



香港中文大學
The Chinese University of Hong Kong



MPUP 5422 Week 2

Cost-benefit analysis

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How do we make decisions?

- Do you want to live in this society?
 - Everything is free.
 - You can get whatever you want.
 - You can work as much/little as you can.
- When you travel, what hotel do you choose?

Discussion

- Is there an optimal level of pollution?
- If so, how do we decide upon the optimal level?



MARGINAL THINKING



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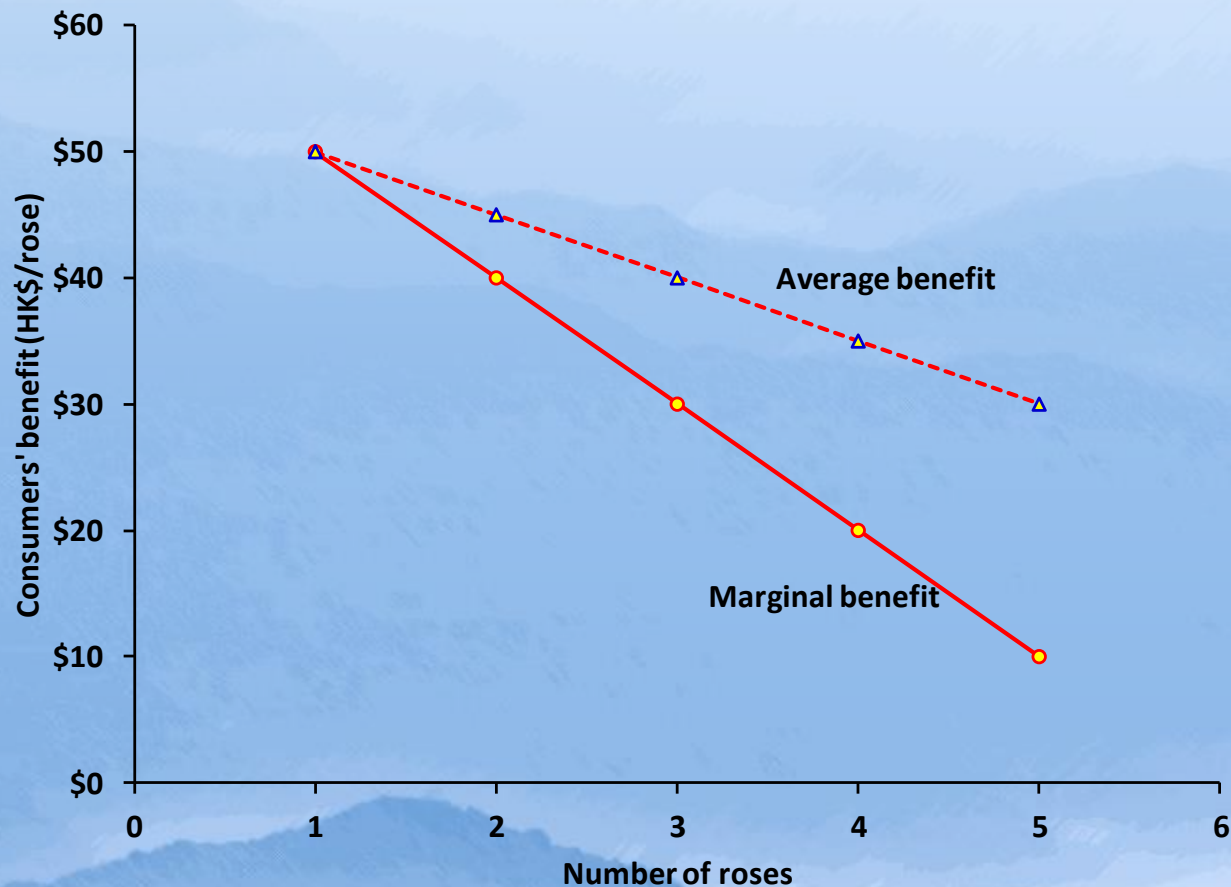
Marginal thinking

▣ What is beauty?

