Intergenerational equity and climate change

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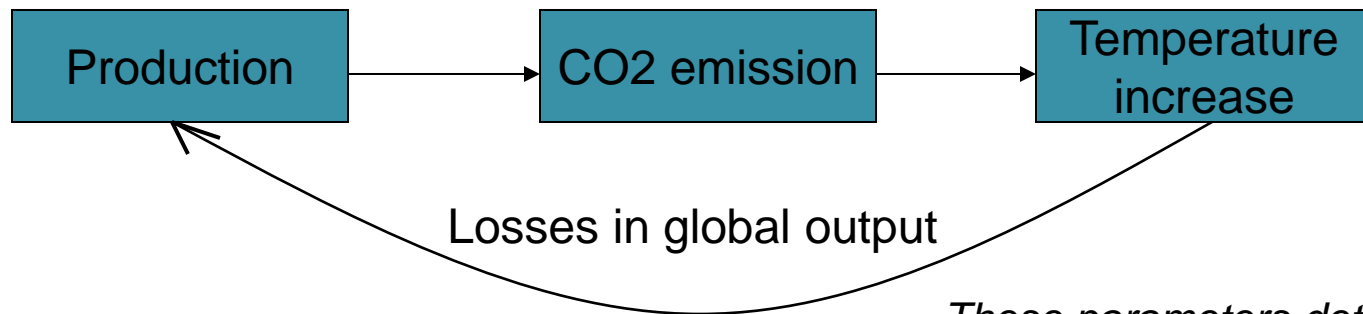
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Outline

- Brief introduction to IAM and motivation of current research

- Description of the Overlapping Generation Model

- Key results of the model

- Conclusions and further dimensions of research

Introduction

- Key aspects of Integrated Assessment Models (IAM)

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│  Production  │ ─────▶ │ CO2 emission │ ─────▶ │ Temperature  │
│              │        │              │        │   increase   │
└──────────────┘        └──────────────┘        └──────────────┘
       ▲                                                 │
       └─────────── Losses in global output ─────────────┘
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These parameters determine the real interest rates

- Social planner problem:

$$W^{Dice} = \sum_{t=1}^{T\max} \frac{1}{(1+\rho)^t}\left(N_t \frac{c_t^{1-\theta}}{1-\theta} \right) \to \max$$

subject to economic and climate constraints.

where ρ is the pure rate of time preferences, θ is the inverse of the inter-temporal elasticity of substitution.

Introduction

- There is an international debate on an appropriate discounting in climate-economy modeling.

- *Nordhaus* among others calibrates the pure rate for social time preferences to 1.5% per year, and elasticity of marginal utility of consumption equals to 2 to reproduce observable returns on capital. As a result, the "optimal" emissions reductions follow a "policy ramp" in which policies involve modest rates of emissions reductions in the near term, followed by sharp reductions in the medium and long terms.

- *Critique:* the use of high time discount rates is inconsistent with classical utilitarianism, which holds that equal weights should be attached to the welfare of present and future generations (Arrow, Broome, Cline, Ramsey).

Introduction

- ***Stern*** among others calibrates the pure rate of time preferences equals to 0.1 percent per year and the elasticity of marginal utility of consumption equals to 1 (logarithmic utility function) and concludes about the need for extreme immediate actions in reduction emissions of GHG.

