

# Lecture 09

## Discounting and Cost Benefit Analysis

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AEM 4510

# Roadmap

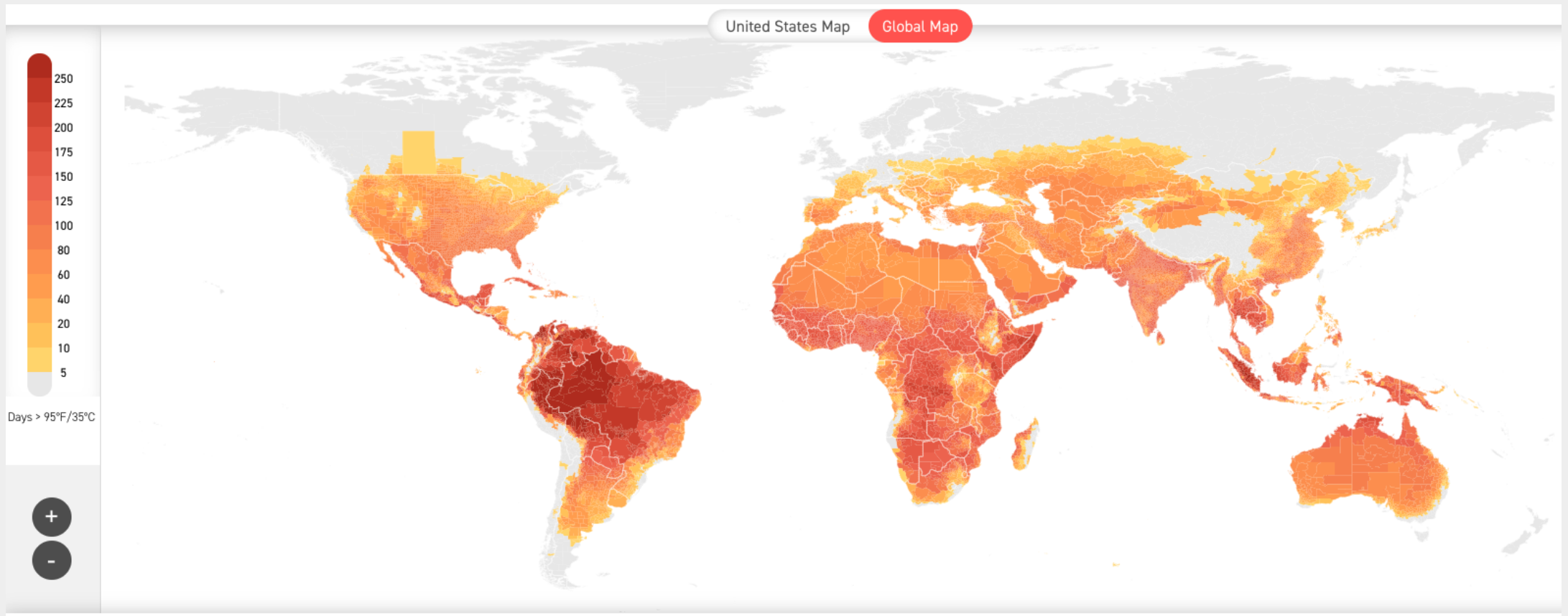
1. What is discounting?
2. What determines the discount rate?
3. What are the implications of discounting on computing the costs and benefits of policies?

# Discounting

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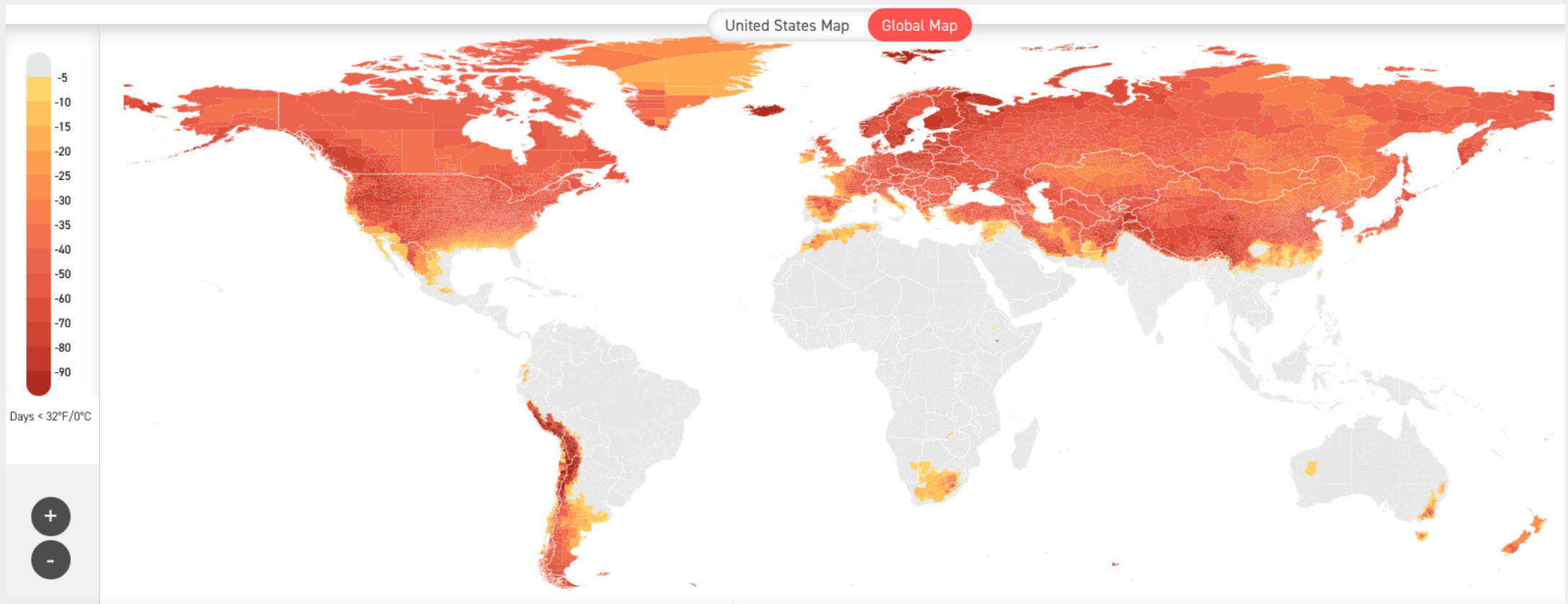
# Motivating discounting: <http://impactlab.org/map>