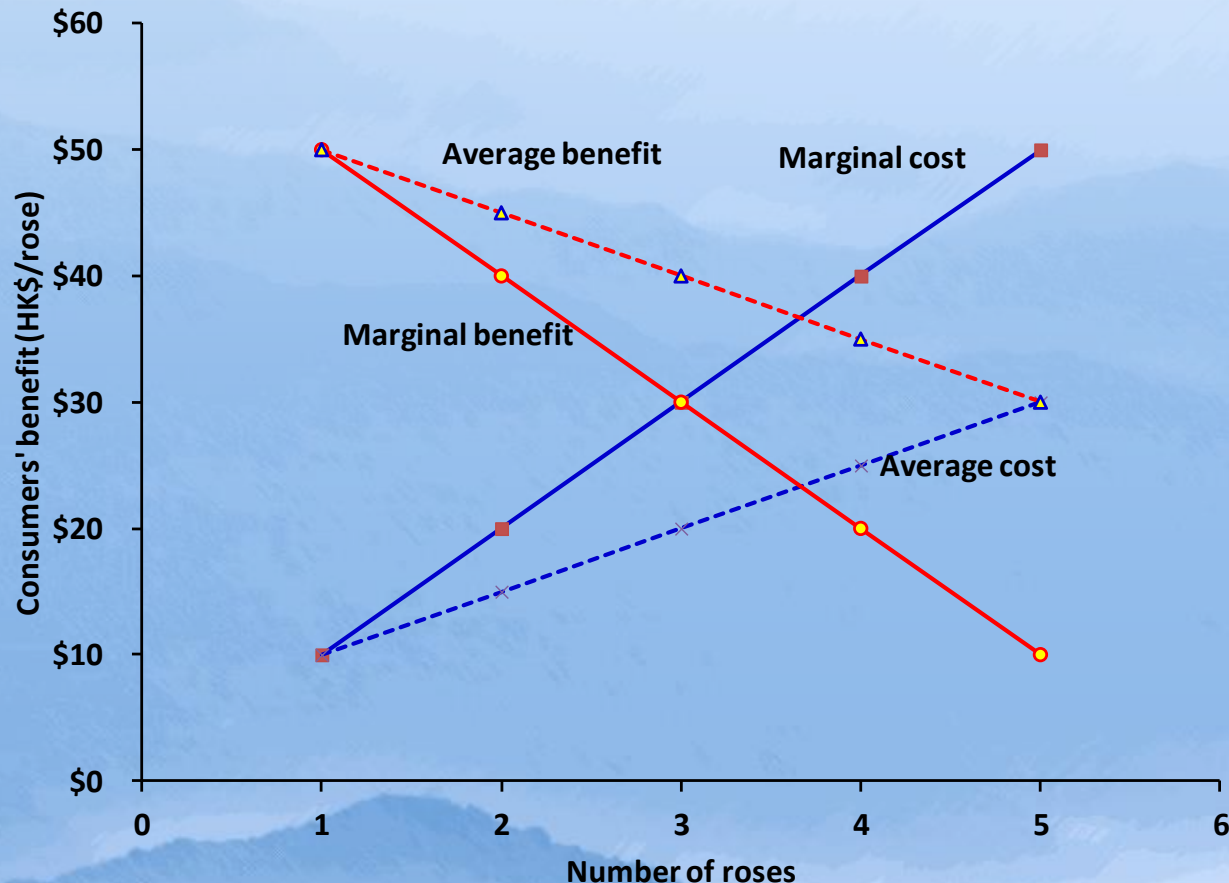
- ▣ “東家之子，增之一分則太長，減之一分則太短；著粉則太白，施朱則太赤。”
 - ▣ 戰國 楚 宋玉 《登徒子好色賦》



Average vs. marginal



We make decisions based on marginal but not average/total costs/benefits.

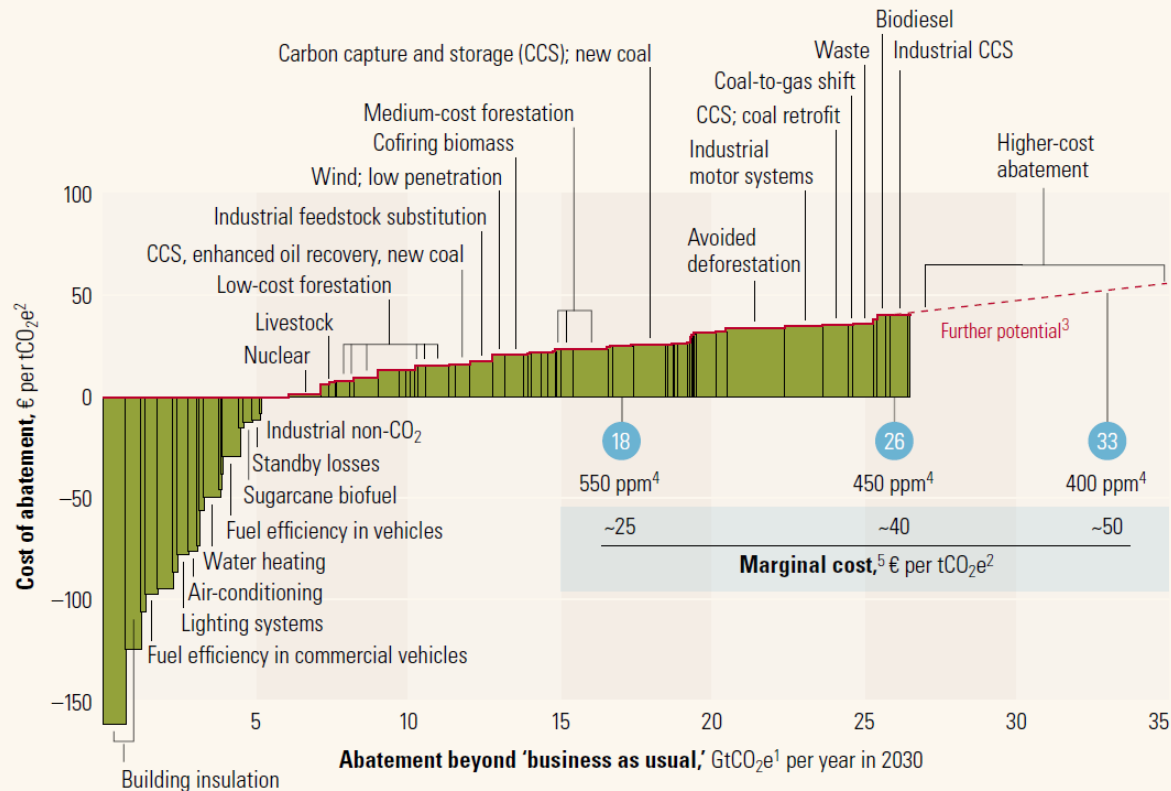


Pollution mitigation costs

What might it cost?

