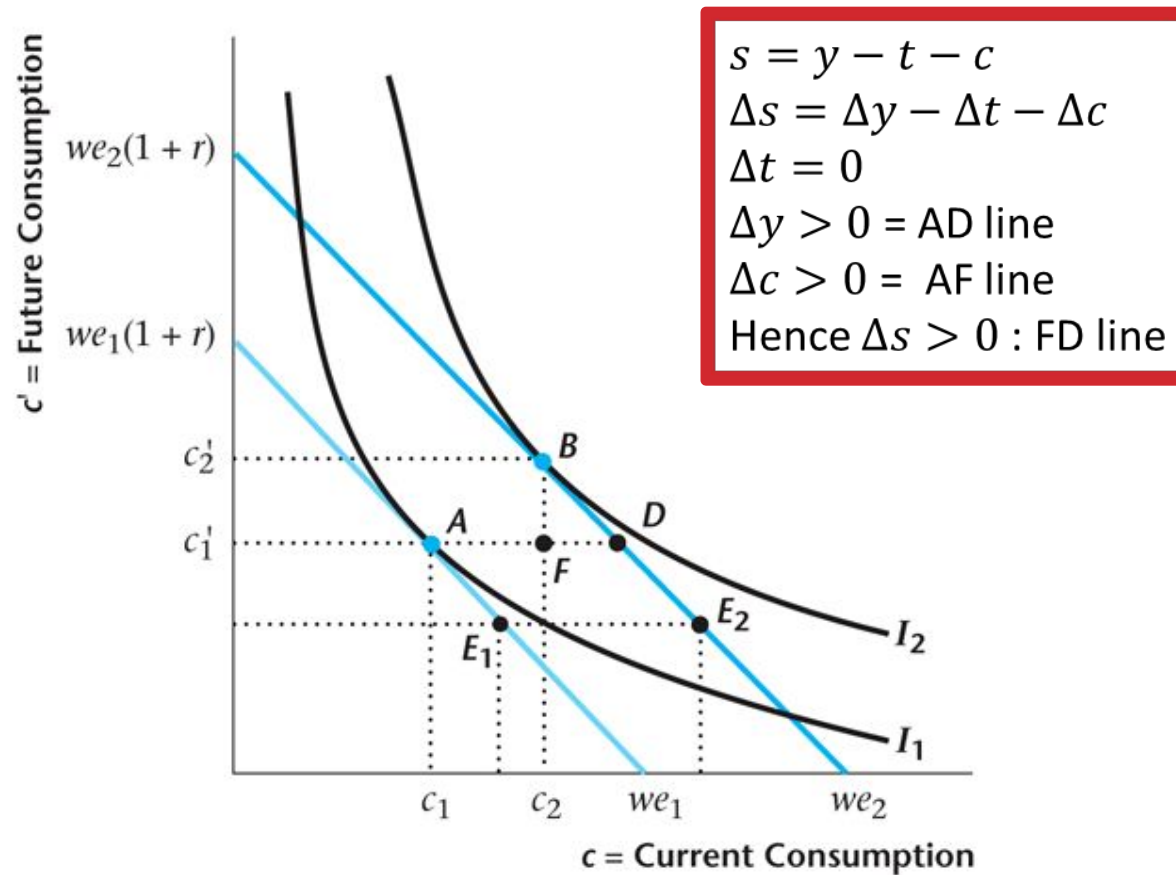
# A Consumer Who Is a Borrower



# An Increase in Current Income for the Consumer

- Current and future consumption increase.
- Saving increases.
- The consumer acts to smooth consumption over time.