- ***Critique:*** the use of low discount rates is inconsistent with observable market returns on capital, saving rates, capital-output ratios (Dasgupta, Nordhaus, Wietzman)
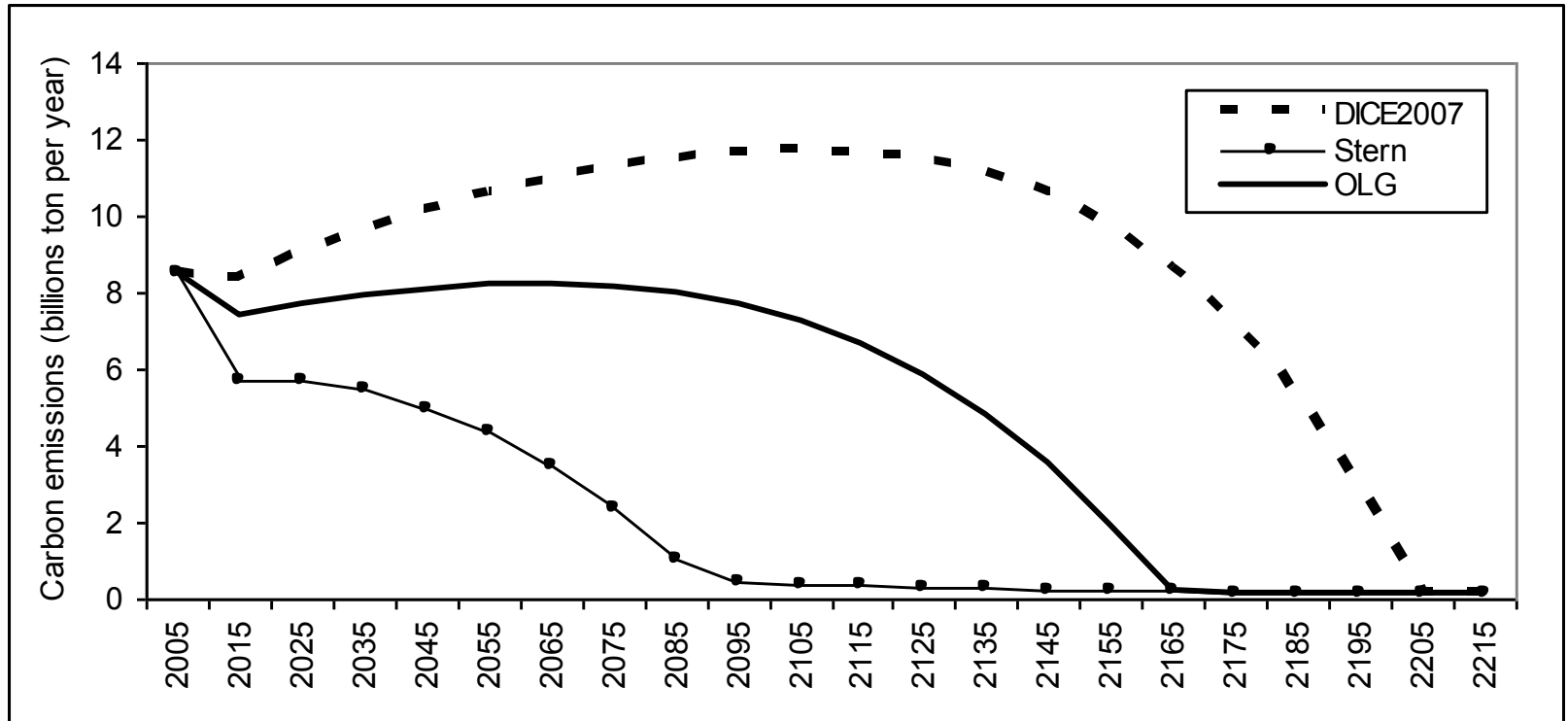
OLG model

- In this study:

  1. We introduce overlapping generations in DICE-2007 model. An OLG model provides two discount rates: the social planner and the individual's discount rates.

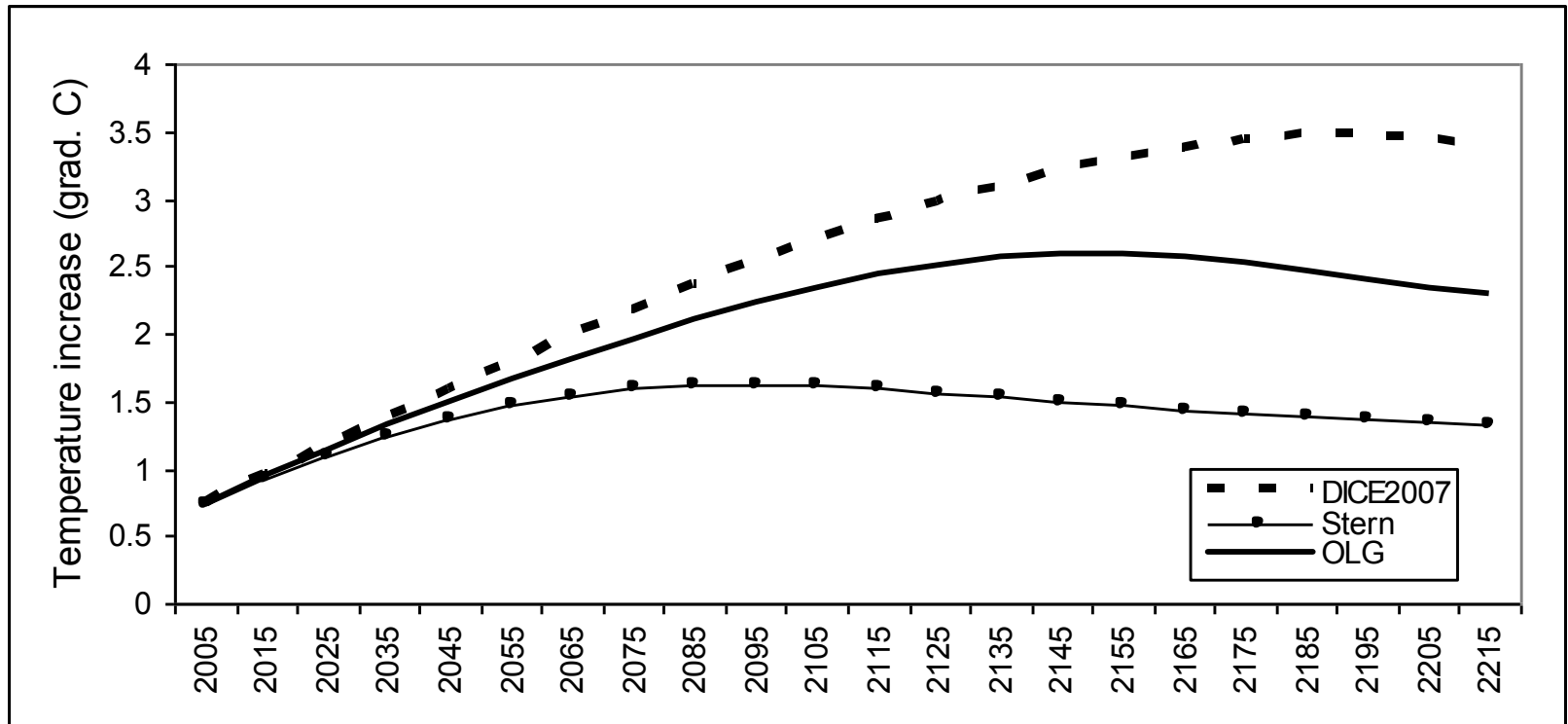 2. We compare results with Stern Review discounting and baseline runs of DICE-2007 model.

