

# Stern, Climate Policy and Saving Rates

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# Thanks and Disclaimer

- Many people and institutions to thank including Simon Dietz, Frank Jotzo, Jack Pezzey, DCC and EERH at ANU
- Presentation represents my professional opinions and views expressed should not be attributed to the Department of Climate Change or the Australian Government



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# Outline

1. Stern's parameters

2. Saving rates associated with Stern's parameters in theory

3. Comparing Stern's and key critic Nordhaus's saving rates in a calibrated model (DICE)



# The Stern Review

- Policy prescription: strong and early action
- Methodology: mixed
  - Includes aggregated economic modelling
- Forming policy requires judgements about importance of future welfare
- Judgements embodied in model parameters



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# Two Ways to Disagree with Stern's Parameter Values

1. The choice of parameter values



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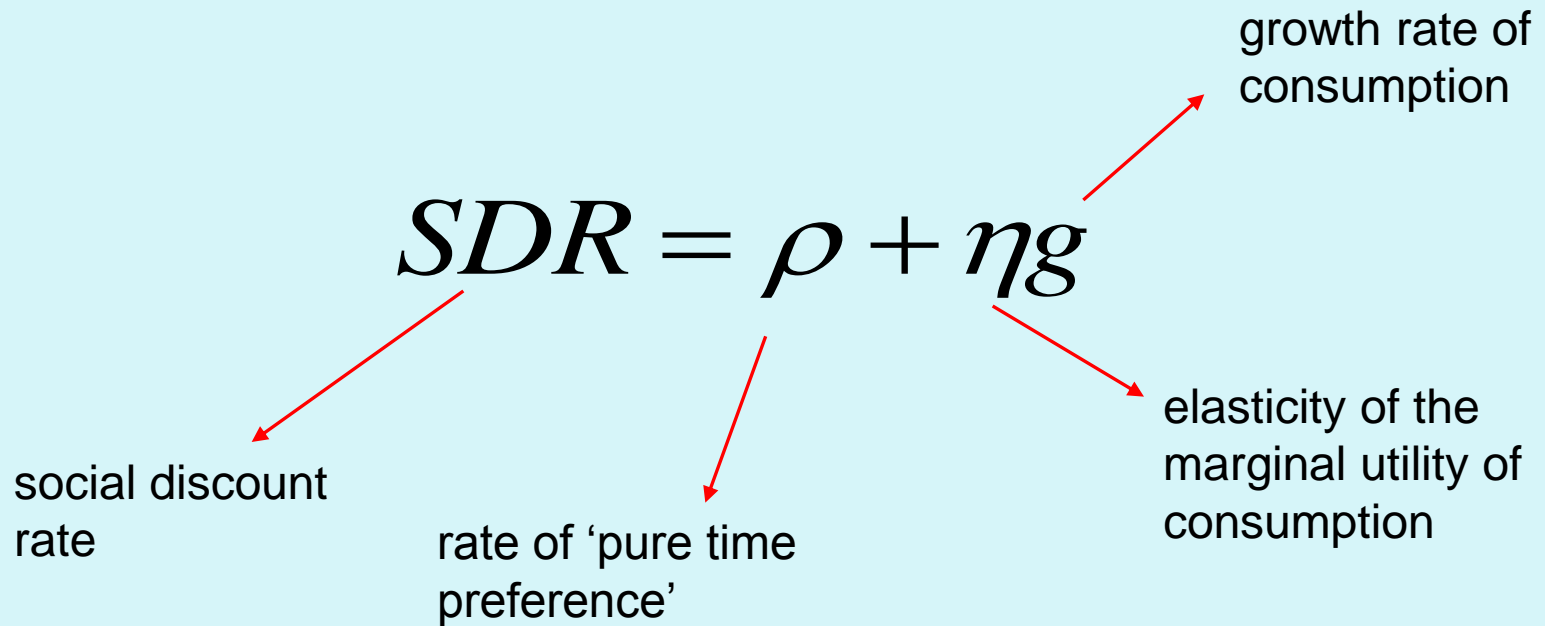
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# Two Ways to Disagree with Stern's Parameter Values