Global cost curve for greenhouse gas abatement measures beyond 'business as usual'; greenhouse gases measured in GtCO₂e¹

- Approximate abatement required beyond 'business as usual,' 2030



Valuing the environment

1. Hedonic pricing
 2. Lost revenue
 3. Contingent valuation & VSL
 4. Innovation
 5. Discount rate
 6. Risk
- How to value the environment
- Influential factors in valuing the environment



HEDONIC PRICING



Hedonic price and estimation

- ▣ “Hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them.”
- ▣ “Econometrically, implicit prices are estimated by the first-step regression analysis (product price regressed on characteristics) in the construction of hedonic price indexes.”
 - ▣ Source: Rosen, 1974



TABLE 1
OLS ESTIMATION RESULTS

Dependent Variable: log(price)			
Number of Observations: 55,799			
R ² : 0.7127			
Adj R ² : 0.7126			
Variable	Parameter Estimate	Standard Error	t-Value
Intercept	3.89437*	0.10776	36.14
DWGRADE	0.15671*	0.00242	64.72
DWTYPE	0.17258*	0.00392	43.98
BATHS_FU	0.07107*	0.00219	32.43
BATHS_HA	0.05302*	0.00237	22.39
FTPRNT	0.10106*	0.00555	18.21
AREA	0.34139*	0.00499	68.45
LSIZE	0.02337*	0.00153	15.32
AGE	-0.02158*	0.00102	-21.23
YRSALE	0.02219*	0.00075808	29.27
DISTBA	0.06991*	0.00317	22.08
BWI	-0.01090*	0.00258	-4.22
DISTDC	-0.07736*	0.00465	-16.62
MHHINC	0.18020*	0.00521	34.6
POPDEN	-0.01548*	0.0009972	-15.52
BLPOP	-0.06475*	0.00905	-7.15
CA	-0.27684*	0.00596	-46.42
CH	-0.22990*	0.00567	-40.58
HO	-0.10029*	0.00333	-30.08
LOWRES	0.06271*	0.01332	4.71
COMIND	-0.07968*	0.0173	-4.61
MEDHRES	-0.03378**	0.01213	-2.78
CROP	0.01192	0.0152	0.78
FOREST	0.02577 ⁺	0.01304	1.98
CONSV	0.27483*	0.0737	3.73
PUBLIC	0.07764*	0.02391	3.25
MILIT	0.21534	0.14009	1.54
OTHER	0.23814*	0.01401	17
AAPUBLIC	-0.15521*	0.02774	-5.6
AAMILIT	0.52320*	0.14892	3.51

*, **, and ⁺ indicate significance at the 0.001, 0.005, and 0.05 levels respectively. Source: Irwin, 2002

The effects of open space on residential property values

- “Results show a premium associated with permanently preserved open space relative to developable agricultural and forested lands and support the hypothesis that open space is most valued for providing an absence of development, rather than for providing a particular bundle of open space amenities.”

- Source: Irwin, 2002



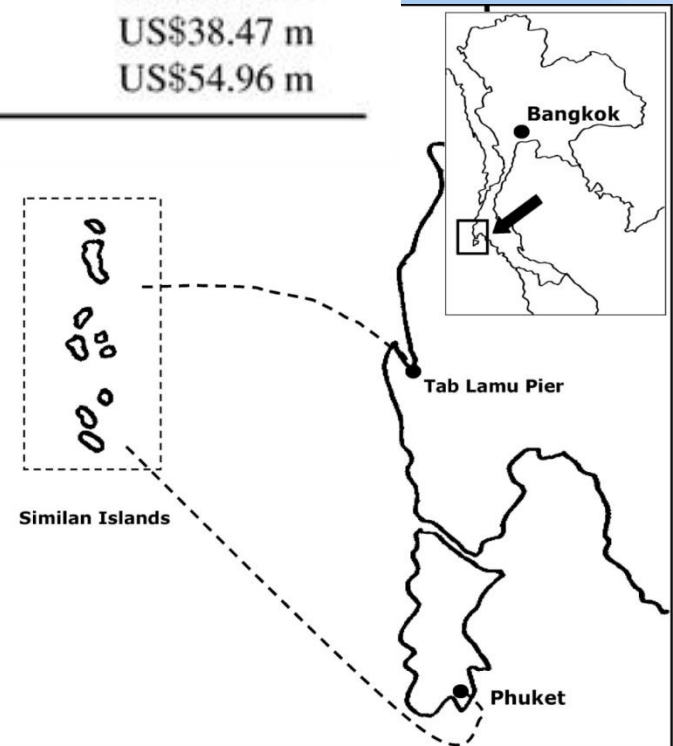
LOST REVENUE



Economic value of SCUBA diving in the Similan islands

Table 4
Estimated consumer surplus from SCUBA diving

Scenarios	No. of SCUBA diver visits per year	Adjusted estimated consumer surplus
25% of visitors are SCUBA divers	8,500	US\$27.48 m
35% of visitors are SCUBA divers	11,900	US\$38.47 m
50% of visitors are SCUBA divers	17,000	US\$54.96 m



