

Discounting the Benefits of Climate-Change Policy

The Stern Review, its Critics, and Policy Implications

Simon Dietz

LSE

Outline

1. The Stern Review's headline results
2. Stern Review discounting explained
3. Debates, old and new, on the consumption discount rate
4. The problem with 'the' discount rate: the effect of discounting endogenously
5. Policy implications

1. The Stern Review's headline results

There can be “no doubt” the economic risks of business-as-usual climate change are “very severe”

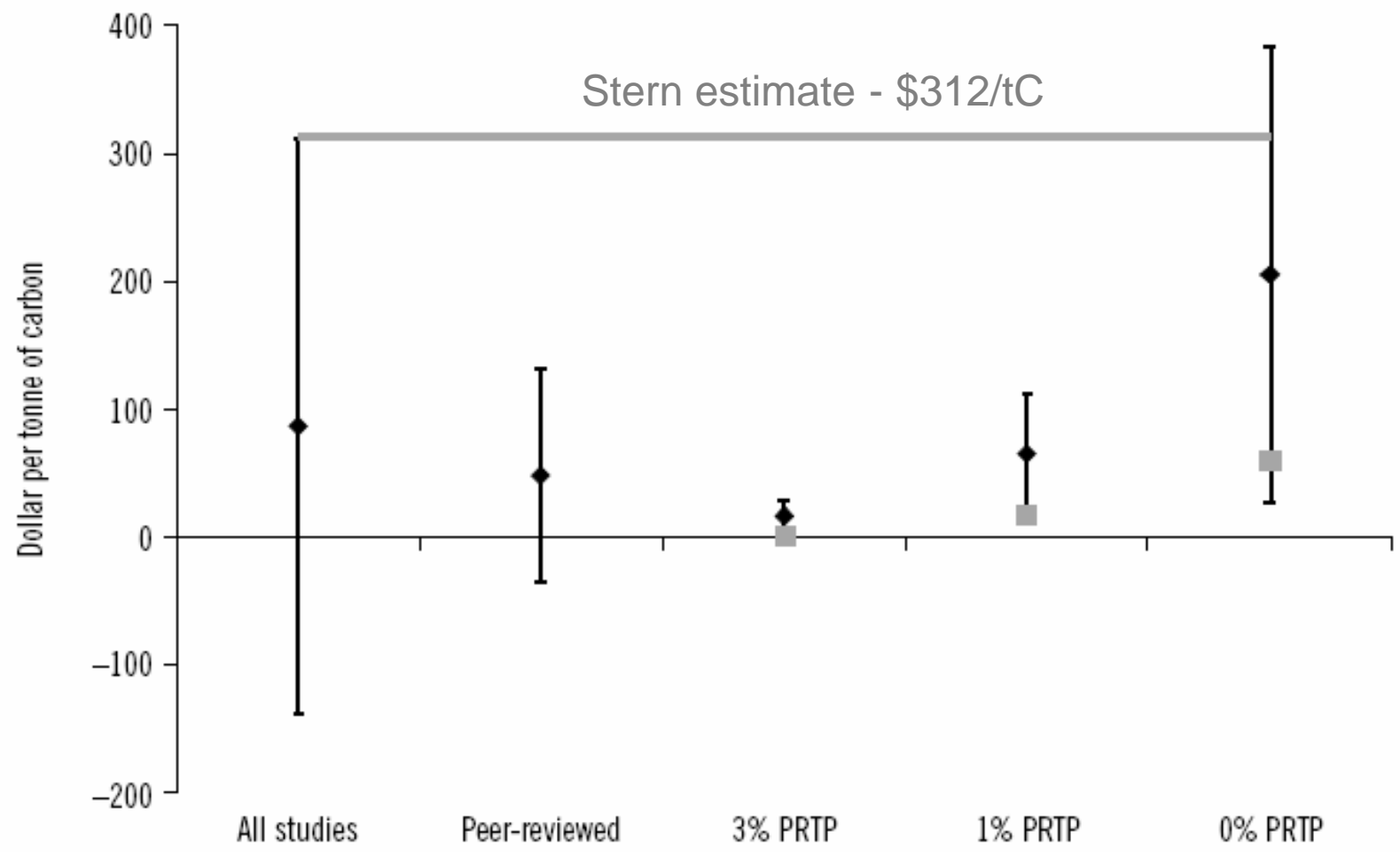
- The total cost of climate change is equivalent to a one-off, permanent 5-20% loss in global mean per-capita consumption today