1. The choice of parameter values
2. The method for choosing the parameter values



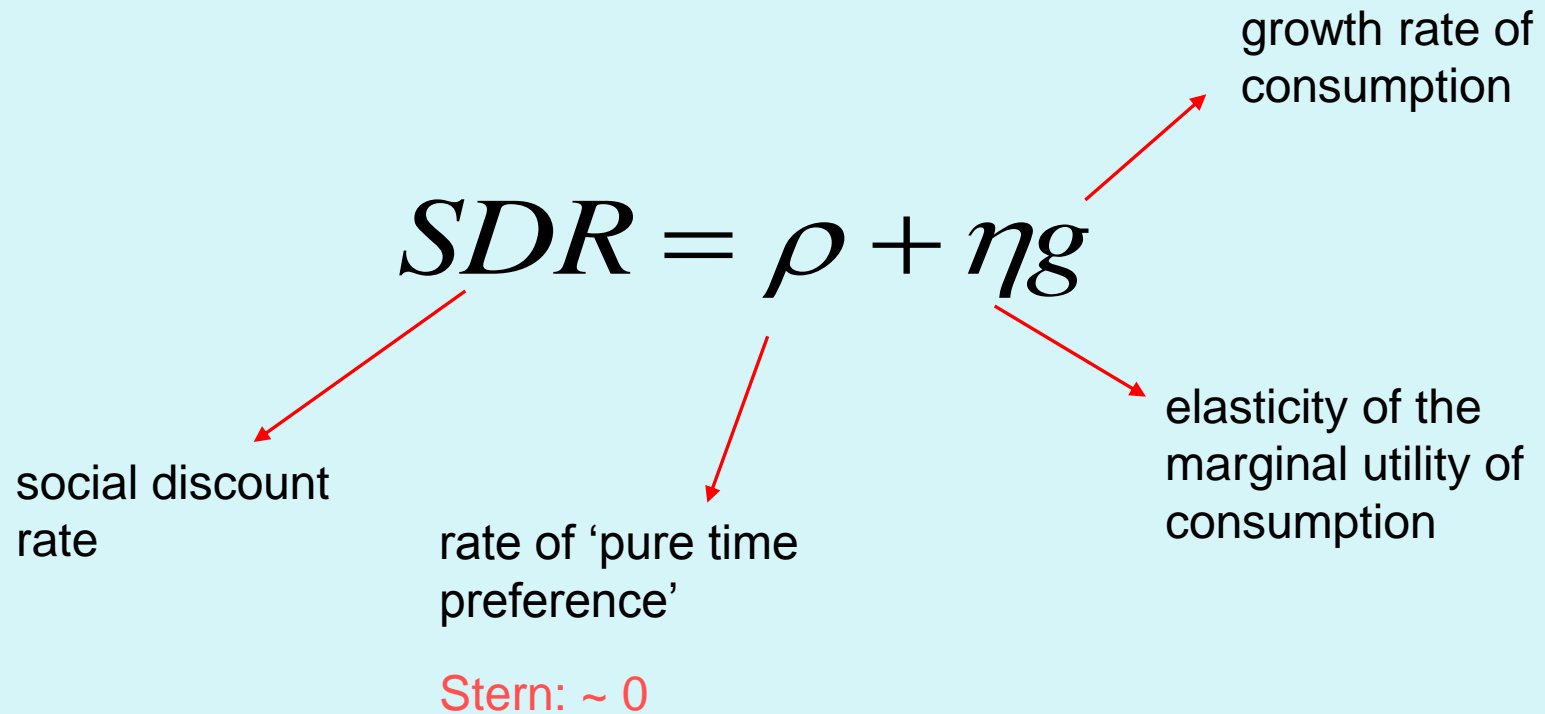
