



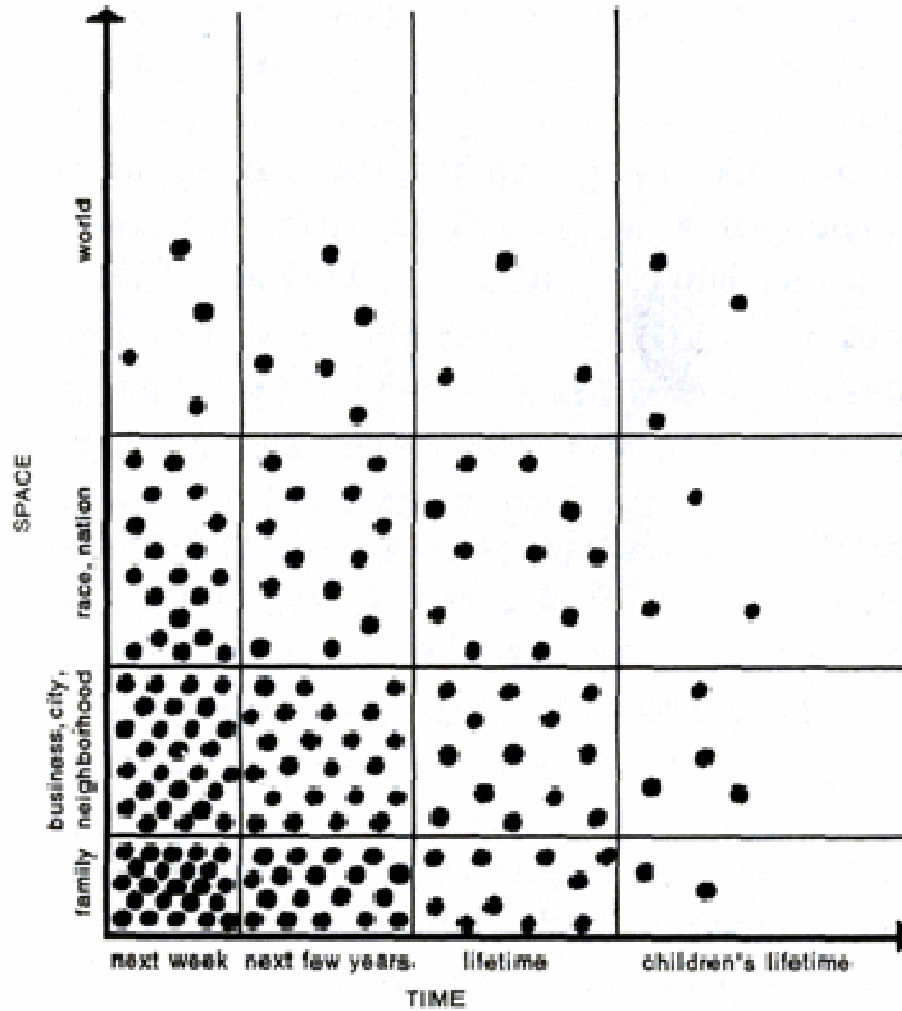
Discounting and Ethics in Integrated Assessment Modeling

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Balaton
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What is policy for?

We hold these truths to be self-evident, that all men are created equal...

Figure 1 HUMAN PERSPECTIVES



Meadows et al., Limits to Growth, 1973

Disclaimer

Economics is not monolithic, and not generally the enemy.

Ethical Assumptions in (Most) Models

- **Anthropocentrism**
- **Discounting & Utility**
 - Time
 - Space
 - Wealth
- **Preferences**
 - Risk neutrality
 - Flow consumption (vs. durable stocks, human capital, ...)
 - Market goods orientation
 - Stability
- **Rationality**
- **Institutional & individual behavior with respect to property rights**

Why Discount?

- **To do cost-benefit analysis**
- **Prescriptive**
 - Condense complex time paths to a single metric with ordered preferences
 - Use metric to compare policies and choose an “optimal” one
- **Descriptive**
 - Represent decisions the way agents do or should make them

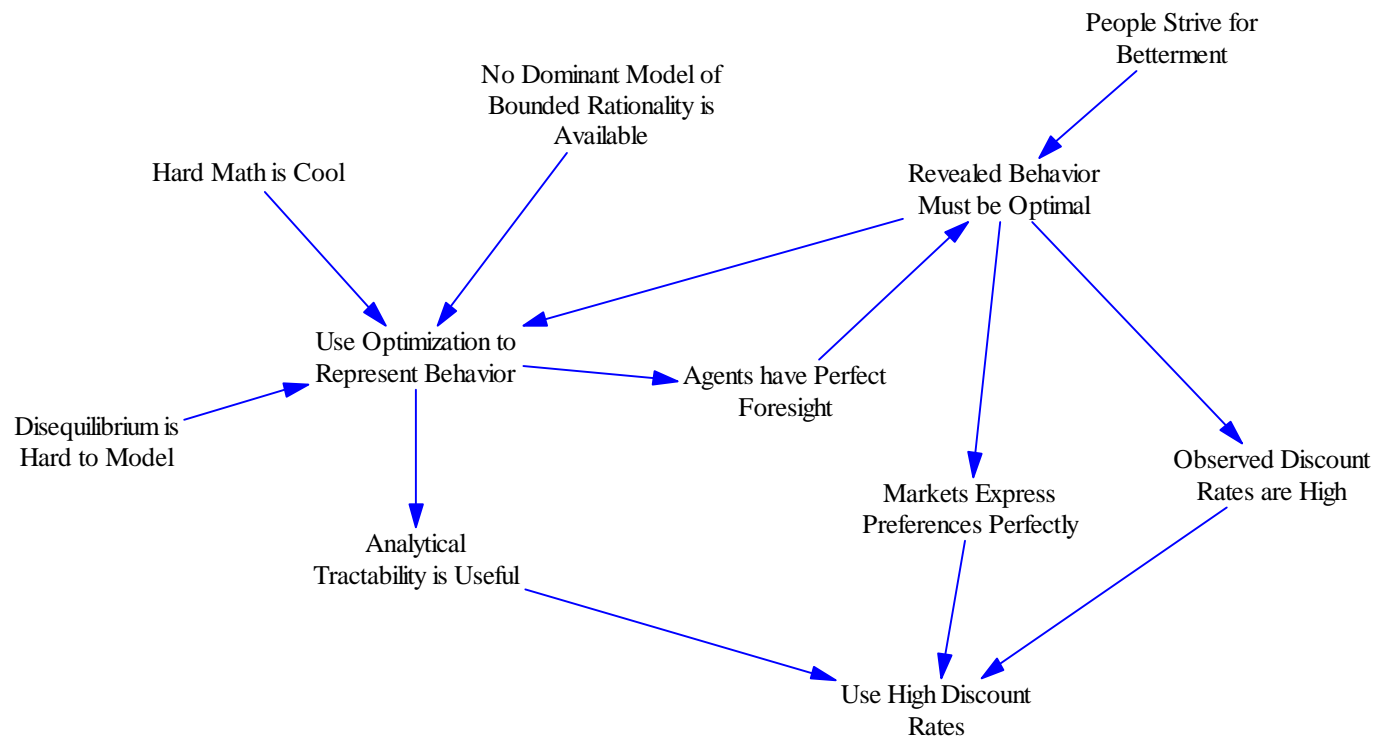
Discounted Utility Inherits Cost-Benefit Issues