	Market impacts only	All impacts
Baseline climate	5% (0-12%)	11% (2-27%)
High climate	7% (1-17%)	14% (3-32%)

Rough estimate with equity-weighting: 20%

- The marginal damage cost of a tonne of carbon emitted today – the ‘social’ cost of carbon – is around \$312 on a business-as-usual path (baseline climate, all impacts)

Compared with the wider literature: higher than most



Source: Tol and Yohe (2006)

2. Stern Review discounting explained

Stern discounting

$$r = d + ?g$$

Pure rate of
time
preference
= 0.1% per
year

Elasticity of
marginal utility
of consumption
= 1

Growth rate of
consumption per capita
= variable

- Unethical to discount utility – i.e. via pure rate of time preference
- Leaves residual risk of extinction = 0.1% per annum
- Elasticity of marginal utility of consumption = 1
- Consumption discounting is endogenous to the path with per-capita consumption growth g

Estimates are highly sensitive to discounting: baseline-climate scenario

		Consumption elasticity of marginal utility				
		1.0	1.5	2.0	2.5	3.0
PRTP	0.1	11.1	6.5	3.6	2.1	1.3
	0.5	8.1	4.5	2.6	1.5	1.0
	1.0	5.2	2.9	1.6	1.1	0.7
	1.5	3.3	1.9	1.1	0.8	0.7

Estimates are highly sensitive to discounting: high-climate scenario

		Consumption elasticity of marginal utility				
		1.0	1.5	2.0	2.5	3.0
PRTP	0.1	14.7	10.2	7.4	8.1	13.2
	0.5	10.6	6.5	4.7	5.0	7.8
	1.0	6.7	4.0	2.7	2.7	3.9
	1.5	4.2	2.5	1.7	1.6	2.1

But risk aversion begins to dominate inequality aversion for very high ?

3. Debates, old and new, on the consumption discount rate

Summarising the critiques

- Plenty have argued that the discount rate should be higher
- But for different reasons
 - Stern discount rates would divert investment from more productive private and, even, public projects (Byatt *et al.*, Lomborg)
 - Stern discount rates are inconsistent with observed saving rates (Dasgupta, Maddison, Nordhaus)
 - So d should be higher (Maddison, Nordhaus)
 - So ρ should be higher (Dasgupta)
 - Stern ρ is too low relative to revealed aversion to risk in insurance data (Gollier)

Private-sector and public-sector returns, and discount rates for climate policy

- All sorts of market imperfections mean that market interest rates do not signify the consumption discount rate/social rate of time preference:
 - Government taxation
 - Externalities etc.
- Discount rates are not the means to account for crowding out (Lind *et al.*, 1982)
- In any case, the core issue is whether revealed preferences are an ethically defensible basis for intergenerational allocations (see later)

Discount rates and saving rates

- Argument is that such a low discount rate leads to very high optimal saving
- Must be true to some extent
- Dasgupta constructs a simple thought experiment:
 - If $r=4\%$, $d=0.1\%$ and $\beta=1$, the optimal saving rate is 97.5%!
- Sounds convincing, but such thought experiments are heavily dependent on model structure:
 - Dasgupta assumes there is no technical progress (productivity can only increase through capital investment)
 - Assume instead that technical progress = 3%, then optimal saving rate is 22.5%
 - Literature on determinants of growth usually finds big role for technical progress (if there is none, we are unlikely to grow much!)

The trouble with ?...