At the end of the century we will have much more hot days in some places



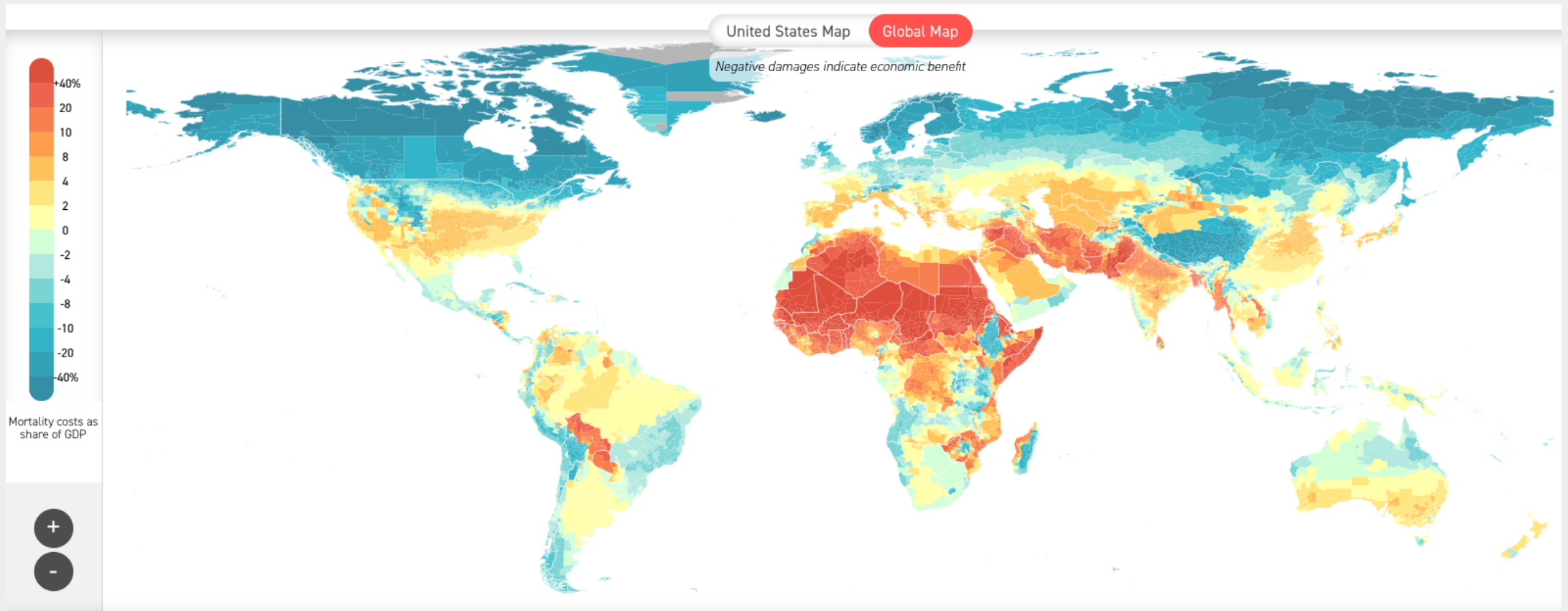
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At the end of the century we will have much fewer freezing days in others



# Motivating discounting: <http://impactlab.org/map>

This has massive implications for mortality



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We use a **discount rate**: a value that tells us how much future dollars are worth in today's terms

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$$\min_{a_1} E[TC] = \underbrace{\frac{1}{2}a_1^2}_{\text{current cost}} + \beta \left[ (1-p) \times \underbrace{0}_{\text{good state cost}} + p \times \underbrace{\frac{1}{2}(1-a_1)^2}_{\text{bad state cost}} \right]$$

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How does discounting affect our decisionmaking?

