MACROECONOMICS

NEW SZÉCHENYI PLAN

ELTE ECON

MACROECONOMICS

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MACROECONOMICS

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MACROECONOMICS

Week 7
Intertemporal consumption-saving decision

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Consumption and saving

- A dynamic, intertemporal decision
- We save so that we can consume more in the future
- We take out loans in order to bring consumption from the future to the present
- In a one period model there is no saving. In the Solow model the savings decision is a mechanical one

Consumption and saving

- Same type of decision as the one between consumption and leissure, but this time it refers to different time periods
- Assumptions:
  - two periods
  - no prodiction (yet)
  - many consumers (no representative consumer)
- Given time path for Y how the consumer decides on time path of C

Budget constraint

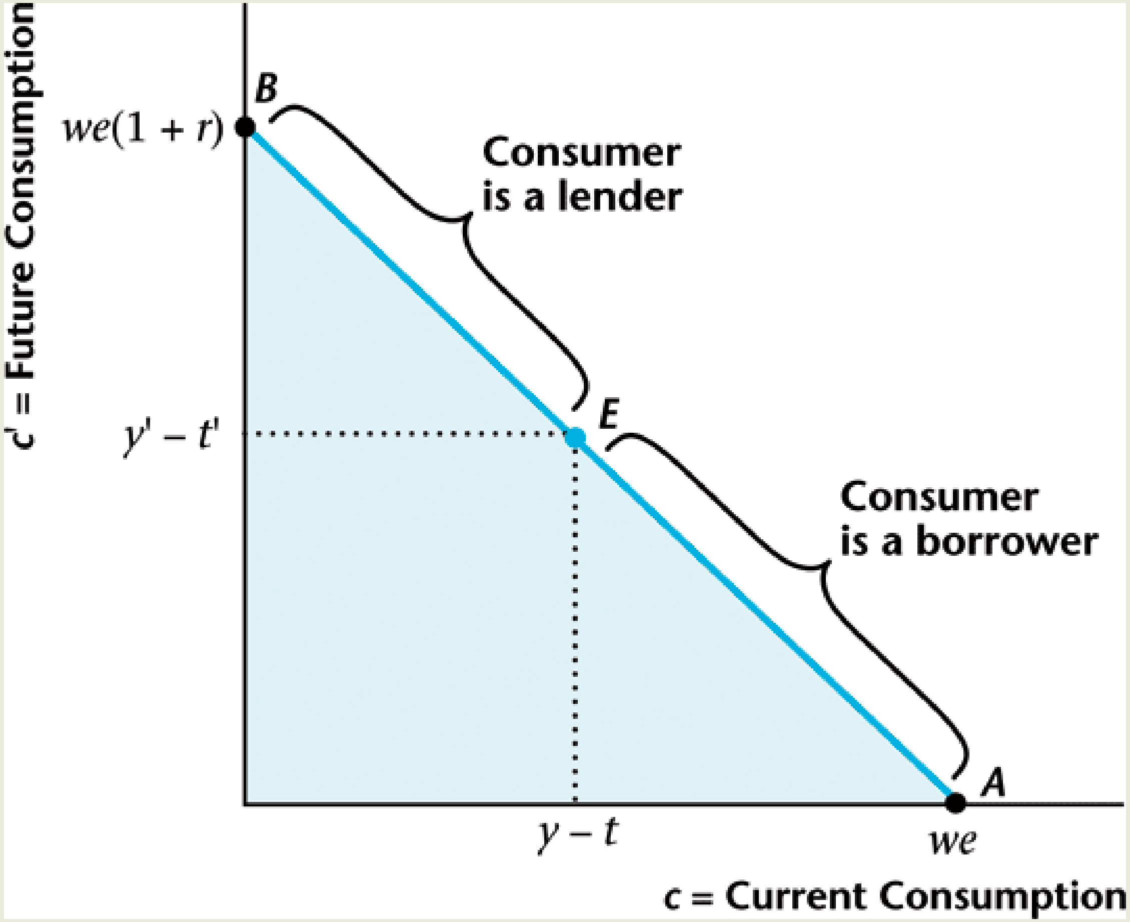
- Current period: $c + s = y - t$
- Future period: $c' = y' - t' + (1 + r)s$
- Assumptions:

We have perfect credit market, no risk, no mediators, no margin between the interest paid on loans given or taken. Everyone can issue the same type of bond. Substituting for s we get:

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

Life time income or wealth, we

Budget constraint



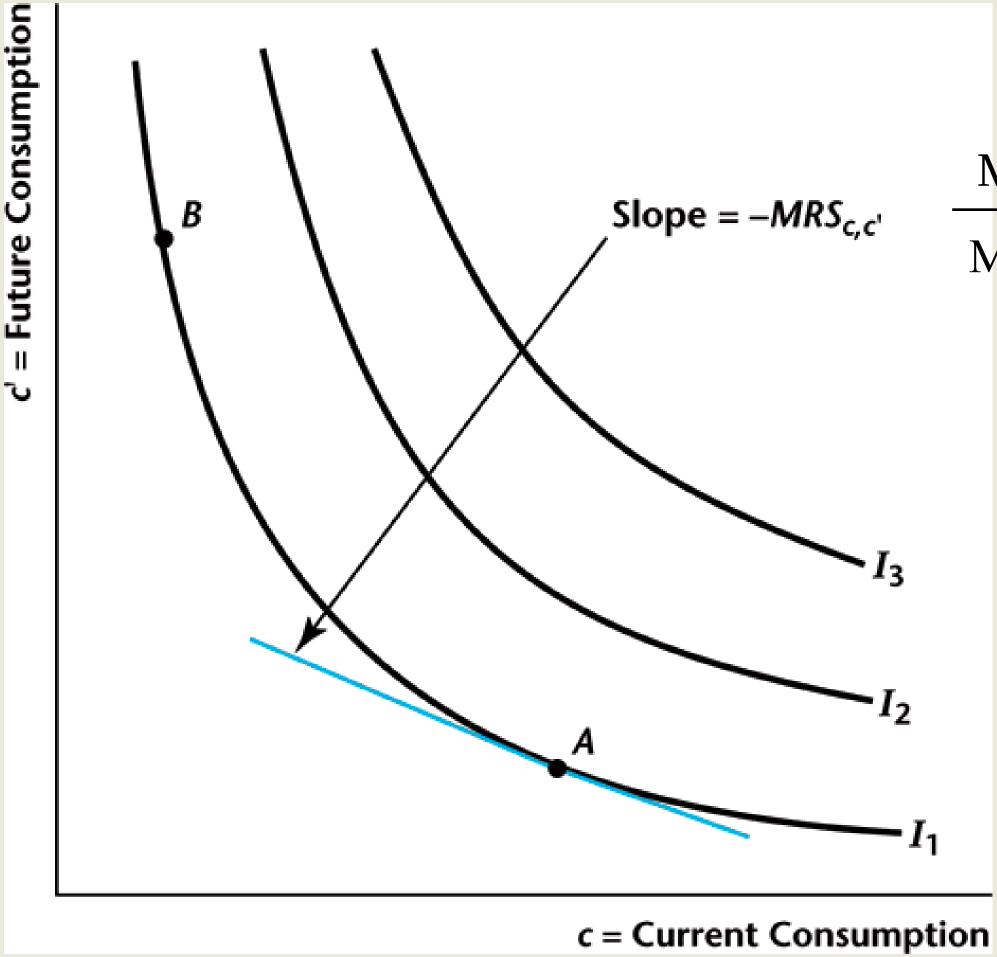
$$c' = -(1+r)c + we(1+r)$$

Budget constraint

- Due to the perfect credit market, the consumer can change the time path for C regardless of current income levels as long as she obeys her intertemporal budget constraint
- Slope of the curve is $-(1-r)$. Giving up one unit of consumption in the present we gain $1 + r$ units in the future. Price of future consumption in terms of current consumption is:

