Fiscal Consolidation and Climate Policy: An Overlapping Generations Perspective

Closing the Carbon Price Gap: Public Finance and Climate Policy
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Sebastian Rausch
ETH Zurich

Motivation & research question

- Revenue-raising climate policy that puts price on carbon can help address two long-term problems in U.S.: growing public debt & build-up of carbon dioxide in atmosphere from burning fossil fuels

- In light of weak political support for carbon tax in U.S., can a carbon pricing policy be socially desirable if combined with a debt-reduction policy?

- What are the efficiency and distributional effects of using carbon tax revenue to reduce public debt?
  1. If a carbon tax were implemented: How does the use of its revenue affect the outcomes?
  2. Inter- and intra-generational distributional implications?
  3. Societal welfare assessment of carbon tax if revenue is used for debt reduction?
  4. If deficit reduction were undertaken: How does a carbon tax compare with other revenue raisers?

Relation to literature & contributions

- Large literature on interaction of environmental taxes with broader tax system (e.g., Bovenberg & Goulder, 1996).
- Little prior research has looked at use of environmental tax revenue for deficit reduction (e.g., McKibbin et al. 2012; Carbone, Morgenstern, Williams, 2013).
- Main contributions of this paper:
  1. Consider using carbon revenue to repay principal debt $\Longrightarrow$ relaxes futures budgets through lower interest obligations
  2. Inter- and intragenerational impacts within Auerbach-Kotlikoff OLG model
  3. Combine OLG approach with large-scale energy-economy CGE model typically used to investigate climate policy issues (e.g., MIT EPPA, Paltsev et al., 2005)
  4. Examine social desirability of combined climate and public debt reduction policy $\Longrightarrow$ SWF approach

Model overview I

- Numerical dynamic general equilibrium model with overlapping generations (OLG) for U.S. economy similar to Auerbach & Kotlikoff (1987) and Altig et al. (2001).
- Multi-sector input-output structure with particular focus on energy as typically adopted in energy-economy CGE models
- Calibration based on Social Accounting Matrix data from GTAP 8
- Fiscal structure includes taxes, government spending and transfers.
- 5 household types within each generation representing quintiles of lifetime-wage income
  - Earnings-ability profiles from Altig et al. (2001); population shares and government transfers from CEX
  - Symmetric preferences assumed across types.
- Decomposition algorithm (Rausch and Rutherford, 2009)

Model overview II

- Annual government budget identity:

$$D_{t+1} - D_t = p_t^G G_t + T_t - \Phi_t + rD_t = B_t - R_t \,,$$

  D_t: debt; $p_t^G G_t$: value of public spending; T_t: transfers; Φ_t: tax revenue; r: real interest rate; B_t: additional borrowing; R_t: repayment of the principal.

- Debt repayment affects net public expenditures (N_t) in current and future periods:

$$N_t = R_t + rD_t - B_t = R_t + r\left(D_0 - \sum_{\tau=0}^{t}(R_\tau - B_\tau)\right) .$$