Direct value of reef fishery

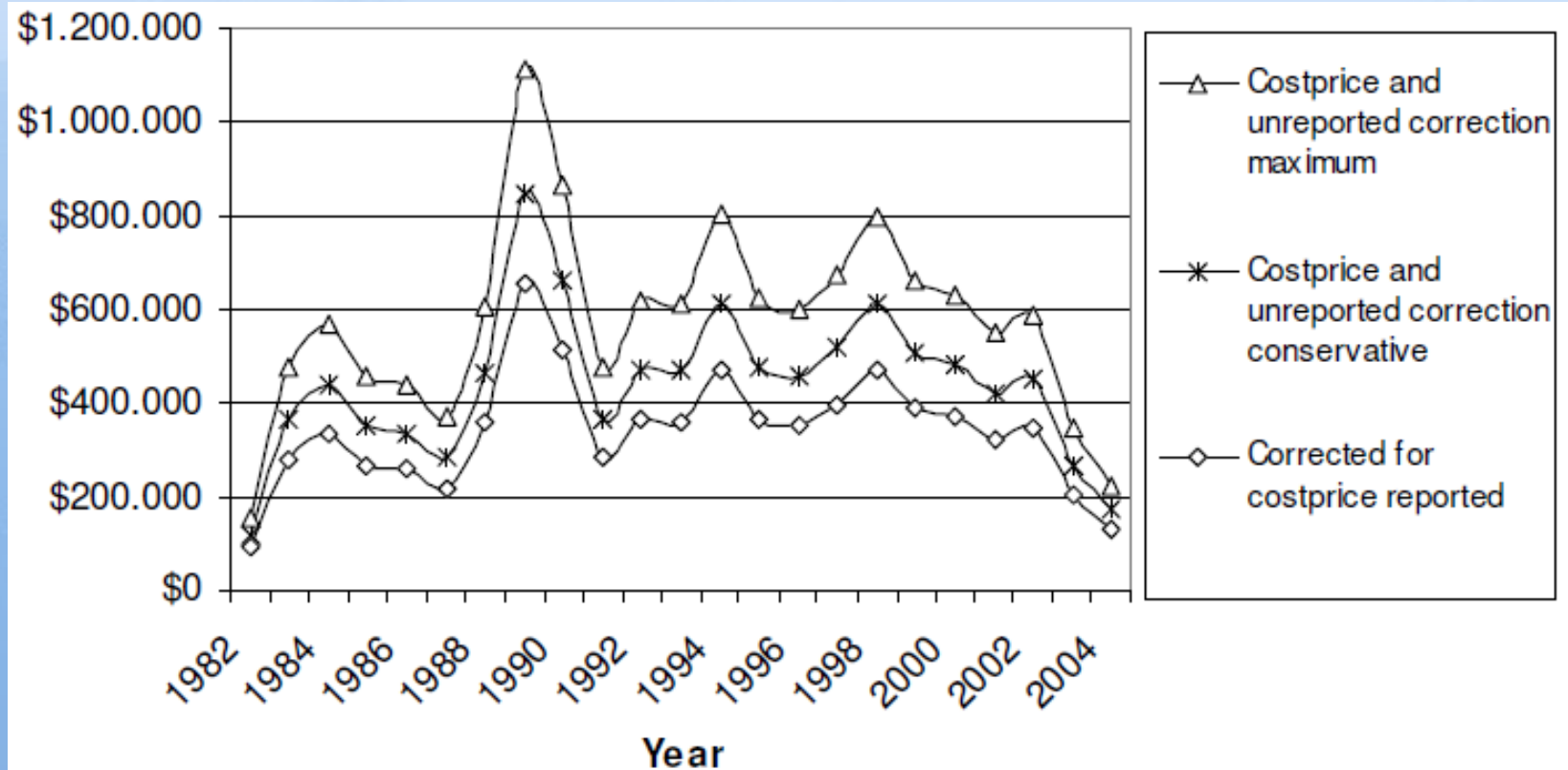


Figure 5.9 Direct Value of reef fishery over the past 22 years

CONTINGENT VALUATION



Concept

- “the contingent valuation (or CV) technique ... is based on the direct elicitation of these values from individuals through the use of carefully designed and administered sample surveys. Its appeal lies in its potential to inform damage assessment in an area (lost passive-use values) where there appear to be no behavioral trails to be followed.”