- Costs and benefits are treated as substitutes, though in fact they fall upon different groups. In practice winners seldom compensate losers.
- Built capital and natural capital are regarded as interchangeable. Future generations may find goods a poor substitute for nature.
- Prices are imperfect reflections of the underlying preferences of humanity; they include errors, biases, and inequities.
- Values assigned reflect stable preferences, but preferences are not laws of the universe, are not universally known to individuals, and evolve over time as a social phenomenon.
- Uncertainties in model structure, particularly concerning extreme and irreversible events like extinction, are seldom sufficiently explored.
- Analyses take a risk-neutral stance. Risks to planet Earth cannot in fact be diversified away by spreading investments across multiple planets.
- Models sometimes identify as attractive tradeoffs that appear bizarre to a human reviewer; in many cases it would be better to view actual time trajectories.
- These subtleties seldom reach the policy arena.

Economic Perspectives

- **Classical discounted utility**
- **Declining discount rates**
- **Intergenerational games**
- **Property rights – overlapping generations**

The Neoclassical Rationale

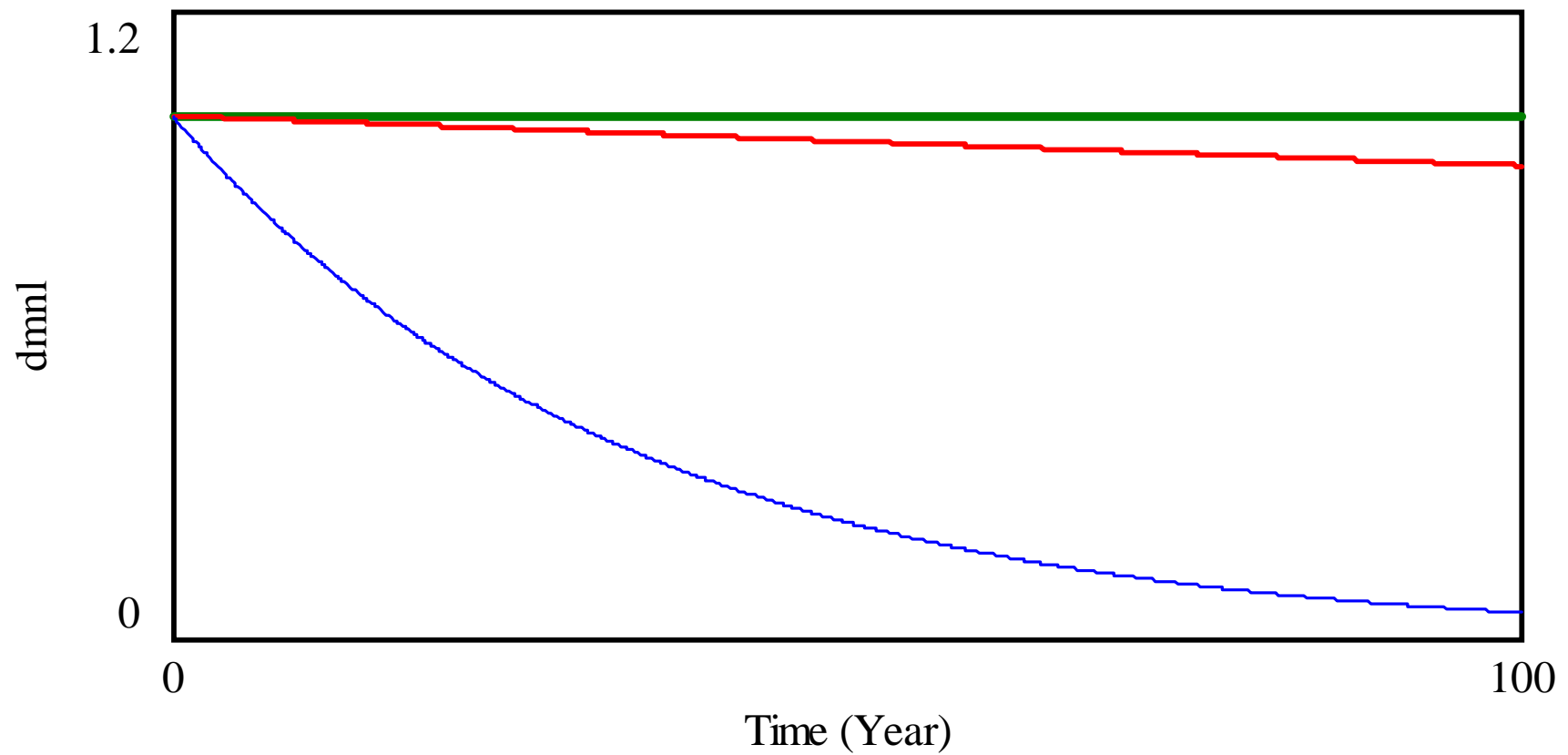


Discounted Utility

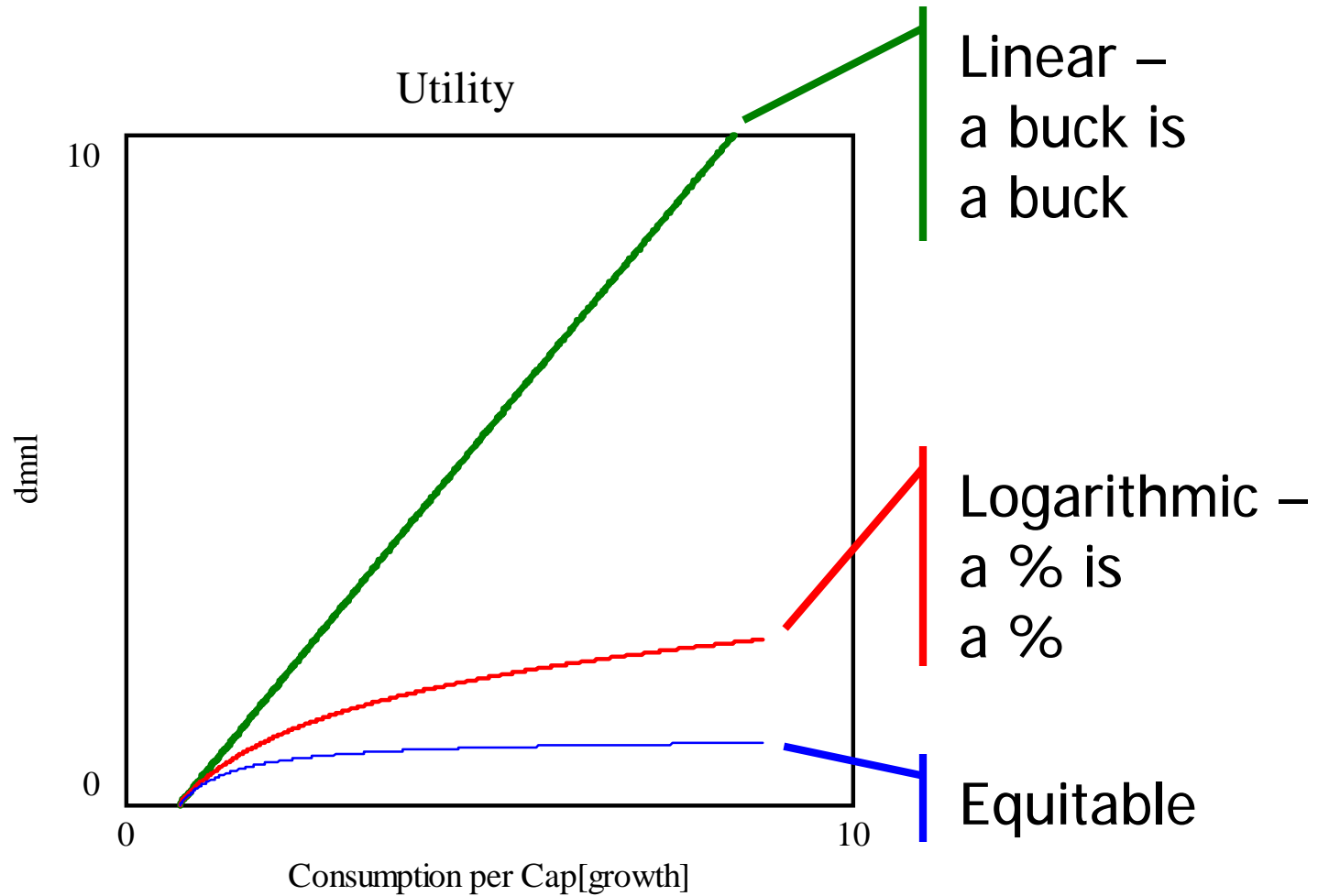
- **Utility**
 - Welfare = Population*F(Consumption/Population)
 - Considers only flows, ignoring services from long lived capital stocks like housing
 - Neglects environmental services and other off-market and intangible phenomena
 - Indifferent to time ordering of welfare – a feast-or-famine cycle scores as well as stable welfare, as long as there's enough feast
- **Origins of the discount**
 - Pure time preference
 - Inequality aversion
- **Basis for parameterization**
 - Empirical
 - Observed market rates
 - Experiments
 - Long run technical progress
 - Ethical

