

Space-Time Discounting For Climate Change Policy

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Definitions of Discounting

Discounting is:

“any reason for caring less (or more) about a future consequence” - Shane Frederick

“any process of revaluing a future event, condition, service or product to give a present equivalent” - Colin Price

The discount rate is:

“a pure number per unit time that allows us to convert values in the future into values today” - William Nordhaus

“the rate at which additional benefits in period $t + 1$ are converted into equivalent amounts of benefits in period t ”
- Amartya Sen

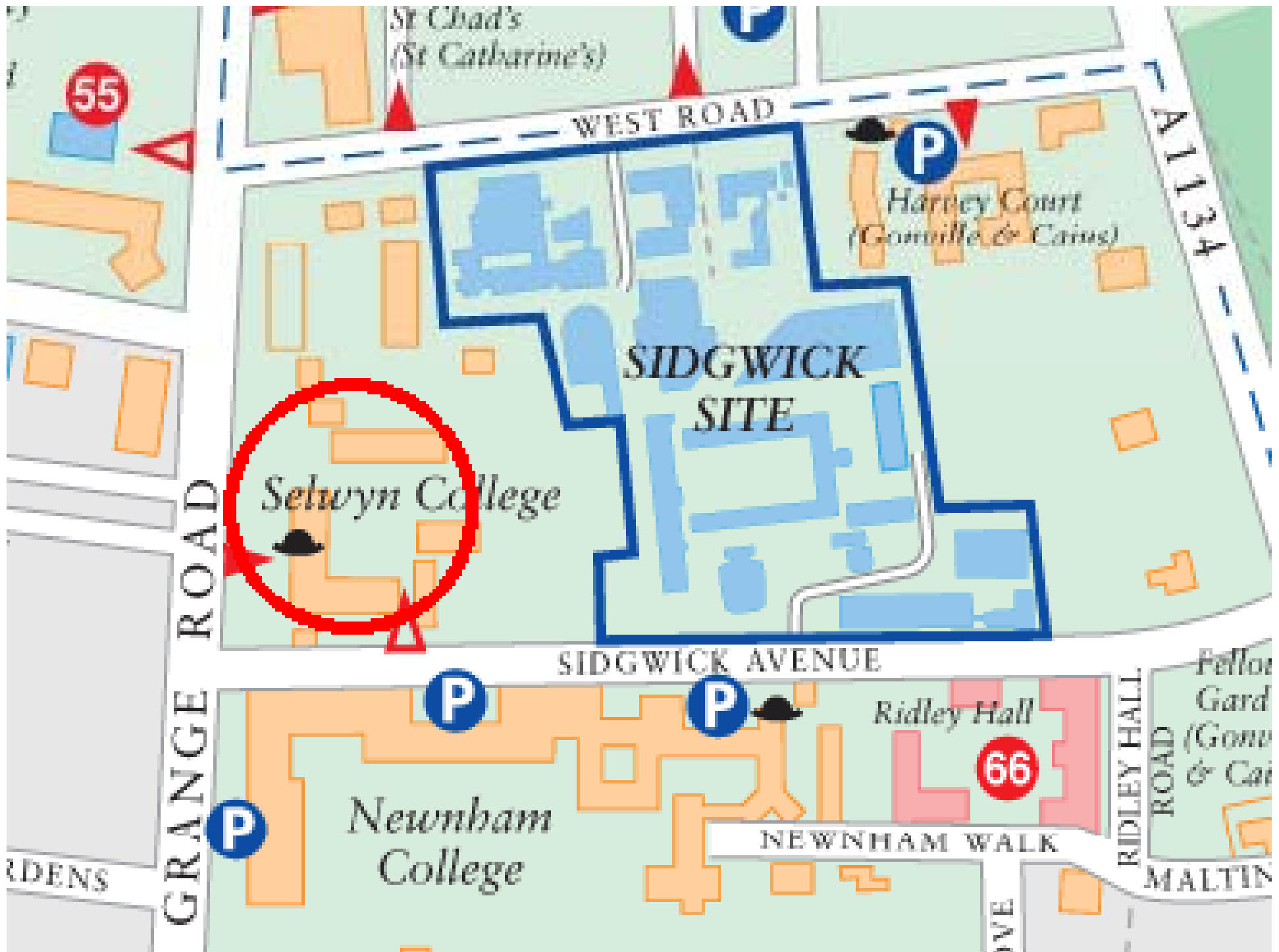
“the rate at which the marginal social value of the numéraire is falling over time” - Jean Drèze and Nicholas Stern

Origins Of Discounting

“...unto a foreigner thou mayest lend upon usury; but unto thy brother thou shalt not lend upon usury.”

