Optimal Dynamic Carbon Taxes in a Climate–Economy Model with Distortionary Fiscal Policy (Lint Barrage, 2020; REStud)

EEE Reading Group

February 4, 2021

Outline

Research Question/Contribution

Question: What is the optimal tax on carbon in an economy with distortionary fiscal policy?

- Optimal Tax = Pigouvian Tax + Wedge

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Contribution: Builds on optimal dynamic carbon tax literature

- Adds fiscal needs + distortionary taxes (2nd/3rd best analysis)
- Dynamic
- Transition to BGP
- Damages in utility + production (feedbacks)

Model Setup

Climate change T_t affects utility $U(C_t, L_t, T_t)$, and output:

$$Y_t = [1 - D(T_t)] A_{1t} \tilde{F}_1 (L_{1t}, K_{1t}, E_t)$$

$$1 - D(T_t) = \frac{1}{1 + 0.0021 T_t^2}$$

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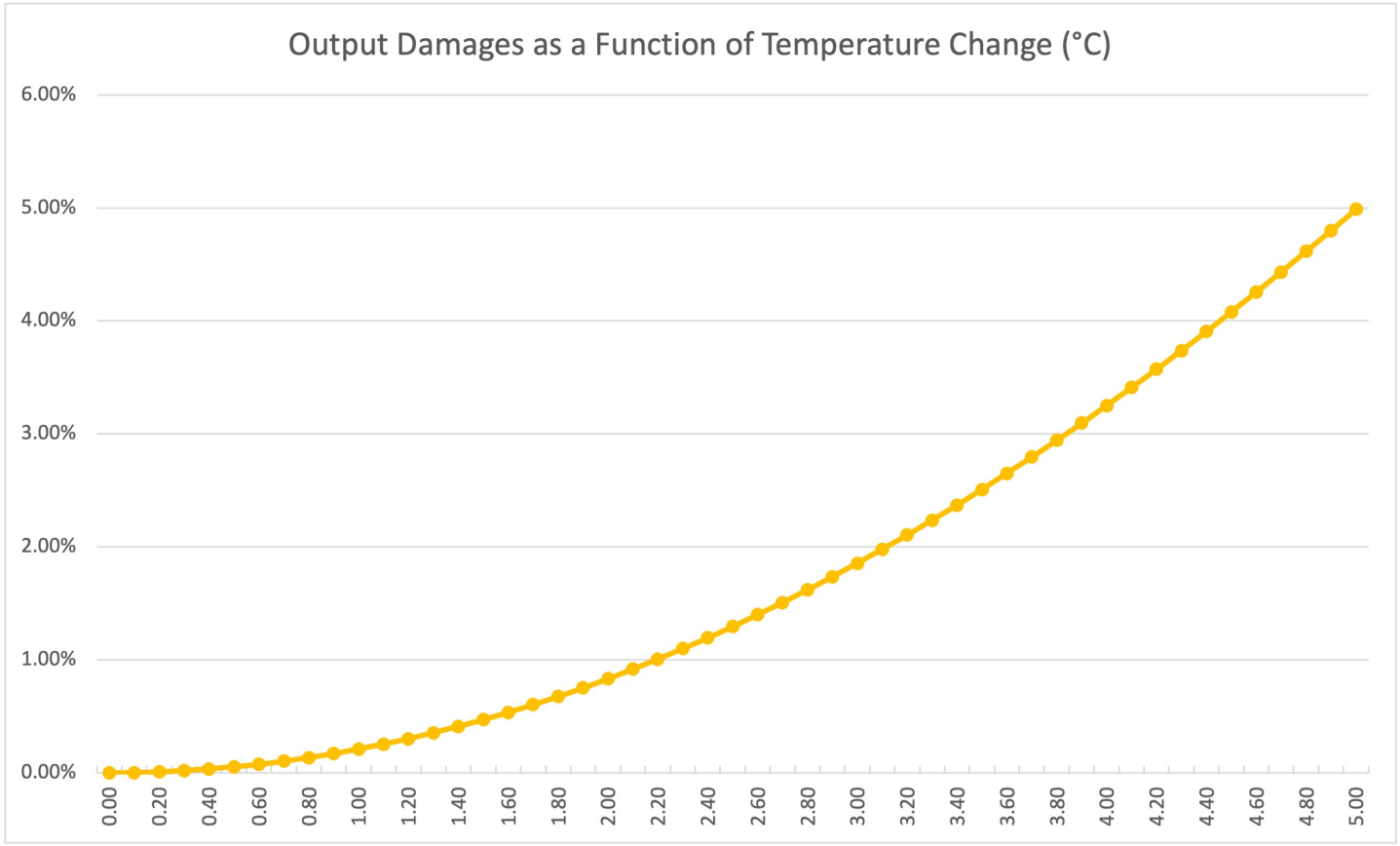
Government budget constraint

$$G_t^C + G_t^T + B_t^G = \tau_{lt} w_t L_t + \tau_{It} E_t + \tau_{Et} E_t^M + \tau_{kt}(r_t - \delta) K_t + \rho_t B_{t+1}^G$$

Damages


Output Damages as a Function of Temperature Change (°C)
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
2.20
2.40
2.60
2.80
3.00
3.20
3.40
3.60
3.80
4.00
4.20
4.40
4.60
4.80
5.00

Model Setup

Pigouvian taxation benchmark

$$\tau_{Et}^{Pigou,\,Y} = -\sum_{j=0}^{\infty} \beta^j \frac{U_{ct+j}}{U_{ct}} \left[\frac{\partial Y_{t+j}}{\partial T_{t+j}} \frac{\partial T_{t+j}}{\partial E_t^M} \right]$$

$$\tau_{Et}^{Pigou,\,U} = -\sum_{j=0}^{\infty} \beta^j \frac{U_{Tt+j}}{U_{ct}} \left[\frac{\partial T_{t+j}}{\partial E_t^M} \right]$$

1: Theoretical Results

"Second Best" Optimal Carbon Tax:

- Let full set of tax instruments be optimised (0 capital tax)
- Carbon externality on production should be exactly internalised
- Carbon externality on utility should be partially internalised
- Thus, optimal carbon tax $<$ pigouvian tax

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"Third Best" Optimal Carbon Tax:

- Energy taxes optimised conditional on other taxes
- Results could go either way now

2: Quantitative Results

Optimal carbon tax schedule 8-24% lower with distortionary taxes

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Welfare gain from carbon tax with fiscal distortions \$21-26 Trillion

- Similar to Ramsey tax reform where capital tax goes to 0
- Significant but not existential

Discussion - Part 1

2nd best analysis NB:

- Which distortions are fundamental to climate question? Fossil fuel subsidies? Energy market structure?
- Which policy parameters should we take as given? (Green New Deal)

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Follow-up Project: Distributional motives of fiscal policy

- Bring IAMs to heterogeneous agent macro frontier

Discussion - Part 2

Results: Benefits of climate policy modest

- Damage function (micro state of the art)?
- Uncertainty
- Discounting
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Can the results be disciplined with empirical evidence?

- E.g. Evidence of fiscal and economic impacts of carbon taxes?