Pure Time Preference

Time Preference



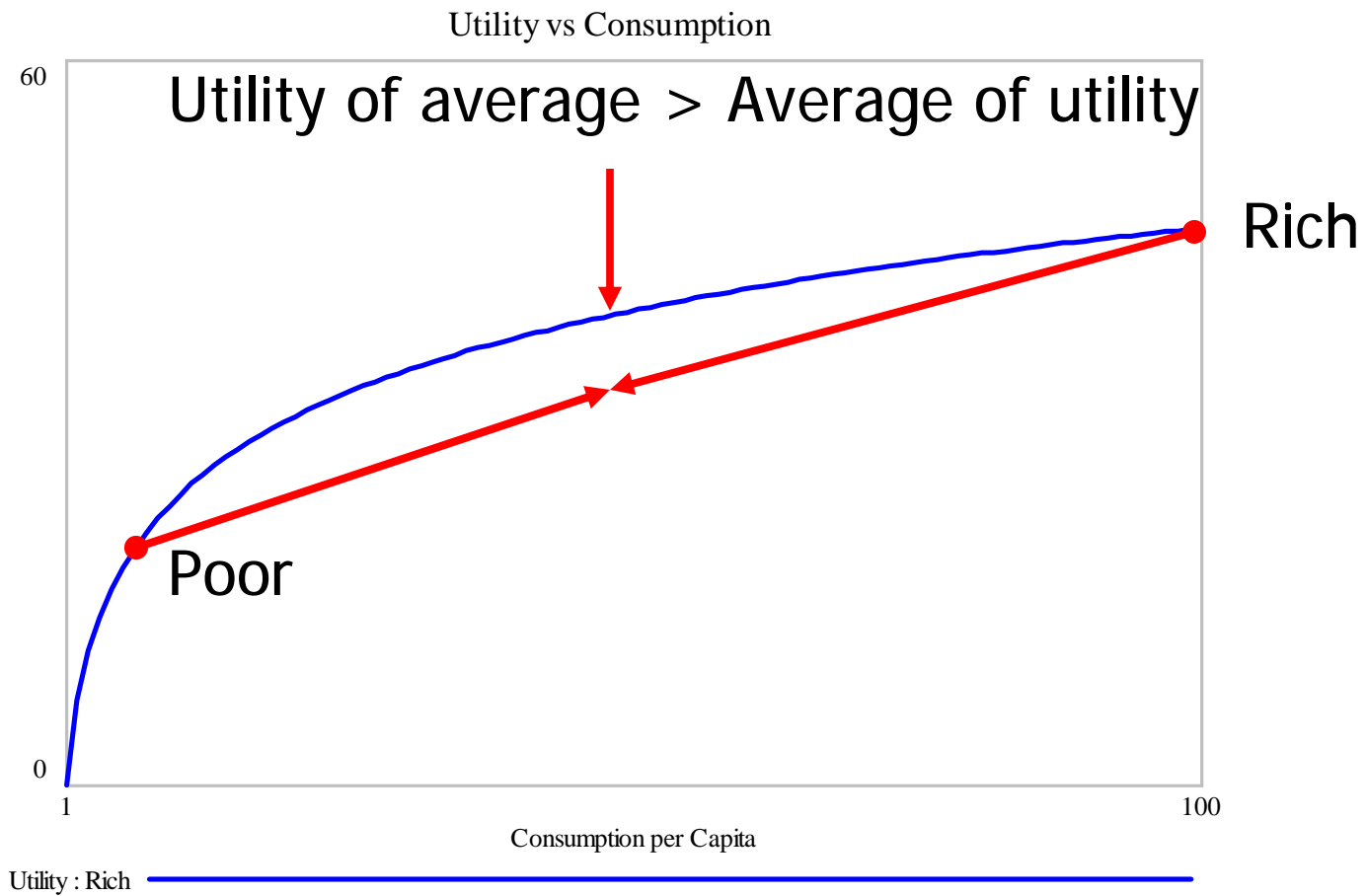
Utility Functions & Inequality Aversion



Regional Dimension

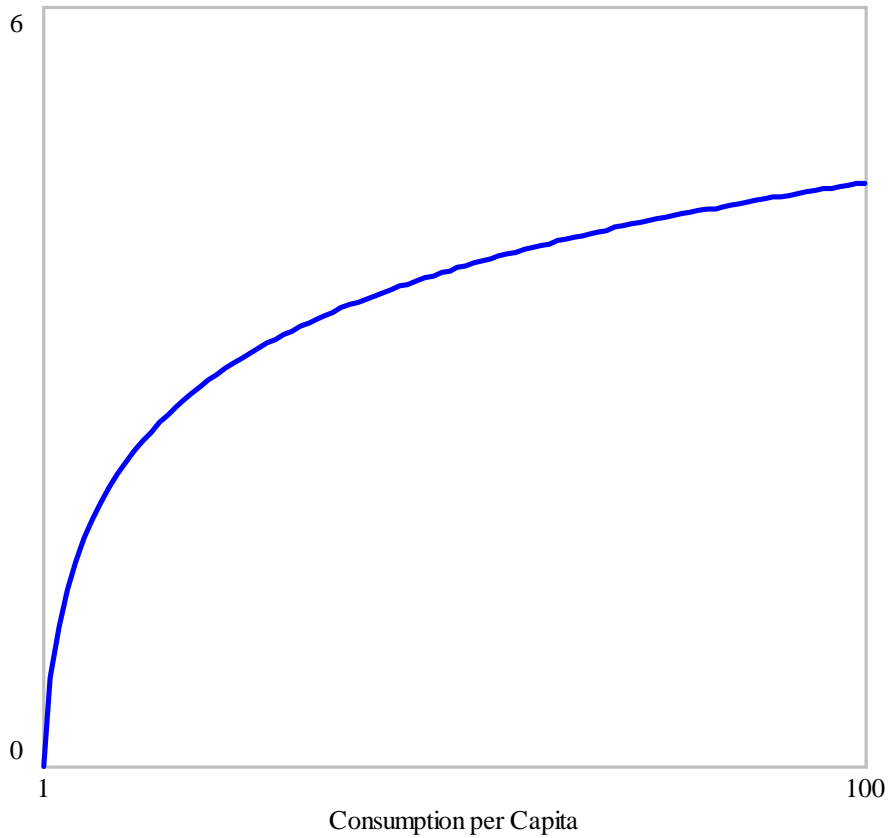
- **Problem:** in a regional optimization model, egalitarian welfare functions make it optimal to redistribute wealth
- **Solution:** Negishi weights – equalize the marginal utility across regions
- **Implicit Assumption:**
 - Descriptive use: life is unfair
 - Prescriptive use: the rich deserve it
- **Surviving question:** what balance of material and environmental investments best serves the poor?