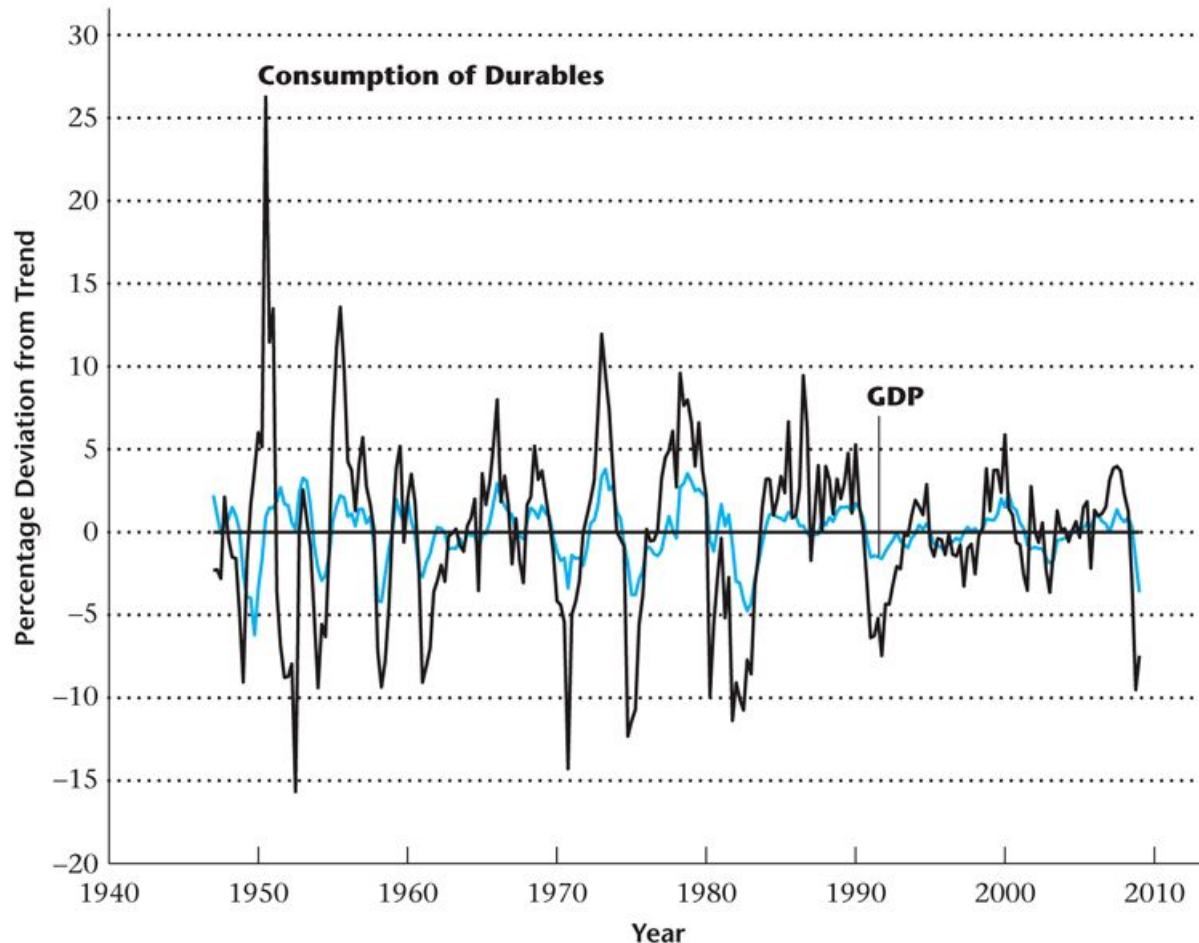
# The Effects of an Increase in Current Income for a Lender