- Deuteronomy XXIII:19-20

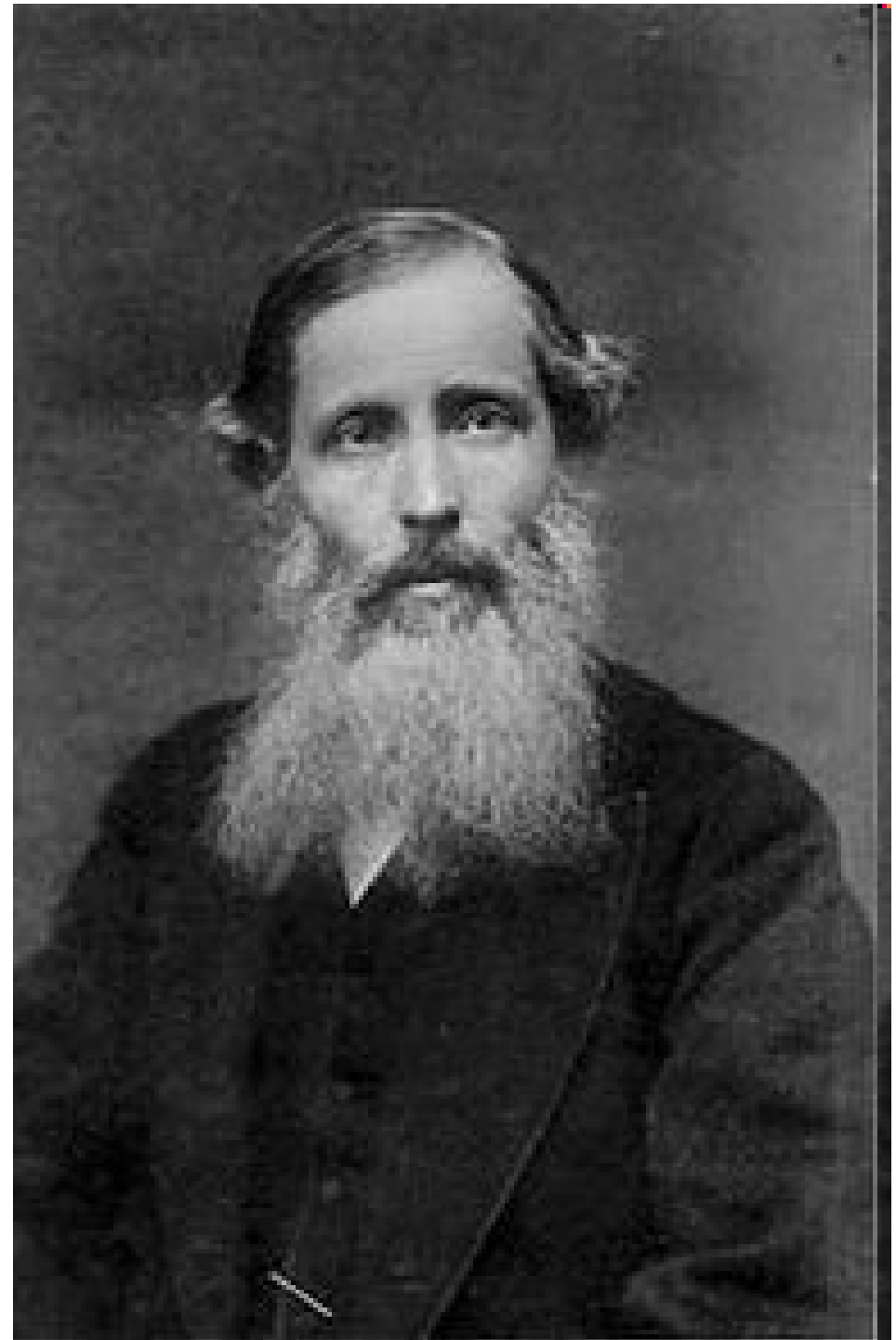
Houkes, John M., 2004. *An Annotated Bibliography on the History of Usury and Interest from the Earliest Times Through the Eighteenth Century*. Lewiston, NY: Edwin Mellen Press, p.18



