

THE ECONOMICS OF CLIMATE CHANGE

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ECONOMISTS' TASKS

1. THINK ABOUT 'OPTIMAL' PATHS FOR CARBON EMISSIONS
2. THINK OF (EFFICIENT) POLICIES TO ACHIEVE SUCH PATHS
3. ANALYZE THE COSTS AND DISTRIBUTIONAL EFFECTS OF CLIMATE DAMAGES
4. ANALYZE THE COSTS AND DISTRIBUTIONAL EFFECTS OF CLIMATE POLICIES
5. UNDERSTAND THE LINKS BETWEEN INCENTIVES (FOR CONSUMERS, FIRMS AND GOVERNMENTS) AND ACTIONS

ECONOMICS OF CLIMATE CHANGE

MORE SPECIFIC QUESTIONS

- THE INTERNATIONAL AND REGIONAL, DISTRIBUTIONAL AND SECTORAL **IMPACT OF EMISSION REDUCTION POLICIES**
- THE “OPTIMAL” OR **NORMATIVE** CONSIDERATIONS OF CLIMATE POLICY
- THE **POLITICAL ECONOMY** OF INTERNATIONAL AGREEMENT
- ROBUST **POLICES** FOR THE UNCERTAIN CONSEQUENCES OF GREENHOUSE GAS EMISSIONS
- THE ROLE OF COMPLEMENTARY **PUBLIC INFRASTRUCTURE INVESTMENT** TO MANAGE THE TRANSITION, AND ITS FINANCING
- THE ROLE OF **CENTRAL BANKS** AND GREEN FINANCE PROJECTS IN SUPPORTING EMISSION REDUCTIONS,
- THE IMPLICATIONS FOR **TRADE** AND TRADE POLICY, MIGRATION, AND GLOBALIZATION.
- ...