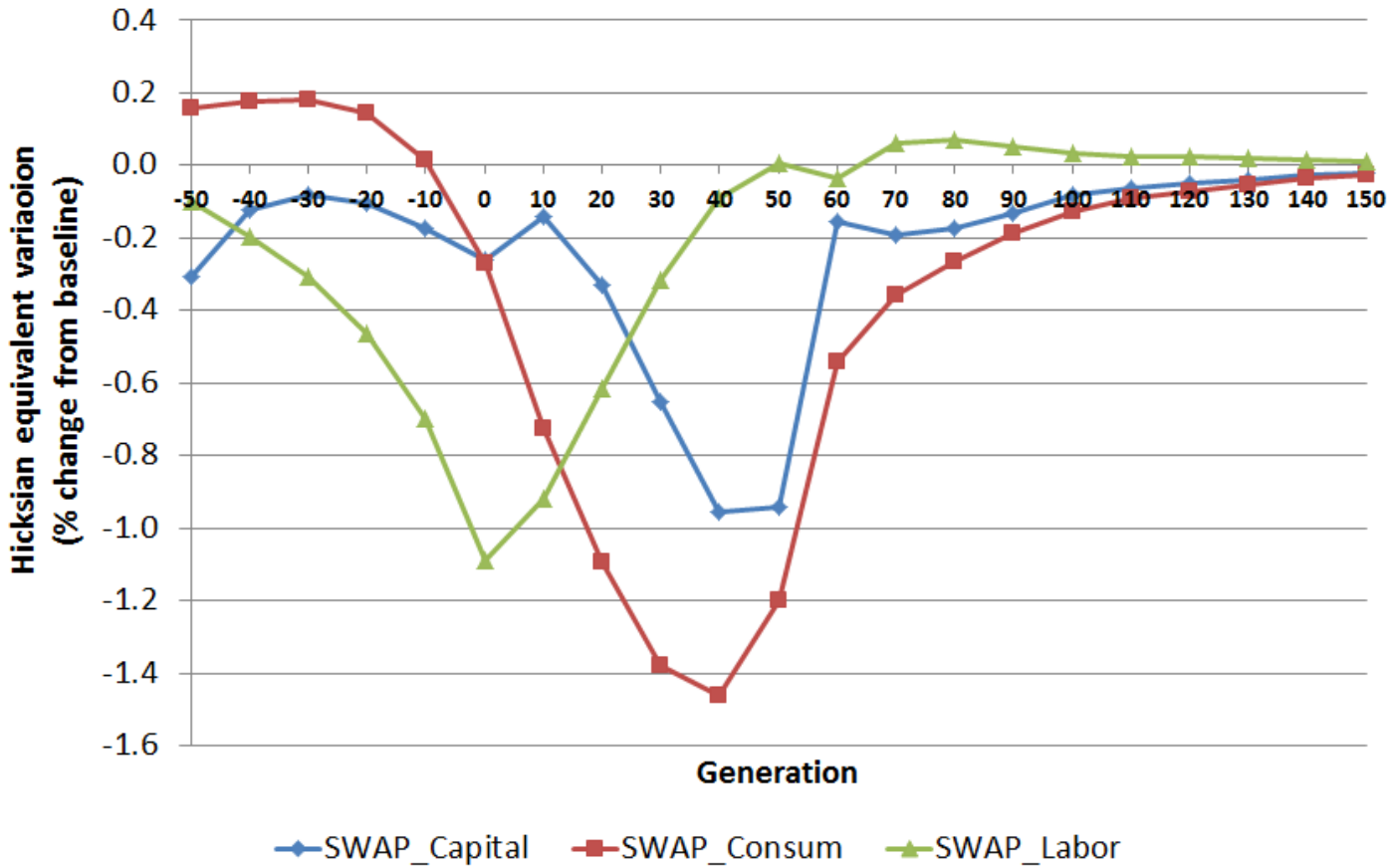
- Level of tax recycling instrument endogenously determined by public budget:

$$p_t^G G_t + T_t + N_t = \Phi_t \,.$$

Thought experiment

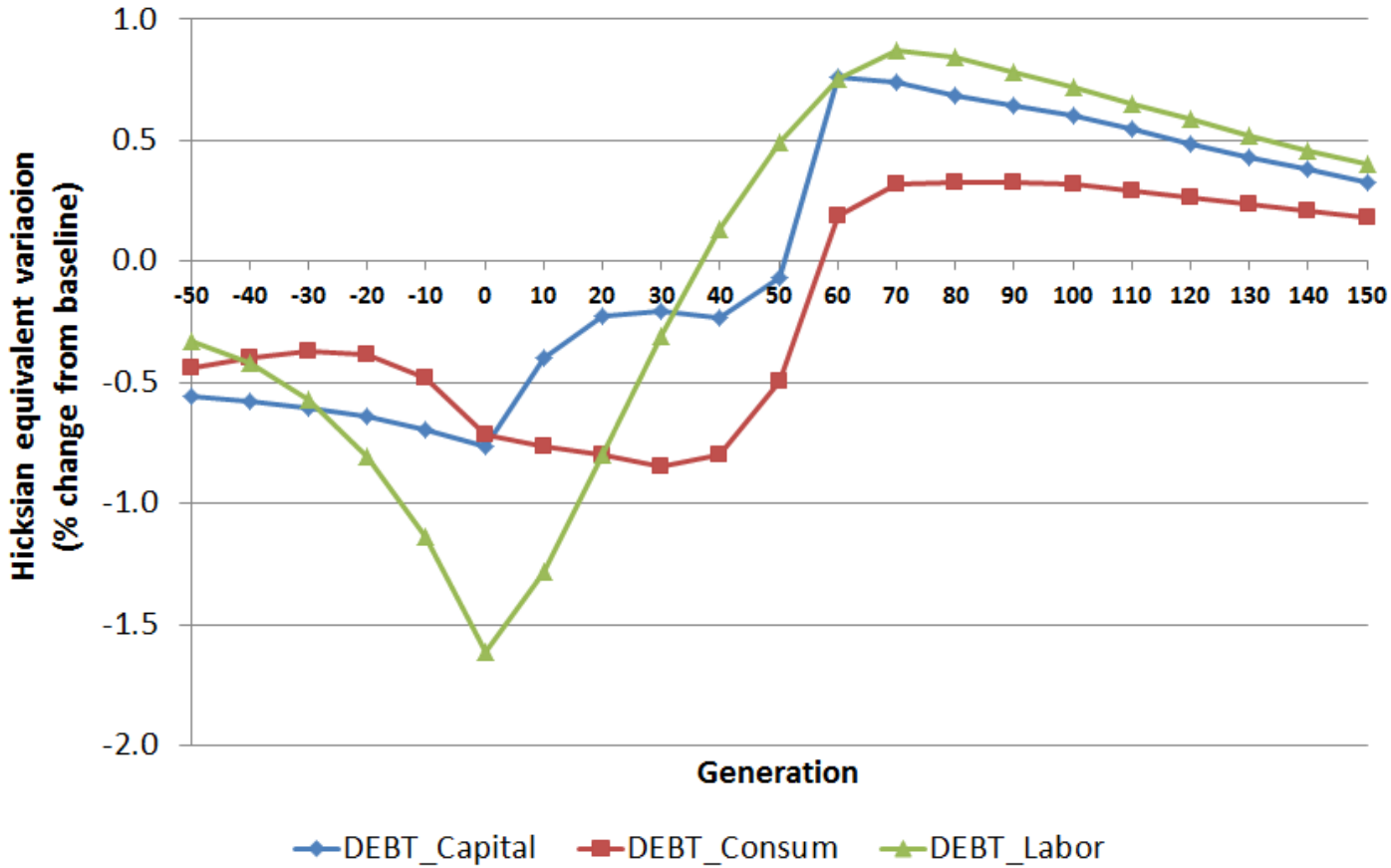
- $20 carbon tax increasing at 4% per year for next 50 years (afterwards emissions can grow without bound).
- 3 revenue recycling instruments: capital, labor, consumption tax
- 2 sets of scenarios reflecting alternative use of carbon revenue:
  1. Revenue-neutral carbon tax SWAPs (leave public debt unchanged).
  2. Carbon revenue is used to repay principal DEBT. Future budget surpluses from reduced interest payments finance tax rate cuts.

Average welfare impacts by generation for carbon tax swaps



- With labor tax recycling, most of burden falls on elderly and young generations, while capital recycling tax puts most of burden on future generations.
- Largest variation in intergenerational impacts for consumption tax recycling.