Henry Sidgwick (1838-1900)

HS's Utilitarianism:

Maximize the total of
pleasure – pain



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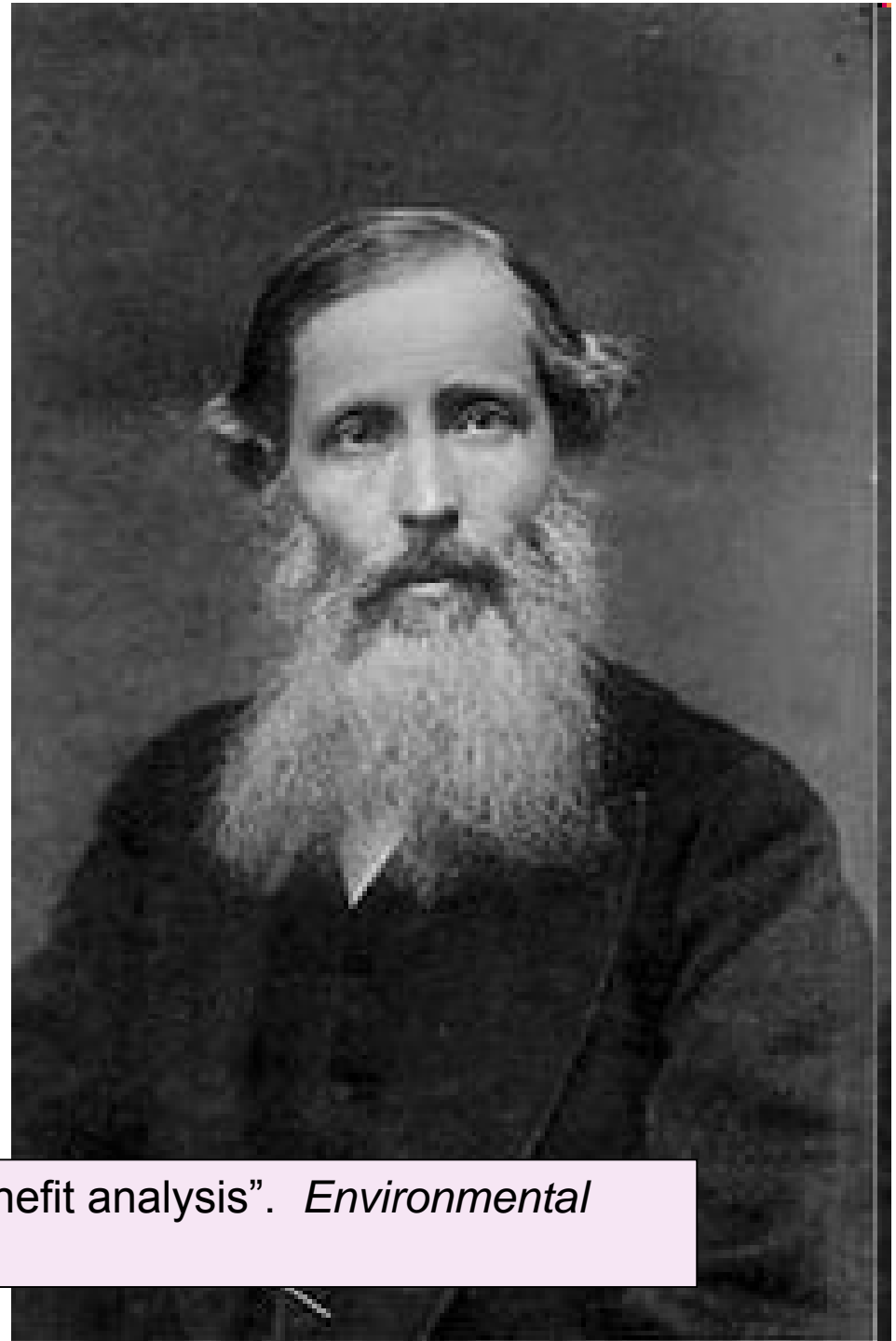
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Later:

- Preference satisfaction
- Measure preference in
monetary units
→ Cost-benefit analysis

Baum, Seth D. "Value typology in cost-benefit analysis". *Environmental Values*, under review.



Reasons For Time Discounting

Consumption inequality

Welfare favoritism

Reasons For Time Discounting

Spatial Components

Consumption inequality

e.g., lower income countries

Welfare favoritism

e.g., nationalism

Reasons For Time Discounting

Market Reasons

Inflation

Investment opportunity

Welfare Reasons

Consumption inequality

Heterogeneous utility fns.

Welfare favoritism

Psychological Reasons

Event proximity

Willpower

Philosophical Reasons

Excessive sacrifice

Infinite values

Uncertainty

Reasons For Time Discounting

[Spatial Components]

Market Reasons

Inflation [purchasing power]

Investment opportunity [arbitrage]

Psychological Reasons

Event proximity [real estate]

Willpower [charity]

Welfare Reasons

Consumption inequality [LIC's]

Heterogeneous utility fns. [culture]

Welfare favoritism [nationalism]

Philosophical Reasons

Excessive sacrifice [charity]

Infinite values [beyond Earth]

Uncertainty ['bird in hand']

Baum, Seth D. "Space-time discounting without ethical anthropocentrism".
Ecological Economics, under review.

Psychology:

How do people discount
across space and time?

Reasons For Time Discounting

[Spatial Components/Analogues]

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Inflation [purchasing power]

Investment opportunity [arbitrage]

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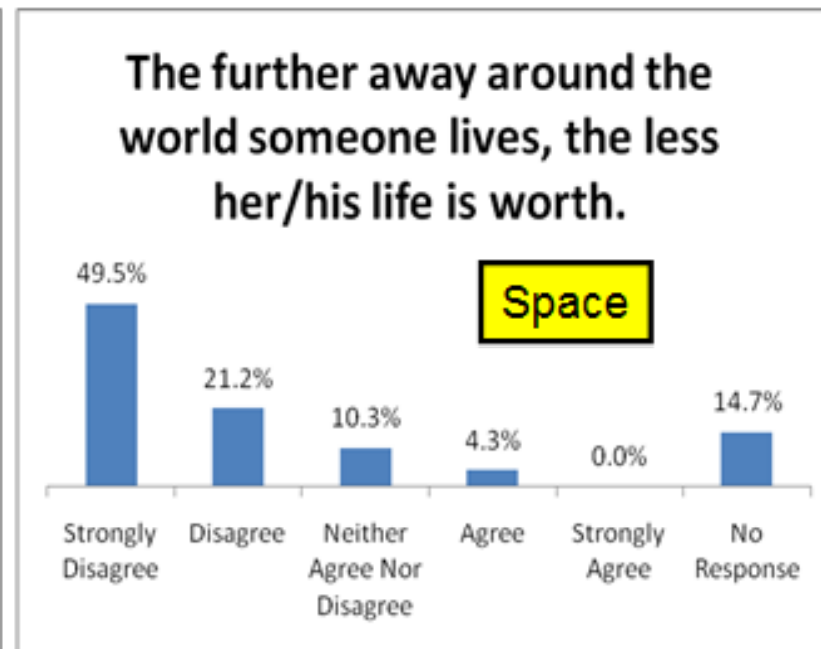
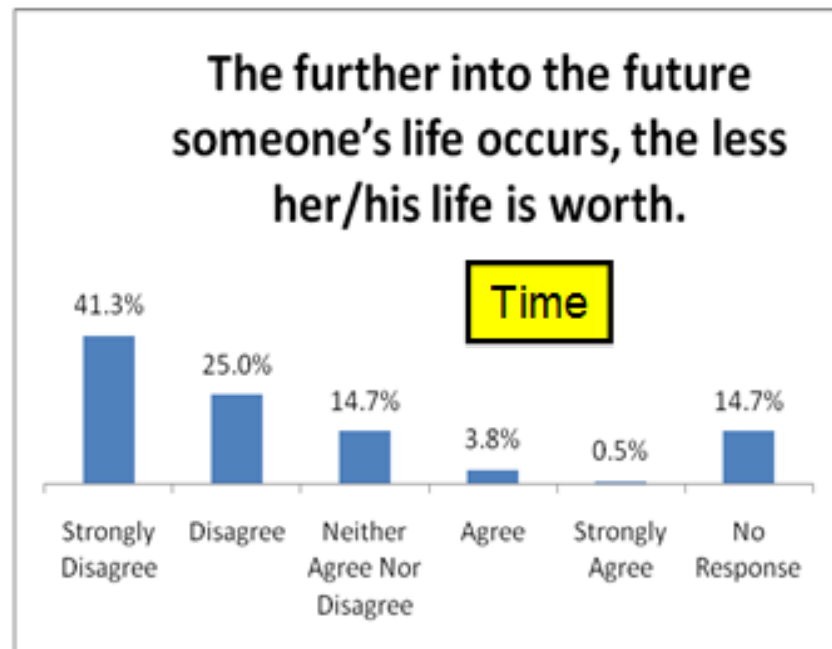
Welfare favoritism [nationalism]