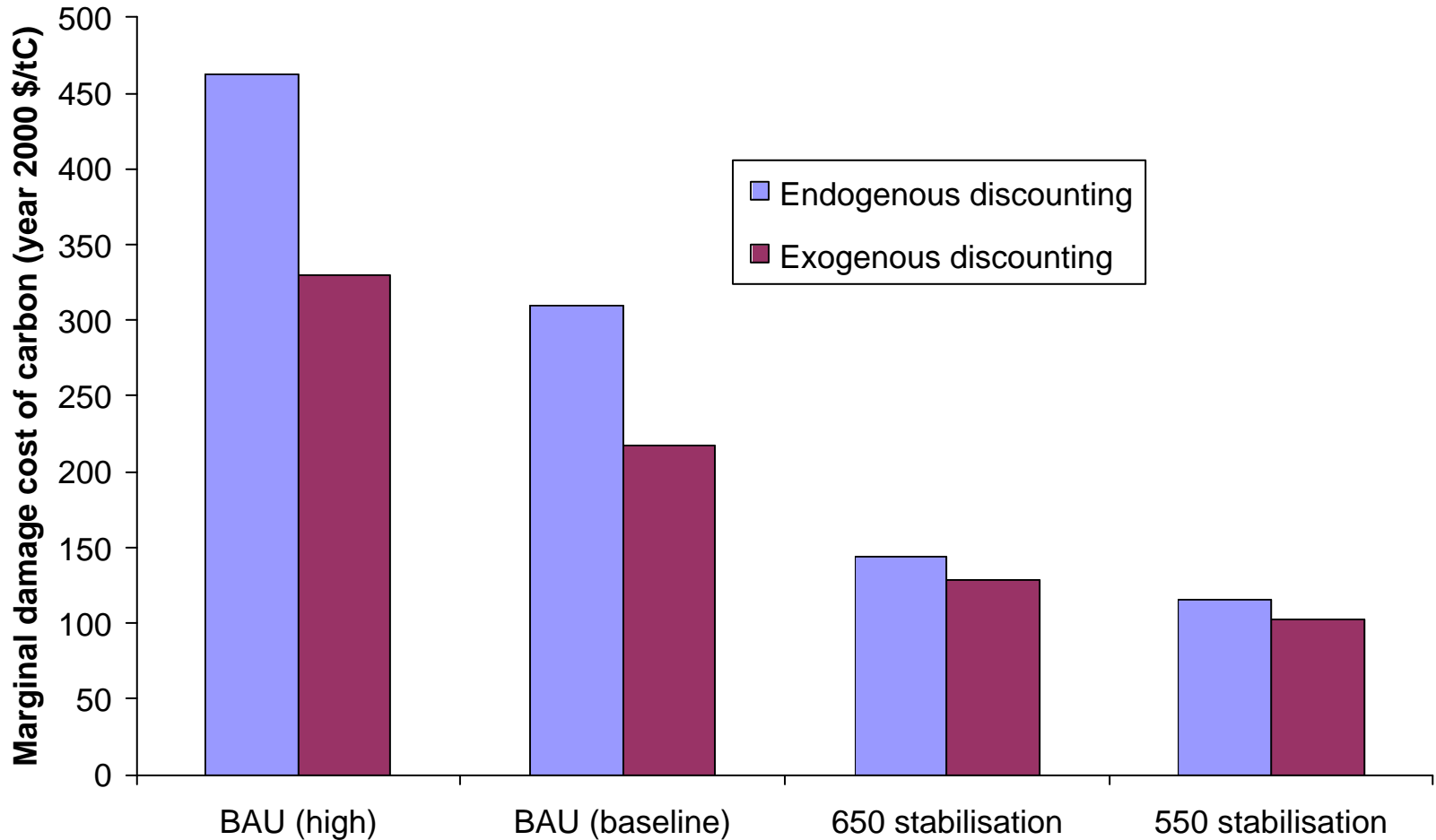
- ...Is that it does three jobs at once in the simple, standard framework:
 1. Inequality aversion across time
 2. Inequality aversion across space
 3. Risk aversion
- ‘Leaky bucket’ experiments on redistributing income point to low ?
- Some data on risk-aversion might point to high ?
- But some gambling behaviour points to low or even negative ?
- So market data are ambiguous