Willingness to pay vs. Willingness to accept

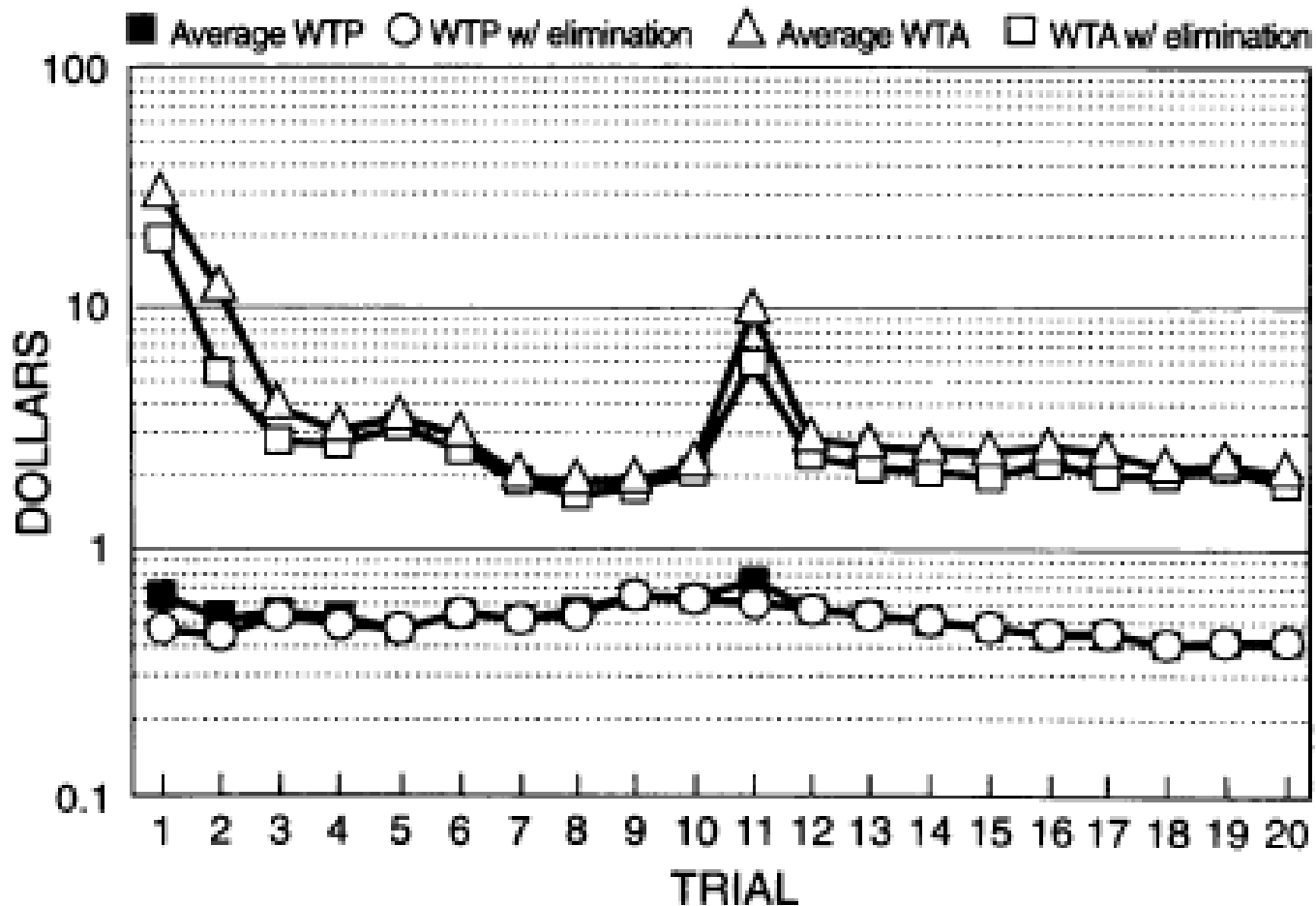


FIGURE 7. WTP AND WTA COMPARISON:



Individual willingness to pay for saving a statistical life

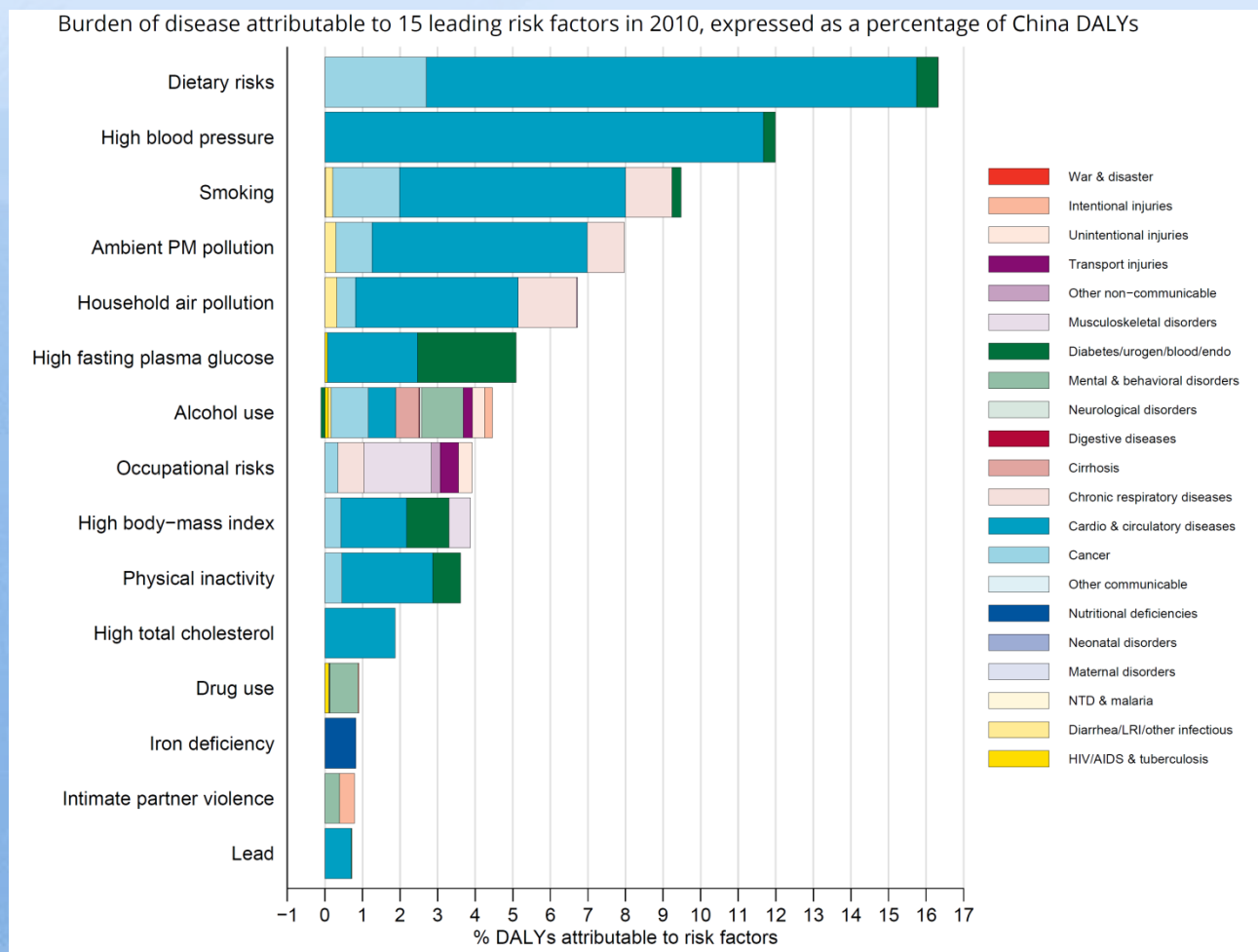
United States

Type of Study and Sources	Amount (millions*)
Average of 29 Studies	\$ 1.95
Extra Wages for Risky Jobs (15 studies)	1 .00-3.00
Demand and Price	
Safer cars (Winston & Mannering, 1984)	1.90
Smoke detectors (Dardis, 1980)	1.00- 1.80
Houses in polluted areas (Smith & Gilbert, 1984)	2.30
Life insurance (Landefeld & Seskin, 1982)	1.10
Behavior	
Pedestrian tunnel use (Melinek, 1974)	1.80
Safety belt use (Blomquist, 1979; 1988)	1.30-3.10
Speed choice (Jondrow, Bowes, & Levy, 1983)	1.30-1.60
Driver's travel time (Miller, 1989)	1.00- 1.20
Surveys	
Cancer (Landefeld, 1979)	2.40
Safer bus (Jones-Lee, Hammerton, & Phillips, 1985)	2.60
Safer job (Gegax, 1984)	2.00
Auto safety (Viscusi, Magat, & Huber, 1989)	2.20

China

Variables	Median	95% CI	
Average WTP per person (Chinese yuan)	14.3	12.7	15.9
Average WTP for saving a statistical life (Chinese yuan)	286,000	254,000	318,000
Average WTP for saving a statistical life (U.S. dollar)	34,458	30,602	38,313

Disability-Adjusted Life Years (DALYs)



INNOVATION



Porter Hypothesis

Pollution = Inefficiency

Green and Competitive: Ending the Stalemate

by Michael E. Porter and Claas van der Linde

Pollution's hidden costs – wasted resources and effort – are buried throughout a product's life cycle.

