Discounting disentangled: An expert survey on the determinants of the long-term social discount rate

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Hyper-sensitivity of long-term CBA to discount rates

The problem

- Long-term valuations are highly sensitive to the choice of discount rate
- The literature documents material disagreement over the appropriate value of the long-term, risk-free, social discount rate (SDR)
- How much would you invest now to avoid 1000€ of climate damages a century from now? Stern's SDR implies 250€, while Nordhaus' 10€

It matters!

- Choosing the SDR for long-term public project appraisal is "one of the most critical problems in all of economics" (Weitzman 2001 AER)

Weitzman (2001), American Economic Review

What he did

- Asked >2000 economists for appropriate 'real discount rate' or 'rate of interest' with which to discount projects aimed at mitigating climate change
- Finds substantial heterogeneity: mean(median) of 4%(3%) and min(max) of -3%(27%)

Problems

- Recommendations are difficult to interpret because respondents could have different concepts in mind when answering
- No information that lets us understand the reason for any given response
- No separation of normative and positive responses. This matters when we aggregate different responses (Freeman & Groom 2014 EJ; Heal & Millner 2014a,b PNAS,NBER)

The Ramsey rule

The rule

$$r = SDR = \delta + \eta g$$

where:

- r is the expected average risk-free market interest rate over horizon
- δ is the rate of pure time preference
- η is the elasticity of marginal utility of consumption
- g is the expected per-capital real growth rate of consumption

The workhorse model

- Found in policy guidance around the world (UK, France, Germany, IPCC)
- "Useful framework for intergenerational discounting issues" (Arrow et al. 2012 RFF-WP)

Our survey

We elicit...

- Responses on individual components of the Ramsey rule
- The weight to be put on normative and positive considerations in determining the SDR
- Acceptable ranges for the SDR

This allows us to...

- Better disentangle expert advice on the SDR into constituent parts
- Provide important inputs into the discounting policy debate underway in many countries such as the UK, US, Netherlands, and Sweden
- Address important conceptual and practical issues concerning aggregation of expert opinions and the term structure of SDRs

What we did

Sampling of 'experts'

- Combes and Linnenmer (2010), 103 journals rated A or higher since 2000
- 'Social discounting', 'social discount rate', 'discount rate' in the abstract or main text
- Weak relevancy filter
- 627 potentially relevant experts identified

The survey

- Simplified and parsimonious
- 7 questions plus open comments
- Conducted via e-mail and online (May to November 2014)

Preamble

- Imagine that you are asked for advice by an international governmental organization that needs to determine the appropriate real social discount rate for calculating the present value of certainty-equivalent cash flows of public projects with intergenerational consequences.
- For its calculations, the organization needs single values for the components of the real social discount rate. While this does not capture all of the important complexities of social discounting, it does reflect most existing policy guidance on the matter. Your answers will therefore help to improve the current state of decision-making for public investments.
- Specifically, you are asked to provide your recommendations on the single number, global average and long-term ($>$ 100 years) values of the following determinants of the social discount rate:

Survey questions

1. Growth rate of real per-capita consumption [X% per year] (g);
2. Rate of societal pure time preference (utility disc. rate) [X% per year] (δ);
3. Elasticity of marginal utility of consumption [X] (η);
4. Real risk-free interest rate [X% per year] (r);
5. What relative weight should the governmental body place on the following rationales for determining the social discount rate: a) Normative issues [X%] and (b) Descriptive issues [X%]
6. What is your recommended real social discount rate for evaluating the certainty-equivalent cash flows of a global public project with intergenerational consequences [X% per year]?
7. What minimum and maximum real social discount rate would you be comfortable with recommending [X% per year]?
8. Do you have any additional comments?