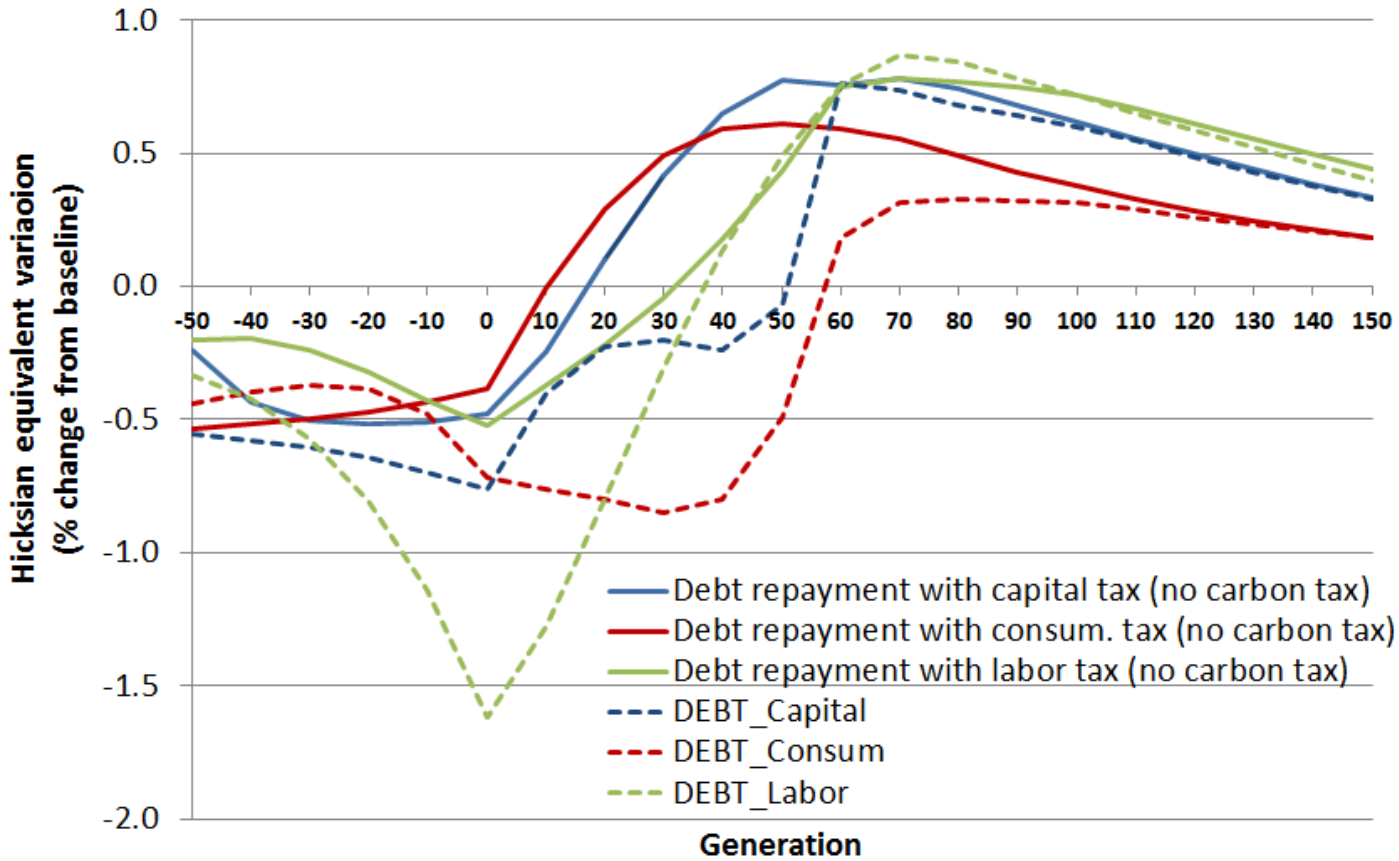
Average welfare impacts by generation for debt repayment



- Costs of fiscal consolidation are borne by elderly and subsequent young generations, while future generations gain.
- Larger losses for elderly generations but similar pattern for alternative instruments as for tax swap cases.