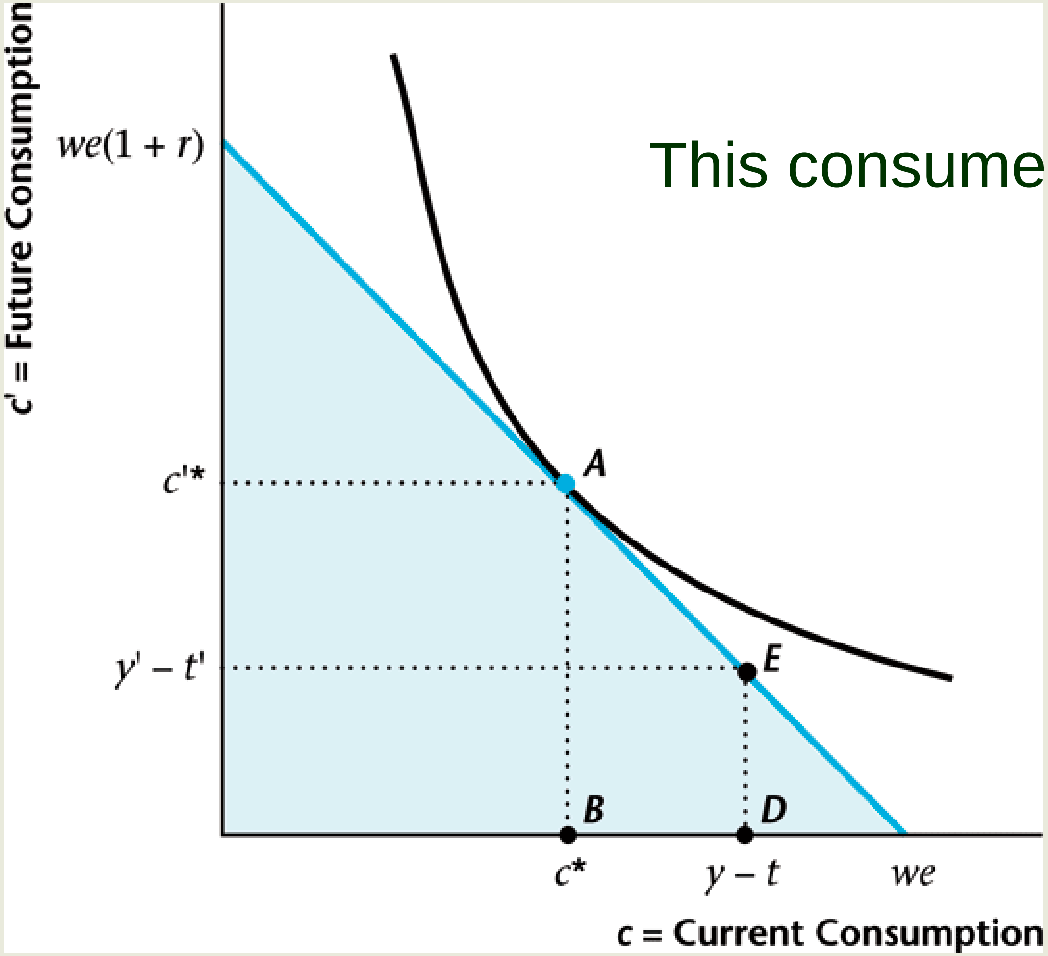
$$\frac{\mathbf{1}}{\mathbf{(1 + r)}}$$

Consumer preferences



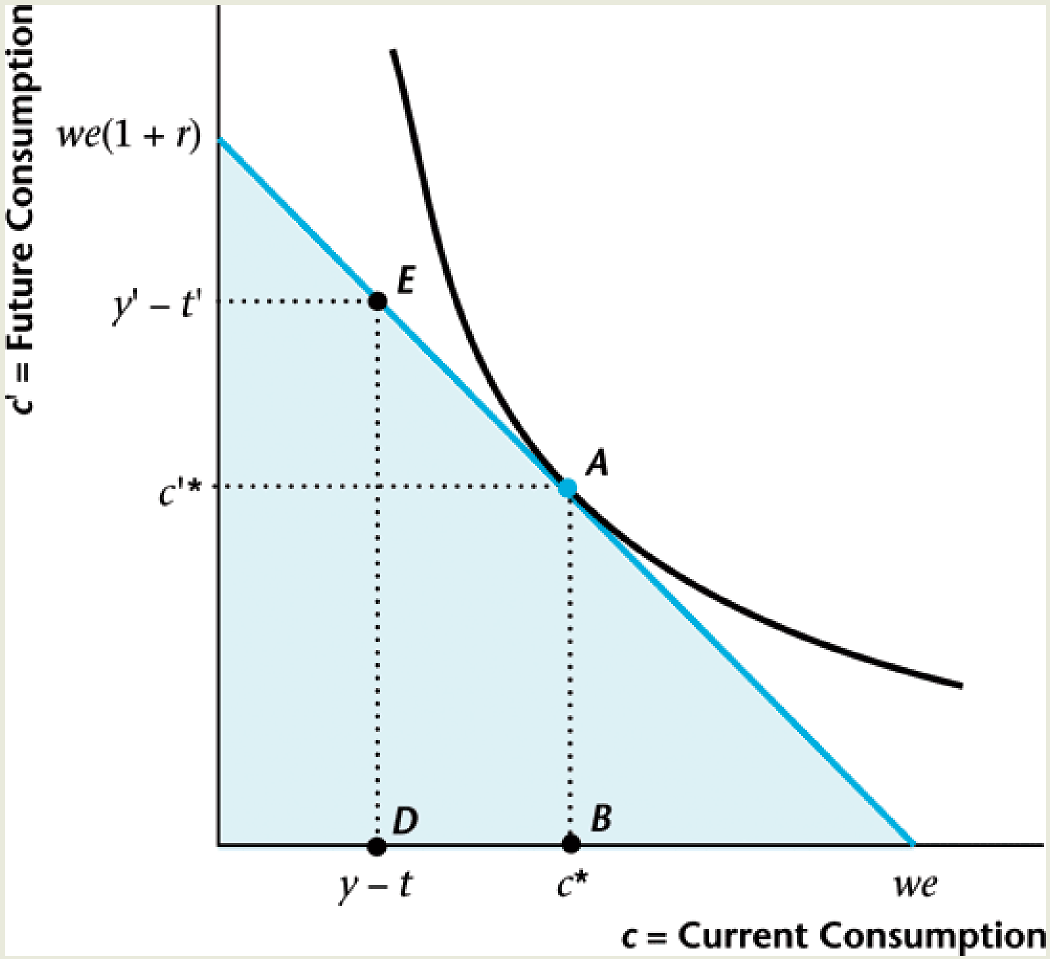
$$\frac{MUC}{MUC'}$$

Equilibrium



This consumer saves

Equikibrium-borrower



Calculus

$$\text{U} = \ln c + \ln c'$$

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

Solution:

$$L = \ln c + \ln c' + \lambda\left(y + \frac{y'}{(1+r)} - t - \frac{t'}{(1+r)} - c - \frac{c'}{(1+r)}\right)$$

$$\frac{1}{c} = \lambda, \qquad \frac{1}{c'} = \frac{\lambda}{(1+r)} \qquad \rightarrow c = \frac{c'}{(1+r)}$$

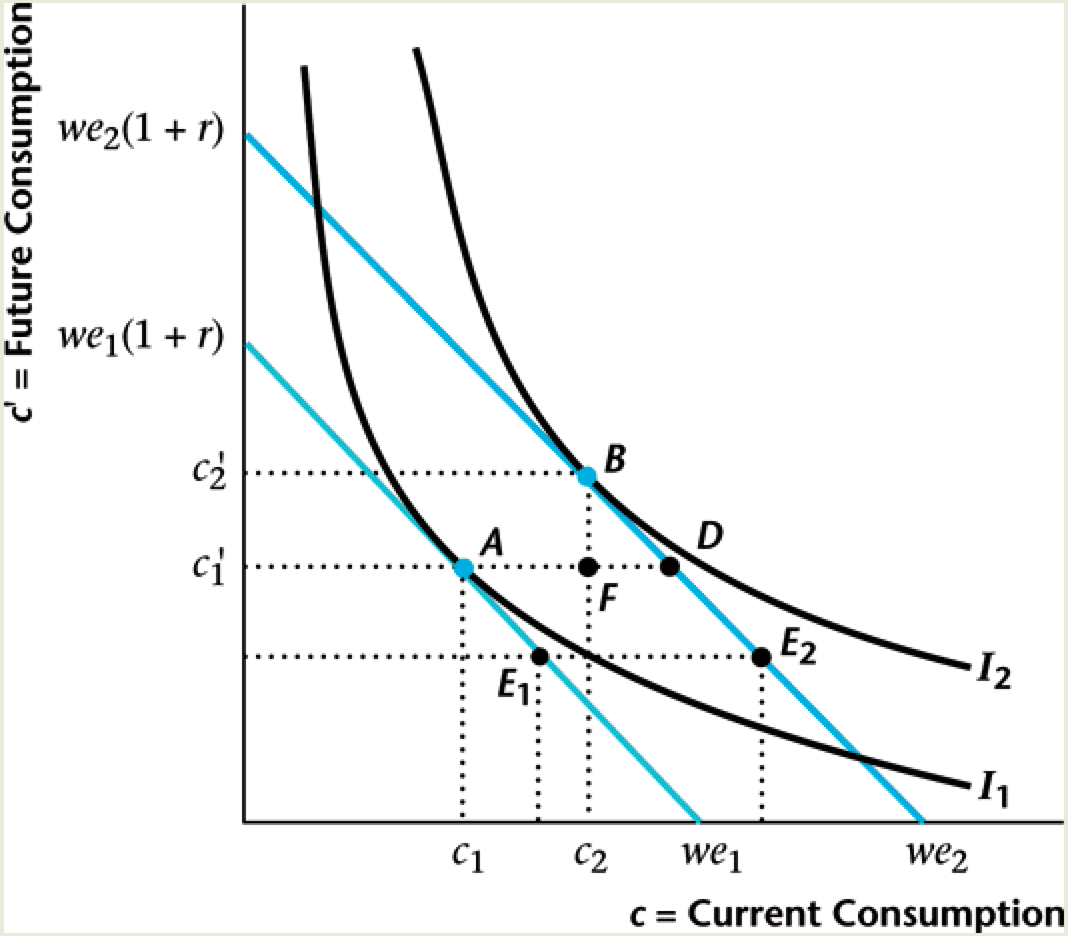
Substituting into the budget constraint:

$$c = \frac{1}{2}\left(y + \frac{y'}{(1+r)} - t - \frac{t'}{(1+r)}\right)$$

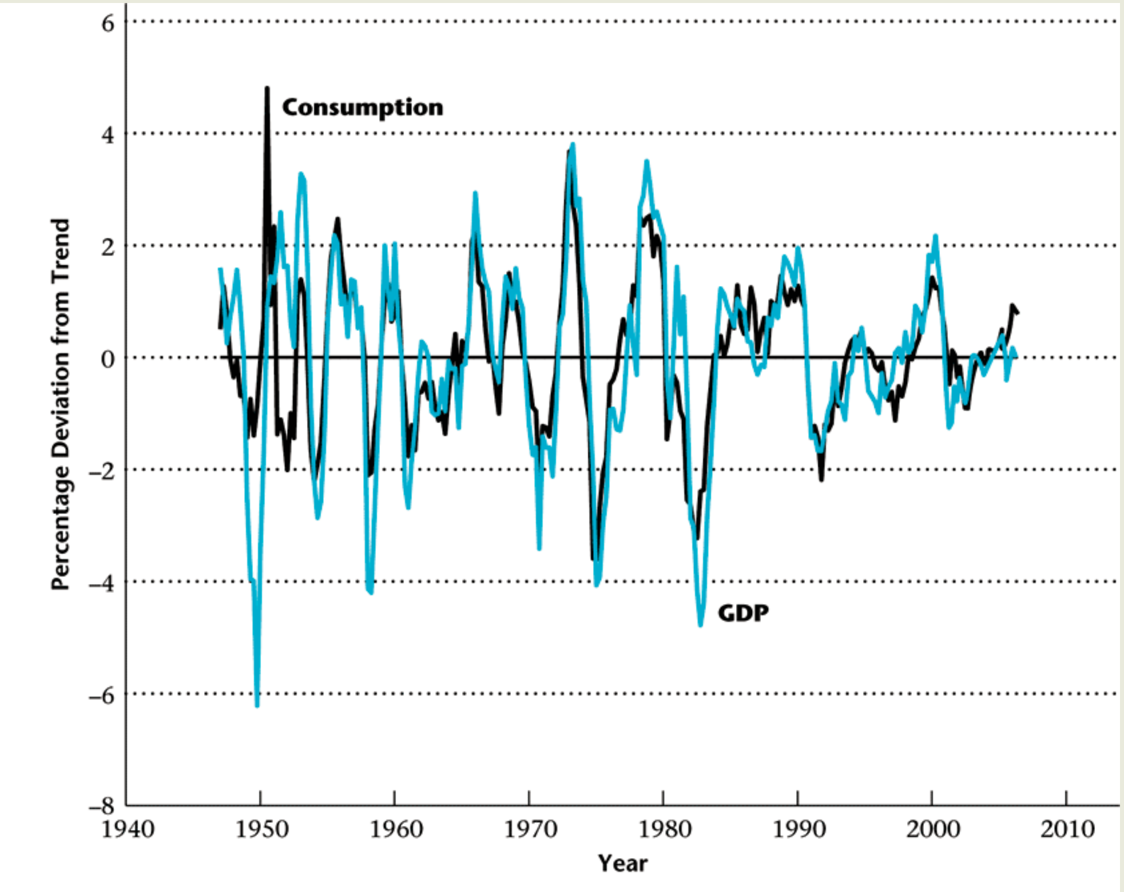
An increase in current income

- c relative to c' depends only on the slope of the contraint (on r) An increase in current income will result in the consumer increasing c in both periods. Therefore, some of the increment of y will be saved
- The consumer smooths her consumption in time

Consumption smoothing, a saver



Consumption smoothing



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Infinite time horizon

$$U = \sum_{t=0}^{\infty} \beta^t \ln c_t$$

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t c_t = \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t (y_t - t_t)$$

Lagrange:

$$L = \sum_{t=0}^{\infty} \beta^t \ln c_t + \lambda \left(\sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t (y_t - t_t) - \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t c_t \right)$$

Solution:

$$\frac{\beta^t}{c_t} = \lambda \left(\frac{1}{1+r}\right)^t \; minden\ t - re \;\; \rightarrow \;\; \frac{c_{t+1}}{c_t} = \beta(1+r)$$

$$\sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t c_t = \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t (y_t - t_t)$$

