7. Solutions to Climate Change - II

ECO232 Fall 2019

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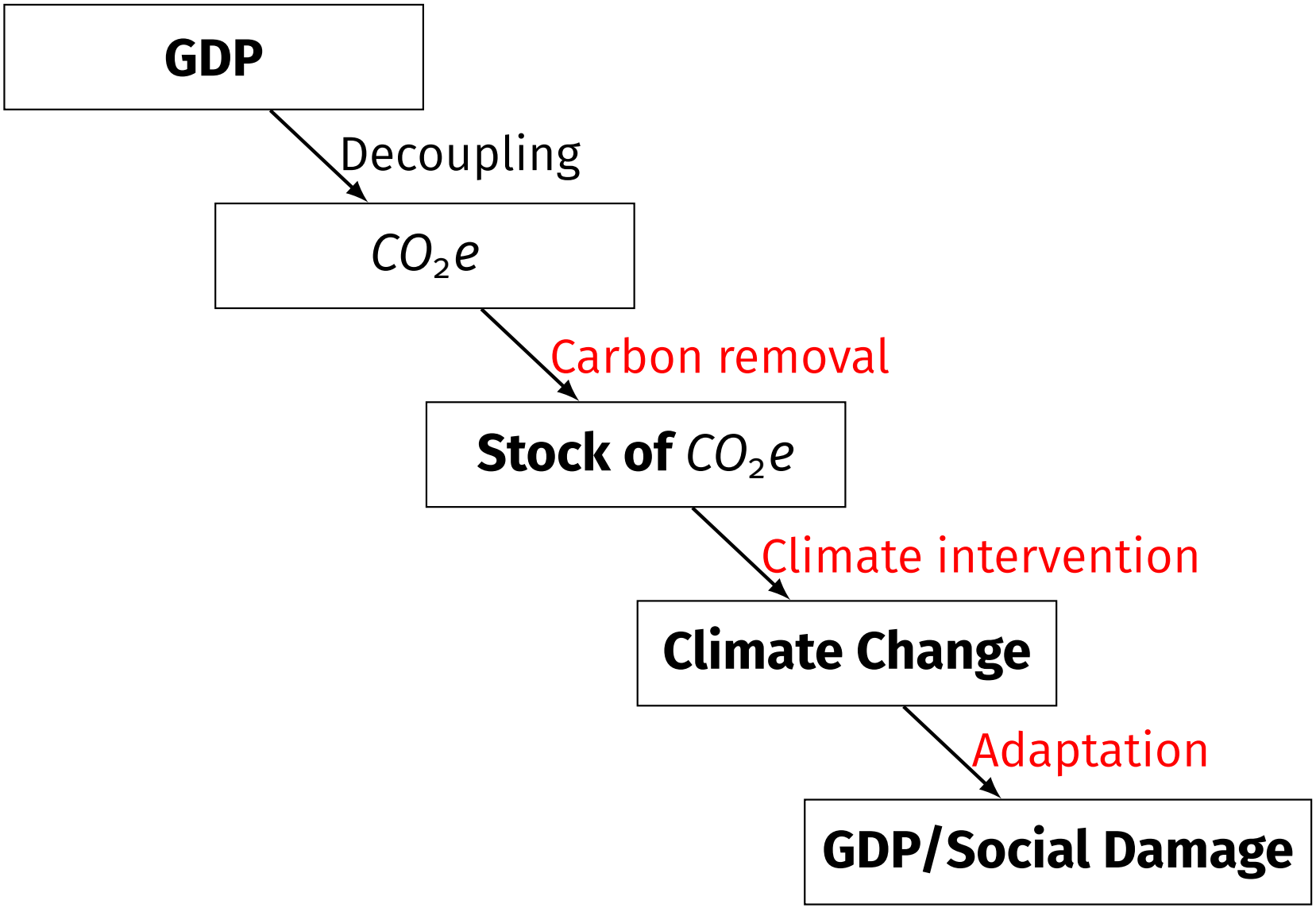
Outline

1. Framework
2. Carbon Removal
3. Intervention 1: Albedo Modification
4. Intervention 2: Geo-engineering
5. Adaptation

Framework

Global economic dose-response function



Carbon Removal

Carbon removal

CDR: Extract CO_2 from the atmosphere (e.g., with carbon-eating trees)

Not CSS, but similar

Evaluating carbon removal

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- Reduces stock of CO_2e in atmosphere
- No new global risks
- Easy for global governance to manage
- Abrupt termination: few consequences
- May be implemented incrementally
- Only solution given human behavior

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- Technology not ready
- Expensive

Intervention 1: Albedo Modification

Albedo modification

Increase the amount of sunlight that is scattered or reflected back to space

Reduce the amount of sunlight absorbed by the Earth

- Inject aerosols into the stratosphere
- Marine cloud brightening
- Enhanced surface reflectivity

Evaluating albedo modification

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- Could be implemented quickly
- Substantial climate effects within years
- Inexpensive

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- Same stock of CO_2e in atmosphere
- New global risks
- Hard for global governance to manage
- Abrupt termination: big consequences

Intervention 2: Geo-engineering

Geo-engineering gambles

Geo-engineering sounds precise; it is not

Radical transformation of climate to offset damage:

- Ocean acidification (?)
- Atmosphere

Geo-engineering has potentially massive, unknown and destabilizing side-effects (esp. by disrupting rainfall cycles)

Volcanoes on earth

Mount Pinatubo exploded in 1991

Impacts of Mount Pinatubo explosion

- Emission of 22,000 tons of SO_2
- Global temperatures fell by $-0.4\,^{\circ}\mathrm{C}$ for 2 years
- Massive acid rain and other weather effects

This is crazy thinking

Adaptation

Adapt

☺

- Get used to it
- Adaptation is immmediate
- Private sector will invent things

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- Cannot get used to some things (biophysical limits)
- Private sector cannot invent everything
- Hard to develop policies for localized effects
- Unfair to some regions
- No idea how much or how often to adapt

Any Questions?

Framework

Carbon Removal

Intervention 1: Albedo Modification

Intervention 2: Geo-engineering

Adaptation