

# **3. Economic Impacts of Climate Change**

## **– Summary**

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ECO232 Fall 2019

October 18, 2019

# Outline

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1. Dose-Response Functions
2. GDP+Social Damage
3. Impacts on Economy
4. Economic metrics

# **Dose-Response Functions**

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# Global economic dose-response function

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Economic dose-response function is more expansive:

- ▷ quantitative relationship between **doses of carbon** and corresponding **climate reactions** and then the corresponding ***economic consequences***

Economic dose-response function is even more expansive:

- ▷ quantitative relationship between ***doses of economic activity*** on **doses of carbon** and corresponding **climate reactions** and then the corresponding **economic consequences**

# Nordhaus framework

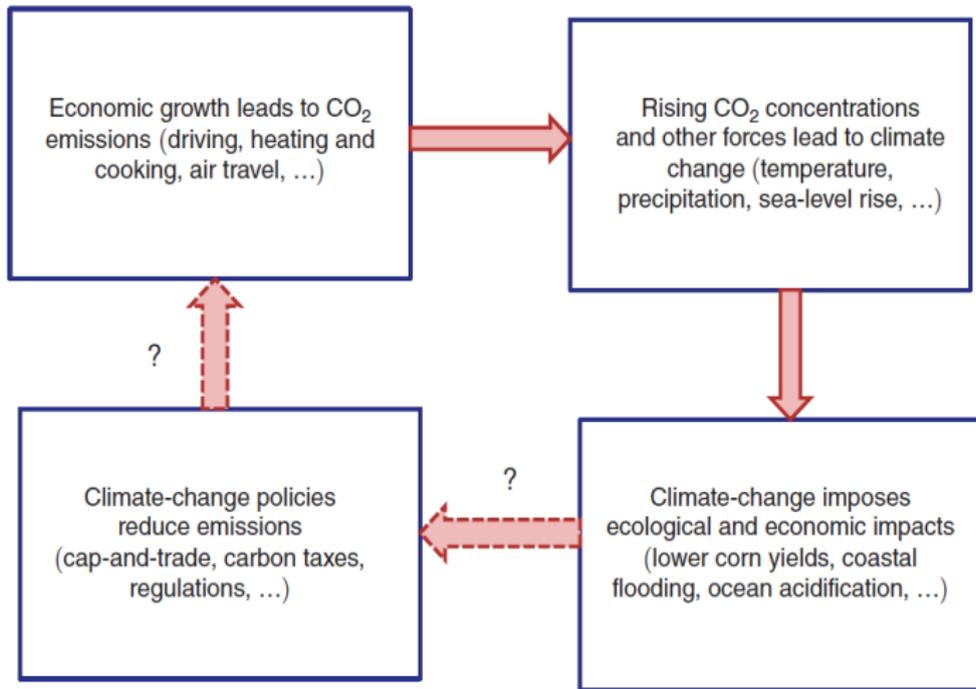
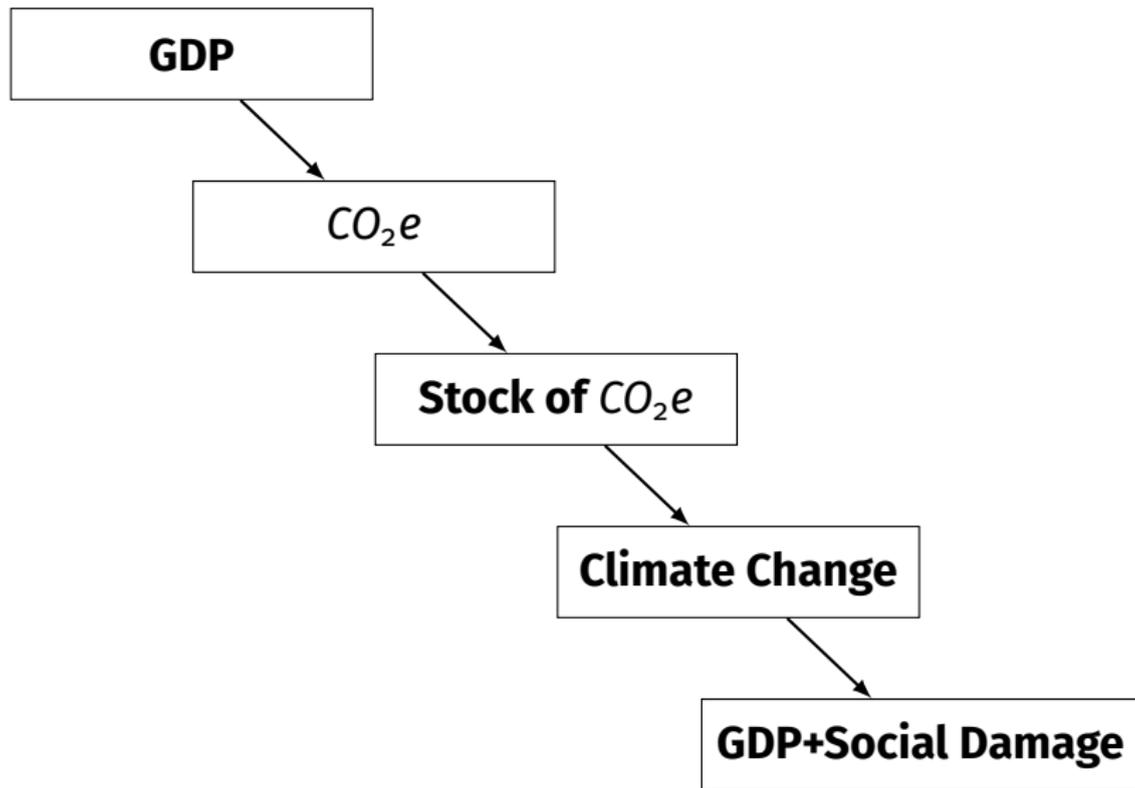
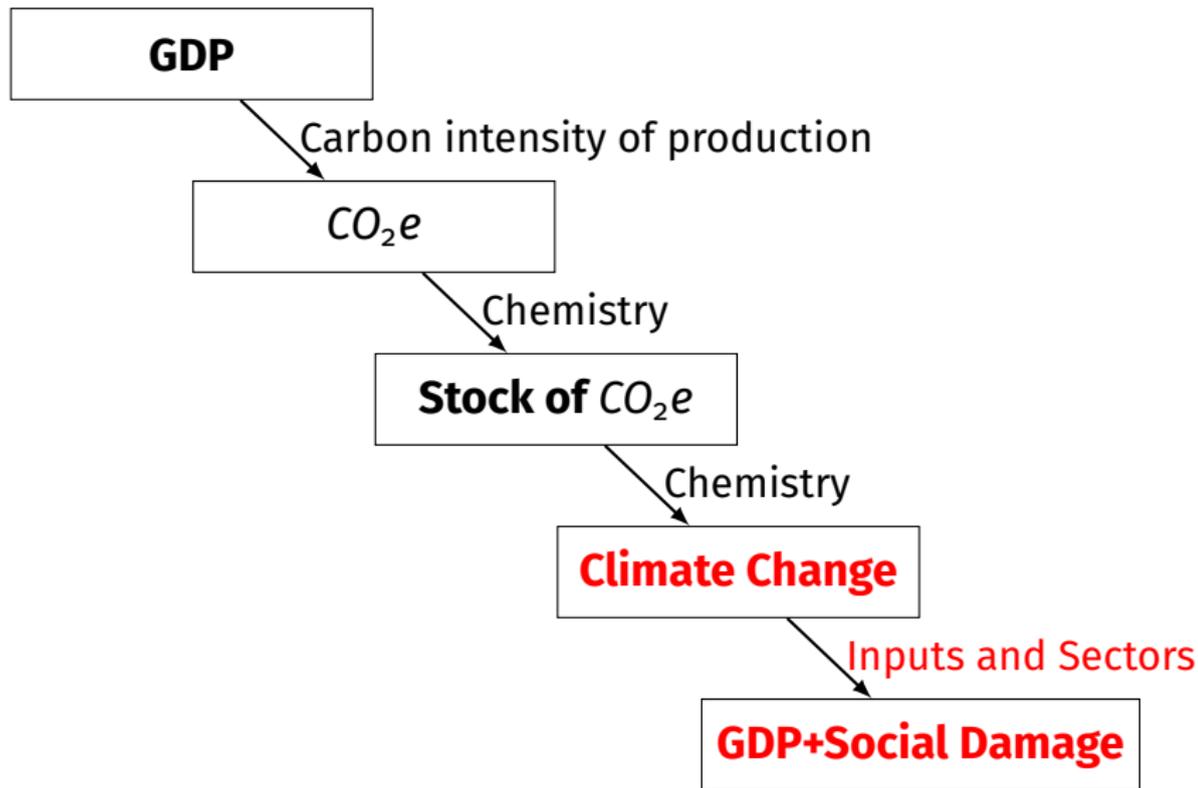


