The cost of climate change mitigation: uncertainties and metrics matter

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What is the cost of climate mitigation?

Uncertainties on
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These uncertainties add to the ones surrounding physical systems and future impacts of climate change.

Methodology

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- ▶ Set an emission reduction objective (50% reduction in 2050 wrt 2010)

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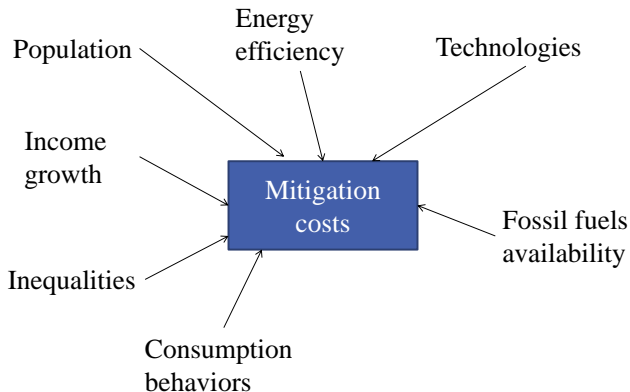Objective: analyze mitigation costs across a large number of scenarios generated by socio-economic uncertainties.

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- Define ex-ante the important drivers of emissions and mitigation costs

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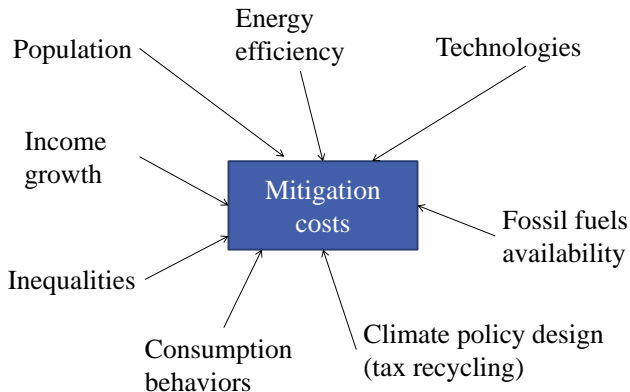Objective: analyze mitigation costs across a large number of scenarios generated by socio-economic uncertainties.

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- ▶ Find good metrics for mitigation costs

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- Run hundreds of scenarios combining uncertainty on these drivers
- Find good metrics for mitigation costs
- Analyze the influence of the different drivers on mitigation costs with data-mining tools

Potential drivers of climate mitigation costs

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Population → Mitigation costs

Energy efficiency → Mitigation costs

Technologies → Mitigation costs

Income growth → Mitigation costs

Inequalities → Mitigation costs

Consumption behaviors → Mitigation costs

Climate policy design (tax recycling) → Mitigation costs

Fossil fuels availability → Mitigation costs

⟶ **648 scenarios (324 baselines)**

Two most common metrics

- Carbon price (marginal abatement cost)

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- Macroeconomic cost:

$$\text{macro cost} = \frac{\text{GDP}_{\text{policy}}}{\text{GDP}_{\text{bau}}}$$