# Disagreement #1



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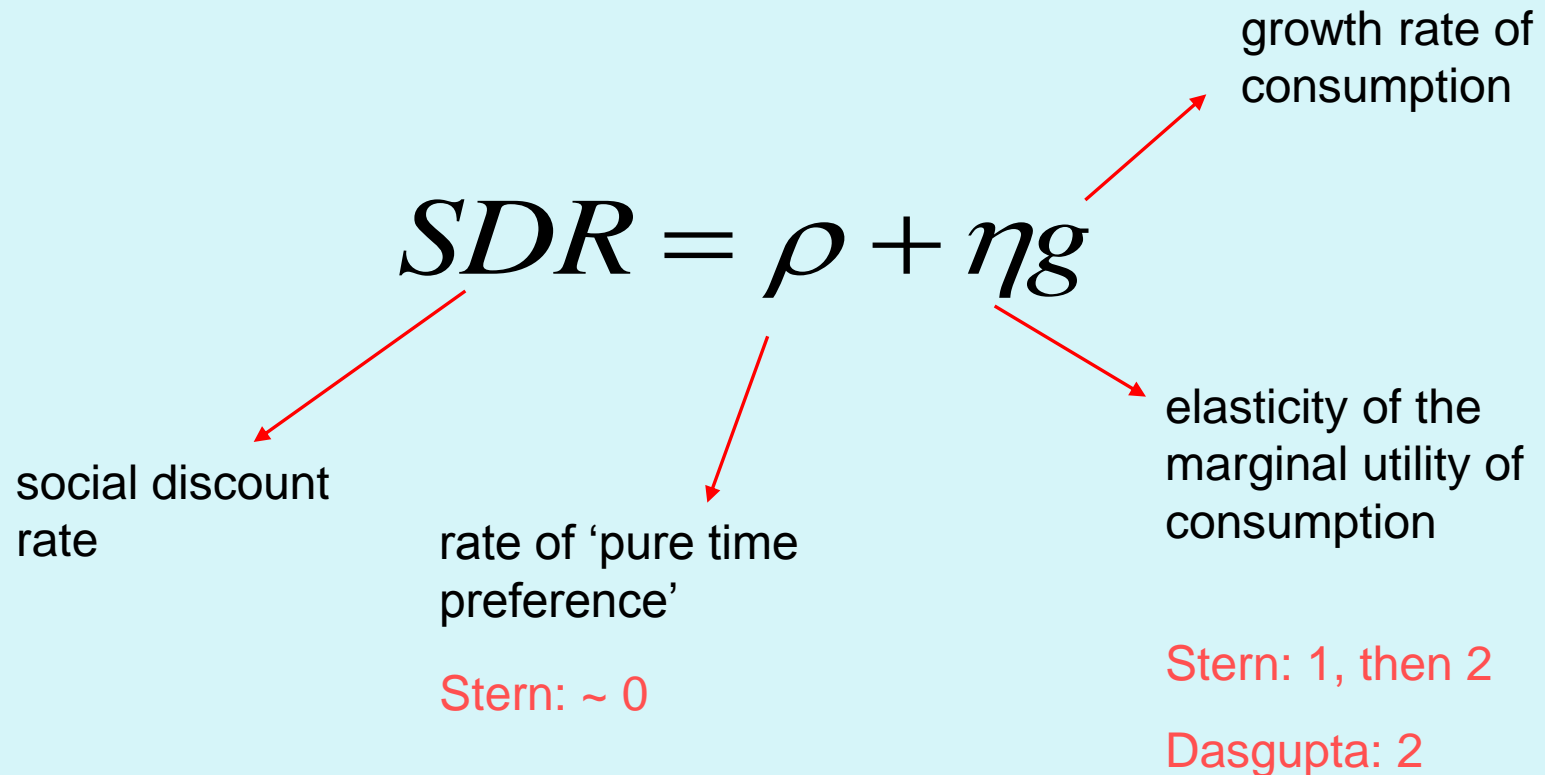