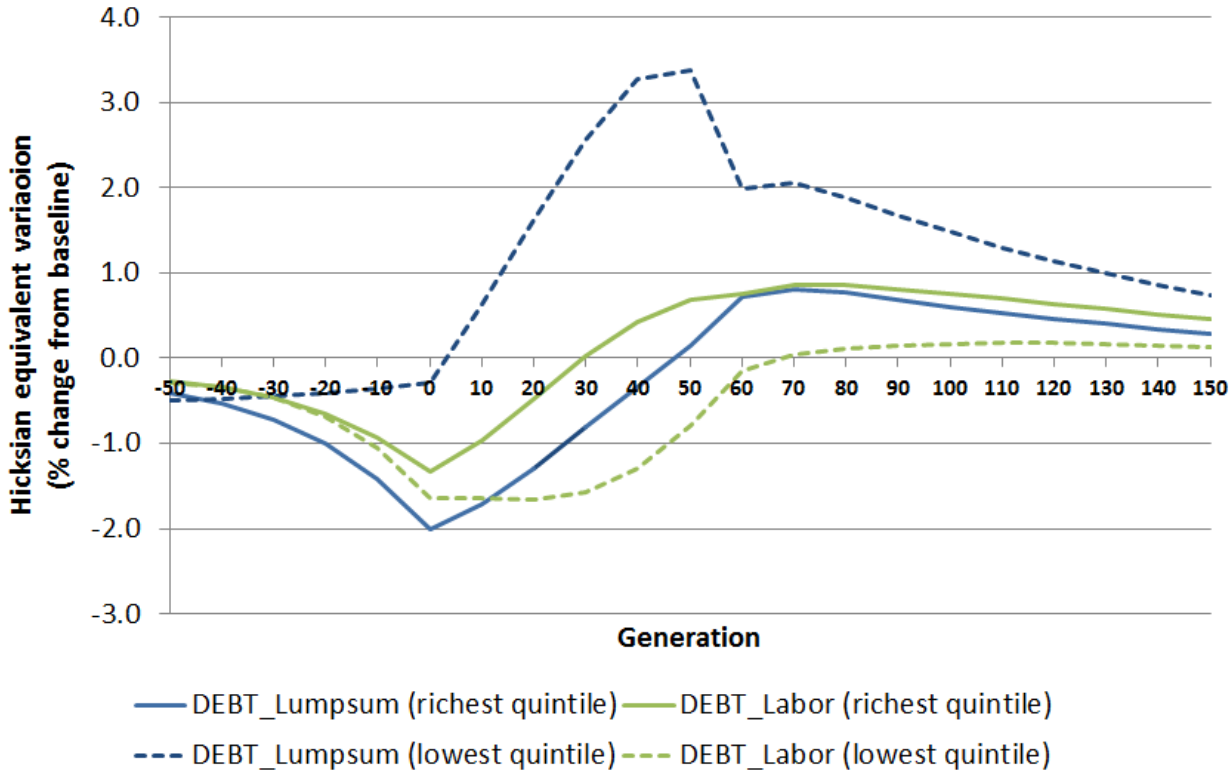
How does a carbon tax compare with other revenue raisers?

Average welfare impacts by generation



- Same debt repayment schedule implemented using one of non-CO_2 tax instruments.
- Using carbon tax to raise revenue is less efficient vis-à-vis any of the other taxes considered here (ignoring environmental benefits from reduced CO_2 emissions).