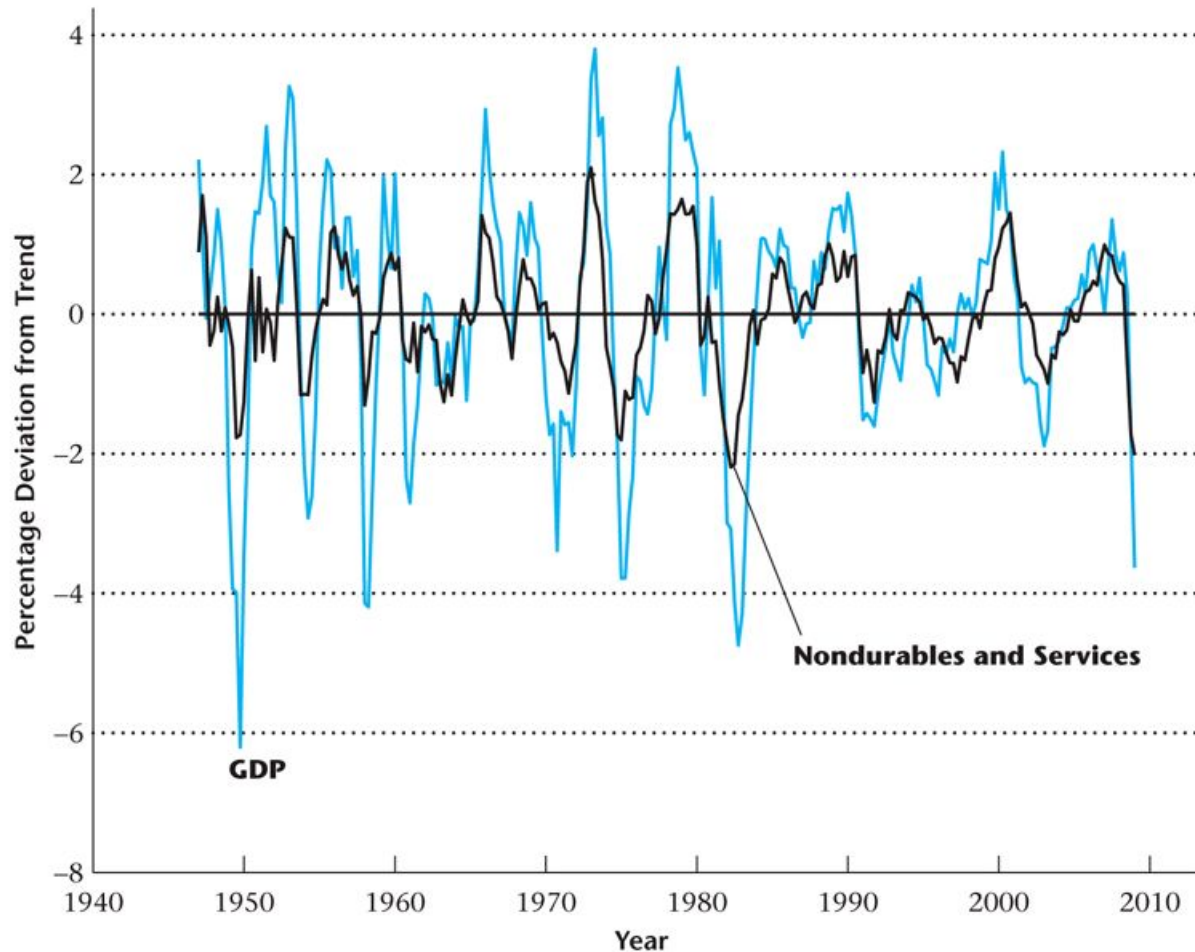
# Observed Consumption-Smoothing Behavior

- If all consumers try to smooth consumption overtime, we should observe that aggregate consumption is smoother than aggregate income
- Aggregate consumption of non-durables and services is smooth relative to aggregate income, but the consumption of durables is more volatile than income.
- This is because durables consumption is economically more like investment than consumption.

