

Lecture 23: Review of Modules 1 and 2 for Final Exam

Prof. Parthum
Environmental Economics
Econ 475

But first! Breaking news for Climate Economics

- On November 11th at the 27th Conference of Parties (COP27) in Egypt, the EPA announced [a new rule](#) that aims to drastically reduce methane emissions from oil and gas infrastructure (wells, transmission lines, etc.).

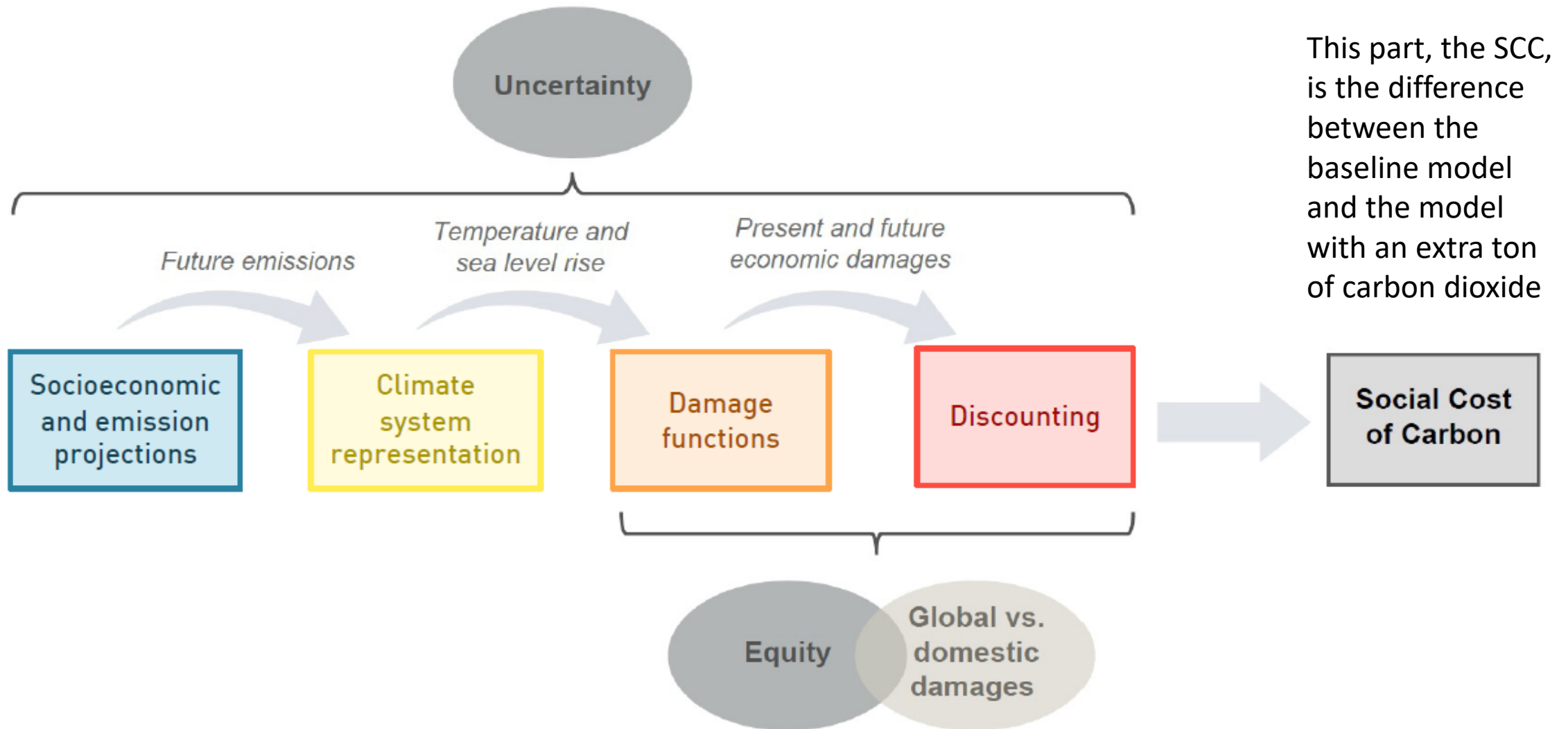
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- The climate benefits alone are estimated at \$48 billion (NPV) over the next 10 years.

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- The climate benefits alone are estimated at \$48 billion (NPV) over the next 10 years.
- In addition to announcing this major step, EPA released [new updated](#) estimates of the social cost of greenhouse gases. The updates account for major scientific advances in climate and economic sciences (complete with [replication code and data](#)!)

