Overlapping Generations & Fiscal Policy

• Focus on Intergenerational Redistribution and other issues excluded in representative agent models.
• Assume lump-sum taxes:
  \[ T_{1t} = \text{per-capita net taxes on the young} \]
  \[ T_{2t+1} = \text{per-capita net taxes on the old. If negative, interpret as transfer } TR_{t+1} = -T_{2t+1}. \]
- Government debt = \( D_{t+1} \) (aggregate, at end of period \( t \)). Government spending = \( G_t \)

• Individual budget constraints with taxes:
  \[ C_{1t} + a_t = W_t - T_{1t} \quad \text{and} \quad C_{2t+1} = (1 + r_{t+1}) \cdot a_t - T_{2t+1} \]
  \[ \Rightarrow \text{IBC:} \quad C_{1t} + \frac{1}{1+r_{t+1}} \cdot C_{2t+1} = W_t - T_{1t} - \frac{1}{1+r_{t+1}} \cdot T_{2t+1} \]

• Consumption depends only on the present value of net taxes:
  \[ C_{1t} = C_1(W_t - T_{1t} - \frac{T_{2t+1}}{1+r_{t+1}}, r_{t+1}) \]
  - Illustration: Indifference curve diagram with endowment point \( (W_t - T_{1t}, -T_{2t+1}) \)
  - Consider a marginal change in taxes by \( (\Delta T_{1t}, \Delta T_{2t+1}) \)
    If \( \Delta T_{2t+1} = -(1 + r_{t+1}) \cdot \Delta T_{1t} \) then \( \Delta C_{1t} = \Delta C_{2t+1} = 0 \) and \( \Delta a_t = -\Delta T_{1t} \)
    \[ \Rightarrow \text{No consumption effect. Tax cut is saved.} \]

• Neutrality result: “Timing” of taxes over the life cycle does not influence consumption.
Notes about individual behavior from the indifference curve diagram (for reference later).

1. Consumption $C_{1t} = C_1(W_t - T_{1t} - \frac{T_{2(t+1)}}{1+r_{t+1}}, r_{t+1})$ is
   - increasing in current income $W_t - T_{1t}$
   - increasing in future net transfers ($TR = -T_{2t+1}$)
   - influenced by interest rates through two effects: (a) the substitution effect;
     (b) an income effect due to future taxes/transfers: if $(-T_{2t+1}) > 0$, high $r$ reduces $\frac{(-T_{2t+1})}{1+r_{t+1}}$

2. Timing of taxes matters for individual savings: $a_t = W_t - T_{1t} - C_{1t} = a(W_{t-1} - T_{1t-1}, T_{2t}, r_t)$
   - increasing in current income $W_t - T_{1t}$
   - decreasing in future net transfers $(-T_{2t+1})$, which means increasing in $T_{2t+1}$
   - influenced by the same interest rates effects as consumption but in the opposite direction

Note that partial derivatives are linked:
   - Since consumption can be written as $C_{1t} = C_1(W_t - T_{1t} - \frac{T_{2(t+1)}}{1+r_{t+1}}, r_{t+1})$
     $$\Rightarrow \frac{\partial C_{1t}}{\partial TR_{t+1}} = \frac{1}{1+r_{t+1}} \frac{\partial C_{1t}}{\partial (W-T_t)} > 0,$$
     where $\frac{\partial C_{1t}}{\partial TR_{t+1}} = -\frac{\partial C_{1t}}{\partial T_{2t+1}} > 0$.
   - From the budget equation: $\frac{\partial a}{\partial (W-T_t)} = 1 - \frac{\partial C_{1t}}{\partial (W-T_t)}$ and
     $$\frac{\partial a}{\partial T_{2t+1}} = -\frac{\partial C_{1t}}{\partial T_{2t+1}} = -\frac{1}{1+r_{t+1}} \frac{\partial C_{1t}}{\partial (W-T_t)} = -\frac{1}{1+r_{t+1}} (1 - a_W).$$
Denote $a_W = \frac{\partial a}{\partial (W-T_t)}$.
The Government Budget

