Design of a Climate Agreement

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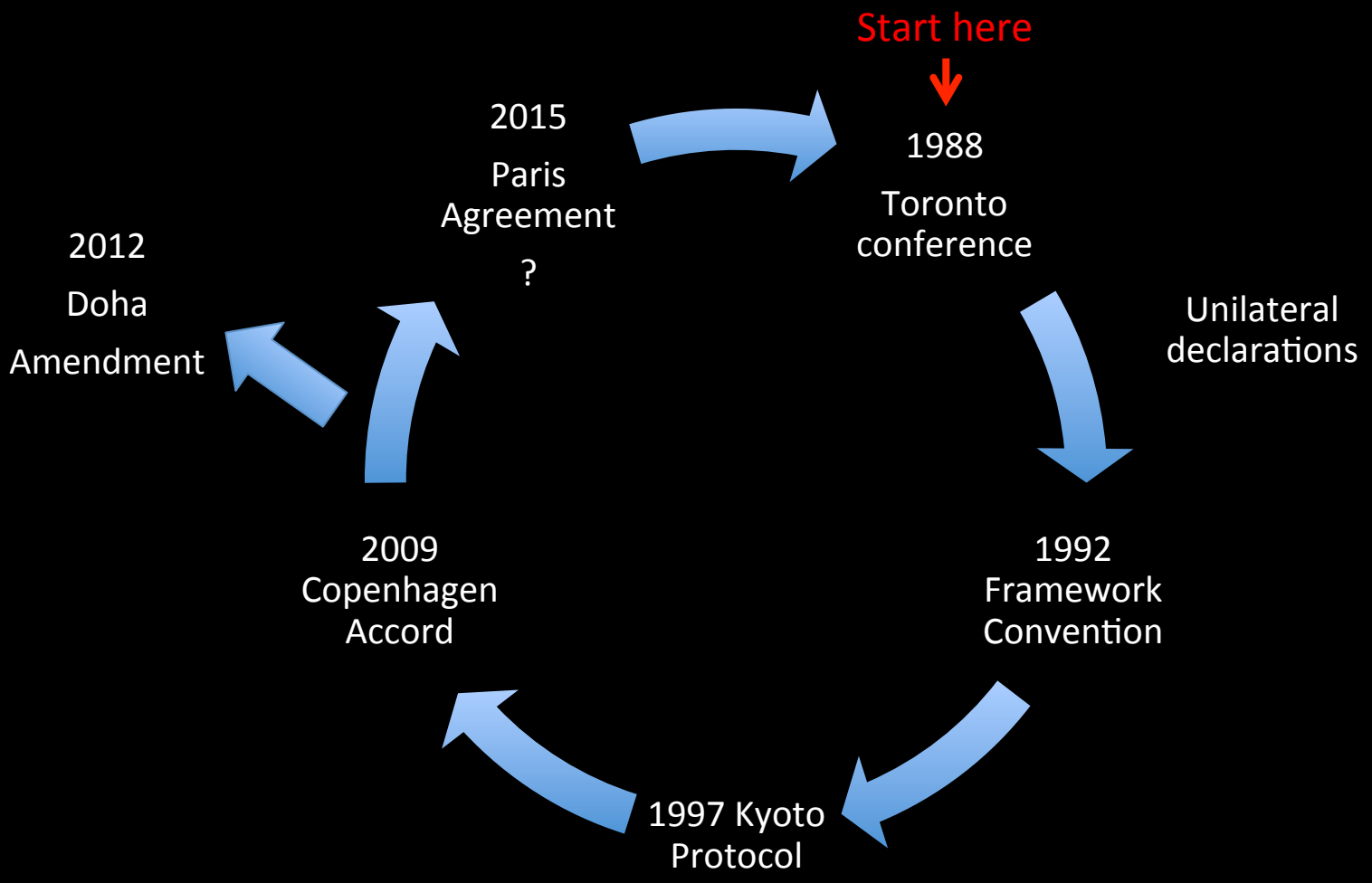
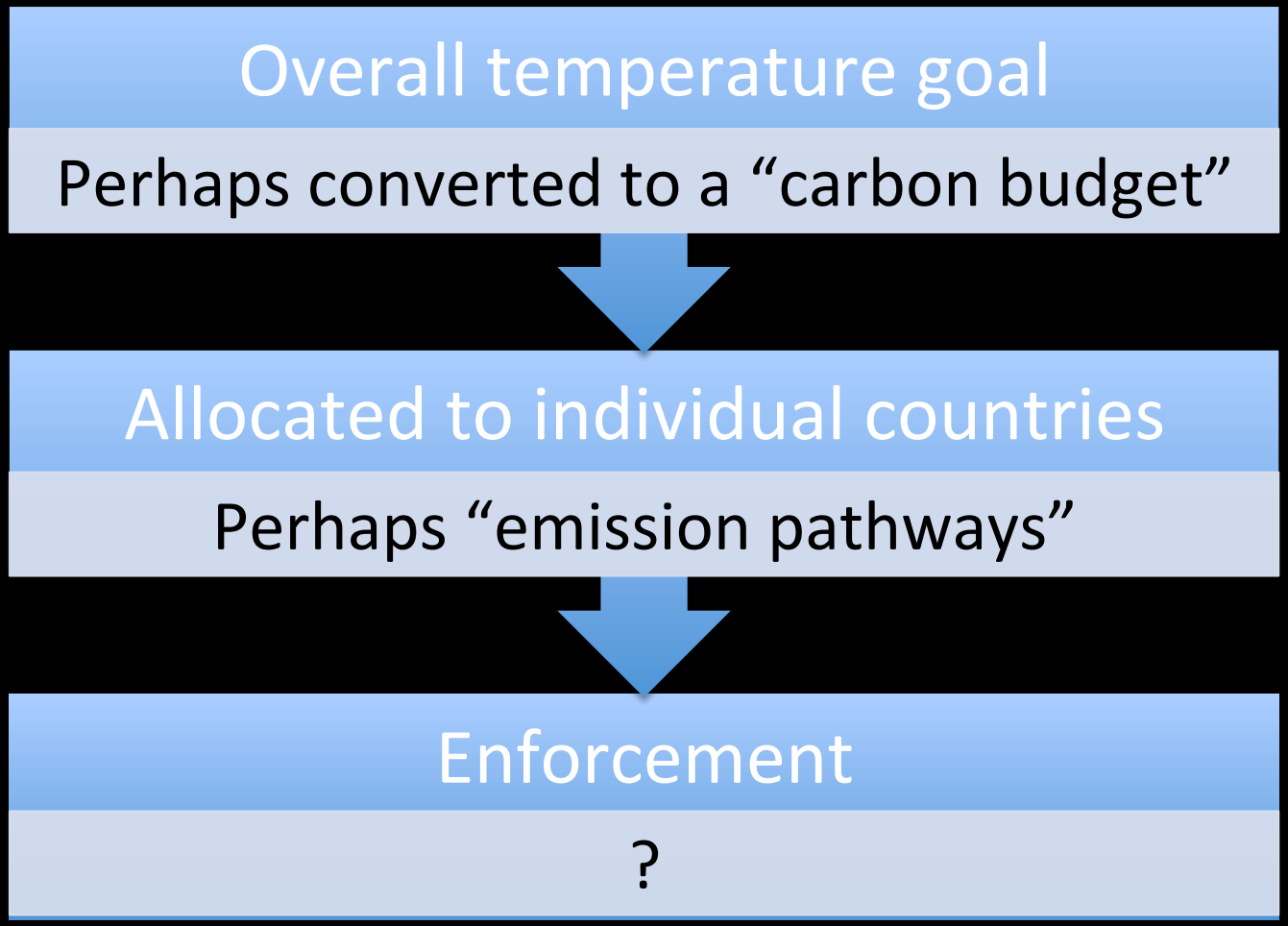
Timeline of Climate Negotiations