The possible range of costs is large and the two metrics are not good proxys for one another
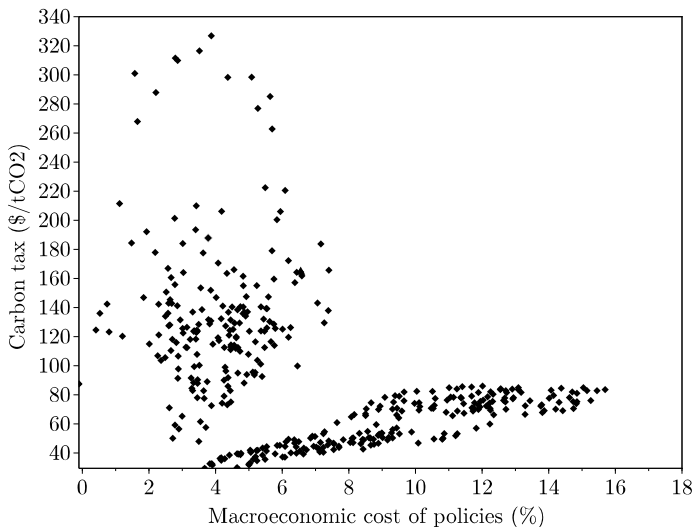
Policy design matters
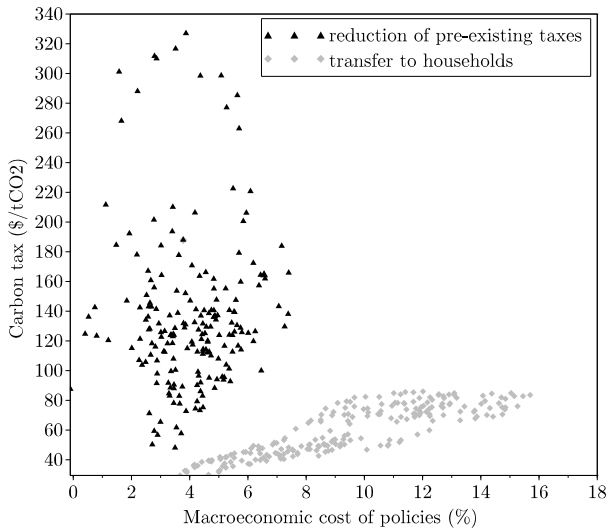
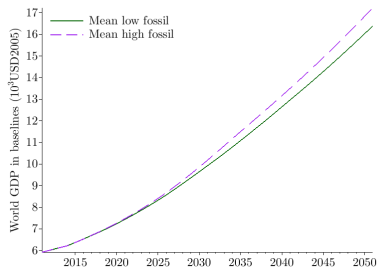# Policy design matters
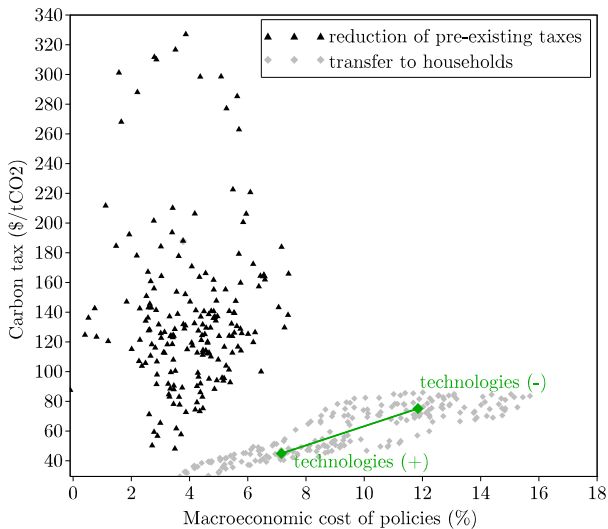