- Budget equation:
  \[ D_{t+1} = (1 + r_t) \cdot D_t + G_t - [L_t \cdot T_{1t} + L_{t-1} \cdot T_{2t}] \]

- New element as compared to the representative agent model:
  \[ \text{Intergenerational redistribution} = \text{Transfers from (or taxes on) retirees financed by taxes on (or transfers from) workers in same or other period} \]

- Capital market equilibrium condition:
  - Savings by the young are invested in capital and government bonds:
    \[ K_{t+1} + D_{t+1} = L_t \cdot a(W_t - T_{1t}, T_{2t+1}, r_{t+1}) \]
  - In a growing economy, balanced growth requires restrictions on policy.
    Common to express debt as debt/GDP ratio; express taxes as share of income = tax rates.
  - Express market clearing in efficiency units:
    \[ k_{t+1} + d_{t+1} = \frac{1}{(1+n)(1+g)} \cdot s \left( 1 - \frac{T_{1t}}{W_t} \cdot \frac{T_{2t+1}}{W_t} \cdot r_{t+1} \right) \cdot w_t \]
    where \( d_t = D_t / (A_t L_t) = \text{debt per efficiency unit (if A constant: per-worker)}. \)
Propositions on Tax Policy: Analysis of marginal changes. Claims:

1. Intergenerational redistribution has real effects.
2. Public debt & deficits without intergenerational redistribution are neutral
3. Public debt & deficits have real effects that are identical to their redistribuional effects.

• Lessons:
  - Budget deficits “matter” in the OG model – can have effects consistent with traditional crowding out.
  - Budget deficits if and only if there serve as an indicator of intergenerational redistribution.
    => Focus of fiscal policy should be on redistribution across generations, not on deficit measures.

• Definition: Generational Account = Present value of current and expected future net taxes on a cohort.
  - Best measure of income effects in OG models.
  - Detailed empirical estimates available, but subject to projection errors.
Scenario #1. Unexpected one-time transfer from young to old

• Consider tax changes $\Delta T_{1t} = \Delta T > 0$ and $\Delta T_{2t} = -(1 + n)\Delta T < 0$.
• Assume normal consumption: $\frac{\partial C_1}{\partial (W - T_{1t})} \in (0,1)$ and $a_W = \frac{\partial a}{\partial (W - T_{1t})} = 1 - \frac{\partial C_1}{\partial (W - T_{1t})} \in (0,1)$

1. Partial equilibrium effects: Individual responses at a given initial interest rate:
   • Young generation: $\Delta C_{1t} = -\frac{\partial C_{1t}}{\partial (W_{1t} - T_{1t})} \cdot \Delta T < 0$, $\Delta a_t = -(1 - \frac{\partial C_{1t}}{\partial (W_{1t} - T_{1t})}) \cdot \Delta T < 0$.
   • Old generation: $\Delta C_{2t} = -\Delta T_{2t} = (1 + n)\Delta T > 0$.
• Result: Decline in savings & supply of credit. Increase in total consumption.

2. Equilibrium effects in period t (given $k_t$):  
   • Condition: $K_{t+1} + D_{t+1} = L_t \cdot a(W_{1t} - T_{1t}, T_{2t+1}, r_{t+1})$
   • Differentiate: $\Delta K_{t+1} = L_t \left(-a_W \Delta T + a_r \Delta r_{t+1}\right)$, where $\Delta r_{t+1} = f''(k)\Delta K_{t+1} / L_{t+1}$
     $$\Rightarrow \frac{\Delta K_{t+1}}{L_{t+1}} = -\frac{a_W}{1 + n + a_r(-f''(k))} \Delta T < 0$$ provided $a_r f''(k) < 1 + n$. Result: reduced capital stock.