The trouble with revealed preferences as a whole

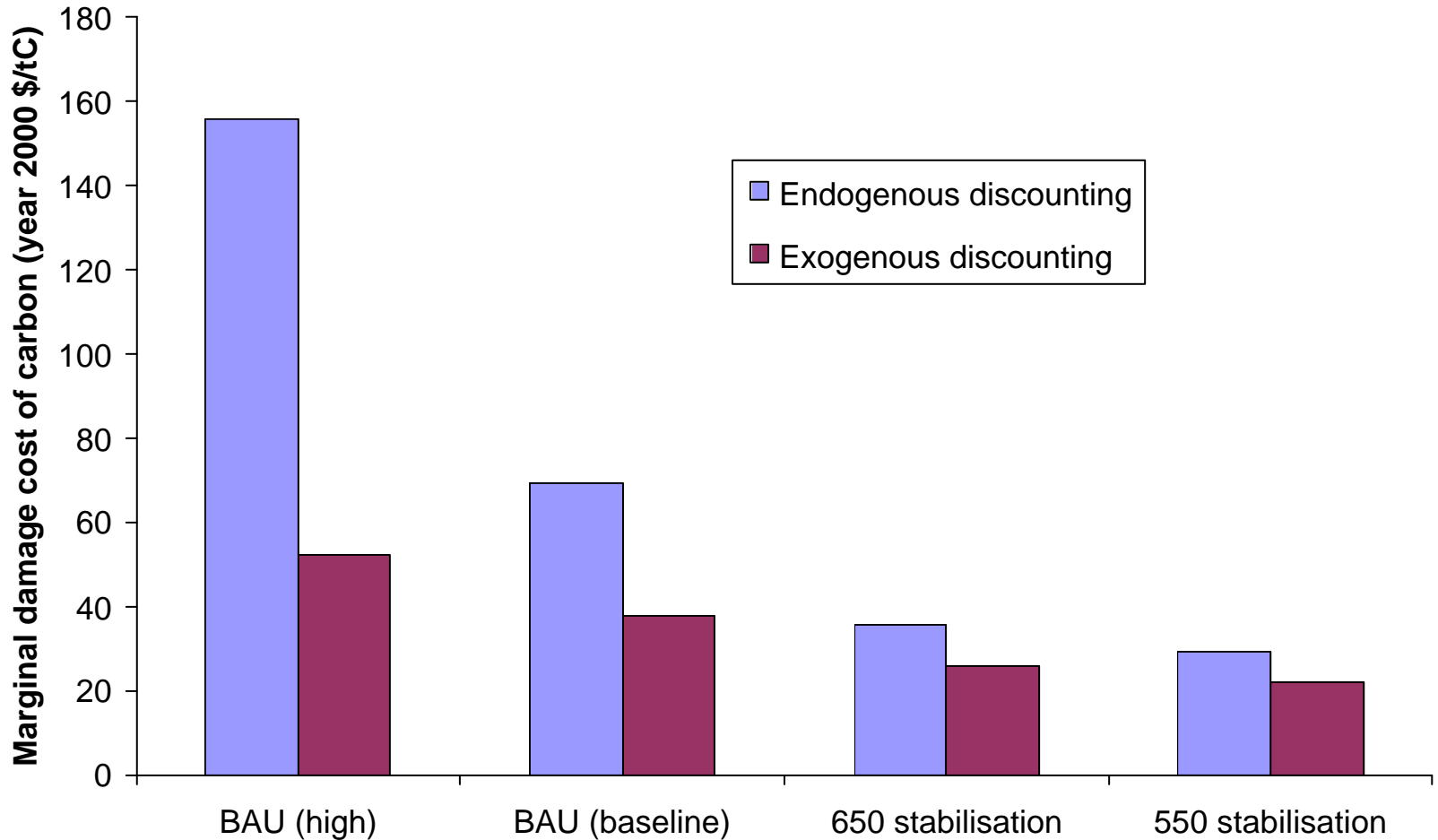
- Expected-utility theory as a whole doesn't fit the data, so we are in the realms of normative economics
- These quandaries are fun, but the real issue is...
- ...whether it is appropriate to use 'revealed ethics'
 - Ethical implications are unavoidable for non-marginal, intergenerational issues
 - No market place answers the question “how should this generation, deciding together, act to allocate resources and protect the environment for the next?”