OLG model
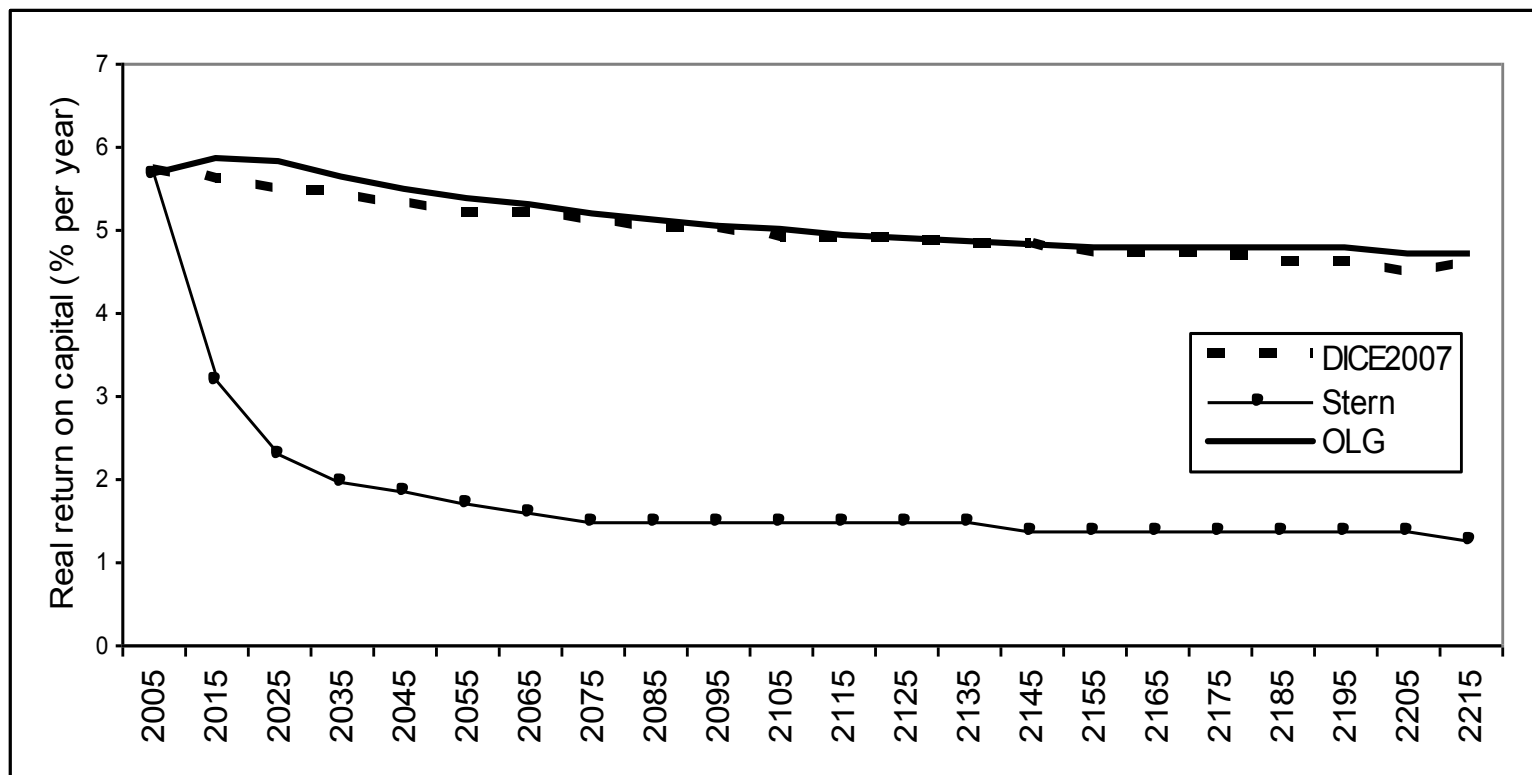
- Households
- Firms
- Climate block
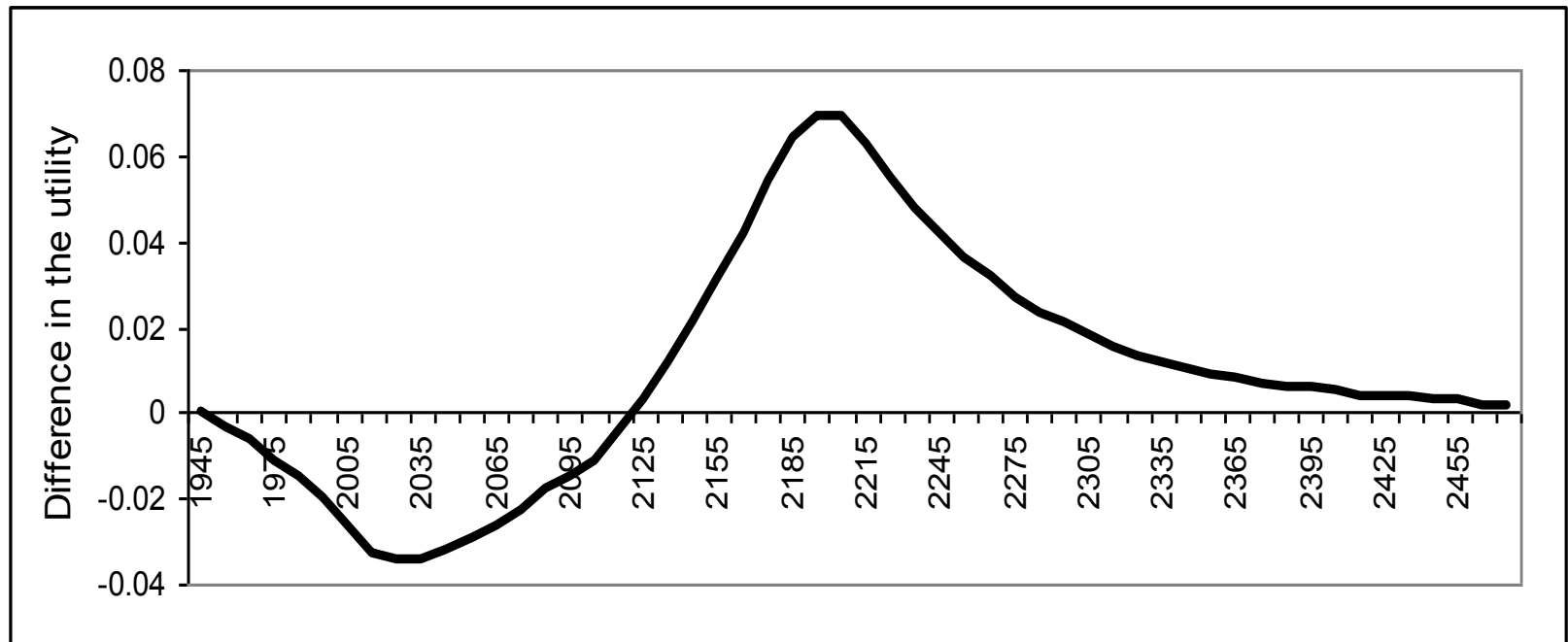- Government

Global emissions of industrial GHG.

Global mean temperature change relative to the 1900 average

Real returns on capital

Who wins and who loses under optimal policy in OLG model compared with DICE-2007 model?

Conclusions

- The results of the analysis are in favor of a more drastic reduction in emissions compared with baseline run of DICE-2007 model.

- However, they are far from the categorical run with the Stern Review discounting.

- In the overlapping generations model the optimal policy of reduction of greenhouse gas emissions could be well approximated by stabilizing emissions in the next century at current levels.

- From this more stringent policy in OLG model compared with optimal emissions reduction in baseline run of DICE-2007 model currently alive people and people to be born in the next hundred and twenty years will suffer.

Thank you for your attention!

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