FIGURE 2. THE CIRCULAR FLOW OF GLOBAL WARMING SCIENCE, IMPACTS, AND POLICY

# Global economic dose-response function



# Global economic dose-response function



# **GDP+Social Damage**

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# Input and sectoral analysis

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For each input and economic sector, look at how climate change impacts production and consumption:

- ▷ Dose-response functions
- ▷ General analysis

## Dose-response assumptions for last two boxes

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Assume world receives a climate change dosage of:

- ▷ Temperature up a few degrees
- ▷ Some sea level rise a few feet
- ▷ More volatile weather (hurricanes)

What does this dosage mean in economic terms over next 30 years (up to 2050)?

Need to put money values on a lot of impacts ("**pricing**")

# Impacts on Economy

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# Many impacts

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- ▷ Labor productivity
- ▷ Infrastructure
- ▷ Energy use
- ▷ Agriculture
- ▷ Health
- ▷ Animals/habitats
- ▷ Human habitats/housing

## Model problems:

- ▷ Hard to put money values on some impacts
- ▷ Not sure how to add impacts across each sector
- ▷ Managed systems v. (imprecise) unmanaged systems
- ▷ Adaptation

## Evidence is incomplete: not all sectors analyzed:

1. Societal change / migration / refugees
2. Ecosystem changes (esp. ocean acidification)
3. Wildfires
4. Inland forest damage (pests)

# **Economic metrics**

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## Economic metrics

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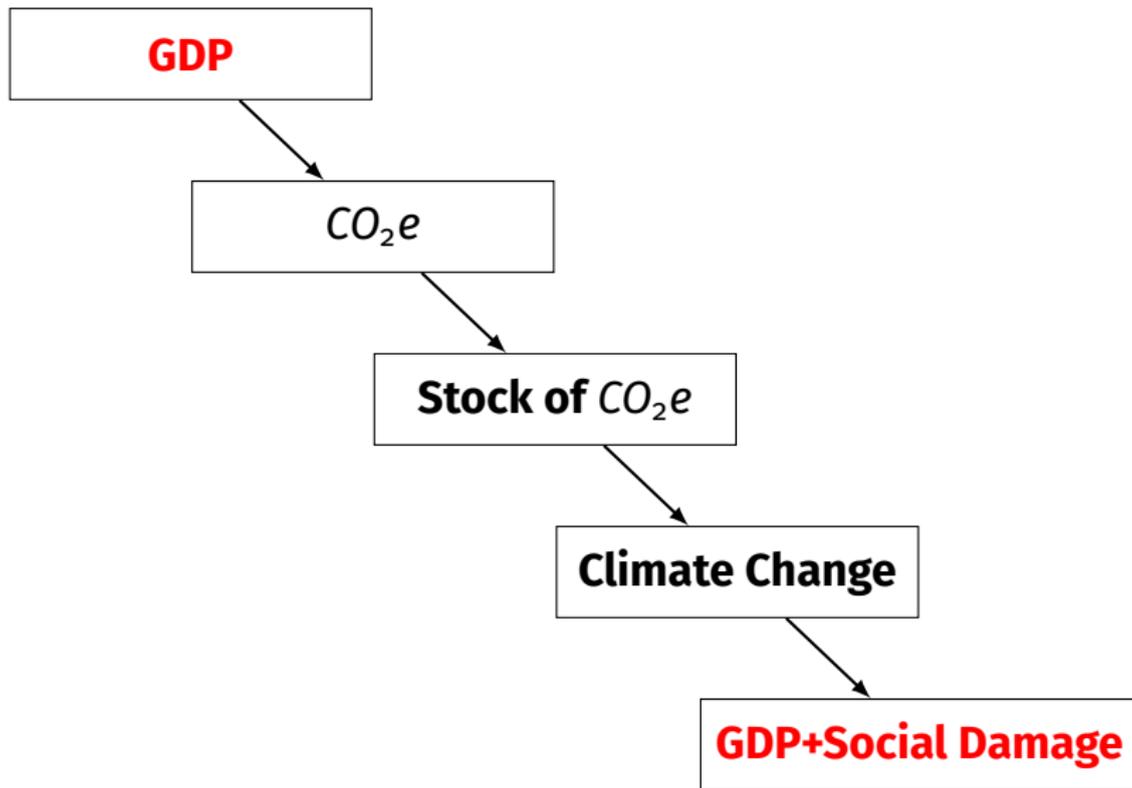
How to express entirety of climate change in economics?