3. Dynamic effects in subsequent periods:
   $$k_{t+1} \downarrow \Rightarrow w_{t+1} \downarrow \Rightarrow (C_{1t+1} \downarrow, a_{t+1} \downarrow) \Rightarrow k_{t+2} \downarrow \ldots$$ with slow return to steady state.
   • Graph: function $k_{t+1} = K(k_t)$ shifts down in period t; then returns to normal $\Rightarrow$ converge to old $k^*$.

• Overall conclusions: Reduced capital stock, higher interest rate, return to steady state.
• Note: government budget balanced in all periods. No changes in debt.
Scenario #2: Pre-announced transfer from young to old (one-time, one or more periods ahead)

- Consider tax changes $\Delta T_{1t+1} = \Delta T > 0$ and $\Delta TR_{t+1} = -\Delta T_{2t+1} = (1 + n)\Delta T > 0$.
- Known to generation t at time t [Example: Retirement benefit enacted in period t.]

1. Individual responses in period t: Generation t expects $\Delta TR_{t+1} = (1 + n)\Delta T > 0$ and consumes more:
   
   $\Delta C_{1t} = \frac{\partial C_1}{\partial TR} \cdot (1 + n)\Delta T > 0$ and $\Delta a_t = -\Delta C_{1t} = -\frac{\partial C_1}{\partial TR} \cdot (1 + n)\Delta T < 0$, where $\frac{\partial C_1}{\partial T} = -\frac{\partial C_1}{\partial T_2} > 0$.

2. Equilibrium effects: $\Delta K_{t+1} = L_t \left( -\frac{\partial C_1}{\partial TR} \cdot (1 + n)\Delta T + a_r \Delta r_{t+1} \right)$
   
   $\Rightarrow \frac{\Delta K_{t+1}}{L_{t+1}} = -\frac{\partial C_1}{\partial TR} \cdot (1 + n)\Delta T + a_r \Delta r_{t+1} \Rightarrow (1 + n)\Delta T < 0$. Find: Decline in savings & supply of credit.

3. Dynamics over time: $k_{t+1} \downarrow \Rightarrow w_{t+1} \downarrow$

   - Impact on generation t+1: Higher taxes and lower wages $\Rightarrow (C_{1t+1} \downarrow, a_{t+1} \downarrow) \Rightarrow k_{t+2} \downarrow \ldots$
   - Graph: function $k_{t+1} = K(k_t)$ shifts down in period t; also down in t+1; then return to normal

   $\Rightarrow$ Converge to old $k^*$.

- Overall conclusions: Reduced capital stock, higher interest rate, return to steady state.
Scenario #3. Deficit-financed tax cut to be paid-off by future generations

- Consider Tax cut for period-t workers, financed by budget deficit $\Delta d > 0$.
- Resulting debt paid off by workers in period-(t+1). No taxes on retirees. No fiscal impact after (t+1).

\begin{align*}
\text{Period } t: & \quad \Delta T_{1t} = -\Delta d < 0, \text{ Implies public debt } \Delta D_{t+1} = L_t \cdot \Delta d > 0. \\
\text{Period } t+1: & \quad \Delta T_{1t+1} = \frac{1}{L_{t+1}} (1 + r_{t+1}) \cdot \Delta D_{t+1} = \frac{1 + r_{t+1}}{1 + n} \cdot \Delta d > 0.
\end{align*}

1. Partial equilibrium effects in period-t:
   \[ \Delta C_{1t} = \frac{\partial C_1}{\partial (W-T_1)} \cdot \Delta d > 0, \quad \Delta a_t = (1 - \frac{\partial C_1}{\partial (W-T_1)}) \cdot \Delta d = a_W \Delta d > 0. \]