Philosophical Reasons

Excessive sacrifice [charity]

Infinite values [beyond Earth]

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→ People discount similarly across space and time.

Note: N=184, primarily Penn State undergrads

Baum, Seth D. and Peter D. Howe. "Multidimensional descriptive discounting and limitations thereof". *Journal of Economic Psychology*, in preparation.

Climate Change:

What does
space-time discounting
mean for policy?

Reasons For Time Discounting

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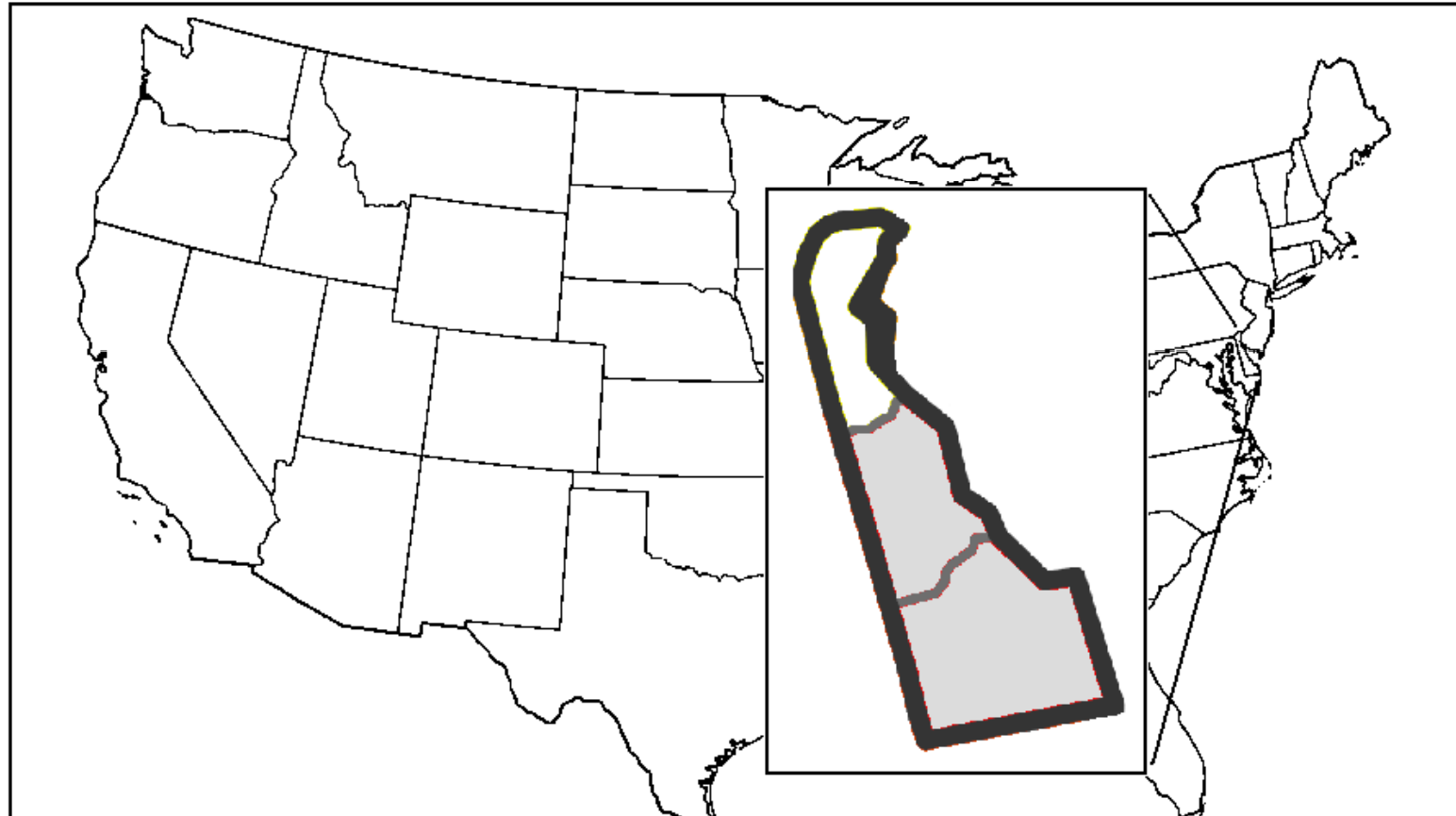
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Adaptation Policy:

Agriculture Indemnity Payouts in Delaware in 2007-2008



Baum, Seth D. and William E. Easterling. "Space-time discounting in climate change adaptation". *Mitigation and Adaptation Strategies for Global Change*, forthcoming, DOI: 10.1007/s11027-010-9239-9.

Agriculture Indemnity Payouts in Delaware in 2007-2008

$$\Delta u(r, t) = \ln(c(r, t) + \Delta c(r, t) + 1) - \ln(c(r, t) + 1)$$

Δu = utility increase due to indemnity payout

r, t = space, time coordinates

c = baseline consumption (household income)

Δc = consumption increase (indemnity payout)

Agriculture Indemnity Payouts in Delaware in 2007-2008

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Average Indemnity Per Household			
	2007	2008	Average
Kent	\$117.63	\$106.56	\$112.10
New Castle	\$2.33	\$11.80	\$7.07
Sussex	\$82.09	\$49.02	\$65.55
Average	\$67.35	\$55.79	\$61.57

Median Income Per Household			
	2007	2008	Average
Kent	\$47,407	\$55,179	\$51,293
New Castle	\$59,871	\$63,301	\$61,586
Sussex	\$50,132	\$47,727	\$48,930
Average	\$52,470	\$55,402	\$53,936

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Disaggregation Scheme	Utility Increase
None	891.71
Time Only	894.04
Space Only	630.19
Time & Space	629.27