# Percentage Deviations from Trend in Consumption of Durables and Real GDP



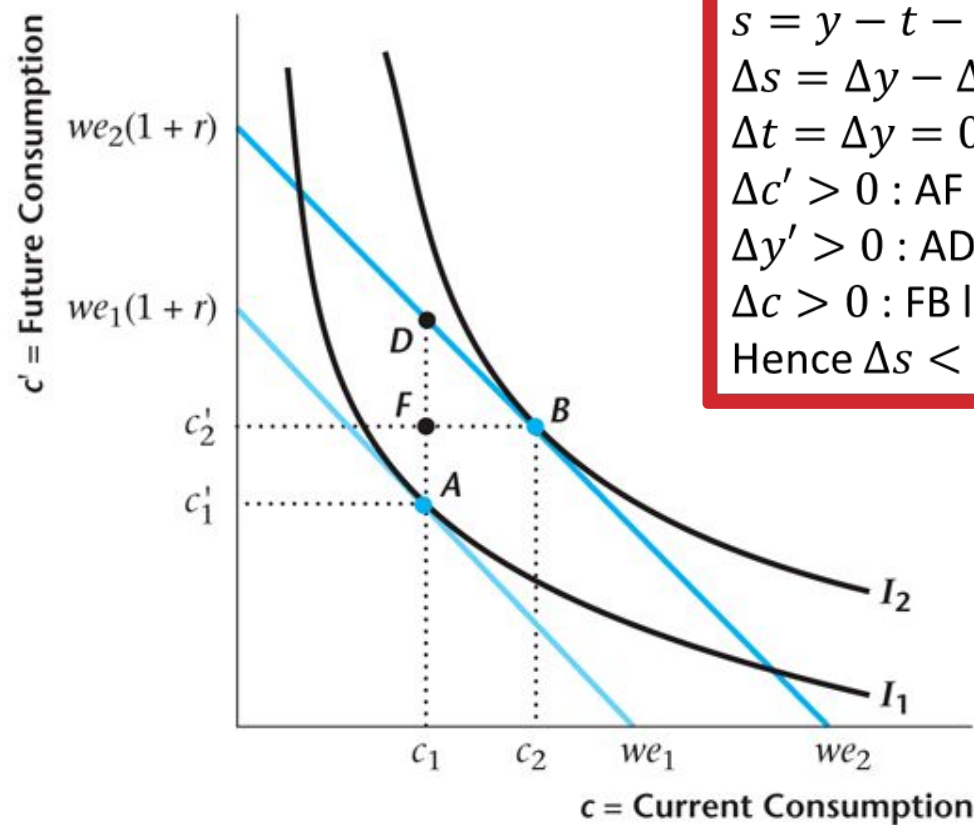
# Percentage Deviations from Trend in Consumption of Nondurables and Services and Real GDP



# An Increase in Future Income for the Consumer

- Current and future consumption increase.
- Saving decreases.
- The consumer acts to smooth consumption over time.

# An Increase in Future Income



$$s = y - t - c$$

$$\Delta s = \Delta y - \Delta t - \Delta c$$

$$\Delta t = \Delta y = 0$$

$$\Delta c' > 0 : \text{AF line}$$

$$\Delta y' > 0 : \text{AD line}$$

$$\Delta c > 0 : \text{FB line}$$

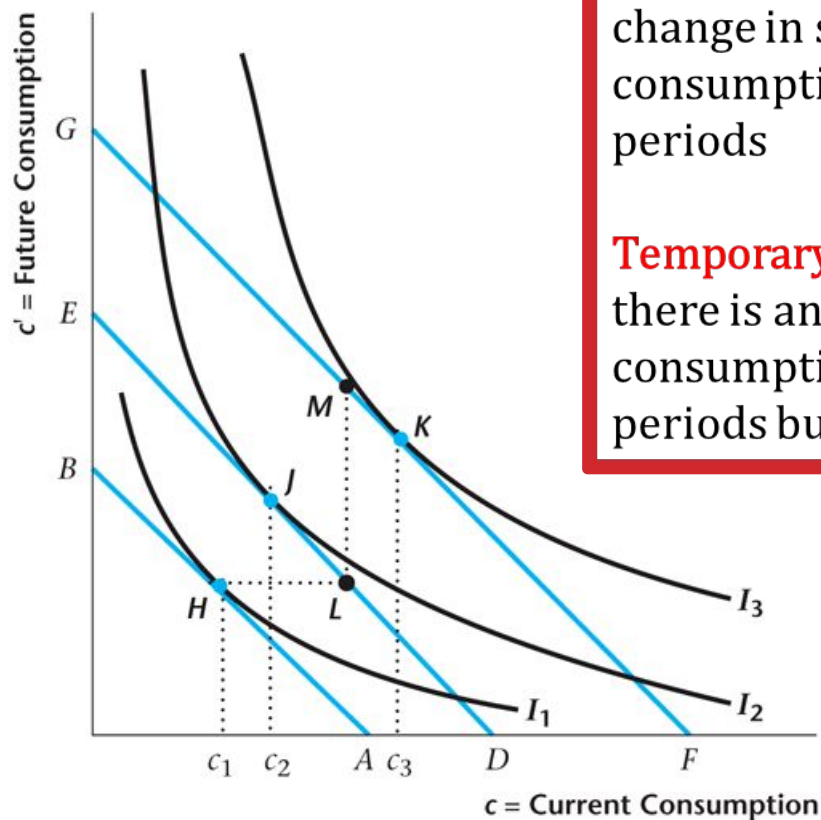
$$\text{Hence } \Delta s < 0$$



# Temporary and Permanent Increases in Income

- As a permanent increase in income will have a larger effect on lifetime wealth than a temporary increase, there will be a larger effect on current consumption.
- A consumer will tend to save most of a purely temporary income increase.
- This is the **permanent income hypothesis** by Milton Friedman