# Discounting and decisionmaking

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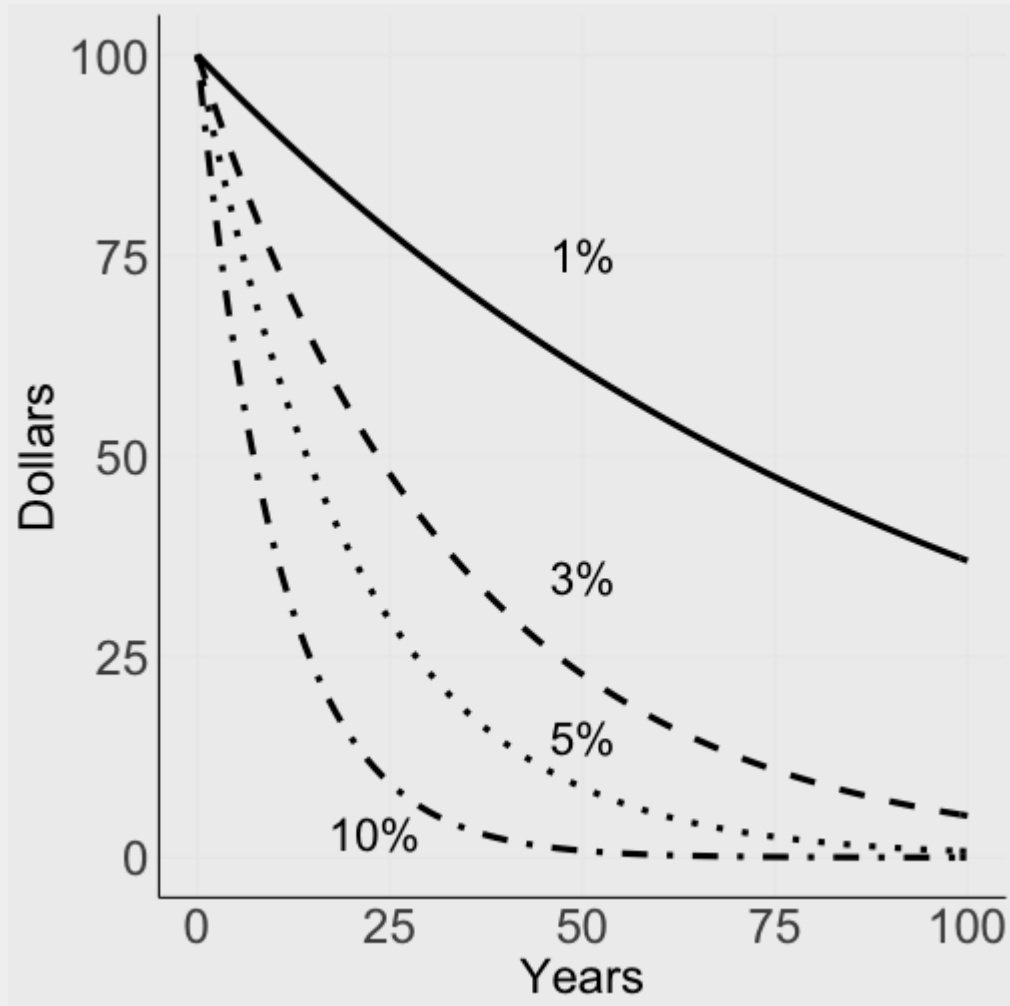
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What is the value of a future payment of \$100?

# PV of \$100



Higher discount rates place less value on future benefits

Things > 30 years in the future have basically no value with a 10% discount rate

At a 1% discount rate we value things 100 years in the future at almost half their value today



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Depending on our choice of discount rate these costs and benefits can be substantial or trivial

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This makes the choice of the discount rate one of the most important (and contentious) things about climate change policy



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Why might this not be the rate we want to choose as a regulator?

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Super-responsibility of government: the government represents future generations as well as current generations (only current ones are represented in the market)

Dual-role of individuals: in political roles, people are more concerned about future generations than in their day-to-day behavior which determines the market rate

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And growth: if someone is richer in 10 years, a dollar is worth more to them today than in 10 years in utility terms

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$g$  is the **growth rate**: how fast does consumption grow over time?

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$g$ : how rich will we / future generations be compared to today?

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Two common approaches: descriptive and prescriptive

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The descriptive approach generally chooses  $\delta$  so  $r$  matches market rates

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That gives us  $r$

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The above arguments are ethical arguments, so are typically used by those favoring the prescriptive approach

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Quick example:  $\delta = 2\%$ ,  $\eta = 2$ ,  $g = 2\% \rightarrow r = 6\%$

# What's the discount rate? Prescriptive

The prescriptive approach often results in  $\delta$  being zero or nearly zero for the ethical reasons described above

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- $\eta$  is large: if there is negative growth, we are **more** likely to invest in the future (future generations will be poorer than today)

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**time** yields a smaller  $\delta$  and  $r$

**intergenerational inequality** yields a larger  $\theta$  and larger  $r$  if growth is positive

# What do the experts think? Weitzman (2001)