Responses

- 197 responses; overall 262 replied (response rate 30%-42%)

Variable	Mean	StdDev	Median	Mode	Min	Max	N
Real growth rate per capita	1.70	0.91	1.60	2.00	-2.00	5.00	181
Rate of societal pure time preference	1.10	1.47	0.50	0.00	0.00	8.00	180
Elasticity of marginal utility	1.35	0.85	1.00	1.00	0.00	5.00	173
Real risk-free interest rate	2.38	1.32	2.00	2.00	0.00	6.00	176
Normative weight	61.53	28.56	70.00	50.00	0.00	100.00	182
Positive weight	38.47	28.56	30.00	50.00	0.00	100.00	182
Social discount rate (SDR)	2.25	1.63	2.00	2.00	0.00	10.00	181
SDR lower bound	1.15	1.38	1.00	0.00	-3.00	8.00	182
SDR upper bound	4.14	2.80	3.50	3.00	0.00	20.00	183
Number of quantitative responses							185
Number of qualitative responses							99
Number of responses used for analysis							197
Number of explained non-responses							27
Number of bias-check responses							38
Total number of responses							262

Growth rate per capita

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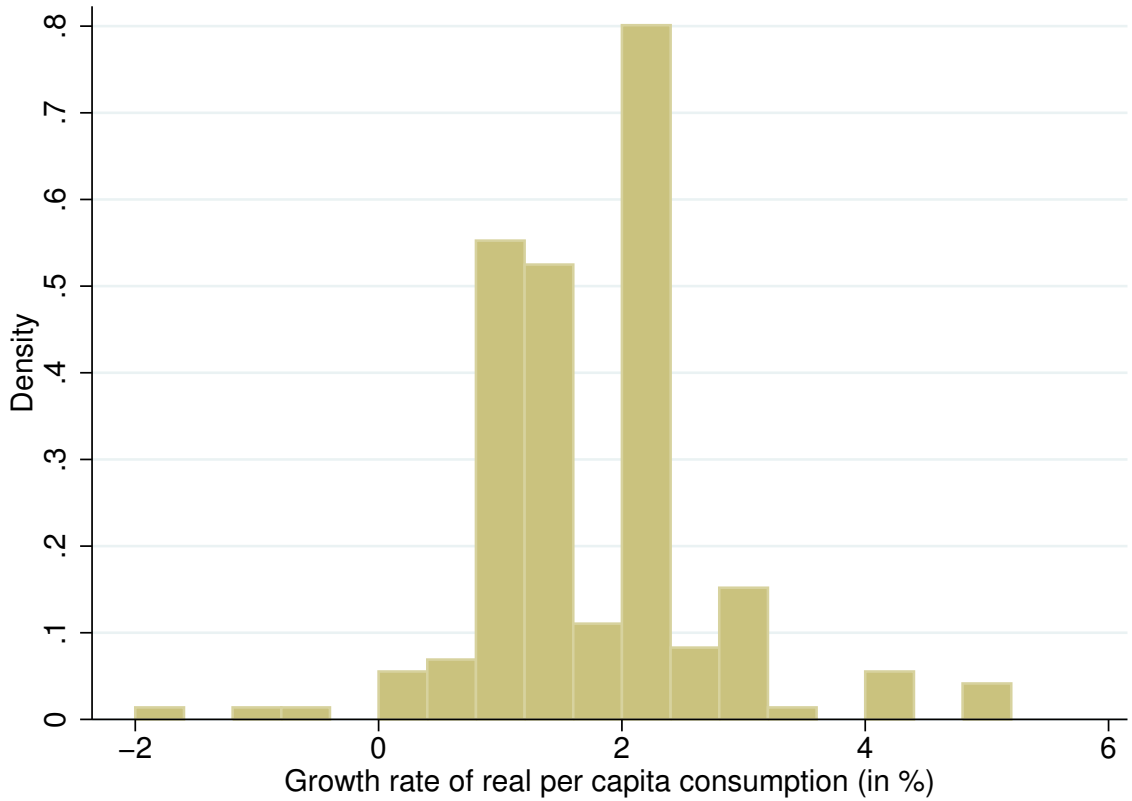