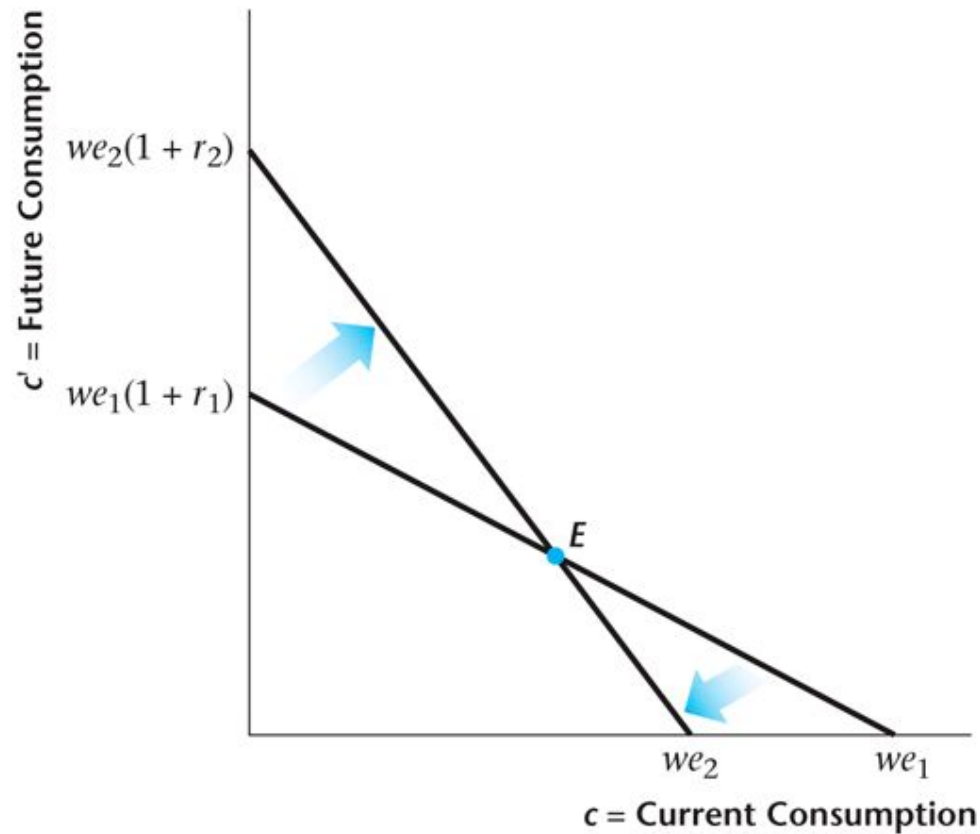
# Temporary Versus Permanent Increases in Income



**Permanent:**  $\Delta y' = \Delta y > 0$ , *no* change in savings, consumption goes up in both periods

**Temporary:**  $\Delta y' = 0, \Delta y > 0$ , there is an increase in savings, consumption goes up in both periods but less