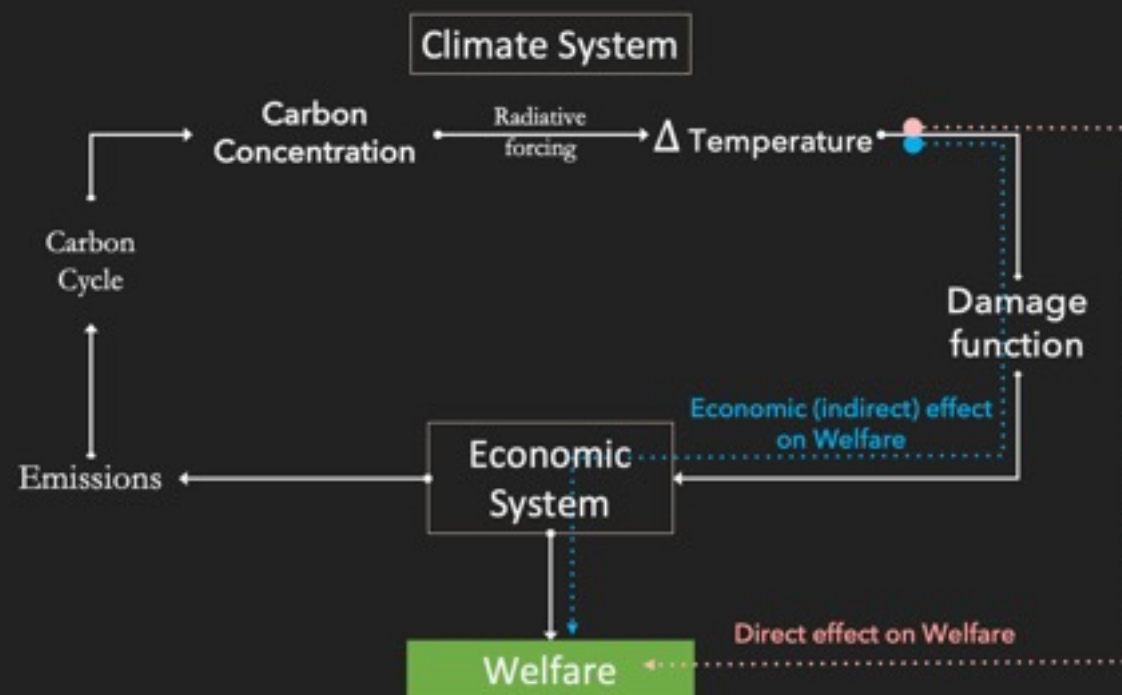
• GENERAL EQUILIBRIUM, INTEGRATED ASSESSMENT MODELS

$$\begin{aligned} & \text{Max } W(u) \\ & \text{s.t. } u \in U \end{aligned}$$

SWF: aggregation + normative parameters
Wellbeing
Eg. Nordhaus DICE model

Feasible paths

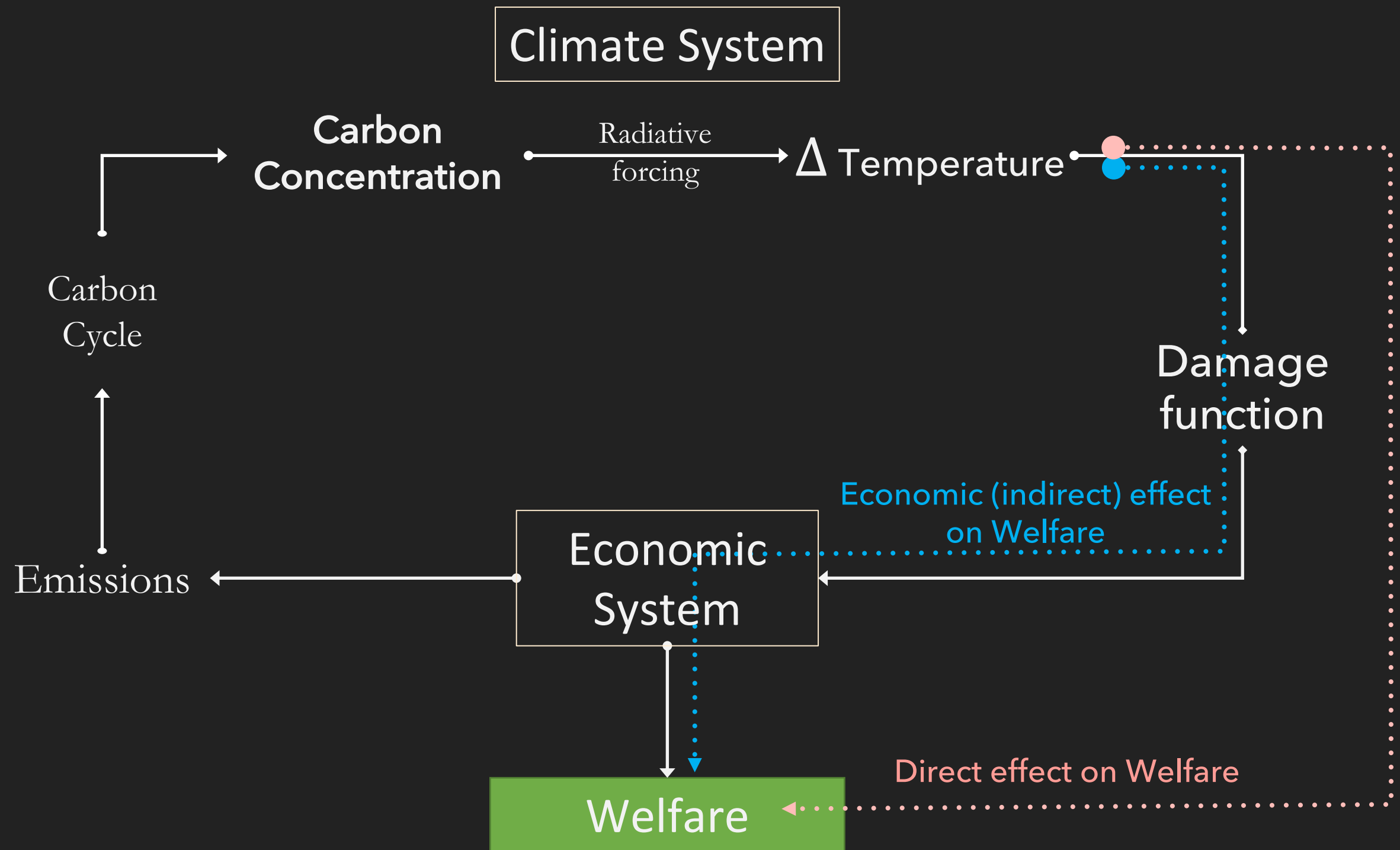
Alt. Cost-Benefit analysis
Eg. The Stern Report