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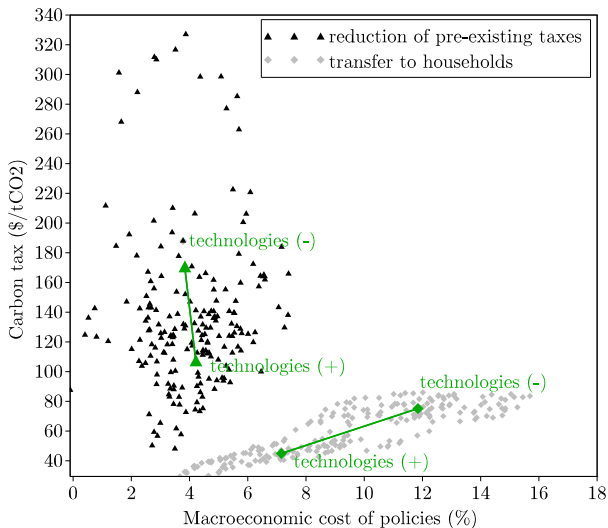
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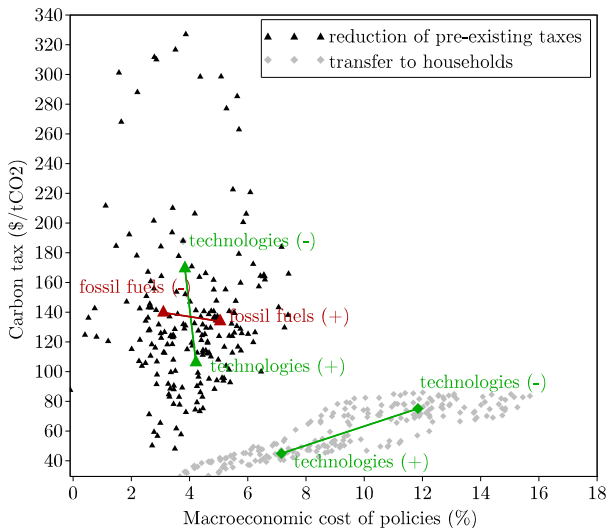
Fossil fuels uncertainty only impact baseline per-capita GDP
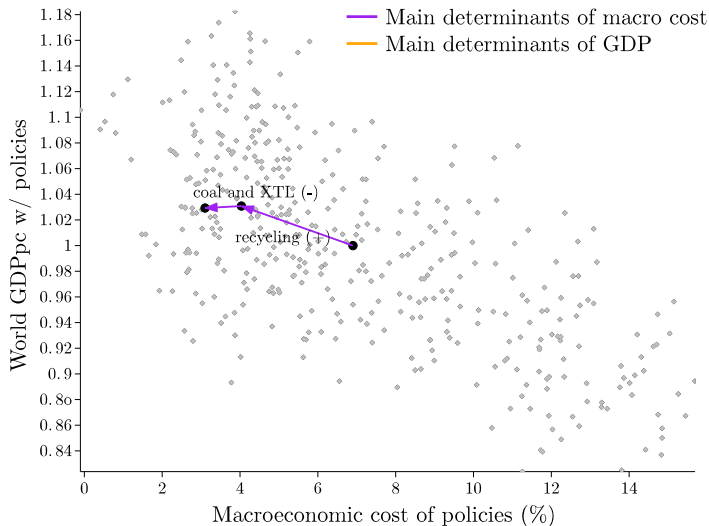