2. General equilibrium effects in period t (given $k_t$):
   - Condition: \[ K_{t+1} = L_t \cdot a(W_t - T_{1t}, T_{2t+1}, r_{t+1}) - D_{t+1} \]
   - Differentiate: \[ \Delta K_{t+1} = L_t \left( a_w \Delta d + a_r \Delta r_{t+1} \right) - L_t \Delta d, \text{ where } \Delta r_{t+1} = f''(k) \frac{\Delta K_{t+1}}{L_{t+1}}. \]
   \[ \Rightarrow \quad \frac{\Delta K_{t+1}}{L_{t+1}} = -\frac{(1-a_w)\Delta d}{1+n-a_r f''(k)} < 0, \text{ provided } 1 + n > a_r f''(k). \]
   - Result: Savings increase less than debt => “Crowding out” of capital investment.

3. Dynamics over time: \[ k_{t+1} \downarrow \Rightarrow w_{t+1} \downarrow. \]
   - Impact on generation t+1: Higher taxes and lower wages => \((C_{1t+1} \downarrow, a_{t+1} \downarrow) \Rightarrow k_{t+2} \downarrow \ldots \)
   - Graph: function $k_{t+1} = K(k_t)$ shifts down in period t; also down in t+1; then return to normal

- Overall conclusion: Deficit-finance seems to have “traditional” crowding out effects.
- Note: Qualitative results are similar to Scenario #2. Claim: They are equivalent up to a scale factor.
Comparison between deficit-finance and intergenerational redistribution

• Redistribuition scenario: \( \Delta T_{1t+1} = \Delta T > 0 \) and \( \Delta T_{2t+1} = -(1 + n) \Delta T < 0 \).

• Deficit finance scenario: \( \Delta T_{1t+1} = \frac{1 + r_{t+1}}{1 + n} \cdot \Delta d > 0 \) and \( \Delta T_{1t} = -\Delta d < 0 \).

• Suppose \( \Delta T = \frac{1 + r_{t+1}}{1 + n} \cdot \Delta d \). Then
  - Generation \( t+1 \) faces the same change in taxes \( \Delta T_{1t+1} = \Delta T \)
  - Generation \( t \) faces the same change in the present value of taxes \( \Delta T_{1t} + \frac{\Delta T_{2t+1}}{1 + r_{t+1}} = -\Delta d \)

  => Period-\( t \) consumption, savings, and capital accumulation responses are the same.

  - Conclude: Deficit finance has real effects because it redistributes real resources.

Scenario #4 (Burden sharing): Share \( \varphi \in [0,1] \) of deficit \( \Delta d \) imposed on the next generation.

  - Assume \( \Delta T_t = -\Delta d < 0 \), \( \Delta T_{1t+1} = \frac{1 + r_{t+1}}{1 + n} \cdot \Delta d \cdot \varphi \), \( \Delta T_{2t+1} = (1 + r_{t+1}) \Delta d (1 - \varphi) > 0 \).

  - Implies same aggregate budget deficit and public debt \( \Delta D_{t+1} = L_t \cdot \Delta d > 0 \) as in Scenario #3.

• Partial equilibrium effects in period-\( t \):

\[
\Delta C_{1t} = \frac{\partial C_1}{\partial (W - T_1)} \cdot \Delta d + \frac{\partial C_1}{\partial T_2} (1 + r_{t+1}) \Delta d (1 - \varphi) = \varphi \frac{\partial C_1}{\partial (W - T_1)} \cdot \Delta d \quad \text{because} \quad \frac{\partial C_1}{\partial T_2} = -\frac{1}{1 + r_{t+1}} \frac{\partial C_1}{\partial (W - T_1)}.
\]

\[
\Delta a_t = (1 - \varphi \frac{\partial C_1}{\partial (W - T_1)}) \Delta d. \quad \text{Find: Real effects proportional to} \ \varphi. \ \text{If} \ \varphi = 0, \ \Delta a_t = \Delta d \quad \text{and} \quad \Delta k_{t+1} = 0.
\]

Conclude: Deficit-finance has real effects only to the extent that it redistributes across generations.