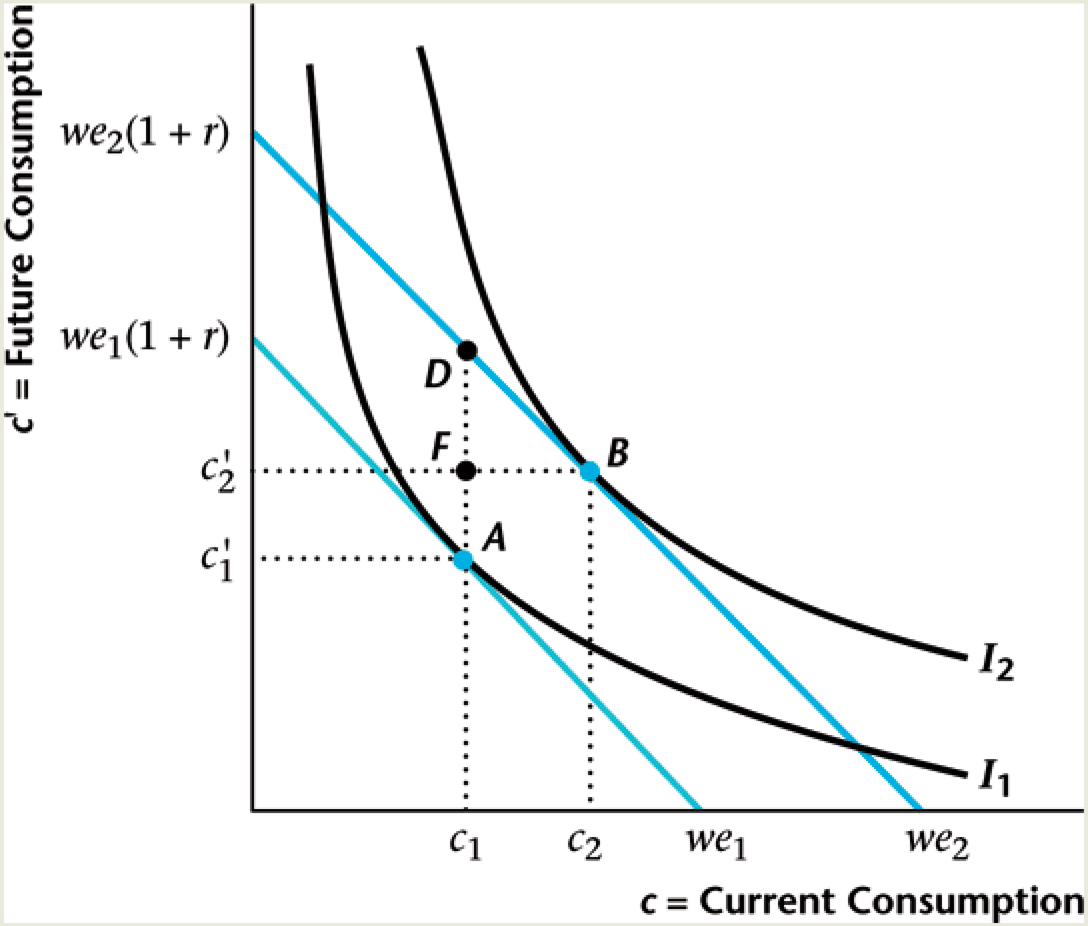
Complete smoothing

- With perfect credit markets time path of c will be completely independent from the time path of Y, level of consumprion would depend on life time income only
- Yearly consumprion relative to one another would depend on the rate of interest only. We would experience total consumption smoothing
- Empírically it does not happen. Why?

Incomplete smoothing

- Cresit markets are not perfect. Risks and the mediation have significant costs
- On aggregate, it is impossible that everyone increases saving at a same time. Someone has to borrow to let someone else to save. Rate of interest moves will clear credit markets. Smoothing will be incomplete

Increase in future period's income



Y increases in the future

$$c = \frac{1}{2}\left(y + \frac{y'}{(1+r)} - t - \frac{t'}{(1+r)}\right)$$

$$\frac{\partial c}{\partial y'} = \frac{1}{2}\frac{1}{(1+r)}$$

Current consimption increases, the consumer smooths backwards. Current income is constant still, current consumprion increases. Savings decrease

Income changes: temporary or permanent

- Temporary: Y increases
- Permanent: Y as well as Y' increases. Impacts on cunsumption add up. Permanent increase in income will make consumprion grow more
- Fitting a consumption function simply on aggregate time serieses of c and Y would be misleading. We do not know what they expected for the future

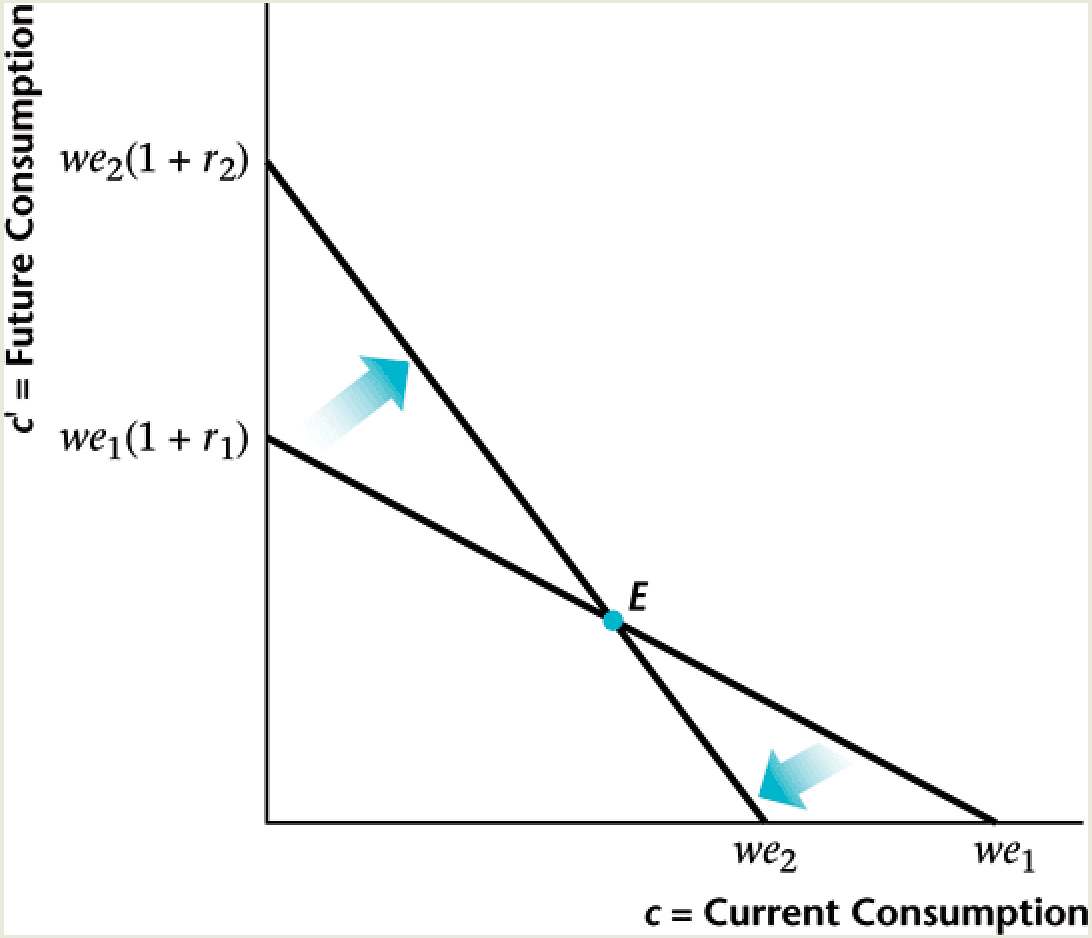
Consumption finction

- Keynes: $C = a + b(Y - T)$
- Friedman: permanens permanent income hypthesis
- $C = a(Y - T)^P$
- A change in taxes will have significantly different impact depending on it being expected as a permanent or temporary. If temporary, then c decreases just a bit, if permanent, then impact on life time income is largar, C can decrease a lot. The keynesian consumption function ignores this difference