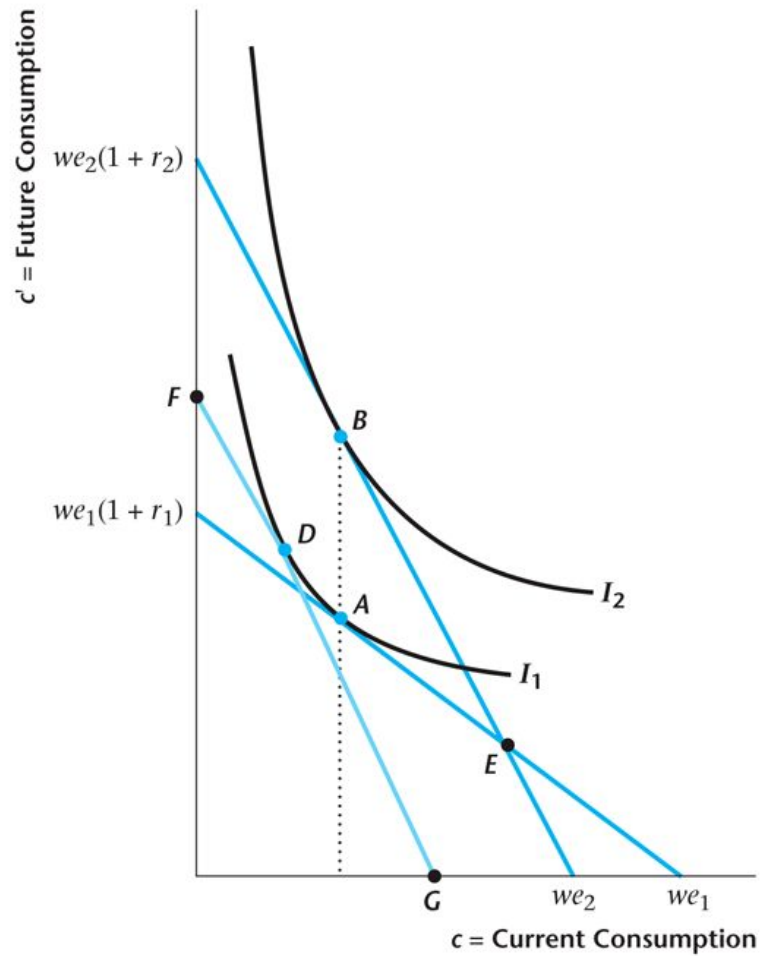
# An Increase in the Real Interest Rate



# An Increase in the Market Real Interest Rate

An increase in the market real interest rate decreases the relative price of future consumption goods in terms of current consumption goods – this has income and substitution effects for the consumer.

# An Increase in the Real Interest Rate for a Lender

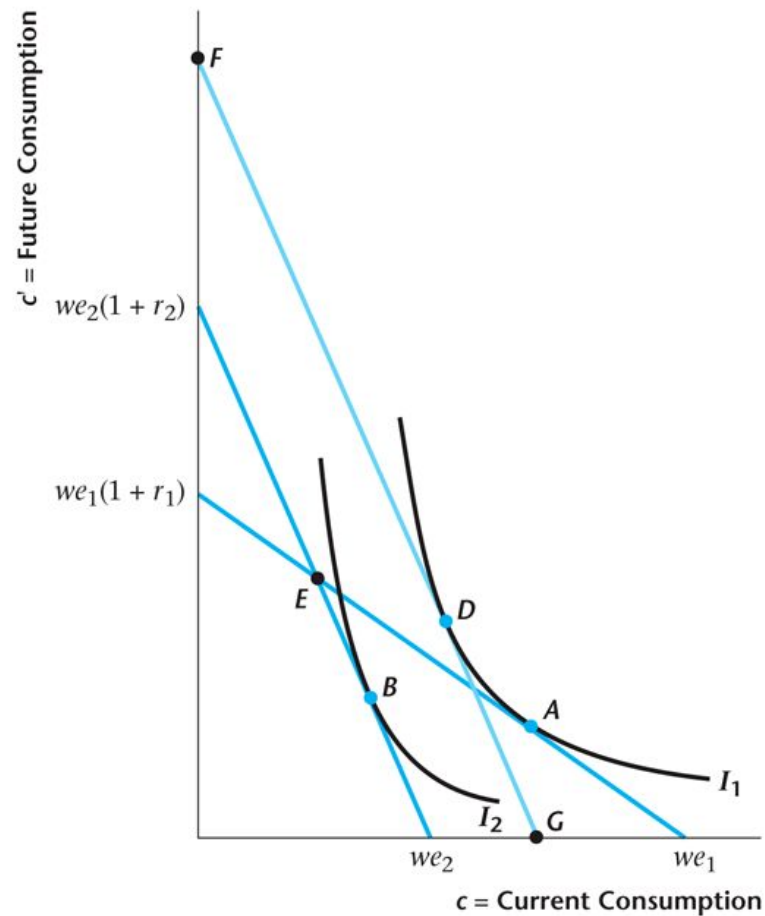


# Effects of an Increase in the Real Interest Rate for a Lender

**Table 8.2** Effects of an Increase in the Real Interest Rate for a Lender

Current consumption	?
Future consumption	Increases
Current savings	?