Interpret observed budget deficits as noisy signals of intergenerational redistribution.
Repeated Intergenerational Transfers: Social security

• Distinguish two basic systems:

1. Fully funded: Contributions invested & returned to same generation.

\[(\Delta T_{1t} = \Delta T > 0, \Delta T_{2t+1} = -(1 + r_{t+1})\Delta T < 0) \text{ for all } t.\]

No intergenerational transfers => No real effects.

2. Pay-as-you-go: Contributions transferred to the old.

=> System of repeated intergenerational transfers => Crowds out capital.

- Constant payment: \[(\Delta T_{1t} = \Delta T > 0, \Delta T_{2t} = -(1 + n)\Delta T < 0) \text{ for all } t.\]

- Constant tax rate: \[(\Delta T_{1t} = W_t \cdot \tau > 0, \Delta T_{2t} = -(1 + n)W_{t+1} \cdot \tau < 0) \text{ for all } t.\]

- Constant tax rates assumption consistent with balanced growth.

• Partial equilibrium impact of PAYG-social security depends on the present value of taxes:

\[
\Delta T_{1t} + \frac{\Delta T_{2t+1}}{1+r_{t+1}} = W_t \cdot \tau - \frac{(1+n)W_{t+1}\tau}{1+r_{t+1}} = W_t \cdot \tau \left(1 - \frac{W_{t+1} + (1+n)}{W_t} \right)
\]

which depends on the relationship between interest rates, wage growth, and population growth.

• Social security in steady state: \[W_{t+1} = (1 + g)W_t \Rightarrow \Delta T_{1t} + \frac{\Delta T_{2t+1}}{1+r_{t+1}} = W_t \cdot \tau \left(1 - \frac{(1+n)(1+g)}{1+r_{t+1}}\right)\]

Conclude: Pay-as-you-go social security is costly in steady state (positive taxes) if and only if the economy is dynamically efficient.
**Government debt (Diamond, 1965)**

- Assume no taxes on the old and no social security. Write \( T_{1t} \) as function of debt:
  \[
  D_{t+1} = (1 + r_t) \cdot D_t + G_t - L_t \cdot T_{1t}
  
  \Rightarrow \quad T_{1t} = \frac{1}{L_t} \left( G_t + (1 + r_t) \cdot D_t - D_{t+1} \right)
  \]

- Intuition: Initial debt is a burden. Budget can be shifted forward by issuing new debt (rolling over).

- Tax burden in steady state:
  - Assume new debt issues are constant share \( \theta \) of wage income (consistent with constant debt/GDP)
  - Assume real government spending is constant share \( \gamma \) of wage income:
    \[
    D_t = \theta \cdot W_{t-1} L_{t-1}, \quad D_{t+1} = \theta \cdot W_t L_t, \quad \text{and} \quad G_t = \gamma \cdot W_t L_t \quad \text{where wages grow at rate} \, g.
    
    \Rightarrow \quad T_{1t} = \gamma \cdot W_t + (1 + r_t) \cdot \theta \cdot W_{t-1} \frac{L_{t-1}}{L_t} - \theta \cdot W_t
    
    \Rightarrow \quad \frac{T_{1t}}{W_t} = \gamma + \theta \cdot \left( \frac{1+r_t}{(1+n)(1+g)} - 1 \right), \quad \text{so} \quad \frac{T_{1t}}{W_t} > \gamma \quad \text{for} \quad 1 + r_t > (1 + n)(1 + g)
    
- Conclude: Tax rate depends on the relationship between interest rates, wage growth, and population growth.
  - Debt is a burden in steady state if and only if the economy is dynamically efficient
  - Equivalence of debt and social security: Present value of retirement benefits is a government obligation.
Scenario: Dynamics of a permanent increase in debt/income:

- Initial period: \( \Delta T_{1t} = -W_t \Delta \theta < 0 \Rightarrow (C_{1t} \uparrow, a_t \uparrow) \)
  - Increase in savings is LESS than the increase in debt: \( K_{t+1} = L_t \cdot a_t - D_{t+1} \) down \( \Rightarrow k_{t+1} \downarrow \).
  - Generation \( t \) is better off: lower taxes and higher return to savings.
- Subsequent periods (\( t+i, i>0 \)): \( \Delta T_{1t+i} = -W_{t+i} \left(1 - \frac{1+r_t}{(1+n)(1+g)}\right) \Delta \theta \).
  - Assume \( \frac{1+r_t}{(1+n)(1+g)} > 1 \). Then \( \Delta T_{1t+i} > 0 \) and \( \Delta W_{t+i} - \Delta T_{1t+i} \downarrow \Rightarrow (C_{1t+i} \downarrow, a_{t+i} \downarrow) \)
  - Mapping \( k_{t+1} = K(k_t) \) shifts down permanently \( \Rightarrow \) Reduced \( k^* \).
  - Generations \( t+i \) are worse off: higher taxes and (due to reduced capital stock) lower wage.

- Common applied questions: for a given policy change, determine
  (a) the impact on consumption, savings, and the capital stock over time;
  (b) the impact on the utility of different generations (i.e. on their consumption opportunities).

Alternative scenarios:
- Case of external debt without international capital movements (in Diamond): then \( K_{t+1} = L_t \cdot a_t \)
  Then savings not diverted to government debt, less negative impact on capital stock.
- Case of a small open economy: no impact on \( r \), no impact on \( k \), foreign debt covers all gaps between \( K_{t+1} + D_{t+1} \) and \( L_t \cdot a_t \).

Optional Exercise: Show that an expansion in social security has similar effects as higher debt.
Altruism and Bequests

• Define: \( b_{t+1} = \) bequests from generation \( t \) to \( t+1 \)

1. **Return to OG model without government**: budget equations

\[
\begin{align*}
C_{1t} + a_t &= W_t + b_t \\
C_{2t+1} + (1 + n) \cdot b_{t+1} &= (1 + r_{t+1}) \cdot a_t
\end{align*}
\]

- Constraint: \( b_{t+1} \geq 0 \). Every person has \( 1+n \) children.

- Motives for bequests are an empirical issue – many possible motives.

- Here focus on pure altruism to show that it yields a dynastic model with Ricardian neutrality.

• Preferences: define \( V_t = \) utility from own consumption plus discounted utility of children.

\[
V_t = u(C_{1t}) + \beta \cdot u(C_{2t+1}) + \gamma(n) \cdot V_{t+1}
\]

- Utility depends on bequests \( \Rightarrow \) Value \( V_{t+1} = V(b_{t+1}) \). [Defer details: example of dynamic programming.]

- Each generation has in effect preferences over an infinite horizon (over two “goods”):

\[
V_t = \sum_{i=0}^{\infty} \gamma(n)^i [u(C_{1t+i}) + \beta \cdot u(C_{2t+i+1})] = u(C_{1t}) + \sum_{i=1}^{\infty} \gamma(n)^i [u(C_{1t+i}) + \frac{\beta}{\gamma(n)} \cdot u(C_{2t+i})]
\]

- Similar to representative agent model, except that generation \( t \) does not control all resources:

  - Applies only if desired bequests are non-negative – called “operational bequests”.
  - Note on \( \gamma(n) \): obtain discrete-time version of Ramsey model if weight is proportional to \( 1+n \).
2. **Combine bequests and government bonds**

- **Claim:** Ricardian neutrality applies when altruistic bequests are operative (Barro 1974).
  
  - Individual budget equations:
    \[
    C_{1t} + a_t = W_t + b_t - T_{1t} \quad \text{and} \quad C_{2t+1} + (1 + n) \cdot b_{t+1} = (1 + r_{t+1}) \cdot a_t - T_{2t+1}
    \]
    
    Assume \( T_{2t+1} = 0 \) because tax timing within a generation is neutral.
  