Effect of an increase in r

- An increase in r reduces the price of consumption in the future in terms of present consumption. Consumption in the fututre gets relatively cheeper, consumption in the present gets more expensive
- This substitutoiion effect is independent of the income effect, and causes consumption to decrease in the present

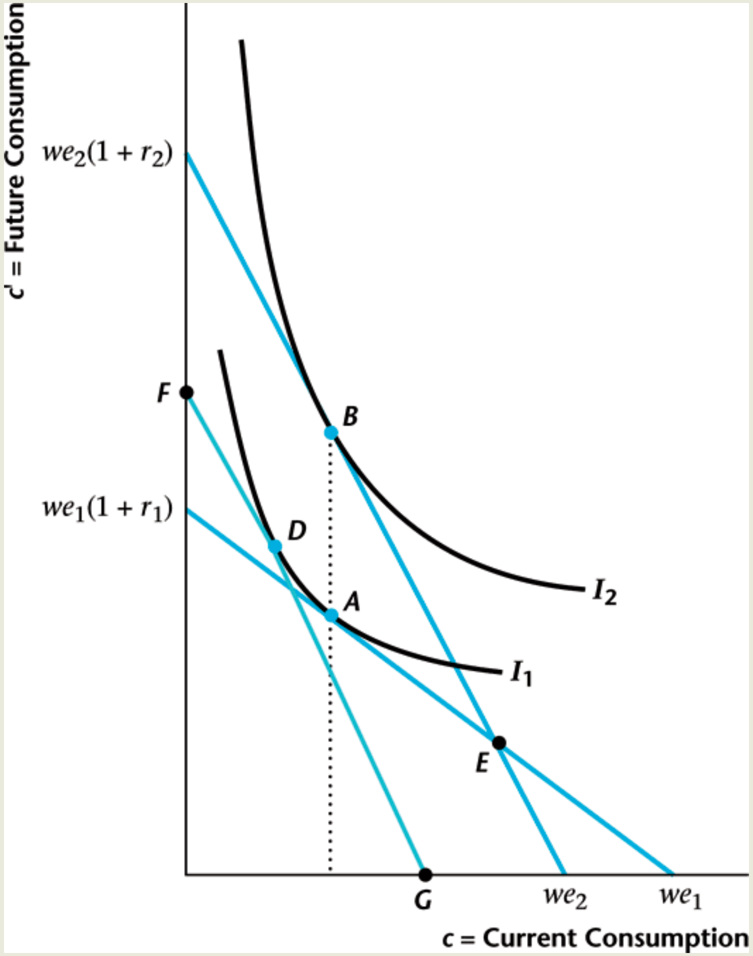
r increases


c' = Future Consumption
we2(1 + r2)
we1(1 + r1)
E
we2
we1
c = Current Consumption

Income effect

- Income in the present would not change. However, if the consumer is a borrower, her future income decreases, if she is a lender it increases
- We know, this also changes present consumption
- Borrower: both effect are negative, C would decreease. Lender: the two effects have the opposite sign, C could go both wayas

Consumer is a lender



In this example the income and substitution effects just cancel each other. However, this is not typical

Example

- If the utility function is logarithmic, then current consumption is:

$$c = \frac{1}{2}\left(y + \frac{y'}{(1+r)} - t - \frac{t'}{(1+r)}\right)$$

$$\frac{\partial c}{\partial r} = -\frac{1}{2}\frac{y'}{(1+r)^2}$$

In this case the concumption decreases regardless of the consumer being a lender or borrower. Other utility functions can produce different results

Government

- We have two periods, the government can also lend or borrow. It issues the same type of bonds that the consumer does. Debt is B
- The government's budget constraint:

$$G = T + B$$

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

Intertemporal budget constraint:

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

Market for loans

- This is the only market in the model. Cosumers borrow or lend, that is they exchange current goods for future goods and the other way around
- The government can borrow from the bulk of consumers only. The credit market is in equilibrium, if government debt equals consumers' savings

$$S^p = B$$

Market for goods

- They exchange current goods for future goods in the credit market. Therefore, if rhe credit market is in equilibrium, then the market for goods is also in equilibrium

$Y = C + T + S^{P},$ $S^{P} = B$

$B = G - T$

$Y = C + G$

Ricardian equivalence

- If time path for G is given and the government obeys her budget constraint, the timing of taxes would not matter, would not effect any variables (c, r)
- In other words: it is all the same if we collect taxes now to finance spending, or we borrow, and pay it off later with interest. The two ways of financing expenditures are equivalent

Ricardian equivalence

- We have N consumers each paying an equal, t, amount in taxes, T = Nt

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

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

Substituting into the consumer’s budget constraint:

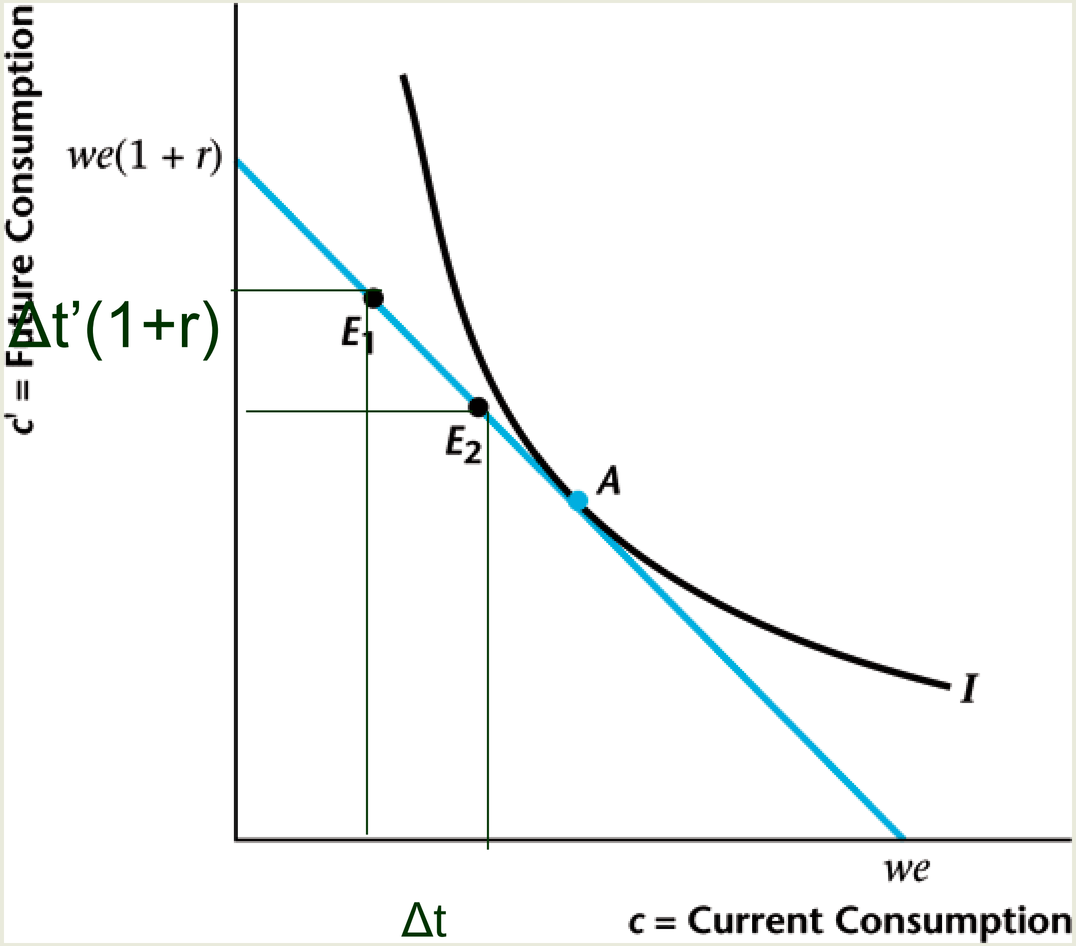
$$c + \frac{c'}{1+r} = y + \frac{y'}{1+r} - \frac{1}{N}\left[G + \frac{G'}{1+r}\right]$$

Timing of taxes would not cgange any budget constraints, therefore c woild not change

Ricardian equivalence

- If the government reduces taxes now with the intent of raising them in the future, then c does not change as consumers’ life time income does not change. The consumer saves the reduction of tax. There will be just as much increase in the supply of credit, that the government needs to borrow to finance the deficit

Ricardian equivalence



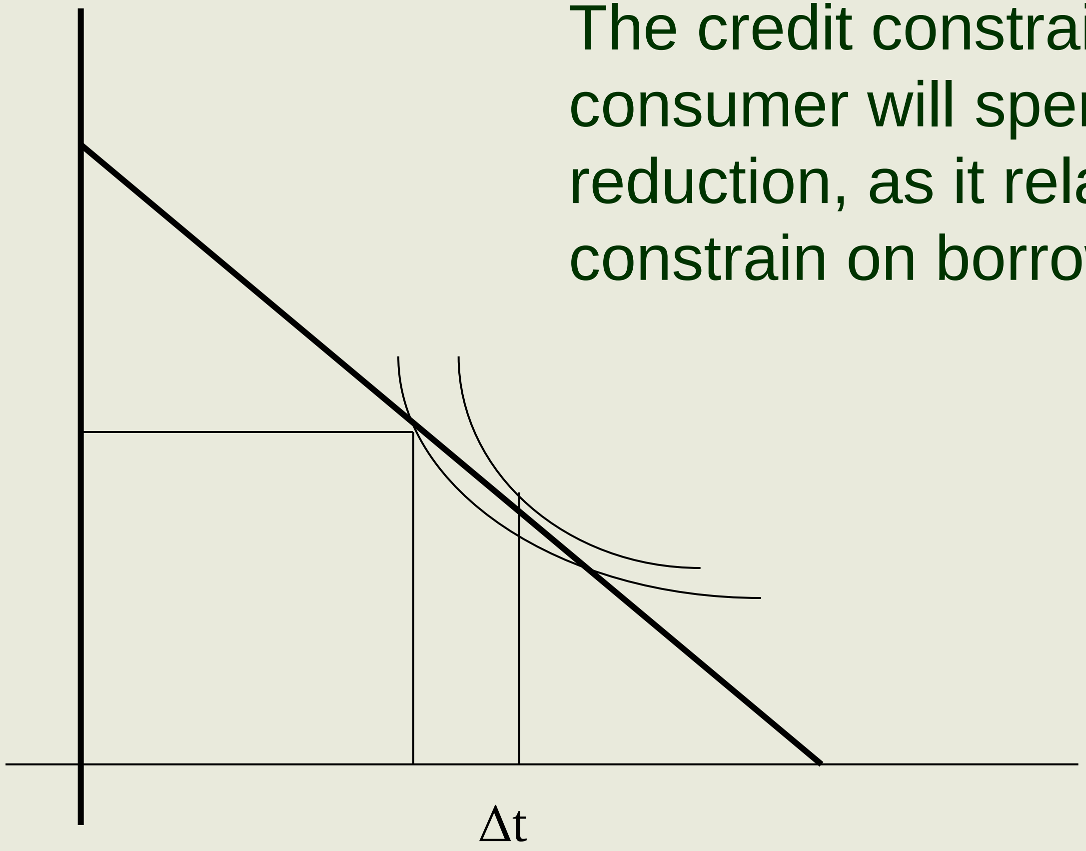
Assumptions

- Taxes do not contain any reduistribution among consumers. If the subject of the tax reduction is not the same as the one obliged to pay later, RE will not hold
- No inter-generational redistribution of income. If the present generation enjoys the tax reduction, but an other generation is supposed to pay it back, the RE would not hold