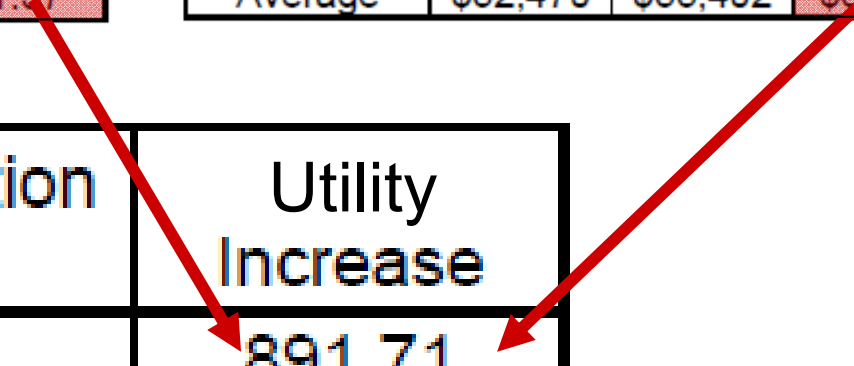
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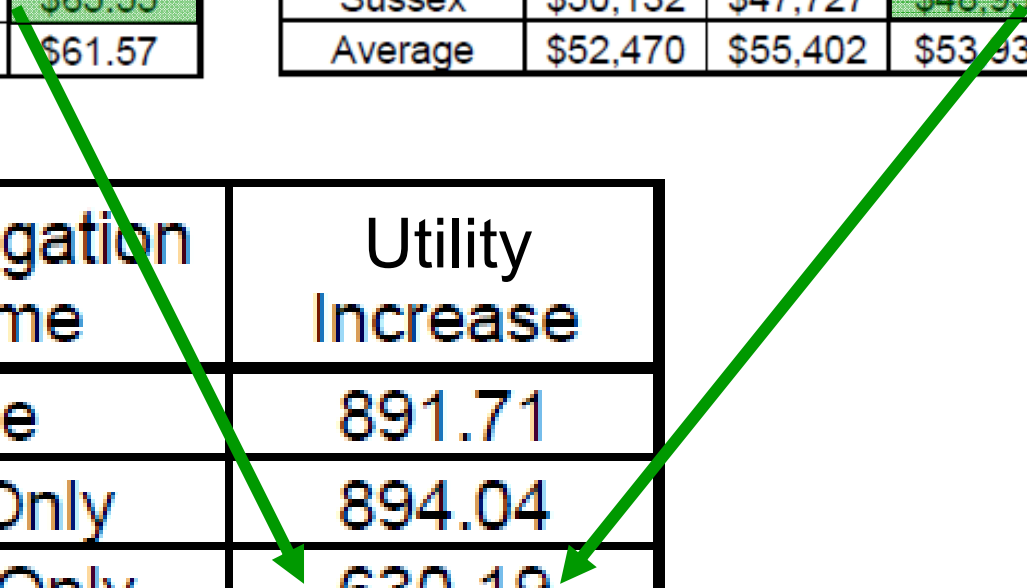
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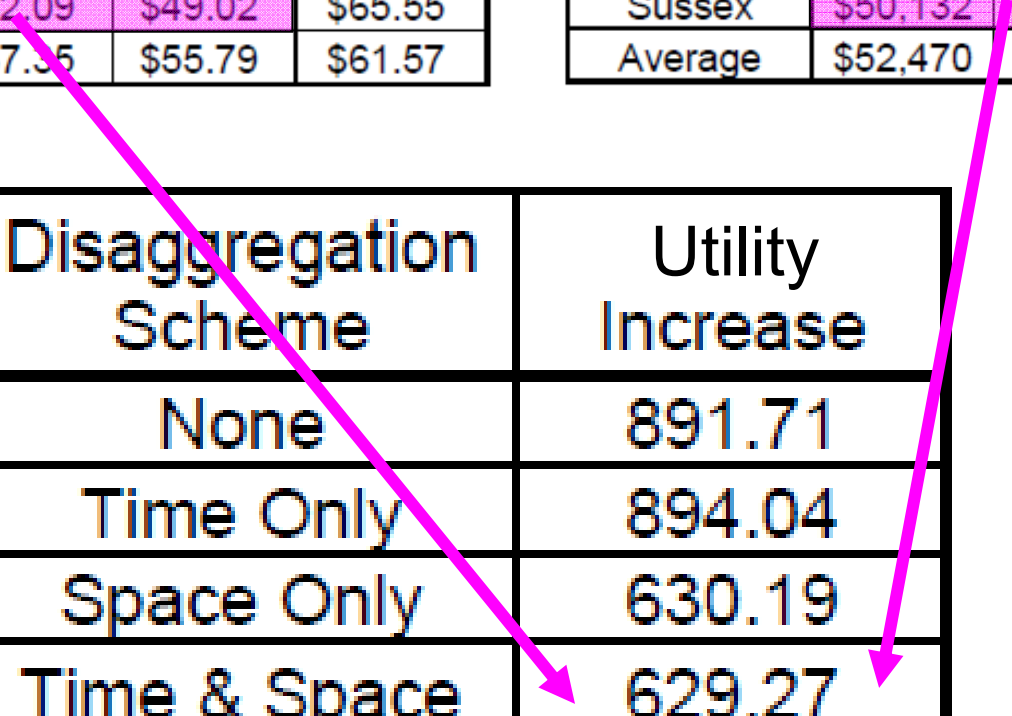
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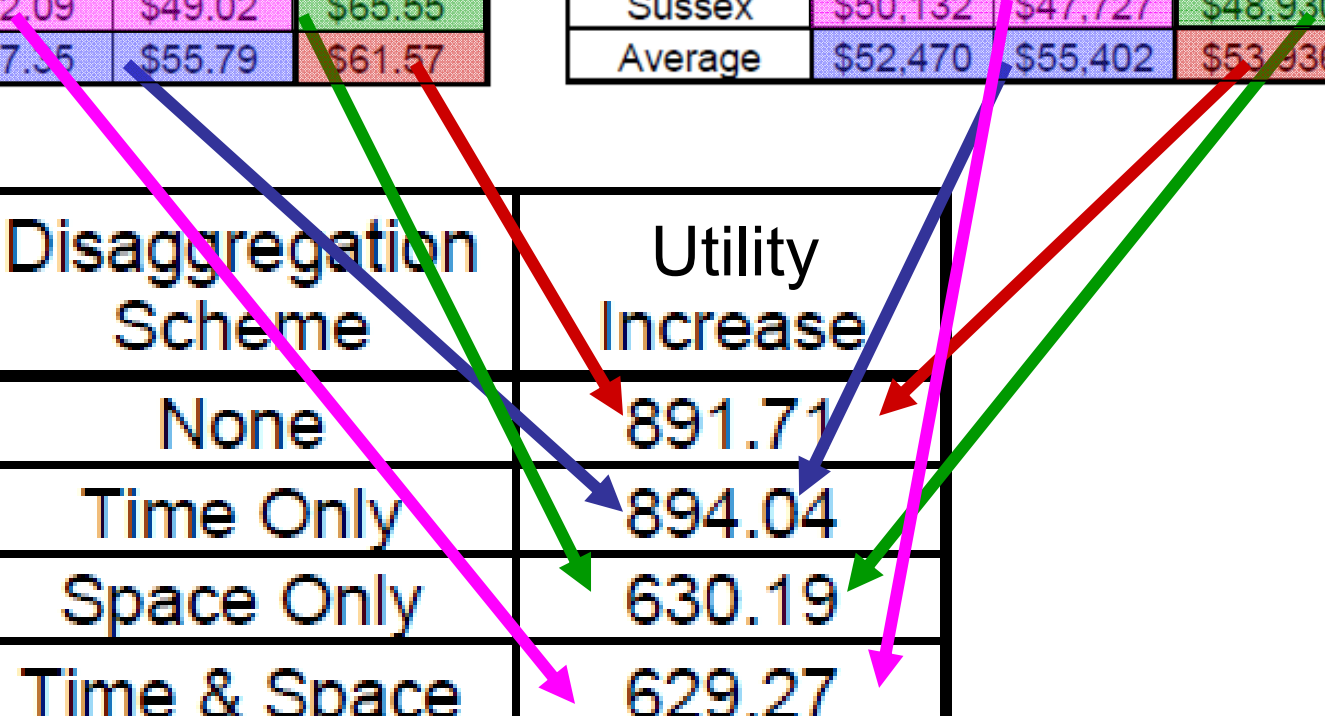
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- Spatial discounting helps us make more accurate policy analyses
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For follow-up questions:

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