Rate of societal pure time preference

Variable	Mean	StdDev	Median	Mode	Min	Max	N
Real growth rate per capita	1.70	0.91	1.60	2.00	-2.00	5.00	181
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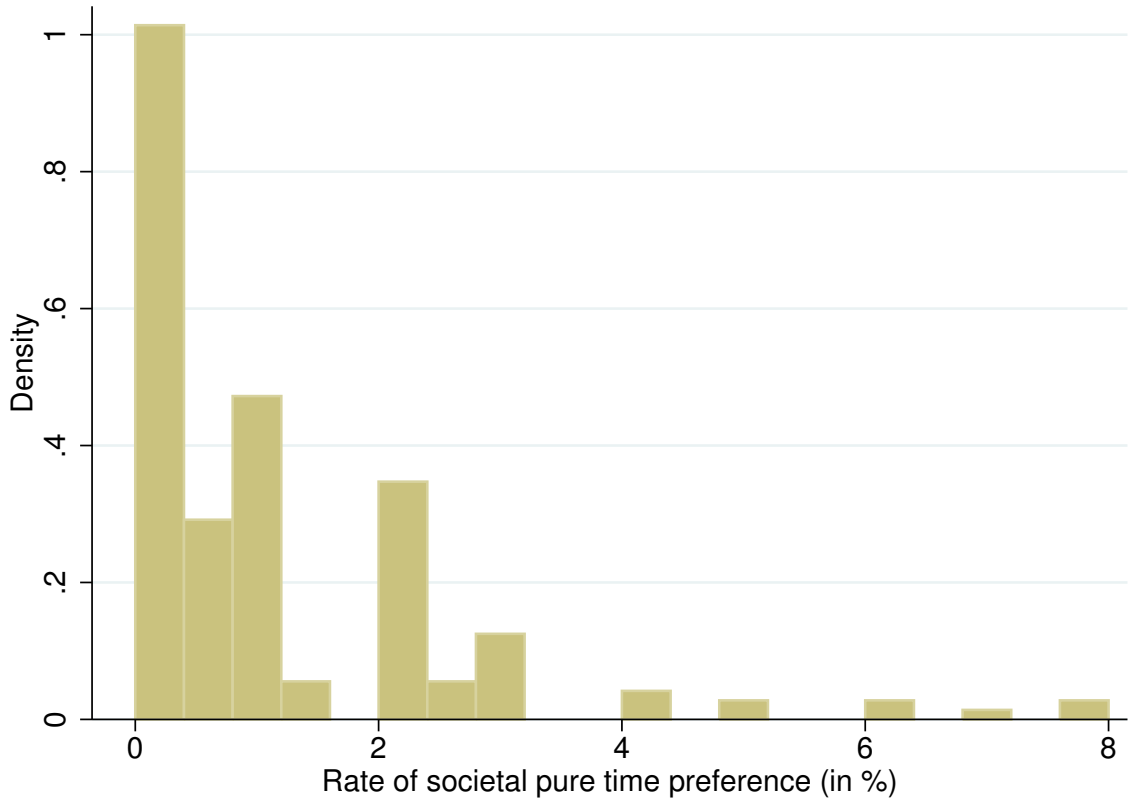
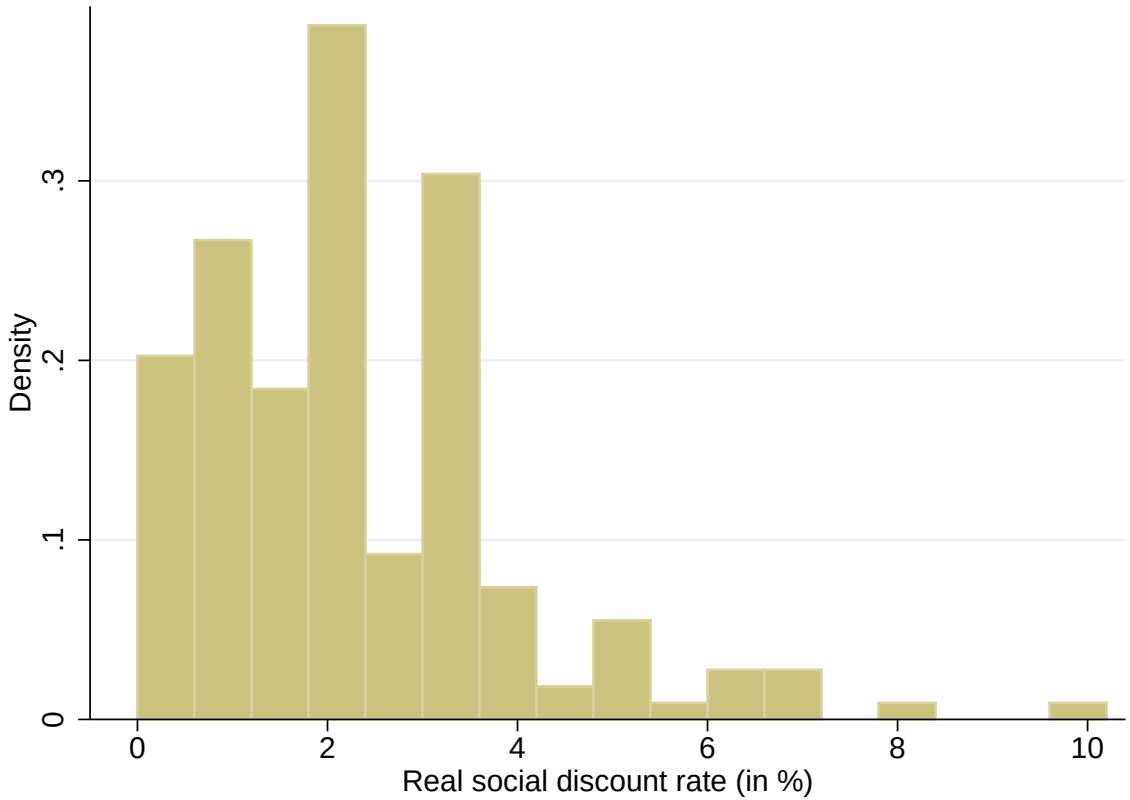