• PARTIAL EQUILIBRIUM, POLICY INSTRUMENTS

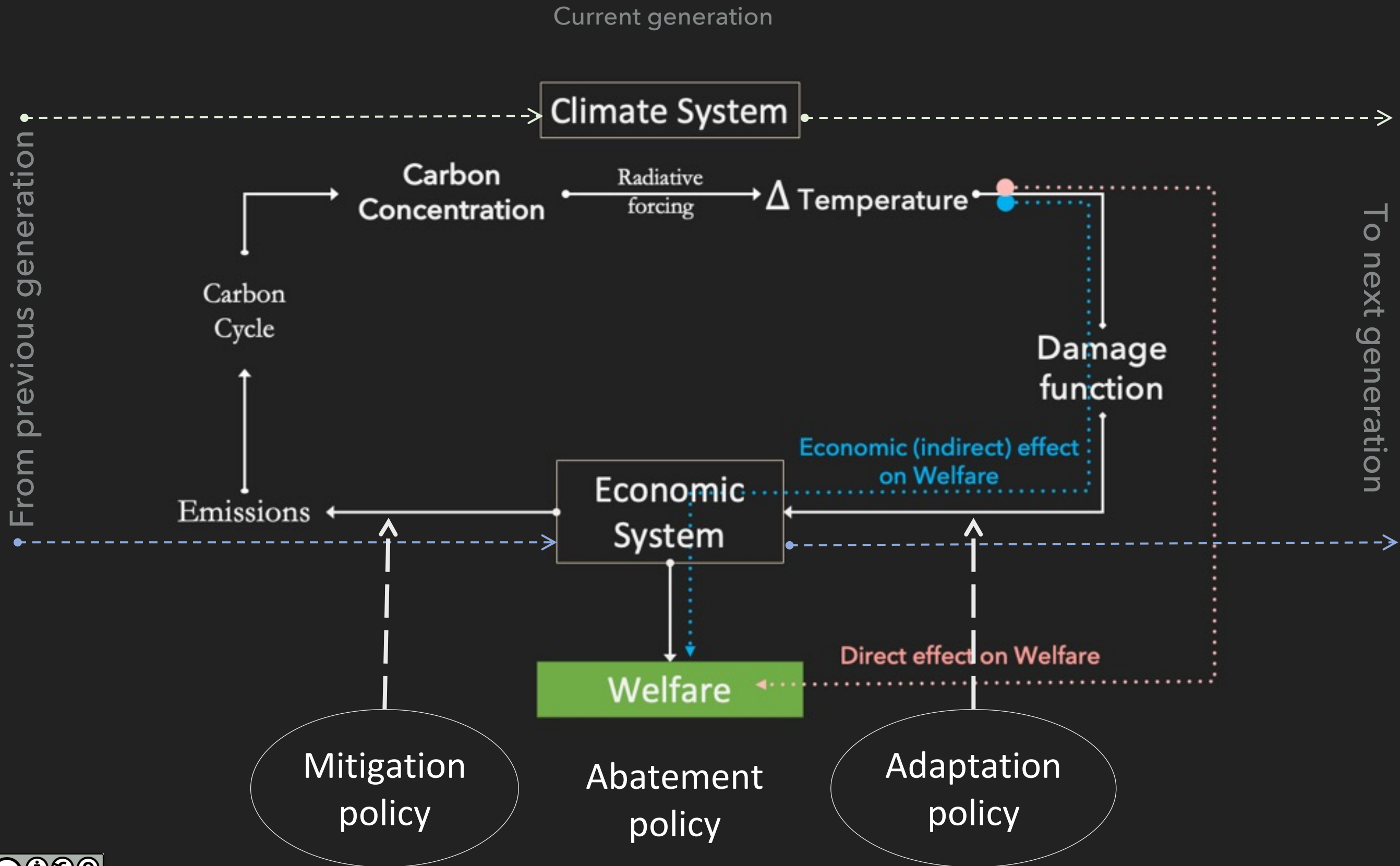
Implementation of emissions paths or mitigation targets

- Cost effective policies and redistribution
- International agreements and cooperation.
- Energy transition: Electrification and renewables.