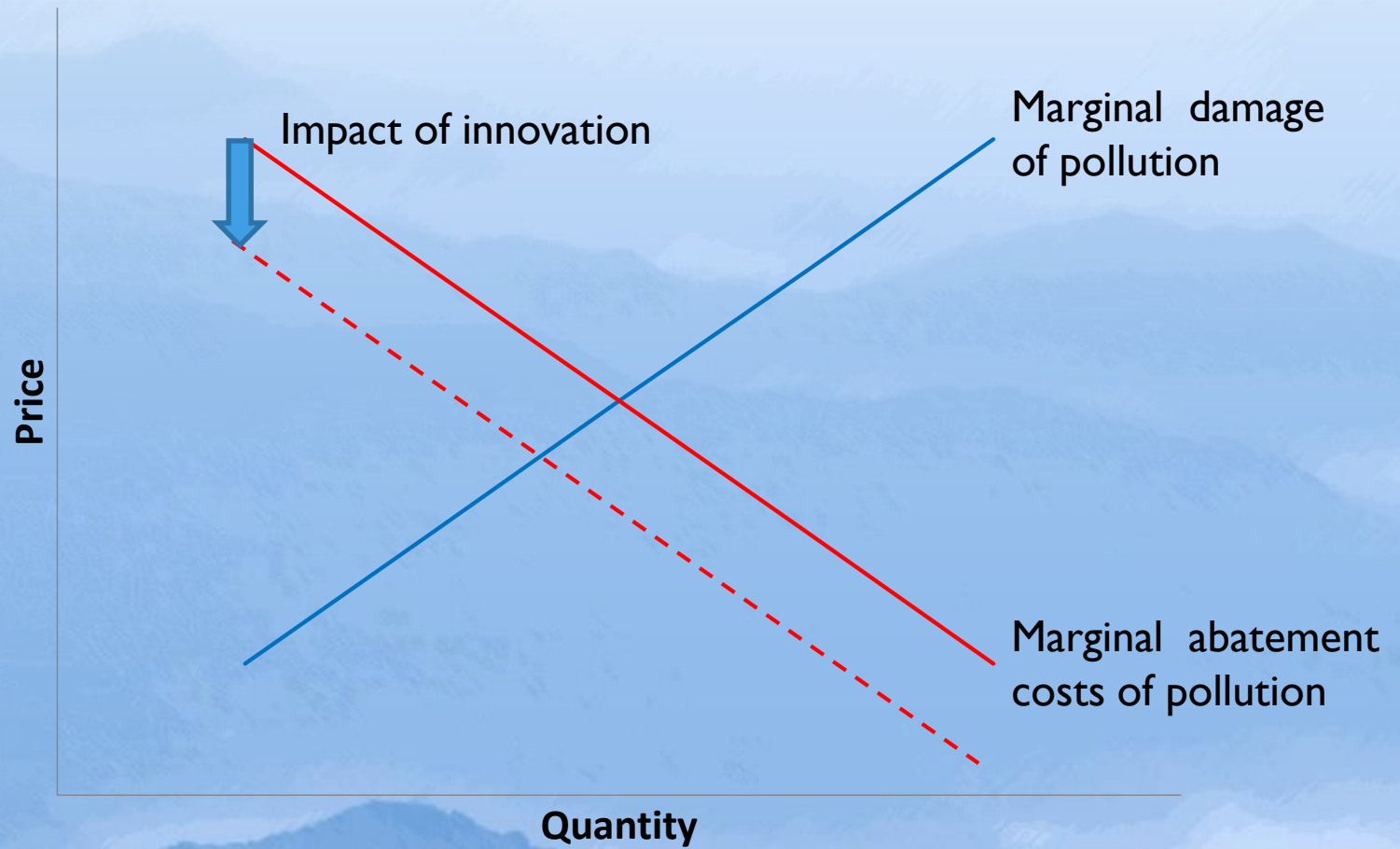
Innovating to meet regulations can bring offsets: using inputs better, creating better products, or improving product yields.

Porter Hypothesis

Our research on competitiveness highlights the role that outside pressure plays in motivating companies to innovate.

Bad regulation is damaging to competitiveness, but the right kind of regulation can enhance it.