Social discount rate

Variable	Mean	StdDev	Median	Mode	Min	Max	N
Real growth rate per capita	1.70	0.91	1.60	2.00	-2.00	5.00	181
Rate of societal pure time preference	1.10	1.47	0.50	0.00	0.00	8.00	180
Social discount rate (SDR)	2.25	1.63	2.00	2.00	0.00	10.00	181



Qualitative remarks

Categories

- Individual survey questions
- Technical issues
- Methodological issues
- Concerns about limited expertise

Overview of issues raised

- Declining discount rates and time-horizon (20)
- Uncertainty (20)
- Substitutability and environmental scarcity (20)
- Heterogeneity and aggregation (19)
- Comparison to Ramsey rule (17)
- ...

Observations

Initial summary

- Our mean (median) SDR value of 2.25% (2%) is much lower than Weitzman's (2001) values of 4% (3%)
- We find much lower heterogeneity in point SDR responses (0 to 10% versus -3% to 27%)

Do experts agree on the SDR range?

Substantial disagreement on point SDRs, but..

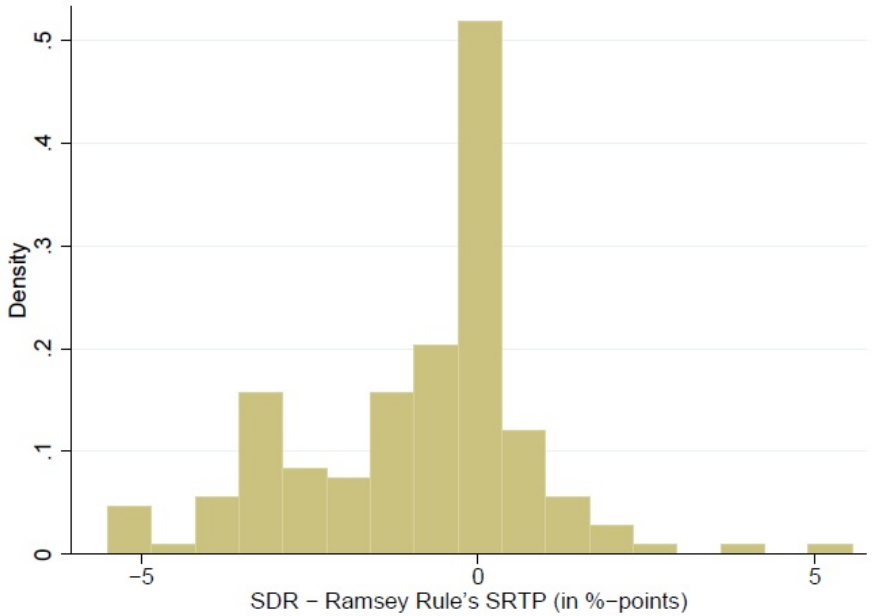
- An SDR of 2% is in the acceptable range of 76% of experts
- On the contrary: Nordhaus (4.5%) is in the acceptable range of only 39% of experts, while Stern (1.4%) is in the range of 57% of experts
- 92% of experts are comfortable with SDRs somewhere in the interval of 1% to 3%