  - FOC for assets: \( u'(C_{1t}) = \beta \cdot (1 + r_{t+1}) \cdot u'(C_{2t+1}) \)
  
  - FOC for bequests: \( \frac{\gamma(n)}{1+n} \cdot u'(C_{1t+1}) \leq \beta u'(C_{2t+1}) \), with equality if \( b_{t+1} > 0 \).

- **Scenario:** Consider a deficit-financed tax cut in an equilibrium allocation with strictly positive bequests:
  
  - Tax cut for period-\( t \) workers; resulting debt paid off by period-(\( t+1 \)) workers. No tax change for retirees.
  
    - Recall effects without bequests: \( T_{1t} \downarrow \Rightarrow (C_{1t}, a_t) \uparrow \Rightarrow C_{2t+1} \uparrow \) and \( T_{1t+1} \uparrow \Rightarrow (C_{1t+1}, a_{t+1}) \downarrow \)
  
    - Recall the bequest condition: \( \frac{\gamma(n)}{1+n} \cdot u'(C_{1t+1}) = \beta \cdot u(C_{2t+1}) \).
  
    - Condition is violated if \( (C_{2t+1} \uparrow, C_{1t+1} \downarrow) \) \( \Rightarrow \) Bequests must increase.
  
  - How much? Suppose savings & bequests change by \( \Delta a_t = -\Delta T_{1t} \) and \( (1 + n) \Delta b_{t+1} = (1 + r_{t+1})(-\Delta T_{1t}) \)
    
    - Generation \( t \): \( \Delta T_{1t} + \frac{1+n}{1+r_{t+1}} \Delta b_{t+1} = 0 \) so present value of consumption unchanged
      
      \( \Rightarrow \) on change in assets, no change in \( K_{t+1} \), no change in \( r_{t+1} \) \( \Rightarrow \) no real effects in period \( t \).
  
  - Generation \( t+1 \): \( \Delta T_{1t+1} = \Delta b_{t+1} \) so present value of consumption unchanged \( \Rightarrow \) no real effect.
    
    - Both generations face unchanged consumption opportunities – FOCs remain satisfied.

- **Intuition:** Generation \( t \) buys all the new government bonds and gives them to their children.
The Controversy about Ricardian Equivalence


• Issue #1: Where are the disagreements?
  - Agreement: Distortionary taxes have incentive effects
  - Agreement: Income effects of temporary tax changes are small
    Ricardian: MPC=0; Life cycle MPC~1/(planning horizon)
  - Dispute is about income effects of “generation-length” tax changes
    Numerical examples: Poterba-Summers (JME 1987)

• Issue #2: Do we ever observe “Ricardian experiments”?
  - Experiment: Tax cut followed by tax increases with equal present value.
  - Assumes exogenous spending; cf. Bohn (JME 1991): Budget deficits are corrected about 50% by lower spending, 50% by higher taxes
  => Budget deficits signal reduced spending; MPC>0 is rational.

• Issue #3: Suppose Ricardian equivalence is approximately correct, should economists still care about government debt & deficits?
  - Political economy issues – dynamic games between generations about redistribution; games between citizens about size of government.
Application to Demographic Change: Do Bequests Matter?

- Bohn (2006): Calibrated world economy. Fact: Large fraction of individual wealth is due to bequests.
  - Version #1: OG without altruism: “Accidental bequests” due to incomplete annuity markets
    (Model assumes each generation inherits an exogenous fraction of the previous generation’s resources.)
  - Version #2. OG with altruistic/dynastic bequests. Experiment: Decline in birth rates; rising longevity.

- Result with accidental bequests: Bequests remain high => Return on capital declines.
- Results with dynastic bequests: decline => Return on capital remains high, determined by time preferences.