Baseline per-capita GDP

Policy per-capita GDP
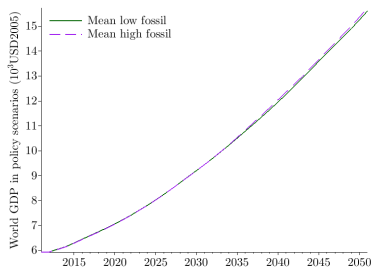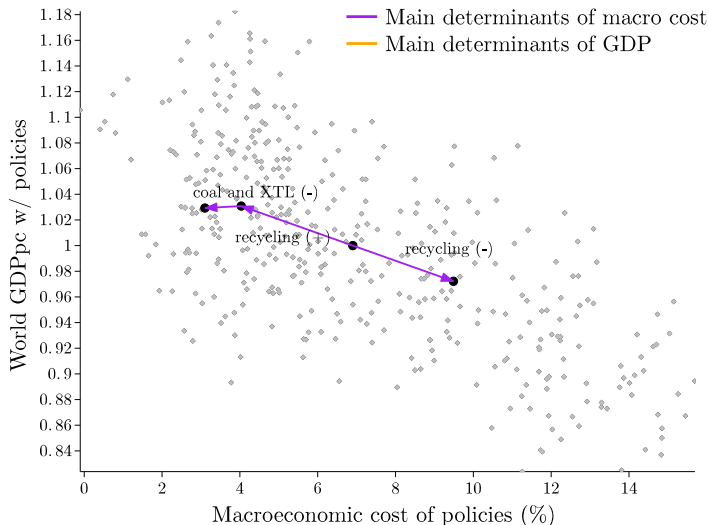
New metric: per-capita GDP in policy scenarios
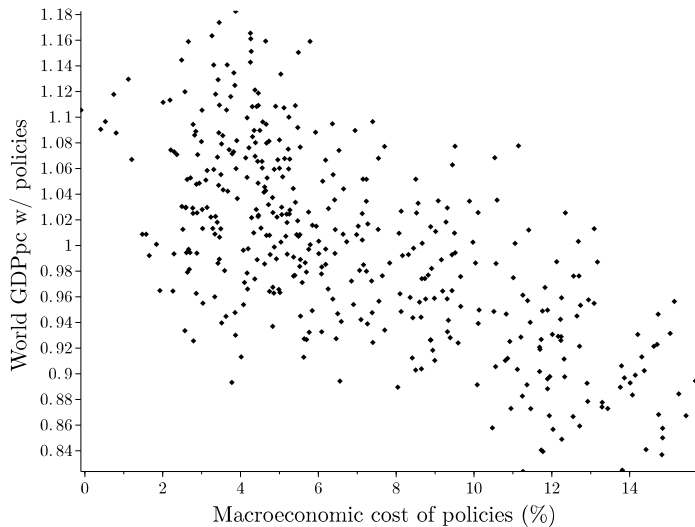
Per-capita GDP and macroeconomic cost are not good proxys for each other
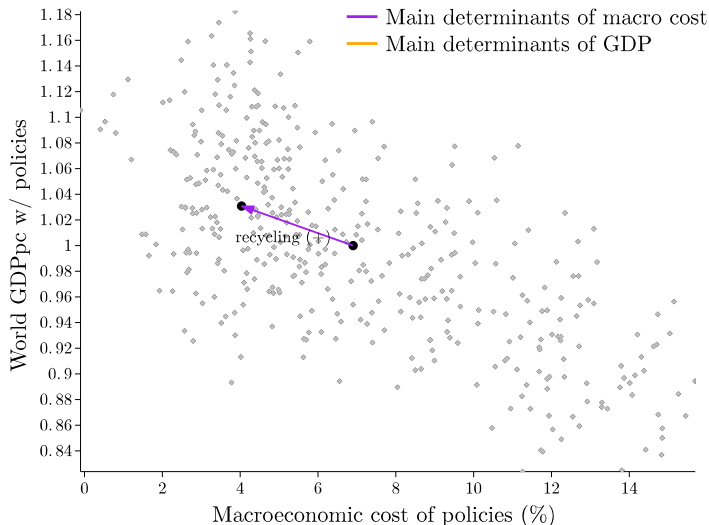
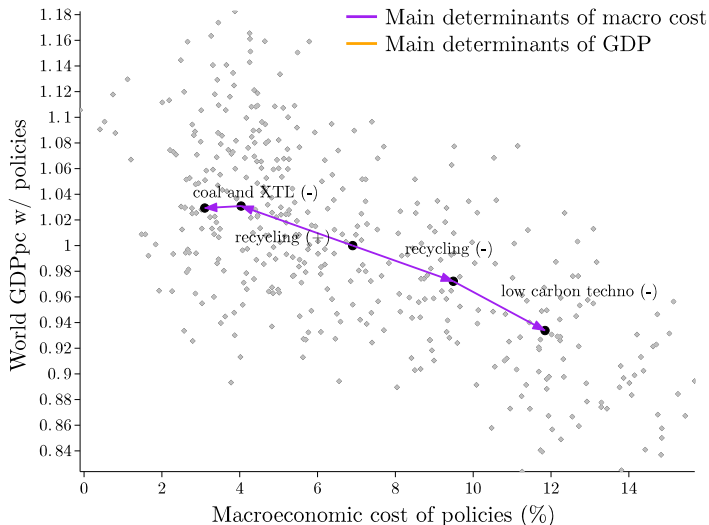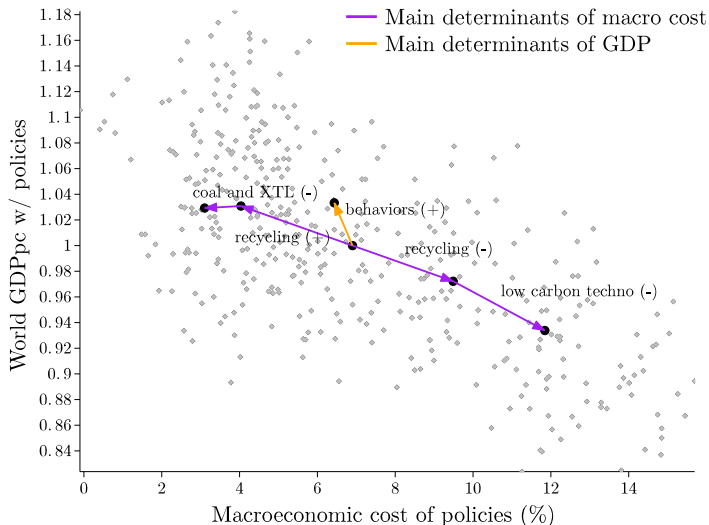# Per-capita GDP and macroeconomic cost are not good proxys for each other