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# Disagreement #1



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# Disagreement #2

$$\cancel{SDR} = \rho + \eta g$$

$$r = \rho + \eta g$$

observed real  
interest rate

Nordhaus: 5-6%

rate of 'pure time  
preference'

Nordhaus: 3, then 1.5

growth rate of  
consumption

elasticity of the  
marginal utility of  
consumption

Nordhaus: 1, then 2



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# “Patently Absurd” Saving Rates?



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Dasgupta



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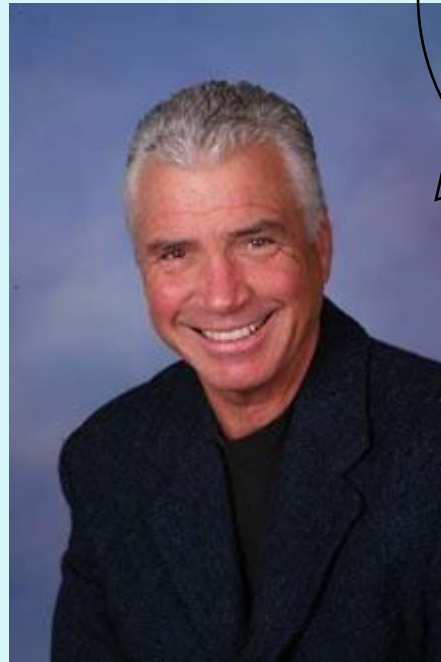
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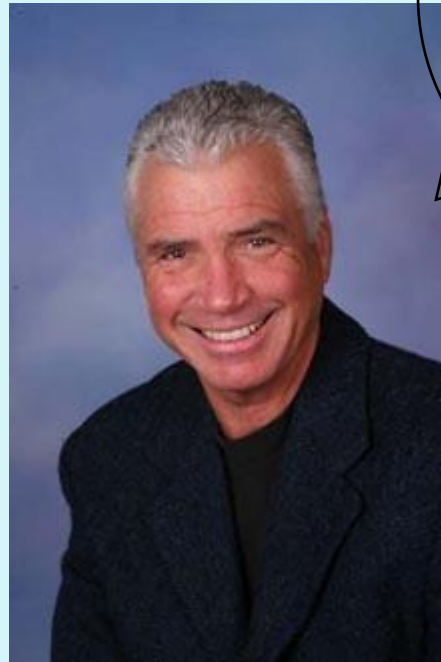
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# “Patently Absurd” Saving Rates?

The resulting saving rates are patently absurd!



Dasgupta



Weitzman

Yep. But I think Stern is right for the wrong reasons.

I think Stern is just wrong.



Nordhaus



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# “Patently Absurd” Saving Rates?

Of course I thought of that!

Yeah, everyone. Stern is right.



Stern



DeLong



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# Saving in the Ramsey Model

- Basis of micro-founded climate policy models
- Specific case: iso-elastic utility and Cobb-Douglas production:

$$Y(t) = A(t)K(t)^\alpha L(t)^{1-\alpha}$$



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- Basis of micro-founded climate policy models
- Specific case: iso-elastic utility and Cobb-Douglas production:

$$Y(t) = A(t)K(t)^\alpha L(t)^{1-\alpha}$$

- Question: what can we say about saving rates?