Rationale for Redistribution

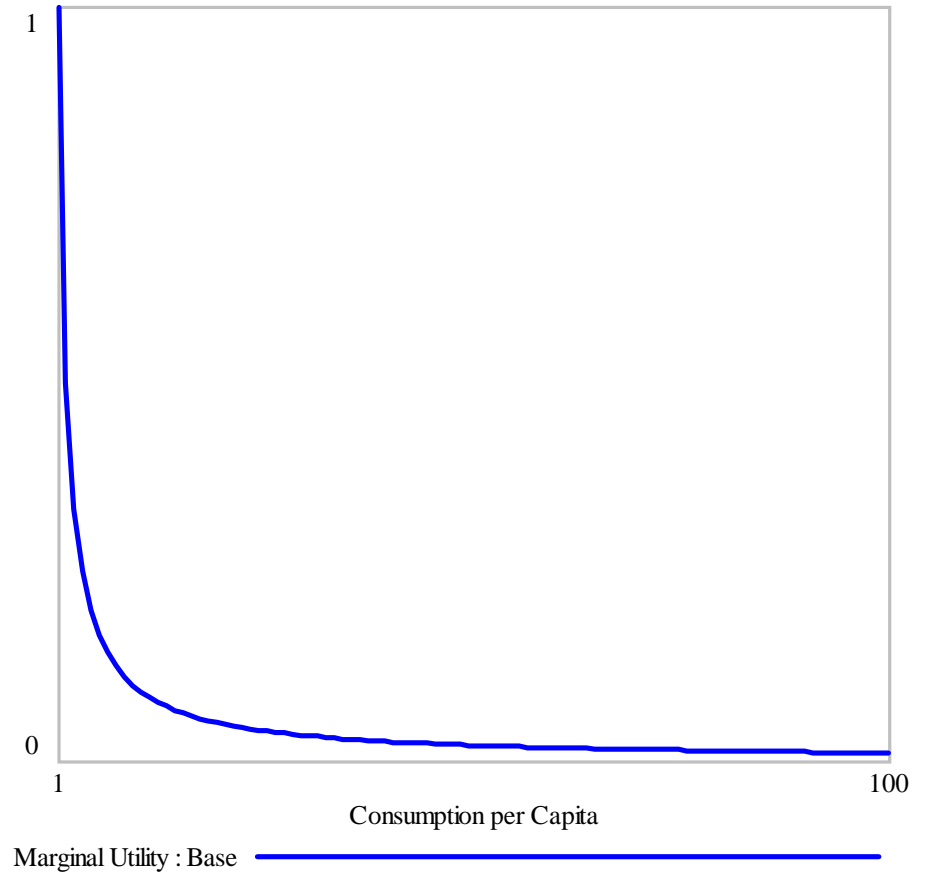


Marginal Utility

Utility vs Consumption

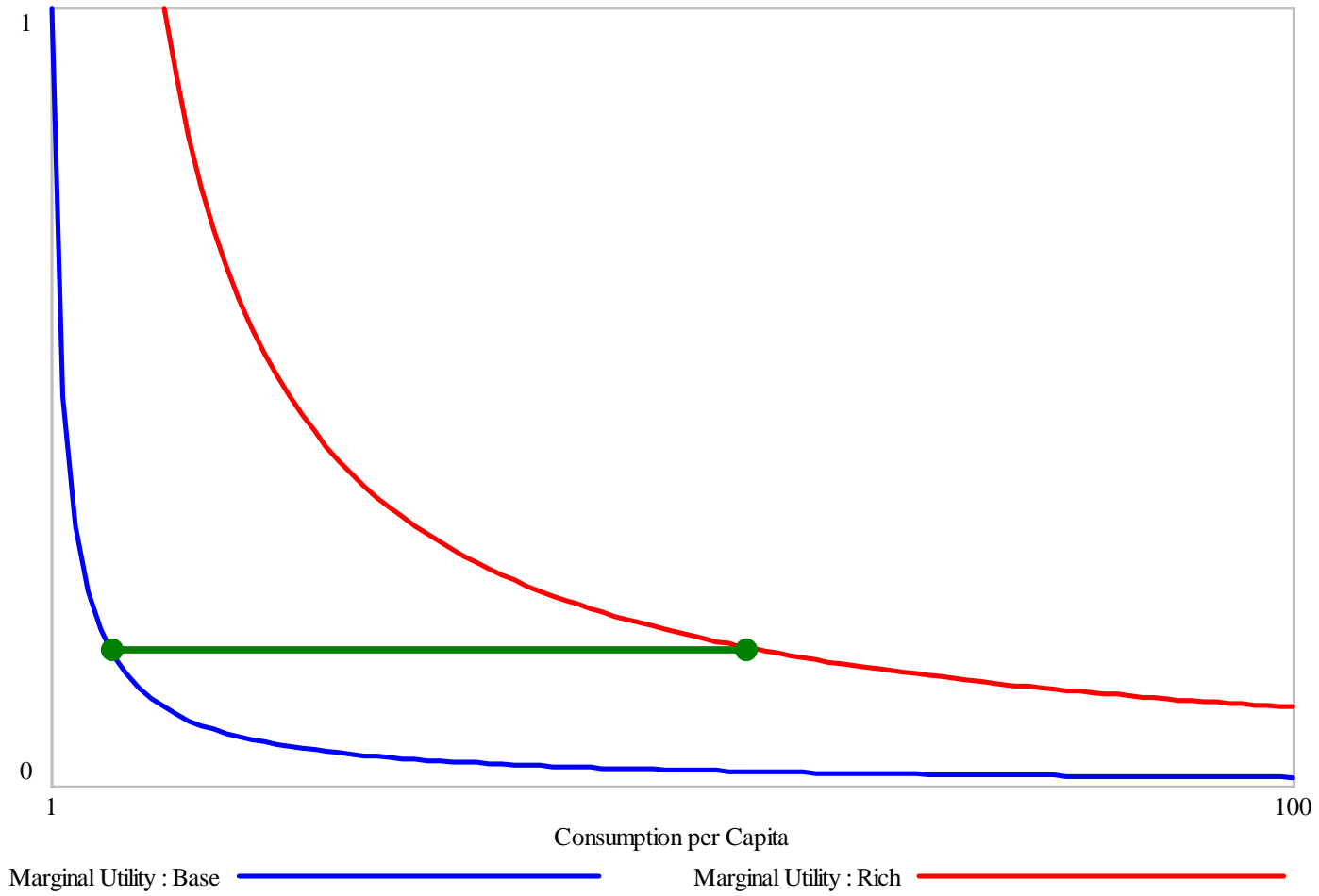


Marginal Utility vs Consumption

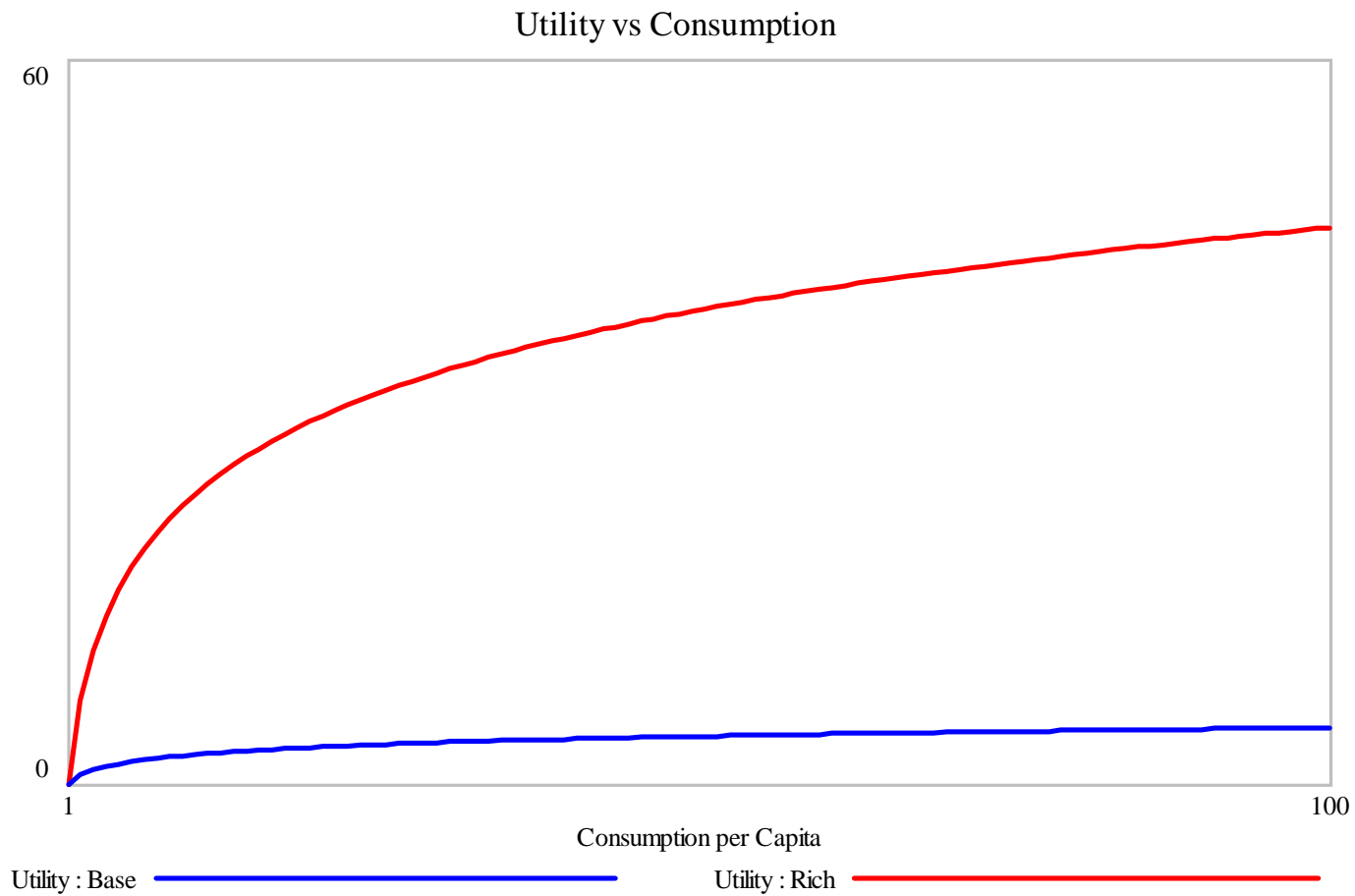


Equalizing Marginal Utility

Marginal Utility vs Consumption



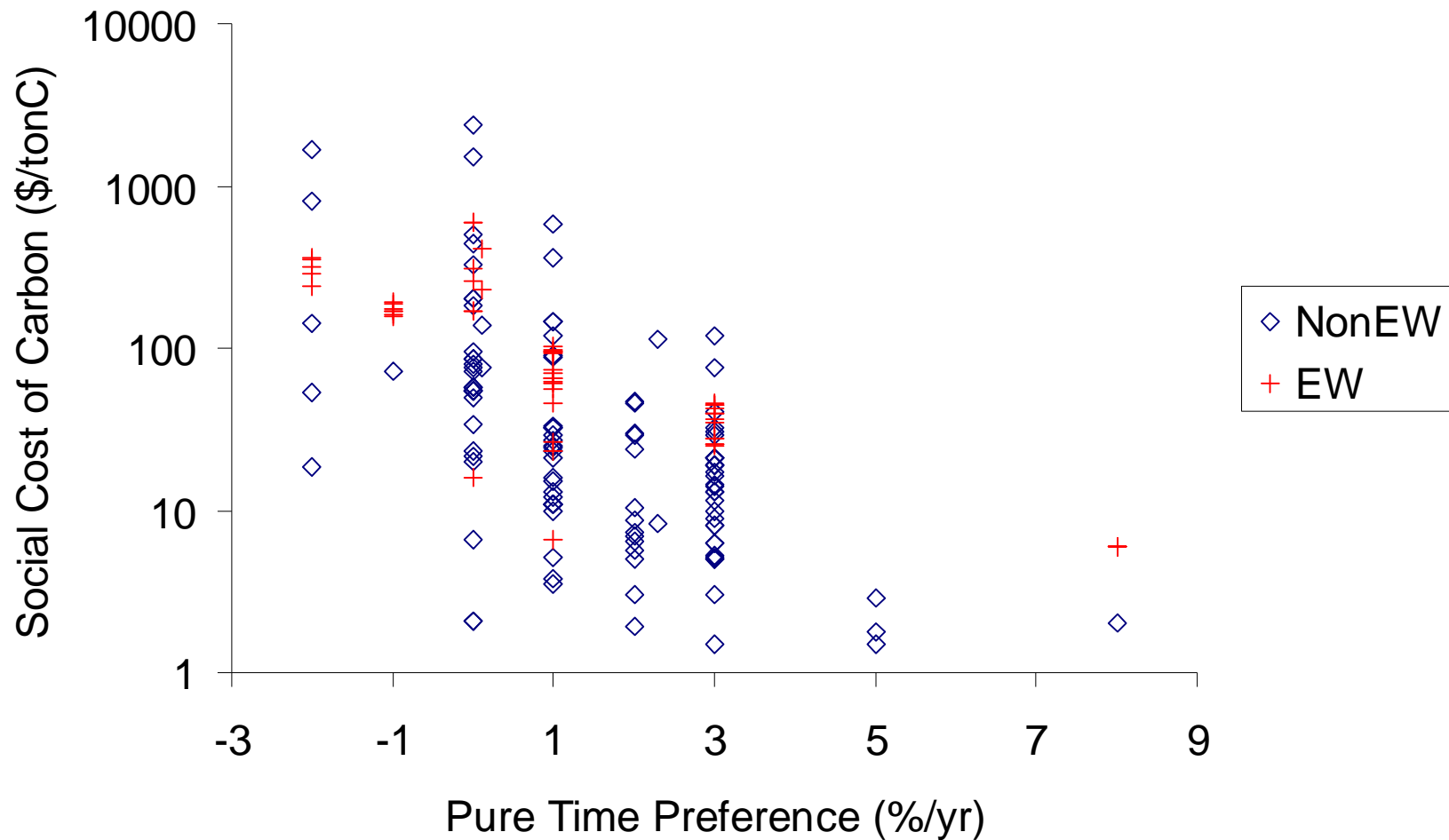
Impact on Utility