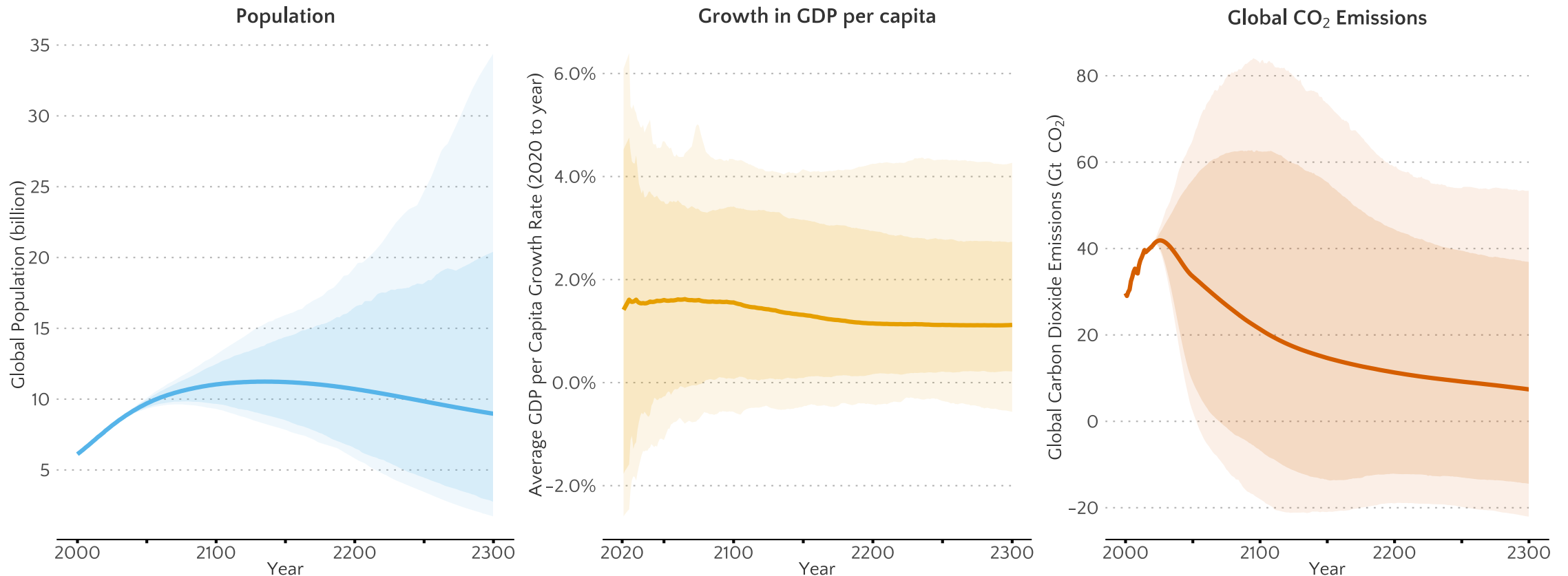
The 4 Main Climate-Economy Modules



EPA Updated SC-GHG

Socioeconomic
and emission
projections

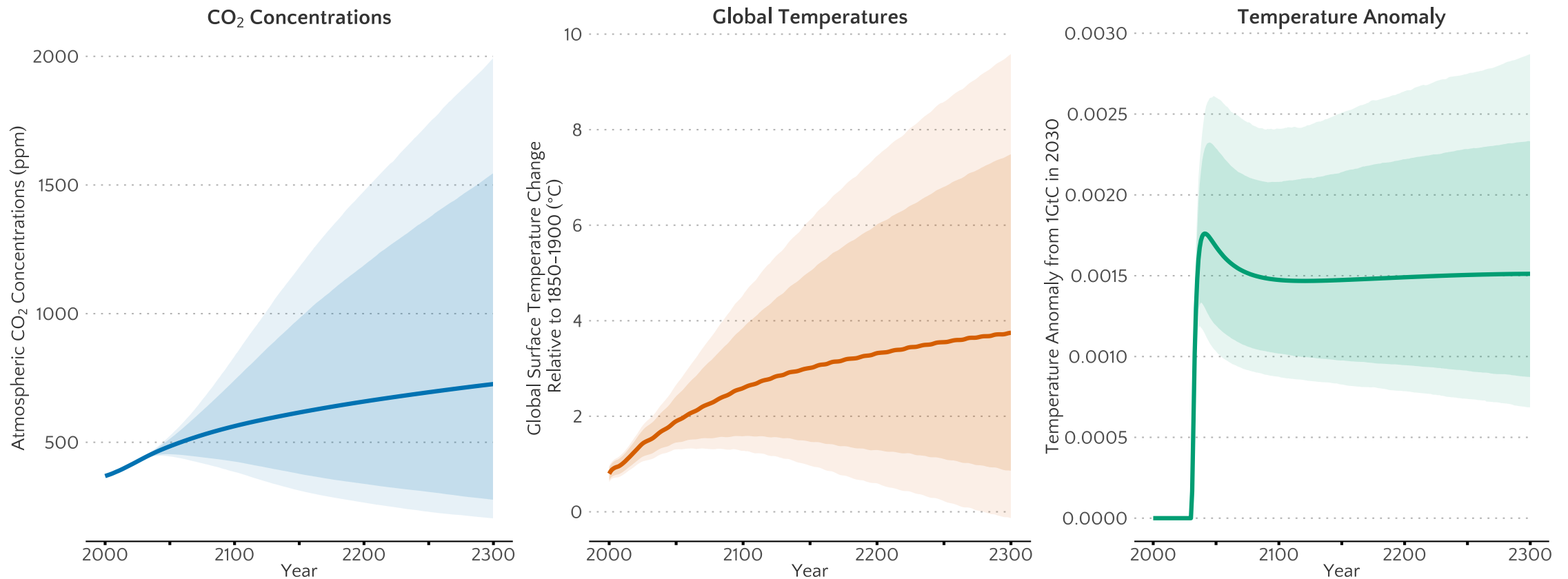
Statistical probabilistic growth scenarios linked to emissions