Impact of innovation



DISCOUNT RATE



Discount rate

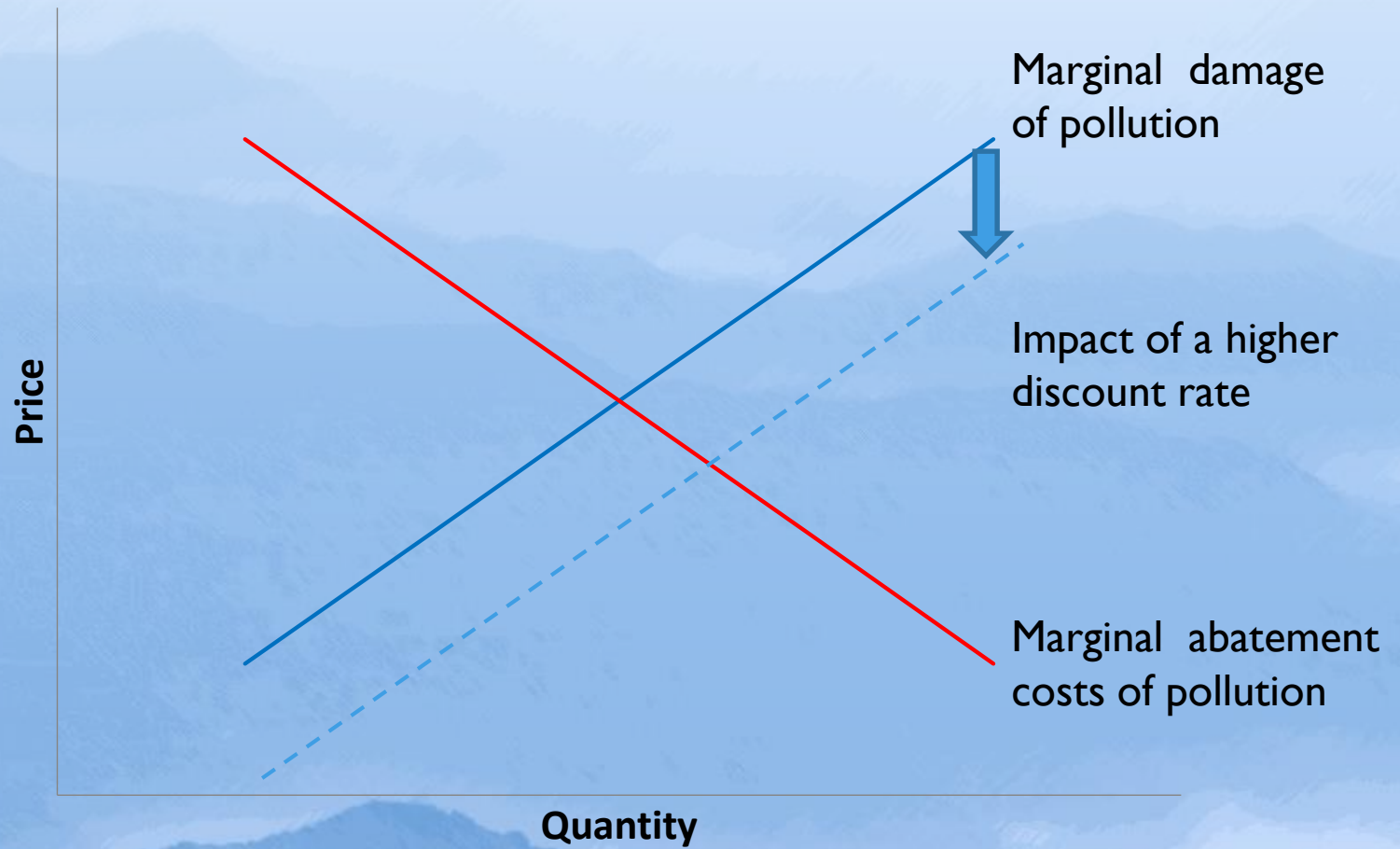
- Impact of discount rates:
 - High discount rates indicate that the immediate future is much more important than the distant future
- When to use discount rate
 - Calculate costs and benefits over time

Social discount rate

- “Under more reasonable conditions, policy makers should be more patient than private citizens, whose choices define the most short-sighted Pareto optimum.”
 - Source: Caplin and Leahy, 2004