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# Saving in the Ramsey Model

- Fact 1: steady-state saving is bounded above by the capital share of output *regardless of pure time preference*
- Fact 2: transitional saving rate is monotonic

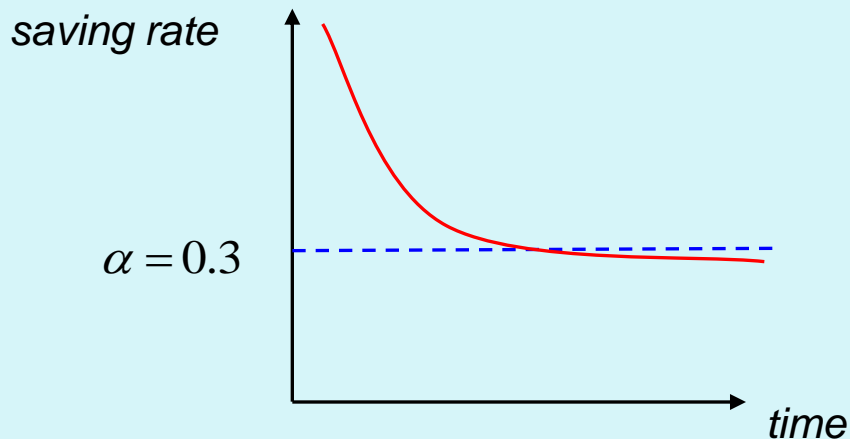


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# Saving in the Ramsey Model

- So: for Stern's parameter choices:
  - saving rates will approach a steady-state level of less than 30% from above.



# What's Absurd About That?

- How to reconcile with Dasgupta's 97.5%?
  - comes from swapping C-D with AK production and removing TFP growth

- In this case

$$s^* = \frac{r - \rho}{\eta r}$$

- For  $r = 4\%$ , Stern's parameters yield

$$s^* = 97.5\%$$

- Plausibility of underlying assumptions?



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# Ramsey and the Climate: DICE

- Sophisticated micro-founded IAM
- Links Ramsey growth model with General Climate Model
- Key differences from standard Ramsey:
  - Finite horizon: complete dissaving
  - Production externality



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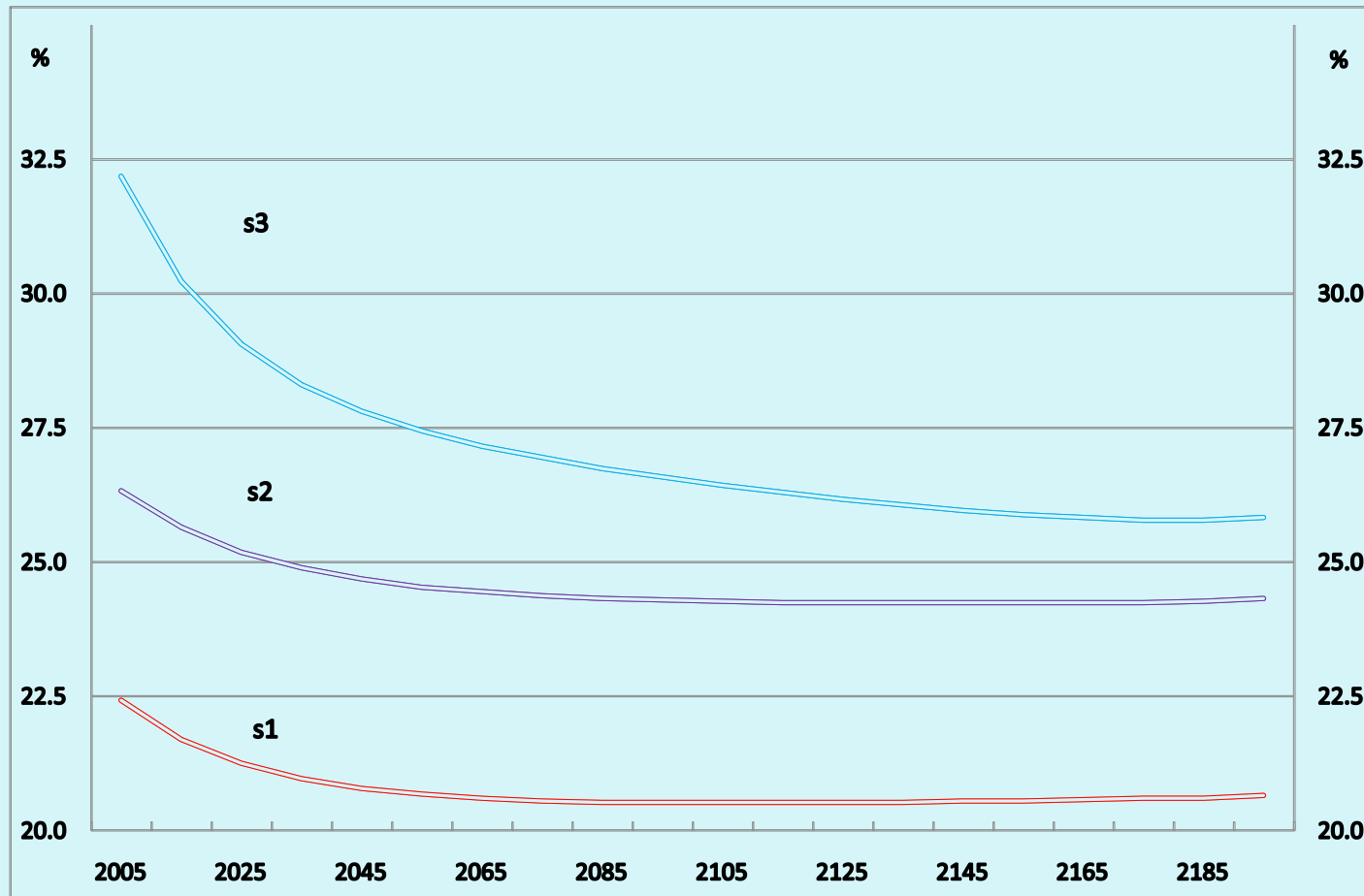
# Are Stern's Rates 'Reasonable'?