EPA's Updated SC-GHGs

Climate
system
representation

Reduced complexity climate systems model – FaIR1.6



EPA's Updated SC-GHGs

Damage
functions

DSCIM

Mortality

Carleton et al. (2022)

Energy

Rode et al. (2021)

Agriculture

Hultgren et al. (2022)

Coastal Damages

Diaz (2016), Depsky et al. (2022),
Kopp et al. (2016), Garner et al.
(2021)

Labor Productivity

Rode et al. (2022)

GIVE

Mortality

Cromar et al. (2022)

Energy

Clarke et al. (2018)

Agriculture

Moore et al. (2017)

Coastal Damages

Diaz (2016), Wong et al.
(2017)

Meta-Analysis

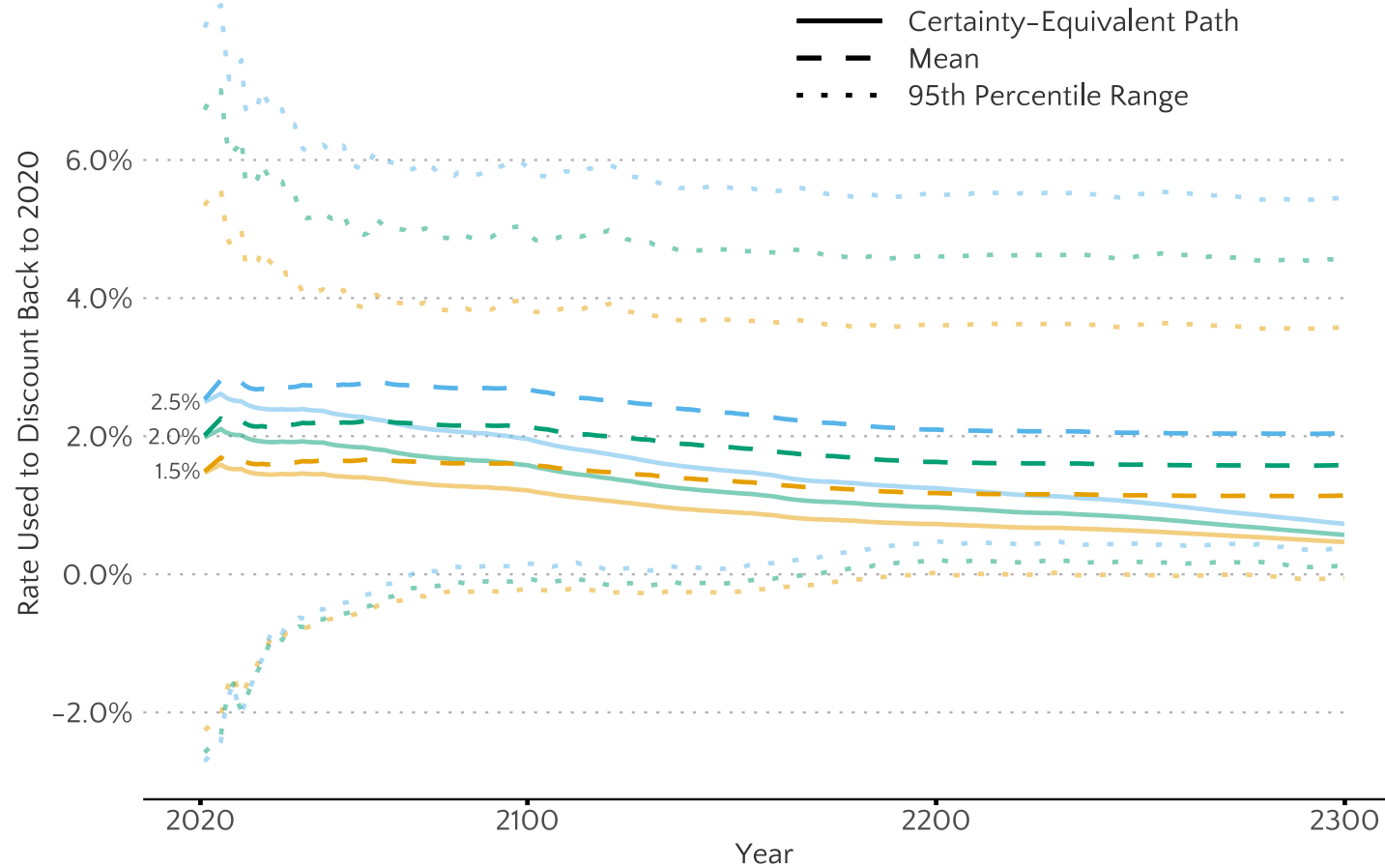
**No sectoral
disaggregation**

Howard and Sterner
(2017)