Assumptions

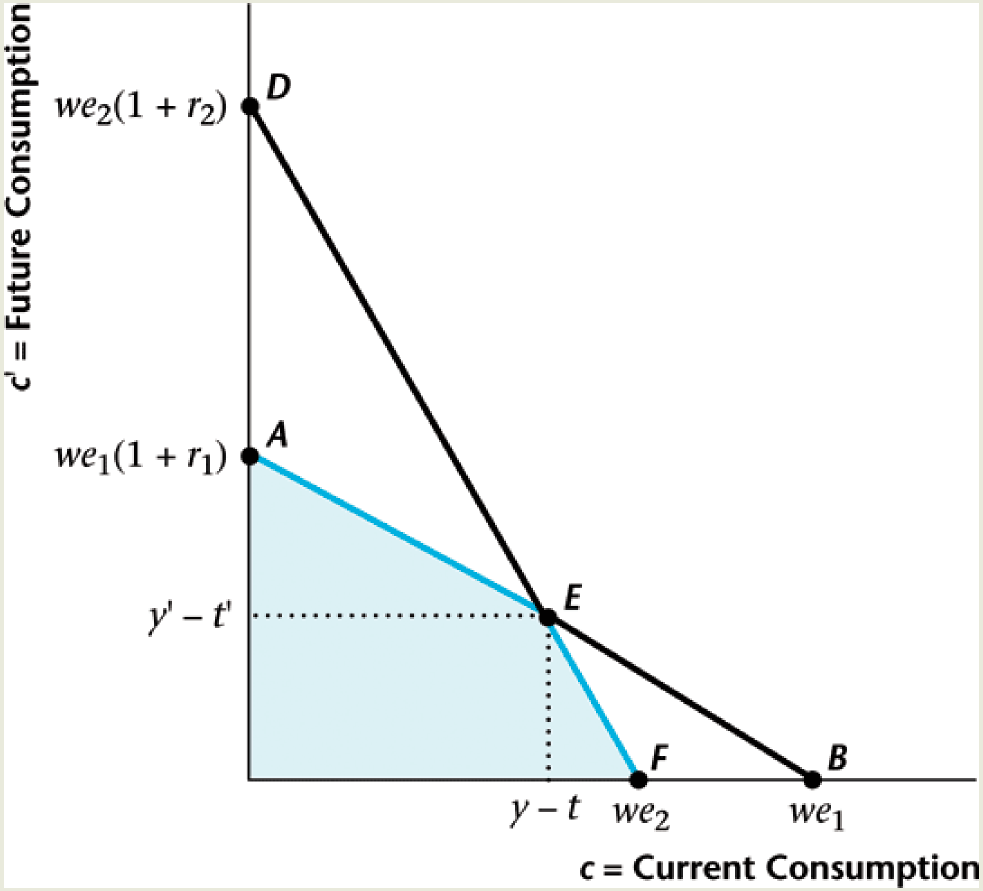
- There are no distortive taxes, taxes collected as lump sum. In prqactice they are collected in percentage terms, that distorts prices, changes saving behavior
- Perfect credit markets. In reality there is no such ting, there is risk and uncertainity, landing and borrowing rates differ. Groups of consumers are credit constrained. They cannot borrow

Credit constrained consumer

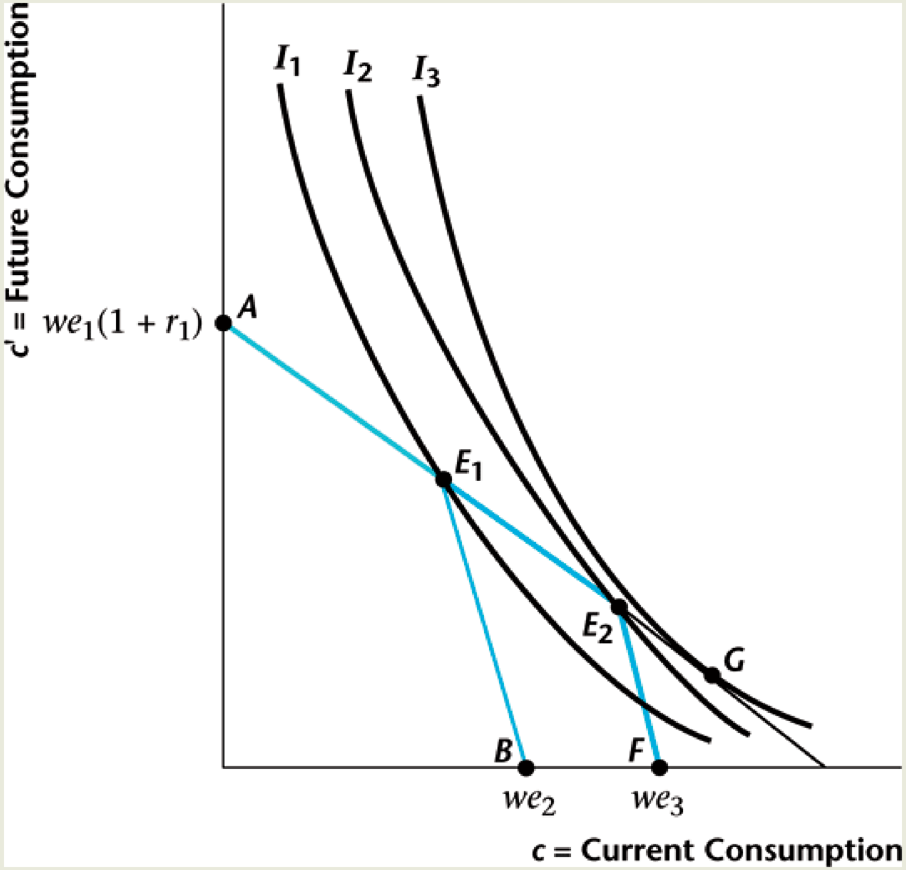


The credit constrainned consumer will spend the tax reduction, as it relaxes her constrain on borrowing

Difference between lending and borrowing rates



Difference between lending and borrowing rates



If the government can borrow at a rate lower than the one charged for the consumer, then she might find it better to use this opportunity