What can we adapt from economic theory?
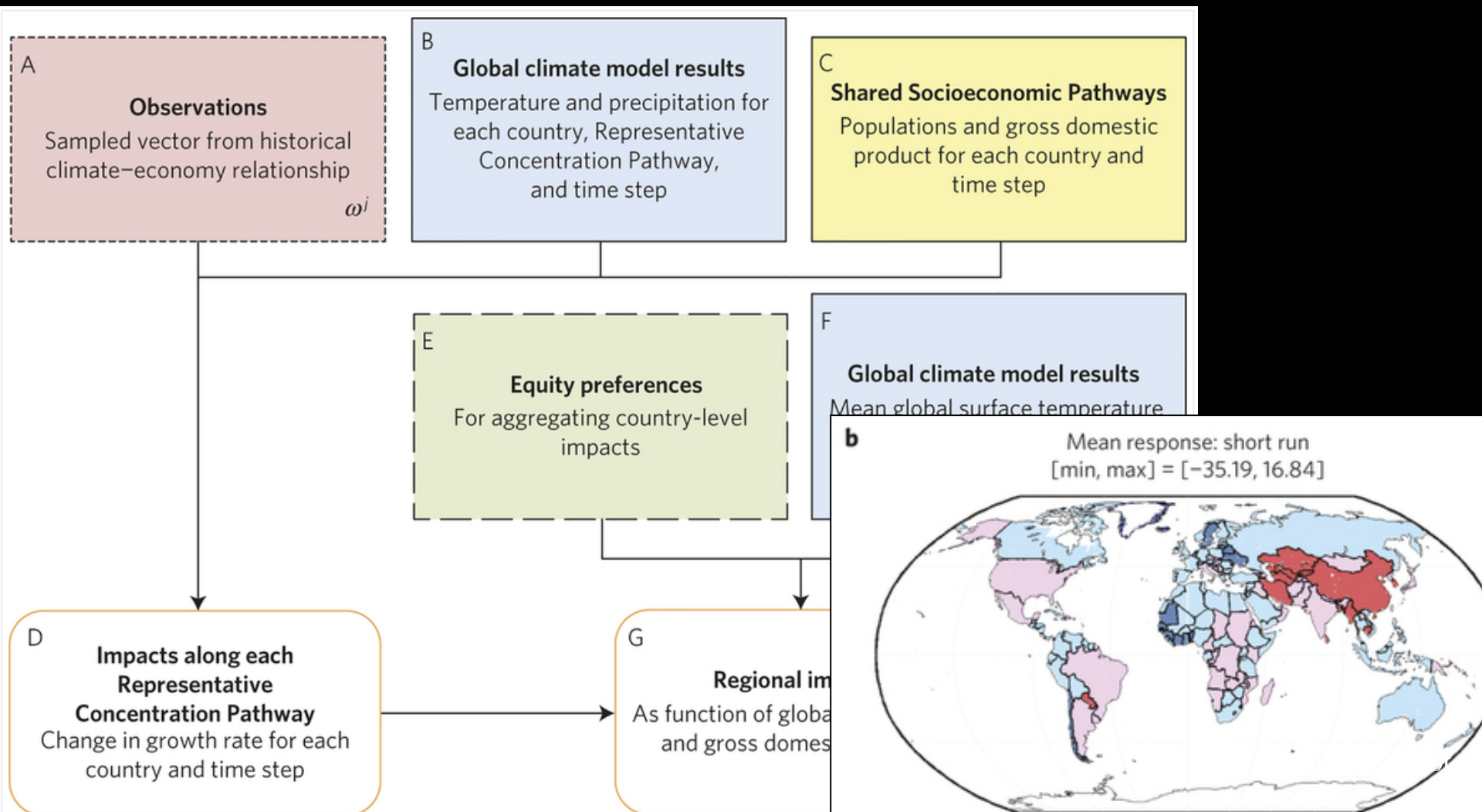
Derek Lemoine

Economics

October 26, 2015

1) <u>Optimization</u>: More complex than it seems ("recursive dynamic programming"). The policy implications of potential tipping points depend on how policy would "optimally" respond to having triggered a tipping point (including <u>adaptation</u>) and on how we expect to <u>learn</u> about tipping points over time (Lemoine and Traeger, AEJ Policy, 2014).