1. Report GDP+Social Damage as % of GDP per year
2. Report GDP+Social Damage per ton of  $CO_2e$  emitted each year
3. Optimality conditions

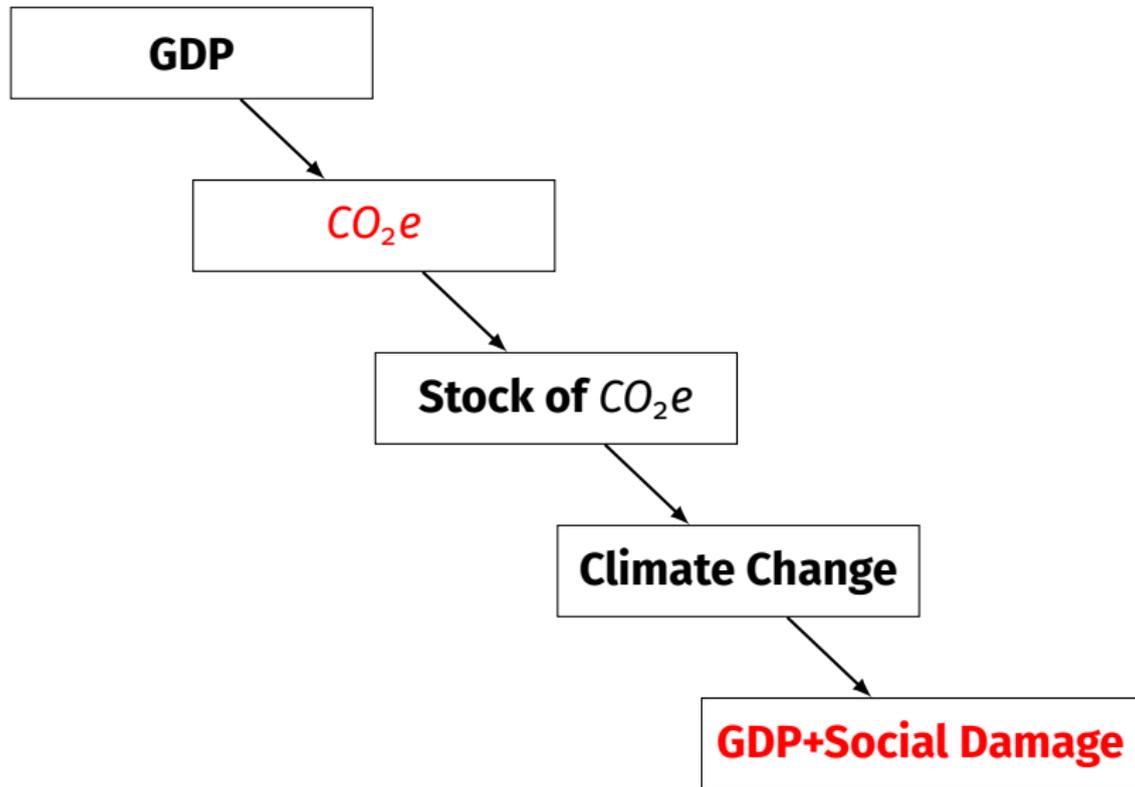
For all three metrics, need GDP+Social Damage estimate