EPA's Updated SC-GHGs

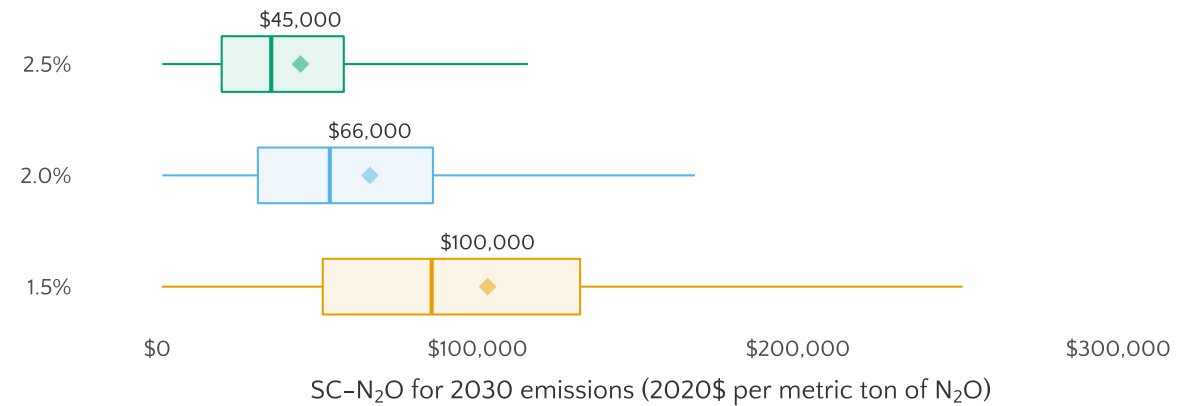
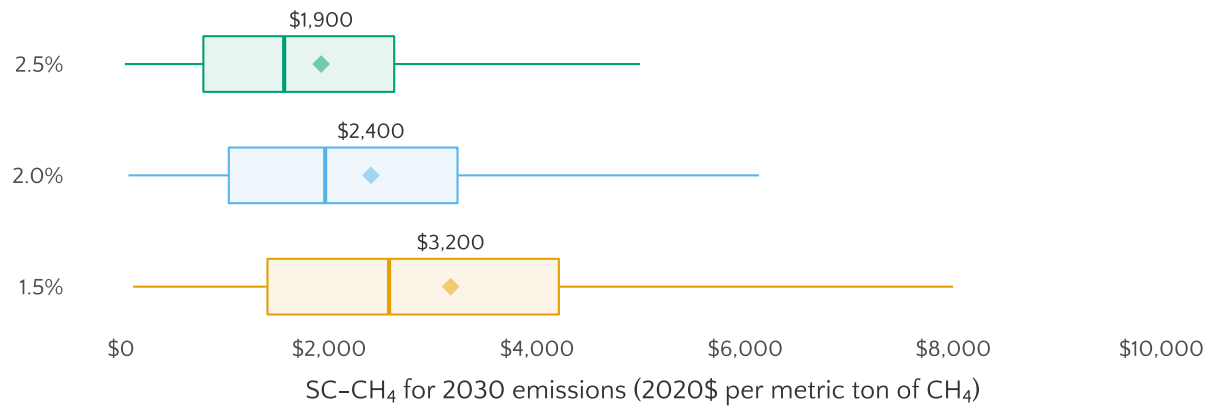
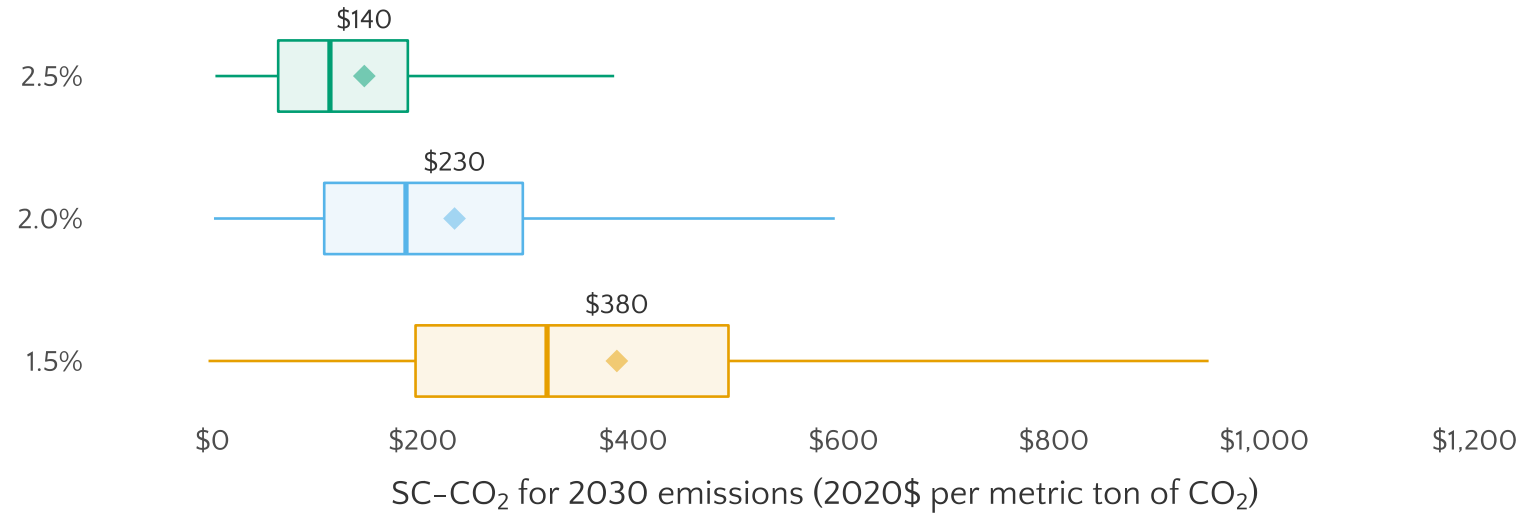
Discounting