Welfare impacts by top and bottom income quintile for debt repayment scenarios



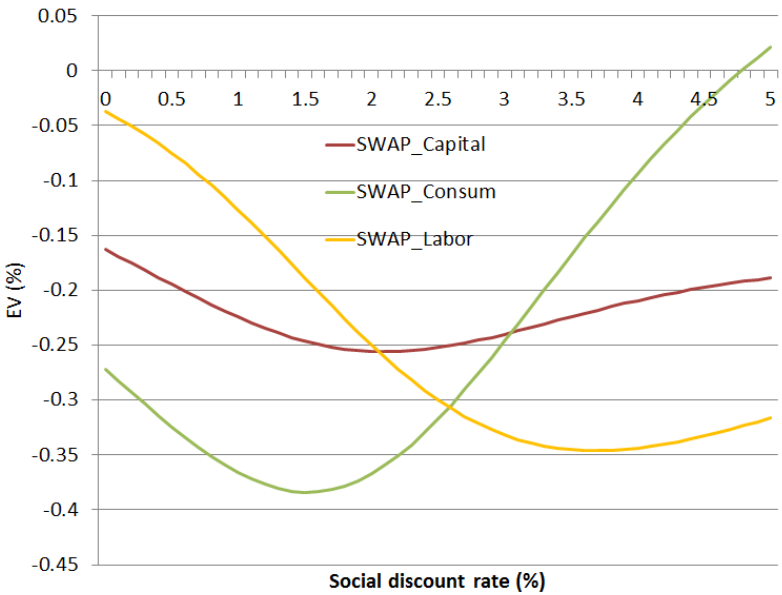
- Substantial variation in intra-cohort impacts depending on recycling instrument (even with "coarse" specification of household heterogeneity).
- Per capita lump-sum transfers implies gains for poorest quintile and losses for rich households.
- Intra-cohort ranking reversed for labor tax recycling that benefits households with high earnings-ability.

Social welfare assessment of tax swap and debt repayment cases ($\rho = 1$)

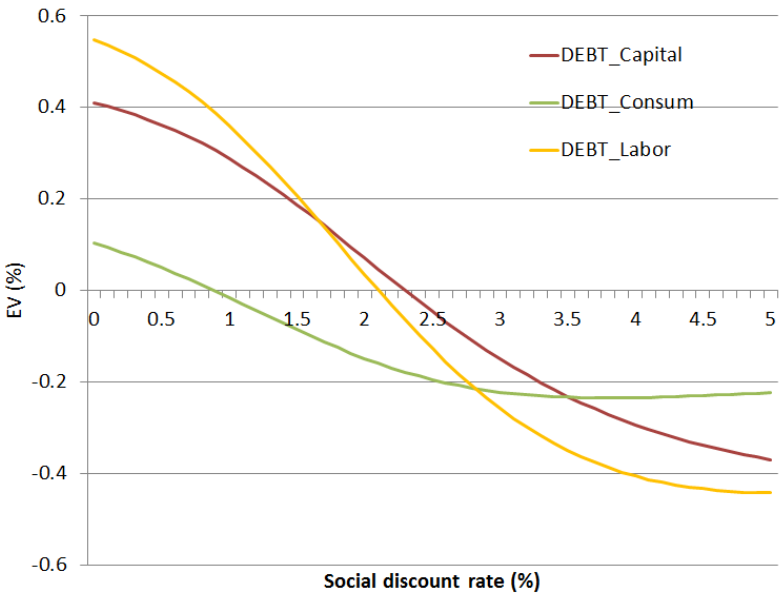
- Social welfare function (SWF):

$$EV_{SWF} = \left(\sum_{g,h} \theta_{g,h} u_{g,h}^{\rho} \right)^{1/\rho} \qquad \text{with } \theta_{g,h} = N_{g,h}(1-\Delta)^{g}$$

ρ: inequality aversion; $N_{g,h}$: number of households represented by generation g and type h; Δ: social discount factor.



SWAP



DEBT

Summary of results

- Overall cost and distribution of that cost vary widely based on how carbon tax revenues are used.
- Revenue-neutral carbon tax swaps imply welfare losses for all generations (average impacts).
- Revenue-raising carbon pricing policy combined with fiscal consolidation may receive more favorable societal assessment on efficiency grounds than just carbon policy alone.
  - Current old and young generations are worse off compared to conventional carbon tax swap, future generations gain.
- Substantial intra-generational variation in impacts: poor or rich households can gain depending on recycling instrument.
- Other, non-CO_2 tax instruments more efficient to raise revenue (ignoring environmental benefits).