- A tipping point occurs once a temperature threshold is crossed. It irreversibly changes the climate system.

- Once a tipping point occurs, the decision-maker reacts. Prior to its occurrence, the decision-maker anticipates its possibility.

- The probability of a tipping point is endogenous in the sense that it depends on the chosen emission path.
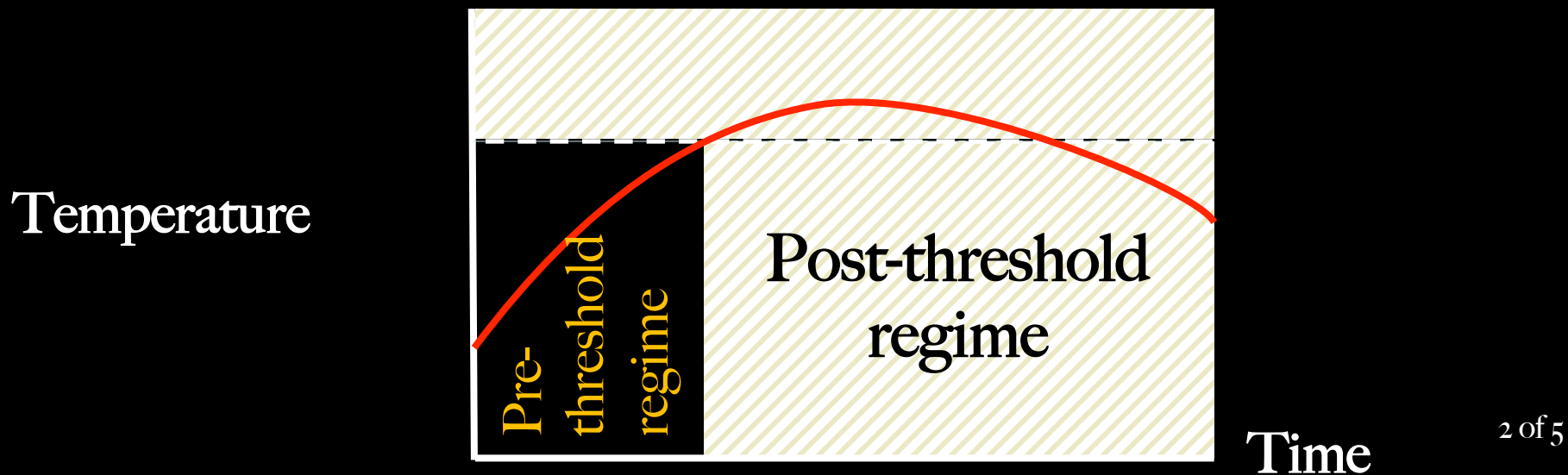
2) Statistics: We estimate the (adaptation-inclusive) cost of past weather and climate shocks from past GDP and climate data. We then use full climate models to project country-level climate variables and the variability of *unanticipated* weather shocks (Lemoine and Kapnick, Nature CC, 2015).

A

Observations

Sampled vector from historical climate−economy relationship

ω^j

B

Global climate model results

Temperature and precipitation for each country, Representative Concentration Pathway, and time step

C

Shared Socioeconomic Pathways

Populations and gross domestic product for each country and time step

E

Equity preferences

For aggregating country-level impacts

F

Global climate model results

Mean global surface temperature

b

Mean response: short run
[min, max] = [−35.19, 16.84]

D

Impacts along each Representative Concentration Pathway

Change in growth rate for each country and time step

G

Regional im...

As function of globa... and gross domes...

Final Good Production

Energy Service Production

Energy Conversion Technology

Energy Resource Extraction

Labor-capital aggregate

4) <u>Valuation under uncertainty</u>: When analyzing how uncertainty affects the value of investments, economists focus on how a project's payoffs correlate with broader wellbeing ("consumption-based capital asset pricing model") and on the value of postponing a decision until more information is revealed ("real options").

Lemoine, 2015
"The Climate Risk Premium"