Dynamic growth-consistent discount rate



EPA's Updated SC-GHGs

Social Cost of Carbon



Topics from Module 1: Why Markets Fail

1. *“Anyone who has taken Econ 101 knows...”*
 - a. If someone starts a sentence with this, anything that follows is likely to be an incomplete picture of whatever the topic is.

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2. Markets are great! But they are *not perfect*.

Topics from Module 1: Why Markets Fail

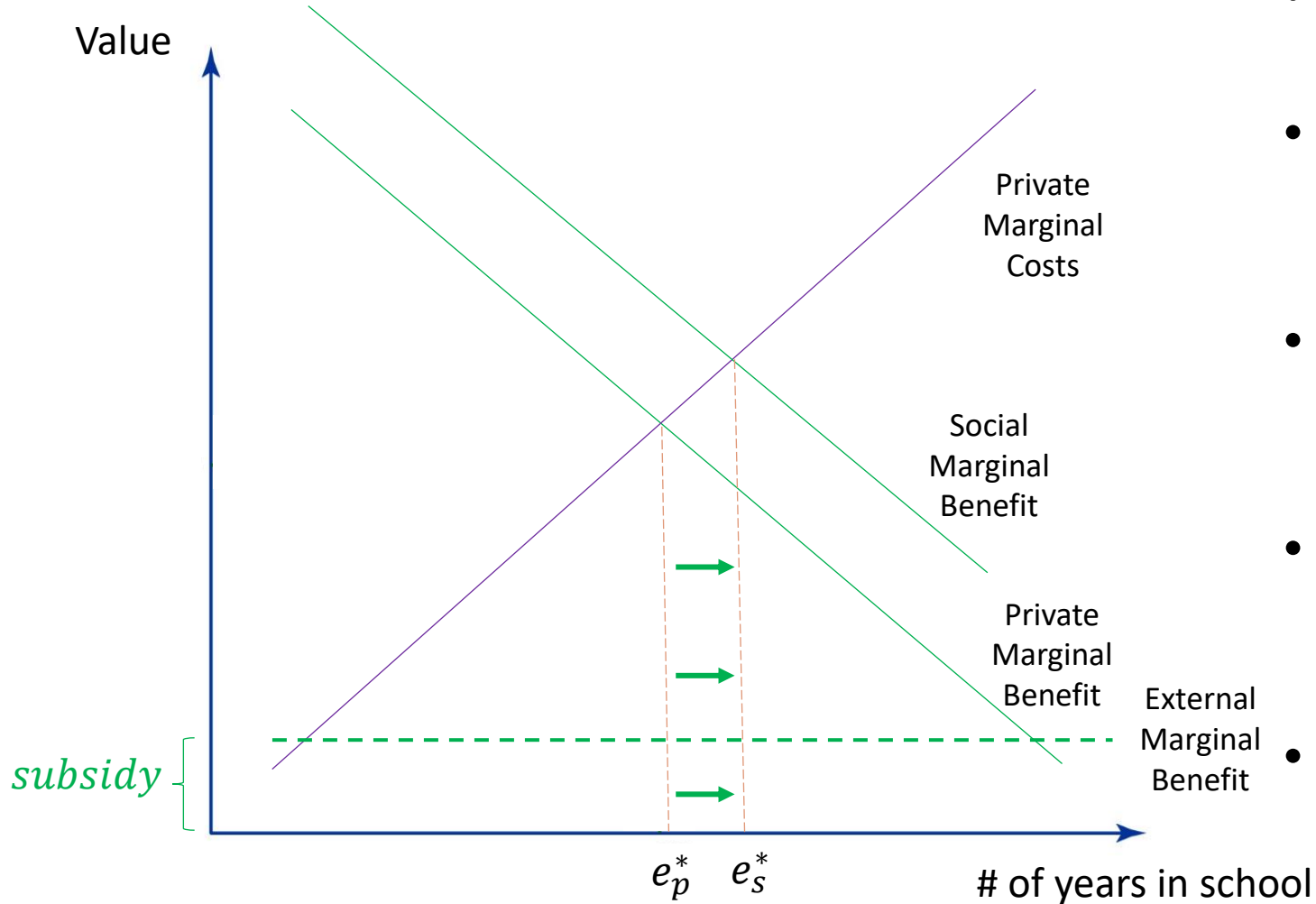
1. *“Anyone who has taken Econ 101 knows...”*
 - a. If someone starts a sentence with this, anything that follows is likely to be an incomplete picture of whatever the topic is.
2. Markets are great! But they are *not perfect*.
3. Markets provide powerful incentives for innovation, production, price discovery, a ***general move towards economic efficiency***, and many more desirable outcomes that improve the wellbeing of societies (note, “wellbeing” is a general term that is used to describe more than just income!)