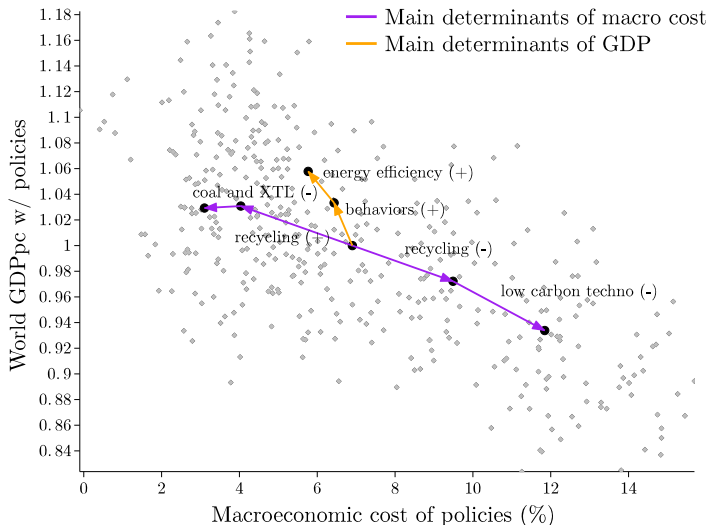# Per-capita GDP and macroeconomic cost are not good proxys for each other

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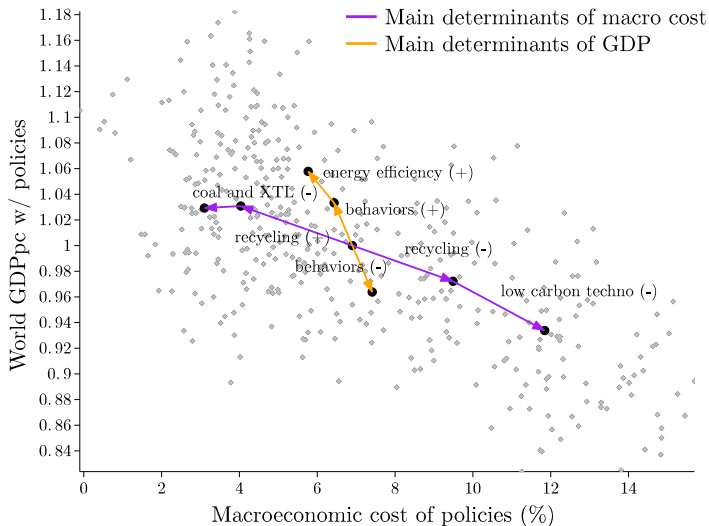# Per-capita GDP and macroeconomic cost are not good proxys for each other

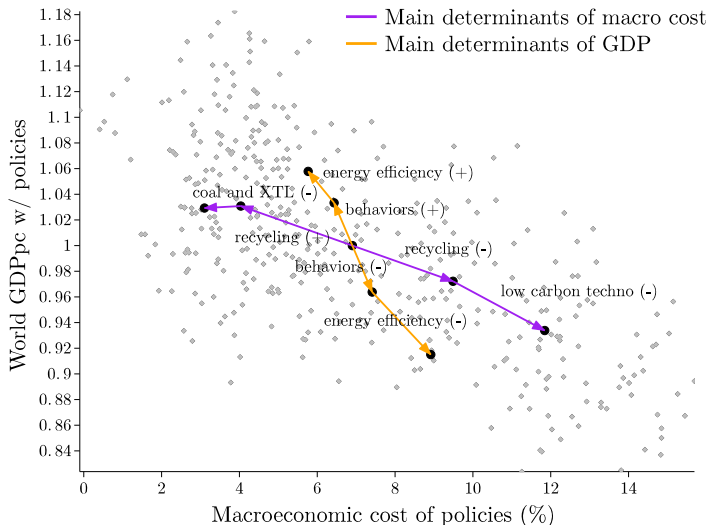# Per-capita GDP and macroeconomic cost are not good proxys for each other

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Conclusions

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- socio-economic uncertainties are important for the evaluation of mitigation costs
- the cost metric used changes the results