The approach: goals, targets, and timetables

	Collective goal	Targets and timetables
Toronto 1988	Reduce global emissions of CO_2 20% from the 1988 level by 2005	None, though many countries announced **unilatera**l targets and timetables.
Rio 1992	Limit concentrations to avoid "dangerous" climate change	"aim of returning individually or jointly to … 1990 [emission] levels" by 2000.
Kyoto 1997	"In pursuit of the ultimate objective of the" UNFCCC…	Annex I parties "shall… ensure that their….emissions…do not exceed their assigned amounts..." for 2008-2012.
Copenhagen 2009	Limit "global emissions so as to hold the increase in global temperature below 2 degrees Celsius…."	"Annex I Parties commit to implement individually or jointly the quantified economy wide emissions targets for 2020, **to be submitted**…by Annex I parties….
Paris 2015	Probably some version of the above.	Parties to submit INDCs, probably subject to assessment and review.

The “top down” approach



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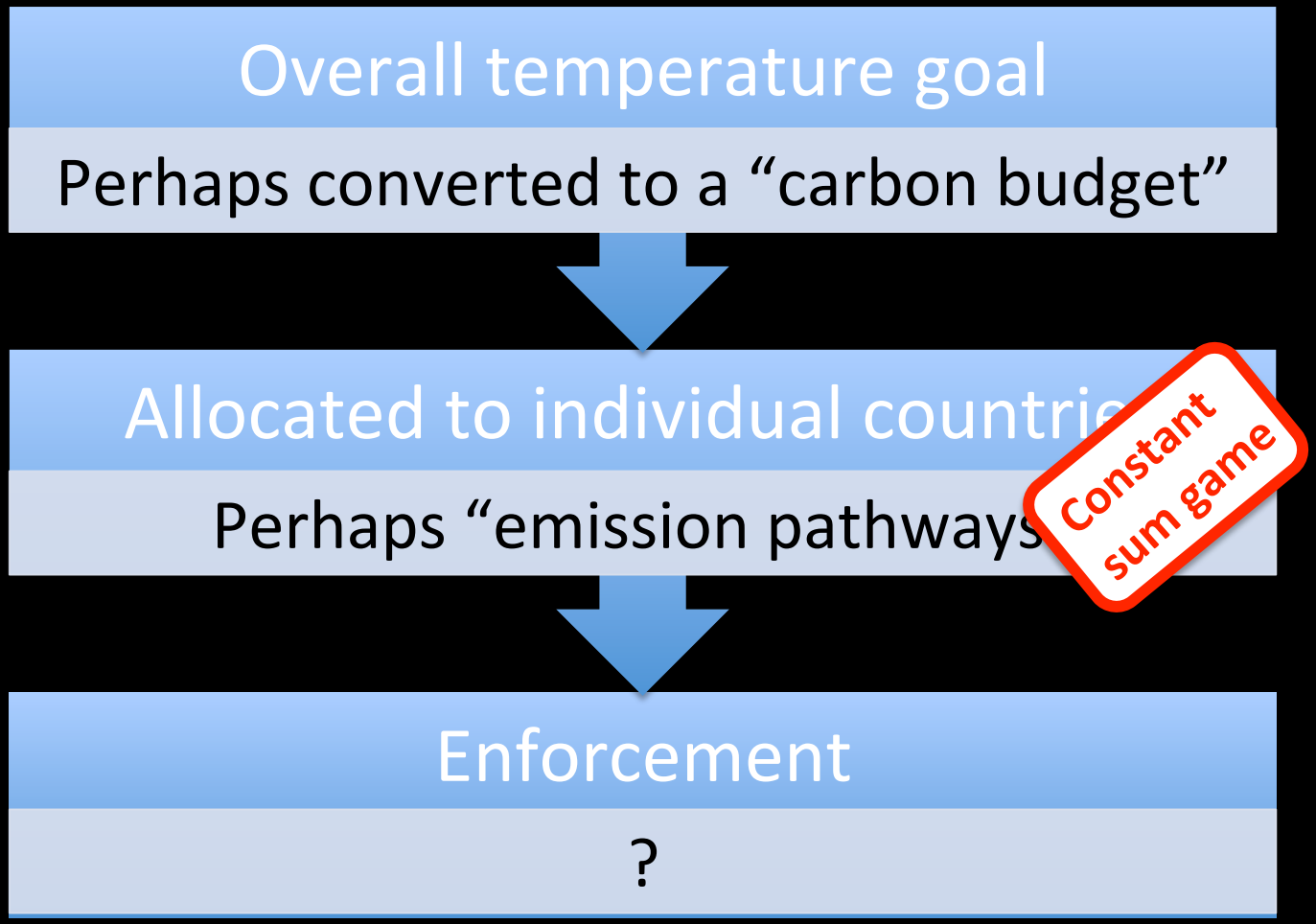
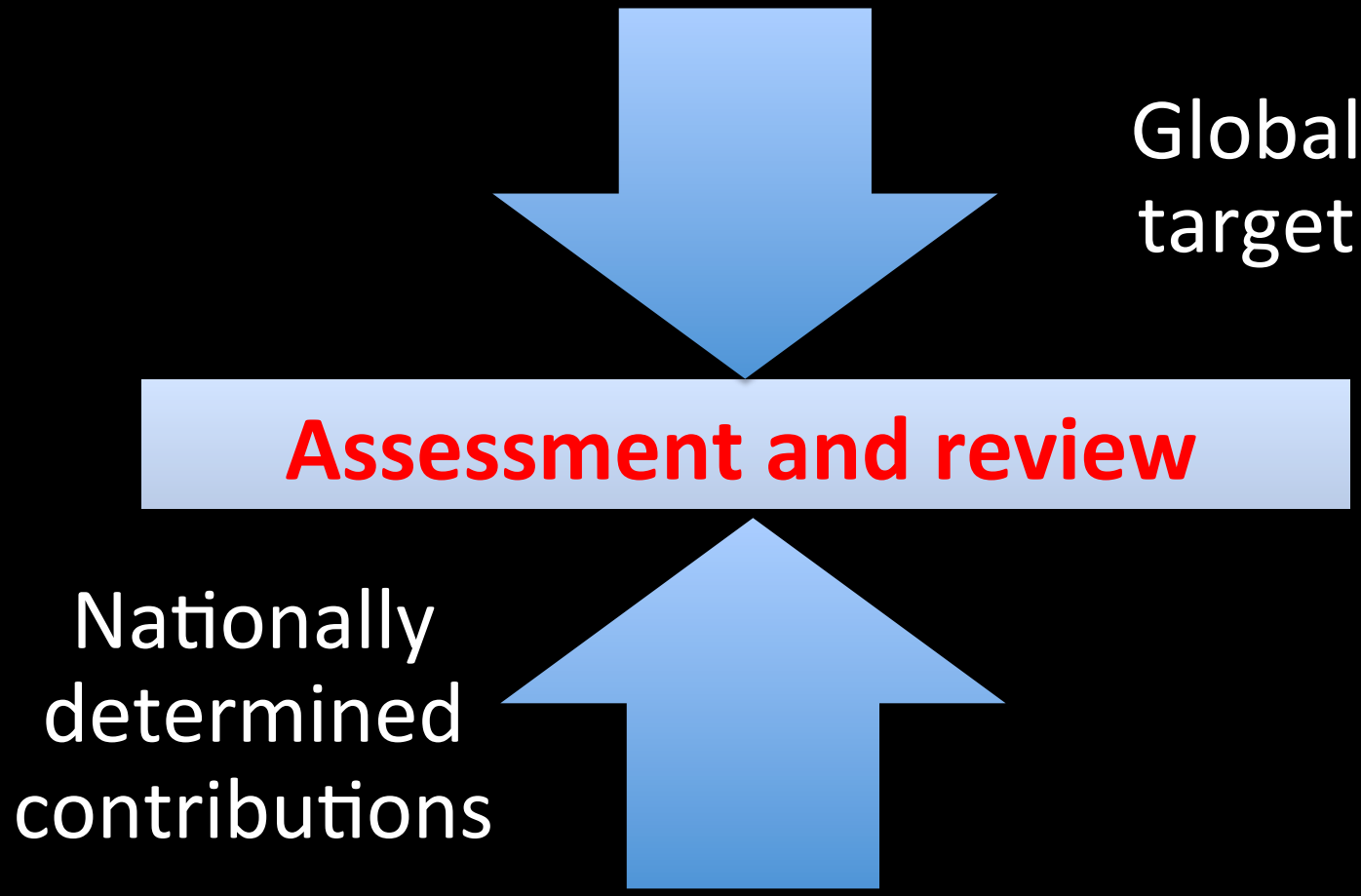