Topics from Module 1: How Markets Fail

There are many different types or root causes of market failures. Think of some examples under each of these categories.

1. Information Asymmetries
 - One party in a transaction knows more than the other
2. Market Structure/Power
 - One party can influence the market equilibrium
3. Public Goods
 - Nonrival and nonexcludable
4. Externalities
 - Private actions have unintended consequences

An Example: The Market for College Education



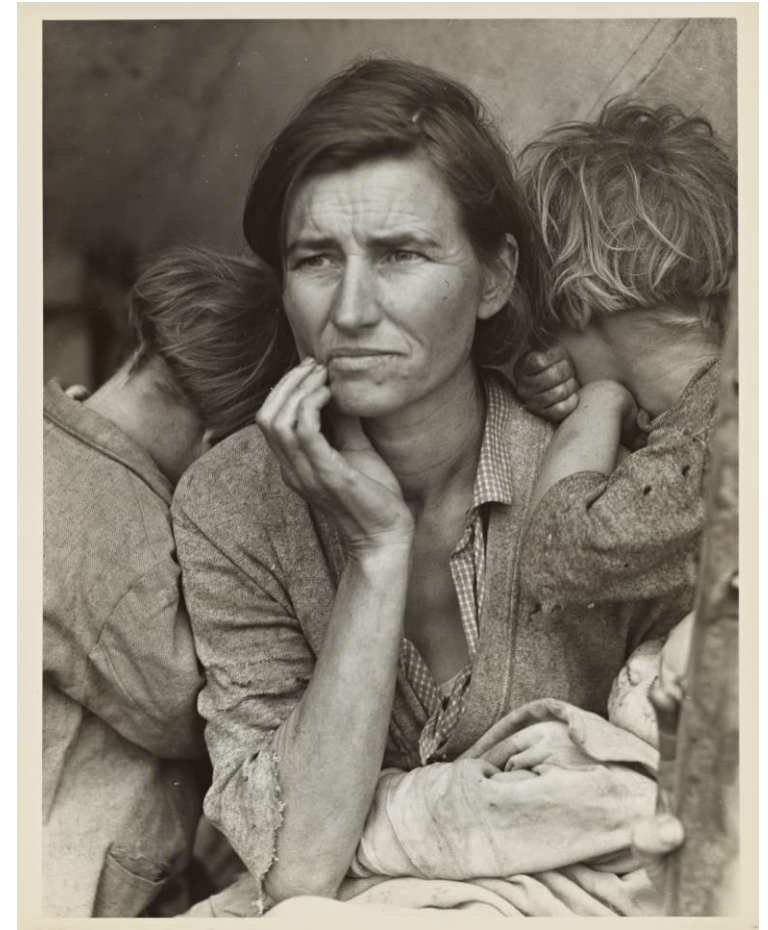
- In education, the externality is a “good”
- The private market would *underprovide* public education
- A government *subsidy* can help correct this market failure
- In this context, is the external marginal benefit actually fixed (flat)?
- Try drawing an example of what you think external marginal benefits are

An Example: Dynamic Externalities

- Pick a number between 0 and 100.
- The person who is closest to 75% of the average number wins an extra point on the exam.

The Dust Bowl

As one “black blizzard” hit after another, harmful dust particles accumulated in people’s lungs, causing hundreds of deaths and sickening thousands.



Source: [history.com](https://www.history.com)

Topics from Module 1:

Positive vs. Normative Notions in BCA

“The original theoretical underpinnings of BCA rest on the Kaldor–Hicks criterion—that is, for any given policy option, could those who gain from an economic change compensate the losers and still be better off than before? The use of this criterion to assess such a potential Pareto improvement is a positive scientific exercise that requires relying on a consumer sovereignty principle in assessing benefits and costs.” – Dr. Al McGartland

“Yet despite what many of these practitioners are taught, the Kaldor-Hicks star around which so many regulatory and policy decisions now orbit is not a value neutral or objective methodology but rather, as seen in the Panamanian example above, a powerful – and yet oft-overlooked – intellectual engine of global inequality.” – Dr. Eli Cook

Topics from Module 2: Environmental Econometrics

When applying a data science toolkit to economic problems, there is oft a specific focus on *causality*

- Why is there such a focus on causality? Correlations are still interesting.
- We want to *know* with some degree of confidence that an intervention/policy etc. affects an outcome. Resources are constrained and interventions cost money!














When estimating the benefits of a policy intervention, we want to know the causal effect of the policy on the outcome of interest. In this simple representation, δ would be the effect of cleanup on Y .

$$Y_i = \mathbf{X}\beta + \delta \text{Cleanup}_i + \phi_i + \varepsilon_i$$














Imagine a policy being proposed to clean up the Cuyahoga River, what are possible outcomes of interest?