- Run DICE with Stern's parameter choices
- Examine saving rates
- Compare with those resulting from Nordhaus's parameters



# Saving Rates in DICE07

Different rates of pure time preference and  $\eta$



Notes: s1: saving rate from DICE07 base run; s2: saving rate in base run with Stern 'hindsight' utility function parameters; s3: saving rate in base run with utility function parameters as in the *Stern Review*.  
Source: author's results from DICE07



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# Another Way to Show Reasonableness

- Look at effect of Stern's saving rates on capital accumulation and optimal rate of emissions control
  - exploits ability to switch off optimal savings in DICE



# Comparison

- Compare emissions control rate under:
  1. Nordhaus default parameters and optimal saving rate
  2. Nordhaus default parameters and fixed saving rate
  3. Stern 'hindsight' parameters same fixed saving rate
  4. Stern 'hindsight' parameters and optimal saving rate



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# Comparison (cont.)

## Scenarios

1. Nordhaus default parameters and optimal saving rate
2. Nordhaus default parameters and fixed saving rate
3. Stern 'hindsight' parameters same fixed saving rate
4. Stern 'hindsight' parameters and optimal saving rate

## Rationale

- Choice of fixed saving rate in (2) to match optimal rate in (1) means that
  - shift from Nordhaus to Stern (1 to 4) can be approx. decomposed into shift from (1 or 2) to (3) (the 'welfare effect') and (3) to (4) (the 'capital effect')
- Hypothesis: capital effect is small as saving rate differences shown to be small