# An Increase in the Real Interest Rate for a Borrower



# Effects of an Increase in the Real Interest Rate for a Borrower

**Table 8.3** Effects of an Increase in the Real Interest Rate for a Borrower

Current consumption	Decreases
Future consumption	?
Current savings	Increases



# Introducing the government

- Government buys  $G$ , financed either with taxes or debt.
- $T=Nt$ ,  $T'=Nt'$
- Private and government bonds are indistinguishable, have same interest rate  $r$

# Government Budget Constraints

The government's current-period budget constraint:

$$G = T + B$$

# Government Budget Constraints

The government's future-period budget constraint:

$$G' + (1 + r)B = T'$$

# Government Budget Constraints

The government's *present-value budget constraint*:

$$G + \frac{G'}{1+r} = T + \frac{T'}{1+r}$$

# Competitive equilibrium

- Each consumer chooses current and future consumption and savings optimally given interest rate  $r$
- The government present-value budget constraint holds
- The credit market clears

# Credit Market Equilibrium Condition

Total private savings is equal to the quantity of government bonds issued in the current period.

$$S^p = B$$

# Credit Market Equilibrium: Implications

Remember:  $S = S^p + S^g = I + CA$

Here  $I=0$ ,  $CA=0$ , and  $S^g = -B$

$$S^p = Y - C - T$$

$$B = G - T$$

Therefore,  $S^p = B \Leftrightarrow Y - C - T = G - T$

Or rearranging  $Y = C + G$

# Income-Expenditure Identity

Credit market equilibrium implies that the income-expenditure identity holds.

$$Y = C + G$$



# Ricardian Equivalence

- The **Ricardian Equivalence Theorem** states that , under some conditions, a change in the timing of taxes is neutral, i.e. has no effect on the interest rate and on current and future consumption

# Ricardian Equivalence

Key equation: The consumer's lifetime tax burden is equal to the consumer's share of the present value of government spending – the timing of taxation does not matter for the consumer.

$$Nt + \frac{Nt'}{1+r} = G + \frac{G'}{1+r}$$

implies

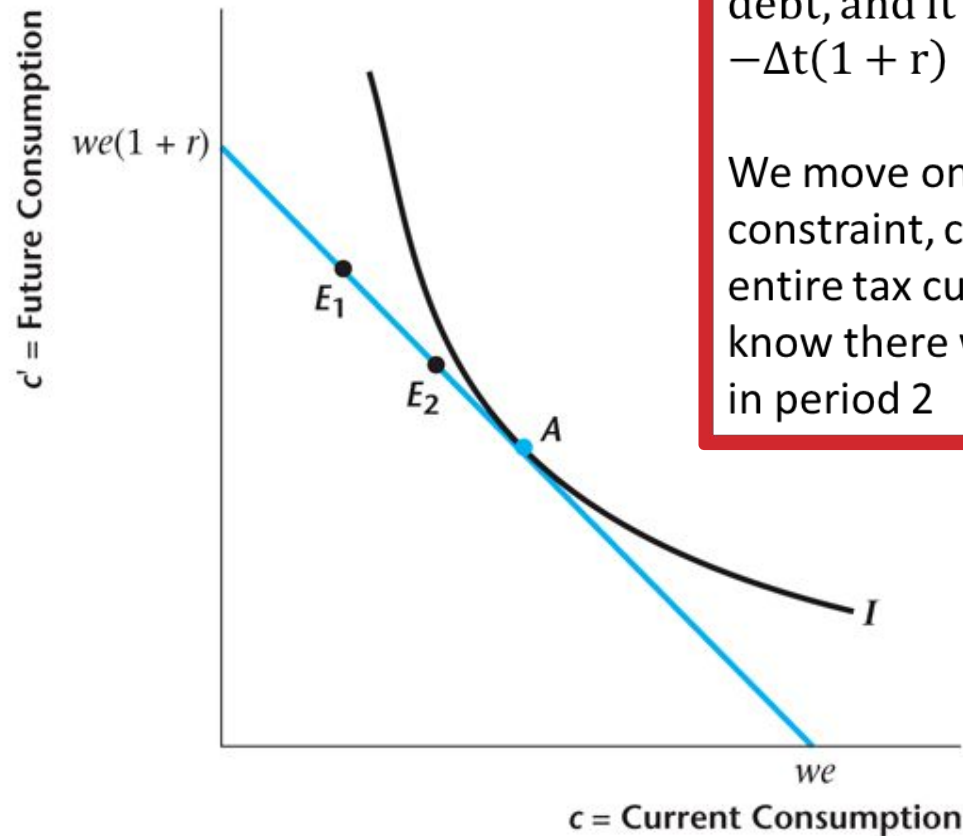
$$t + \frac{t'}{1+r} = \frac{1}{N} \left( G + \frac{G'}{1+r} \right)$$