The Travel Cost Model

$$V_{ijt} = \lambda cost_{ijt} + \beta X + \phi + \varepsilon_{ijt}$$


 $=$



 $+$




 $+$


 $+$


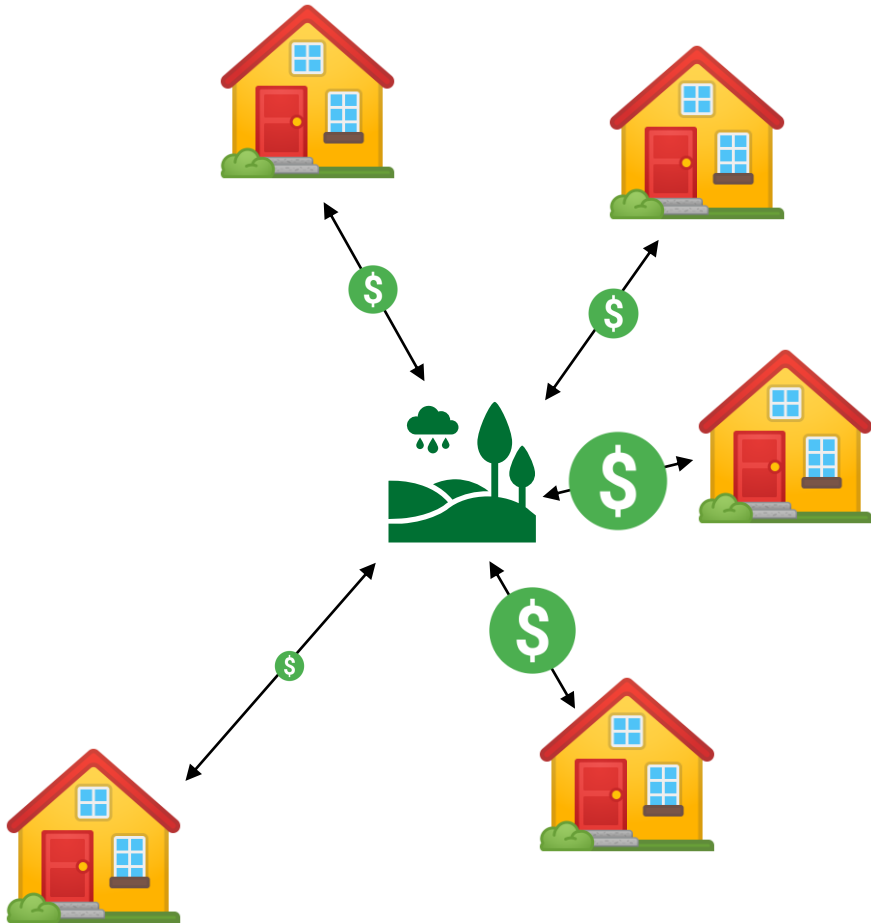
$i=1, j=1, t=1$


 $=$




 $+$





 $+$


 $+$


$i=1, j=2, t=1$

The Hedonic Price Model

$$\text{Price}_{ijt} = \beta X + \phi + \varepsilon_{ijt}$$



- The housing market is a useful tool to estimate the value of nonmarket goods and services.
- Can be a cross-section (e.g., one observation per home, or maybe one year, etc.) or panel (e.g., observe a home sell more than once, multiple years of data, etc.).
- By incorporating distance to an amenity as a characteristic/attribute of the home, it's possible to identify the relationship between home prices and the nonmarket amenity.

Stated Preferences

- Markets cannot capture intrinsic value (value for things simply existing)
- Stated Preferences (Choice Experiments, etc.) construct a hypothetical market



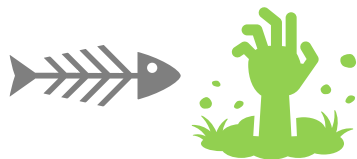
$$U_{ijt} = -\alpha_i price_{jt} + \beta'_i x_{ijt} + e_{ijt}$$

The Random Utility Model (RUM) is often used in many settings that have a “discrete” choice setting.

The model predicts the probability of a particular choice based on a set of explanatory variables (“right hand side”).

$$P_{ijt} = Prob(U_{ijt} > U_{ikt}) = \frac{\exp(U_{it,j=1})}{\sum_j^J \exp(U_{ijt})}$$

Topics from Module 2: Natural Capital



Who is better off?

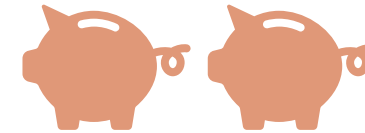
Income
(GDP)

Savings
(stocks)