4. The problem with 'the' discount rate: the effect of discounting endogenously

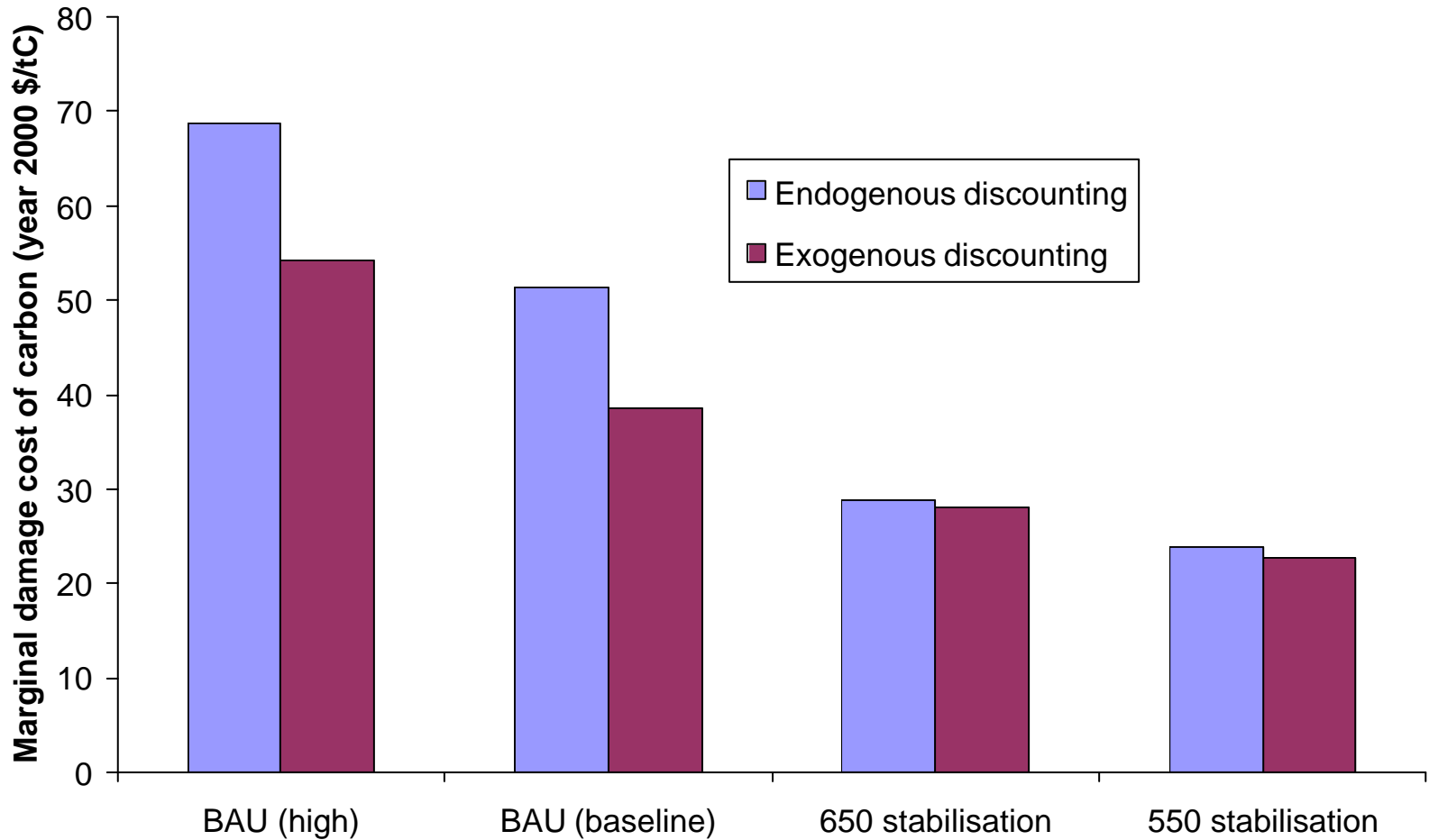
Estimating marginal costs: $d=0.1\%$; $\beta=1$



Estimating marginal costs: $d=0.1\%$; $\beta=2$



Estimating marginal costs: $d=1.5\%$; $\beta=1$



5. Policy implications

Stern Review vs. HMG guidance on appraisal

	Stern Review	Green Book
d	0.1%	1.5%
$?$	1	1
g	Variable, time-declining due to climate-change impacts	2% initially, time-declining (extrapolated on past uncertainty about growth)

- No problem with inconsistency on g
- d more worrisome:
 - Stern says no problem, as Green Book is about project appraisal
 - Hepburn is pragmatic – make climate-change special case
 - Dietz not so sure – other policies also associated with direct costs and benefits over many generations (e.g. nuclear waste disposal)
- Depends ultimately on purpose of Green Book

The social cost of carbon (SCC)

- SCC appears to be dependent on the future path of emissions
- So first we must take a decision on stabilisation
- UK policy roughly commensurate with stabilisation at 550 ppm CO₂e
- So don't use business-as-usual SCC
- No less than £100/tC (rising at a few percent per year) for public investment
- But carbon tax rate may well need to be different

Discounting the Benefits of Climate-Change Policy

The Stern Review, its Critics, and Policy Implications

Simon Dietz

s.dietz@lse.ac.uk

LSE