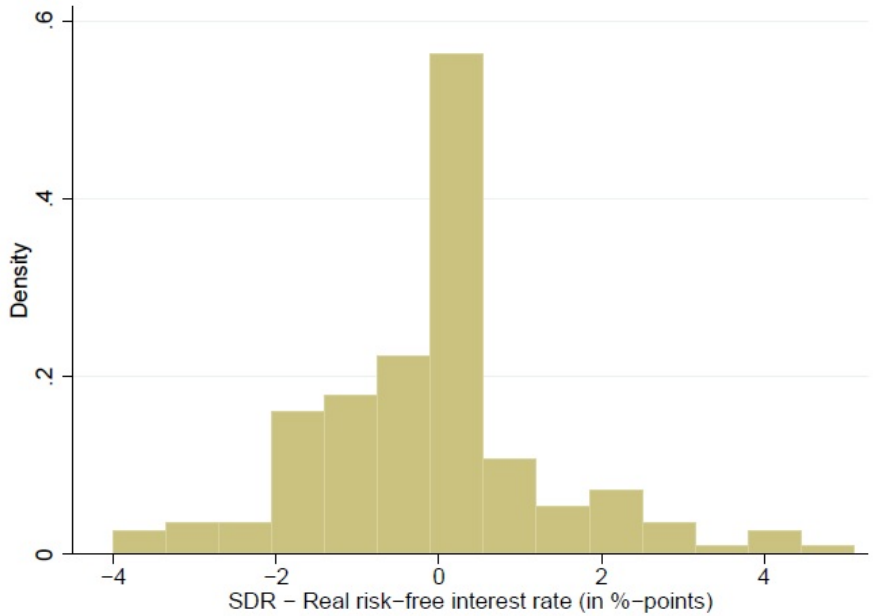
The location of proposed SDR ranges

- The SDR interval of 0 to 3% (0 to 4%) fully contains the acceptable ranges of 46% (64%) of experts
- The majority of experts would not be comfortable with SDRs exceeding 4%
- Results thus suggest that the public debate has been influenced by positions that are not quite in the center of opinion

Do experts use the Ramsey rule?

Variable	Mean	StdDev	Median	Mode	Min	Max	N
Social rate of time preference (SRTP)	3.48	3.52	3.00	4.00	-2.00	26.00	172
Social discount rate (SDR)	2.25	1.63	2.00	2.00	0.00	10.00	181
Real risk-free interest rate	2.38	1.32	2.00	2.00	0.00	6.00	176





Do experts use the Ramsey rule?

Not clear...

- Only 35 experts had an $SDR = \delta + \eta g$
- Only 47 experts had an $SDR = r$
- Only 18 experts had $r = SDR = \delta + \eta g$

Exemplary quotes

- 'My discount rate is less than implied by the Ramsey rule because I use the extended rule, incorporating uncertainty about long term growth'
- 'The Ramsey formula suggests a somewhat higher real social discount rate (6%), but for moral and political reasons (future generations can't vote) I prefer 3%'

Sample selection and robustness checks

Respondents versus 60 random non-respondents

- Mean SDR lower (-0.23) for random non-respondents

Observable characteristics of respondents and non-respondents

- Potential downward-bias in SDR due to Europeans selecting into responding (49% versus 33%)

Early and late respondents

- Mean and median SDRs similar for early and late respondents

Overall

- Not sugguesting any unidirectional bias for the SDR

Conclusions

Discounting raw material

- Survey provides important 'raw' information for intergenerational decision-making

Discounting disagreement

- Substantial disagreement on point SDRs, but..
- An SDR of 2% is in the acceptable range for 76% of experts
- 92% of experts are comfortable with SDRs in the interval of 1% to 3%

Ramsey rule

- 81% of experts do not recommend SDR equal to Ramsey rule's SRTP
- Prominence of the simple Ramsey rule in policy guidance needs to be revisited