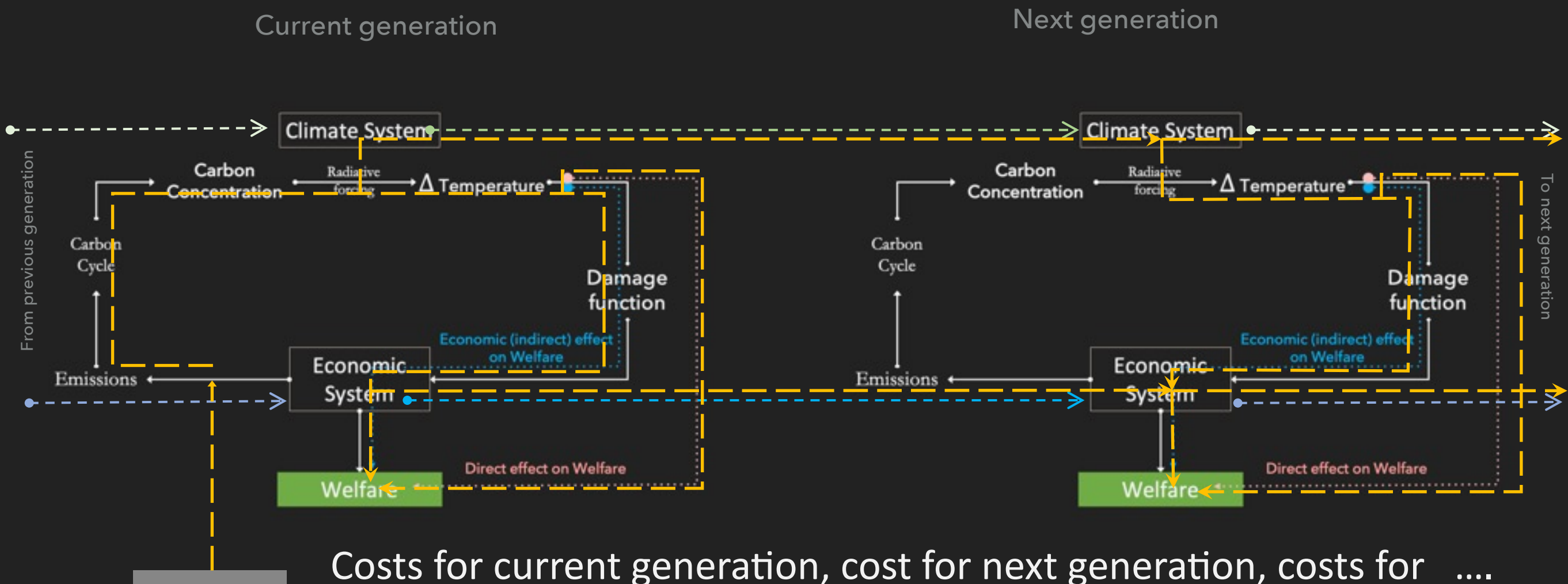


INTEGRATED ASSESSMENT MODEL (CLIMATE + ECONOMIC MODEL)

Dynamic, stochastic general equilibrium models



THE EFFECT OF 1tCO₂ (THE SOCIAL COST OF CARBON)



1tCO₂

Costs for current generation, cost for next generation, costs for

Aggregate to obtain the social cost of carbon

Requirements

- Climate model
- Economics model
- Measure of climate damages and abatement costs
- A measure of wellbeing and social welfare

1. Wellbeing is (a function of) consumption: $u_t = u(c_t)$

$$u(c_t) = \frac{c_t^{1-\eta}}{1-\eta}$$

η : aversion to inequality in consumption
(diminishing marginal utility of consumption)
 $\eta = 1 \rightarrow u(c_t) = \ln c_t$ (neutral)
 $\eta > 1 \rightarrow$ inequality aversion

2. SWF is discounted utilitarianism + representative agent

$$W(u) = \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t L(t) u(t)$$

$$[1]+[2] \rightarrow W(u) = \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t L(t) \frac{c_t^{1-\eta}}{1-\eta}$$

Normative parameters of climate-economy models

- ❖ Pure rate of time preferences r : the rate at which the future declines
- ❖ Degree of aversion to (intergenerational) inequality η : diminishing marginal utility of consumption

CONSENSUS AMONG CLIMATE CHANGE ECONOMISTS

1. Climate change is a global public bad with short and long term impacts: it is the greatest of all externalities (Stern Review, 2007)
2. Urgency: Policies to slow emissions should be introduced as soon as possible.
3. The most effective policy is a combination of policies, but setting a price to carbon (via prices or via quantities) must be part of the package.
4. Effective policies should have the highest possible participation; that is, the maximum number of countries and sectors should be on board as soon as possible. Free-riding should be discouraged.
5. An effective policy is one that ramps up over time—both to give people time to adapt to a high-carbon-price world and to tighten the screws increasingly
6. Projecting (economic) impacts and abatement costs are the most difficult tasks and have the greatest uncertainties of all the processes associated with global warming (Nordhaus, 2019)
7. Mitigation is indispensable, but we also need to invest in adaptation.

MAJOR DISAGREEMENTS AMONG CLIMATE CHANGE ECONOMISTS

1. Normative perspectives: Redistributive impacts, discounting,...
2. Calibration and modelling choices
3. Uncertainties
4. Policy effectiveness
5. Quantitative results
6. ...

REFERENCES

- Nordhaus, W. (2019) “Climate Change: The Ultimate Challenge for Economics,” Am. Econ. Rev. 109, 1991–2014 (2019).
- Stern, N. (2007). The Economics of Climate Change. Cambridge University Press.
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