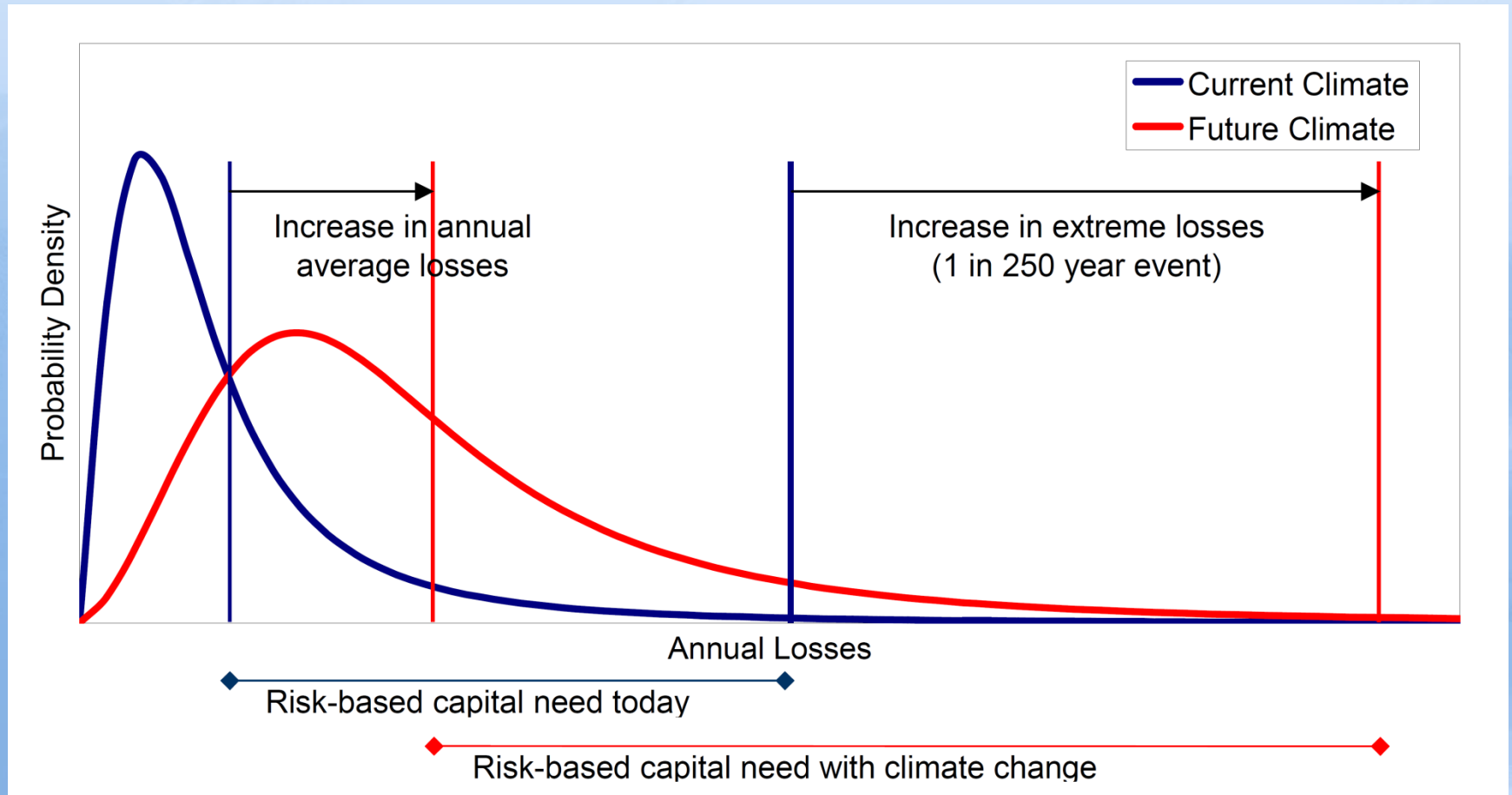
Impact of a higher discount rate



RISK



Extreme events and expected damage



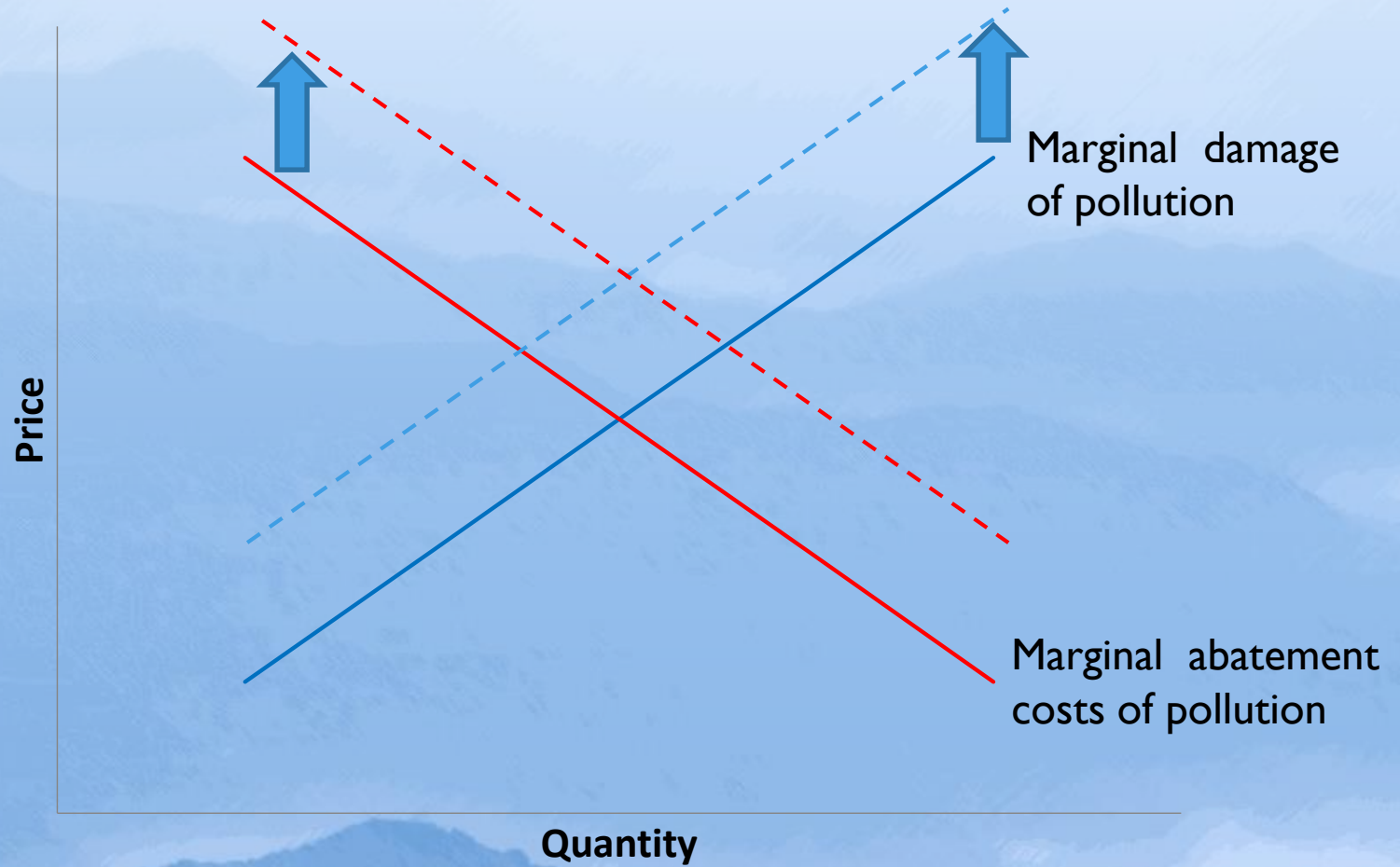
How do we respond to risks?

Are the two scenarios the same?

Extreme events	Scenario 1	Scenario 2
Probability	10%	0.1%
Damage	\$1,000	\$100,000
Expected damage	\$100	\$100

- Which of the scenario is preferred?
 - Risk lover
 - Risk neutral person
 - Risk averter

From risk-neutral to risk-averse



DISCUSSION



Privatization

- Who really values the Earth?

SALE



A video clip