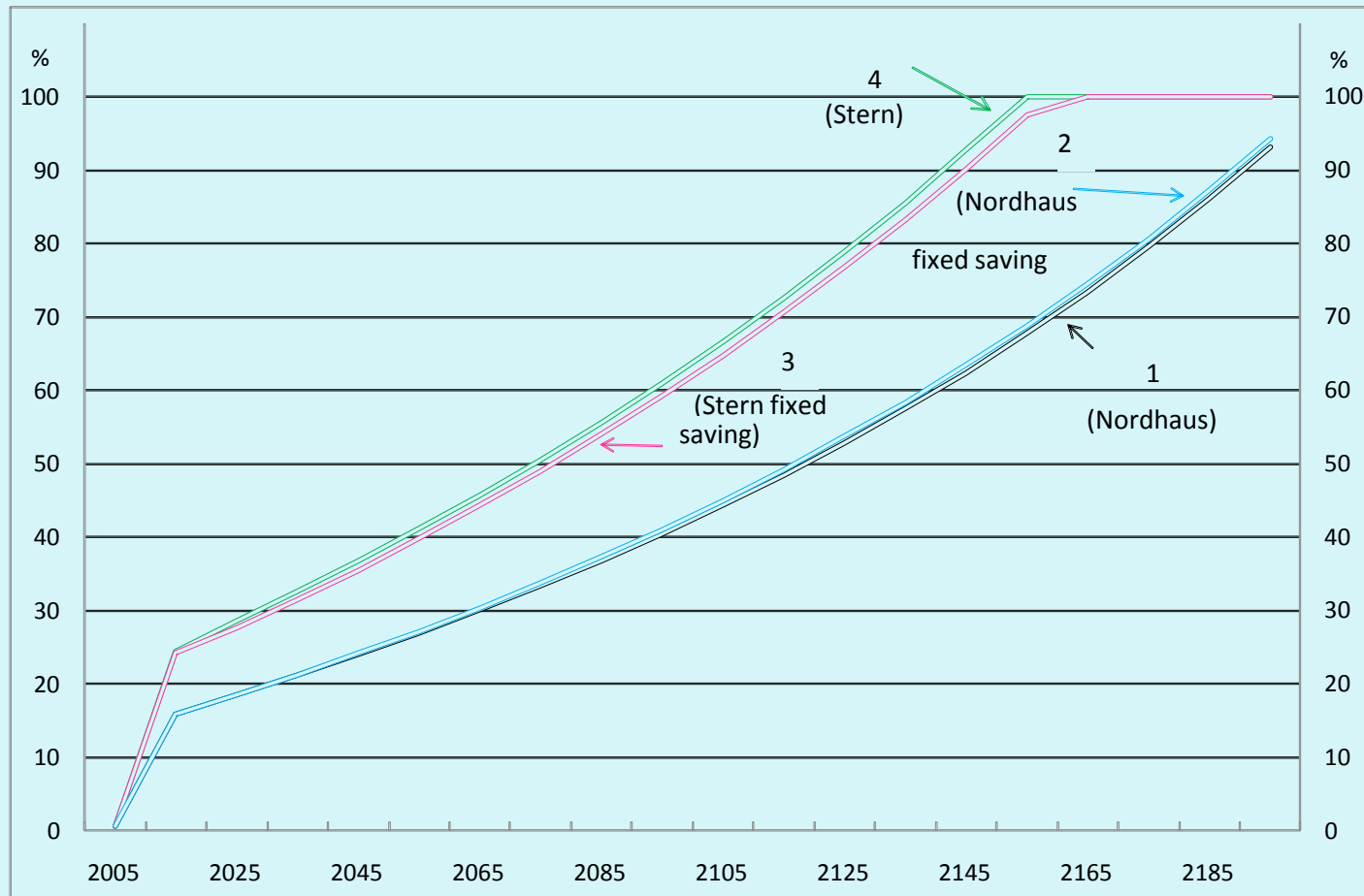


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# Optimal Emissions Control Rates in DICE07

## Different utility function parameters and saving rates



Source: author's results from DICE07



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# Are Stern's Rates 'Reasonable'?

- Broadly yes
- Certainly not 97.5 per cent
- *Maximum* difference with Nordhaus is 4.5 percentage points.



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# In Conclusion

- Clarified the conditions under which ‘high saving rates’ can be used as a criticism of Stern’s utility function parameters
- Future work: many ways of ‘extending’ or altering DICE; key is prioritising areas of most value





# Thank you!



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