Regional è Distributional

- **Within-country income inequality is large, but not normally modeled**
- **Equitable interregional policies could be defeated by inequitable redistribution of transfers**

Example: The Social Cost of Carbon (Tol, 2007)



<http://blog.metasd.com/2008/06/12/exhibit-a-the-social-cost-of-carbon/>

The Stern Review Controversy (Short Version)

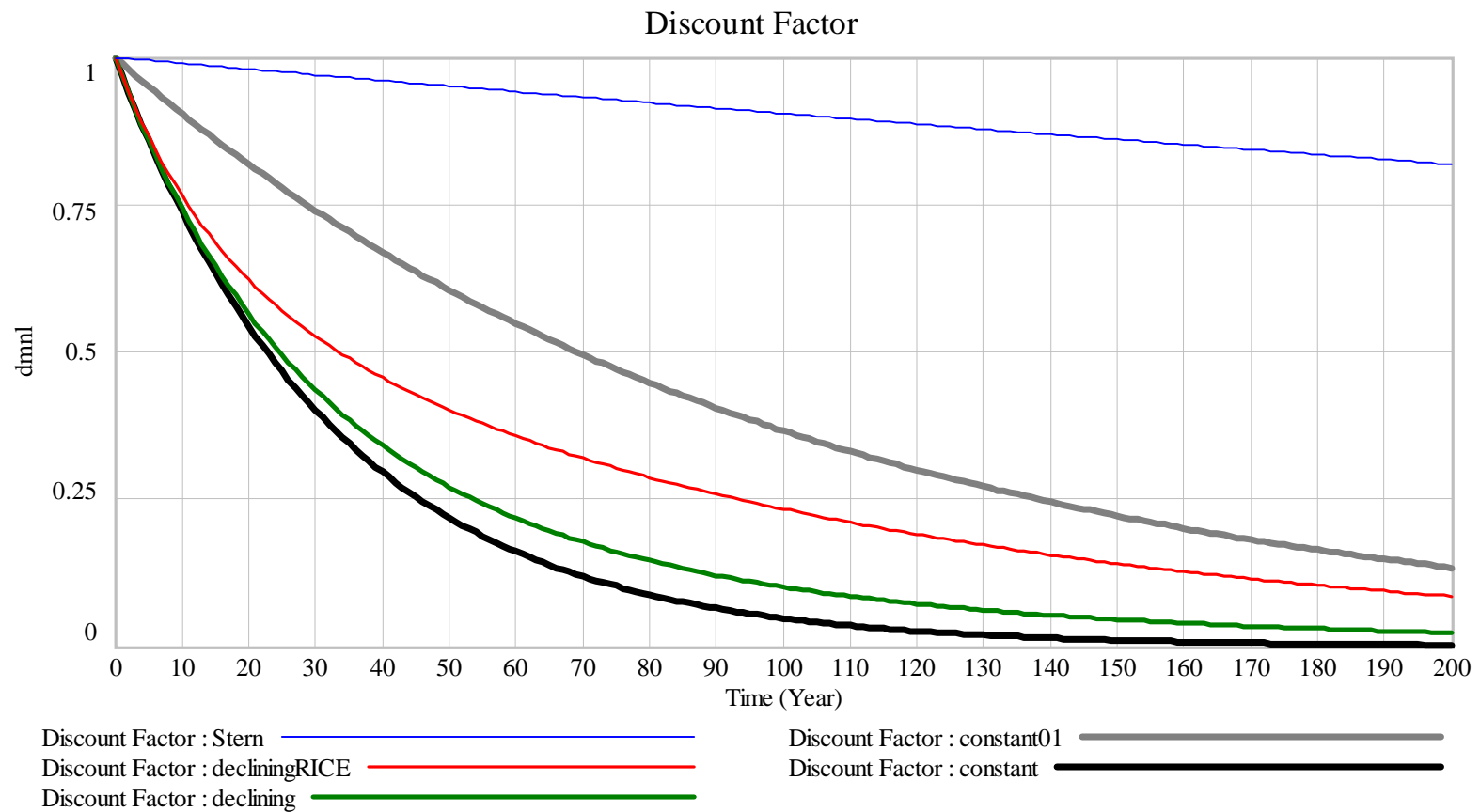
- **Stern chose:**
 - Low discount for pure time preference: 0.1% “extinction risk” (1000 year time constant – relatively equitable)
 - Logarithmic utility (a doubling means the same to rich and poor - relatively inequitable)
- **Result: relatively high marginal cost of carbon emissions**
- **Critique: “Right for the wrong reasons”**