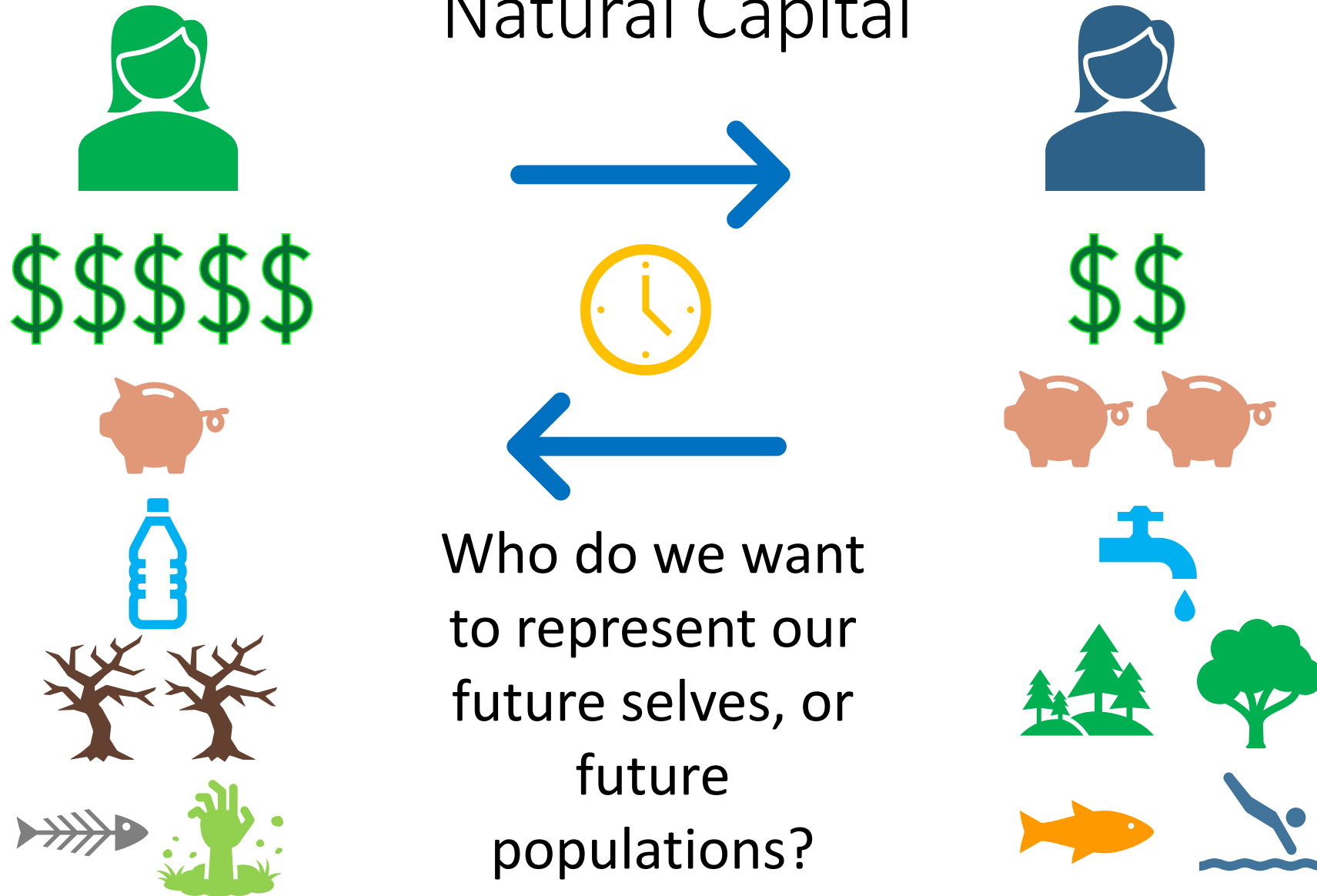
Drinking
Water

Forest
Health

Aquatic
Health



Topics from Module 2: Natural Capital



Topics from Module 2: Natural Capital

- “Sustainability requires that we leave future generations the capacity to be as well off as we are, as to avoid enriching ourselves by impoverishing our successors.” - Solow
- Is extracting a scarce resource (natural nonrenewable resources) necessarily a bad thing? Likely depends on what we do with those scarcity rents (revenues)!
- If we deplete specific natural resources in the process of economic growth, we must leave equivalent capital assets of other types to future generations so that their welfare is not diminished by this depletion.
- We can think of capital investment as another form of Pareto Efficiency, but with an intertemporal dimension.

Why and How Research Happens



Request for Proposals

Evaluation of the Economic and Other Contributions of the Bear River

Overview: A steering committee of stakeholders interested in optimizing the benefits of the Bear River system (hereinafter referred to as the “committee”) is seeking proposals for Independent Contractor Services (“consultant”) to undertake research and prepare a report to examine the regional economic contributions of the Bear River system, including Bear Lake on the Utah and Idaho border, and the Great Salt Lake at the river terminus.

Required Deliverables: The Consultant will prepare and deliver a report detailing the monetary and non-monetary economic benefits to that region. Monetary benefits should include inter-industry spending linkages, employment and employee spending linkages. Non-monetary benefits should include willingness to pay, existence and bequest values.

Benefits to be considered must include, but are not limited to, the following for the entire Bear River System as applicable, including Bear Lake and the Great Salt Lake¹: (1) agricultural production, including ranching and crops, (2) recreation, including water sports, wildlife viewing, hunting and fishing, etc., (3) environmental services, including air quality, water quality and quantity, wildlife migratory corridors, wildlife habitat, endemic species, etc., (4) municipal/industrial water use (5) hydropower production, (7) cultural/sociological values, including historical, sentimental, viewshed, etc.

Project Timeline: Final documents shall be delivered by November 30, 2023.

Next class

- Final Exam Review Part 2 of 2 (Prof. Austin)
- **Final Exam:** Saturday, December 10th ; 4pm-6pm in Car Barn 204
 - Same structure as midterms with additional material from module 4
- **Course Evaluations:** click [here](#) or scan QR
 - Your feedback is very very important and valued!
 - This is your opportunity to grade your instructors