# Ricardian Equivalence

Then, substitute in the consumer's budget constraint – taxes do not matter in equilibrium for the consumer's lifetime wealth, just the present value of government spending.

$$c + \frac{c'}{1+r} = y + \frac{y'}{1+r} - \frac{1}{N} \left[ G + \frac{G'}{1+r} \right].$$

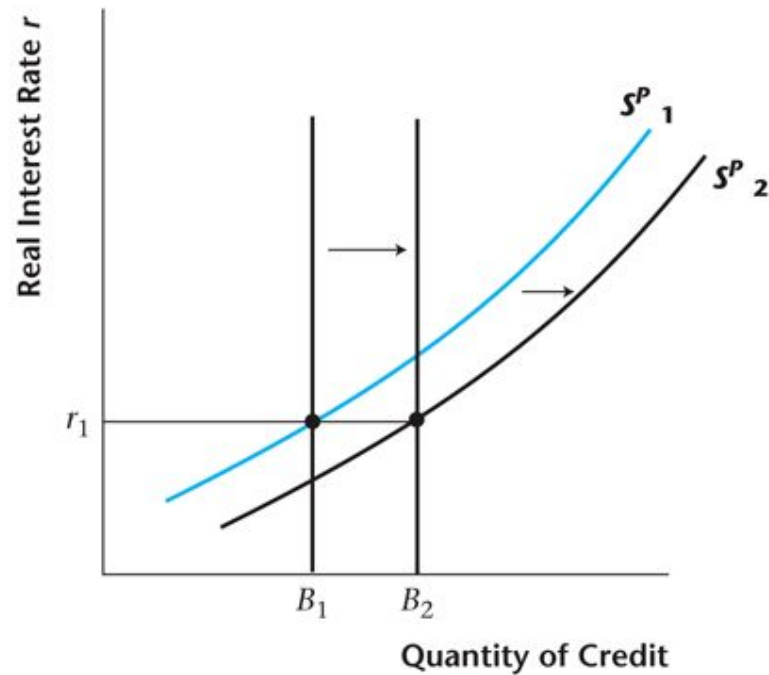
# Ricardian Equivalence with a Cut in Current Taxes for a Borrower



$\Delta t < 0$  is tax cut, financed with debt, and it implies  $-\Delta t(1+r) > 0$  tomorrow

We move on the budget constraint, consumers save the entire tax cut because they know there will be a tax increase in period 2

# Ricardian Equivalence and Credit Market Equilibrium



# Discussion of the assumptions

- Ricardian equivalence theorems says government debt represents our future liabilities as a nation, must be paid by taxing citizens in the future.
- It's a good benchmark to start thinking about government debt, however some of the assumptions are very strong!
- Situations in which it might not hold:
  - Heterogeneity: different taxes for different people
  - Finite lifetimes
  - Distortionary taxes
  - Imperfections in the credit markets

# Readings

- Savings are generally a good idea  
[http://www.youtube.com/watch?v=C\\_8TGTKdrIY](http://www.youtube.com/watch?v=C_8TGTKdrIY)
- The cost of repair  
[http://www.economist.com/node/17173933?story\\_id=17173933](http://www.economist.com/node/17173933?story_id=17173933)
- Economists show “Cash-for-clunkers” was a clunker  
<http://www.theatlantic.com/business/archive/2010/10/economists-show-cash-for-clunkers-was-a-clunker/65356/>