Examples (using DICE model)

		Economic Growth		
		Slow	Moderate	Fast
Discounting Approach	Nordhaus (3%/yr time preference, inequality aversion = 1)	\$9	\$13	\$17
	Stern (0.1%/yr time preference, inequality aversion = 1)	\$89	\$114	\$165
	Fair (0%/yr time preference, inequality aversion = 2.5)	\$74	\$63	\$17

Refinements to Time Preference

- Declining or hyperbolic discount rates
- Uncertainty, diversity (low rates dominate)



Bounds on Pure Time Preference

- **Koopmans**
 - Under fairly general assumptions, zero time preference implies infinite sacrifice by the current generation
 - Thermodynamically impossible?
- **Dasgupta**
 - Finite environment suggests social returns $<$ private returns, possibly negative
 - Risk free rate of return is an improper empirical basis for discounting
- **Weitzman**
 - Discounting is really about future expectations of growth, which is really about future expectations of technology
 - Combinatorics suggest boundless technical potential
 - Thermodynamically impossible?

Other Approaches

- Intergenerational games
- Property rights – overlapping generations
- Skip discounting
 - Allocate atmospheric property rights directly (e.g. EcoEquity's Greenhouse Development Rights)
 - Addresses the interregional problem, but not the intertemporal problem

Elements (usually) missing from the economic model ...

- **Consumption \neq Welfare**
 - What is the economy for, anyway?
- **Interpersonal comparison**
- **Temporal patterns**
 - Differing response to gains, losses
- **Utility of bequests**
- **Compensation for damages**
- **Limits to Growth**
- **Population**

Half-truths

- Equity and efficiency are separable, because the environment is marginal
- Climate mitigation transfers are from the less-well-to-do to more-well-to-do
- Developed countries aren't susceptible to climate impacts
- Development is the best defense against impacts
- Income transfer involves "leaky buckets"
- Future generations might rapaciously exploit our caution

Collision with Other Perspectives

- Are discounting arguments useful?
- Willingness to help
- Reframing equity - IBD editorial
- Wargame observations

Willingness to Help

“I see little evidence, at least in the United States, that people want to make significant additional sacrifices to raise living standards among the people who now live in the developing world. It would surprise me if they could get excited about raising living standards in those same parts of the world at a time in the future when those living standards will be, we may both hope and expect, substantially elevated over where they are now.”

Thomas Schelling

IBD - Reframing Equity

Obama's Global Tax

By INVESTOR'S BUSINESS DAILY | Posted Tuesday, July 29, 2008 4:20 PM PT

Election '08: A plan by Barack Obama to redistribute American wealth on a global level is moving forward in the Senate. It follows Marxist theology — from each according to his ability, to each according to his need.

... Who's to say we can't load up our SUV and head out in search of bacon double cheeseburgers at the mall? China? India? Bangladesh? The U.N.?

CNAS Wargame Observations

- **Context**
 - 2015 negotiation
 - EU, USA, China, India
 - General failure to fulfill Copenhagen commitments
 - Aggressive 2050 goals
 - Emerging climate impacts
 - Participants from security, international policy communities
- **Observations**
 - Negotiators leap directly to commitments and policy instruments
 - Equity is frequently a tool, not a principle

How can we have this conversation?

- **How can models help decision makers understand the implications of their actions?**
 - Forget discounting and just look at futures directly?
 - Make assumptions transparent by making their implications interactive?
 - Characterize existing policy instruments by their equity implications?
- **With whom should we have this conversation?**

Way Forward? – Technical Agenda

- **Conduct an ethical audit of assumptions in existing models used for policy (i.e. not theoretical sketches)**
- **Convene a diverse technical panel to**
 - consider the assumptions identified in the audit, and more importantly identify those which remain unexplored
 - gather existing knowledge on the nature of happiness and the expected relationship of the real world to idealized preferences when human decision making is imperfect
- **Be explicit about descriptive vs. prescriptive uses of discounting**
- **Embrace real diversity of agents**
- **Model realistic problems with wealth transfers**

The Technical Agenda – A Hard Road to Hoe

- Goal: get equity principles in the “alternative” economic literature into decision making models.
- Obstacles:
 - Big IAMs are far down the learning curve: they are a good expression of a bad paradigm
 - Funding follows output (success to the successful), especially when the output is palatable

Way Forward? – Alternative Agenda

- Construct simple models, control panels, or other devices that can be used to present decision makers with choices directly, rather than using discounts to collapse all ethical choices to a single metric
 - Let preferences be constructed
- Use games to put people in the future (adapted referendum)
- Shoot at targets directly (forget discounting)

Thanks!