Use global numbers even though there is significant regional variation

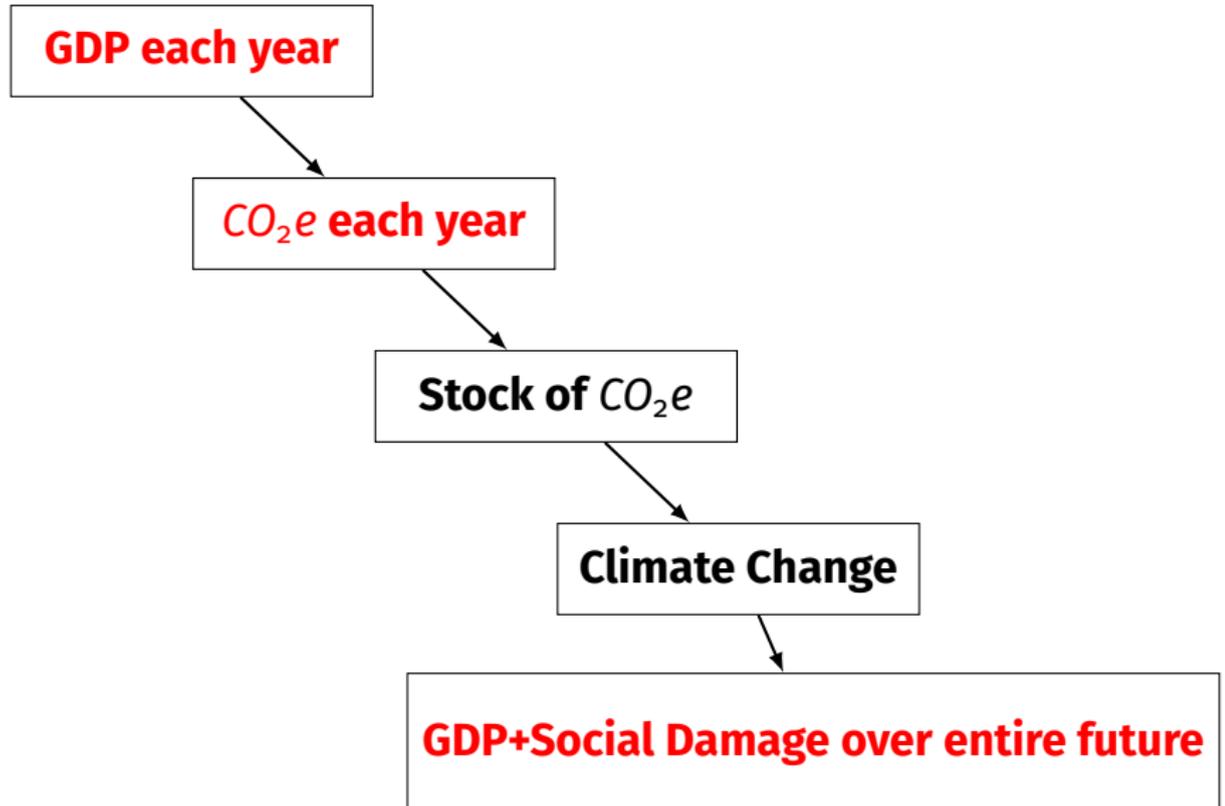
# Metric 1: Ratio of GDP+Social Damage over GDP



## Metric 2: Ratio of $CO_2e$ over GDP+Social Damage



# New Problem: Timing



Assume you put all your money in a bank that pays a 10% interest rate:

1. What will \$100 in the present be worth 1 year in the future?
2. What will \$100 in the present be worth 2 years in the future?

Assume you put all your money in a bank that pays a 10% interest rate:

1. What will \$100 in the present be worth 1 year in the future?
2. What will \$100 in the present be worth 2 years in the future?
3. If someone promises you \$110 1 year from now, what is that worth to you in the present?
4. If someone promises you \$121 2 years from now, what is that worth to you in the present?