The Paris Agreement ?



Will Paris Make a Difference?

- Agreement may not enter into force until 2020.
- It will take perhaps a decade to know how countries have responded.
- Even then, we won't have the "counterfactual."
- Meanwhile, the window of opportunity for avoiding "dangerous" climate change will be closing; an opportunity lost.
- Why wait? Can't we predict whether Paris will help?

Theory vs. Experiments

- In theory, the review process is “cheap talk.” It shouldn’t affect behavior.
- But previous experiments have shown that people are sensitive to social feedback (see, for example, Masclet et al. 2003 and Lopez-Perez and Vorsatz 2010).

New joint work with

Astrid Dannenberg
University of Kassel

Understanding the actual negotiations

By seeing how people play a similar game

Our experiment

- 5 players per group.
- Every player starts with 5 black poker chips worth €.10 each and 15 red poker chips worth €1 each.
- Contributing one chip gives every player €.05.
- If the players contribute “too little,” and a critical threshold is breached, the players lose €20 each.
- The value of the threshold is unknown, but lies between 50 and 100 chips

Incentives

- The best the group can do is for everyone to contribute all of their chips.
  - This eliminates the chance of "dangerous" climate change and pays each player €.05×20×5 = €5.
- If every player seeks to advance his or her self-interest, no player will contribute any chips.
  - This guarantees "dangerous" climate change, and pays each player €.1×5 + €1×15 - €20 = -€4.5.
- To ensure no one loses money, we give everyone an "endowment fund" of €19.

Prisoner’s dilemma game

Experimental payoffs

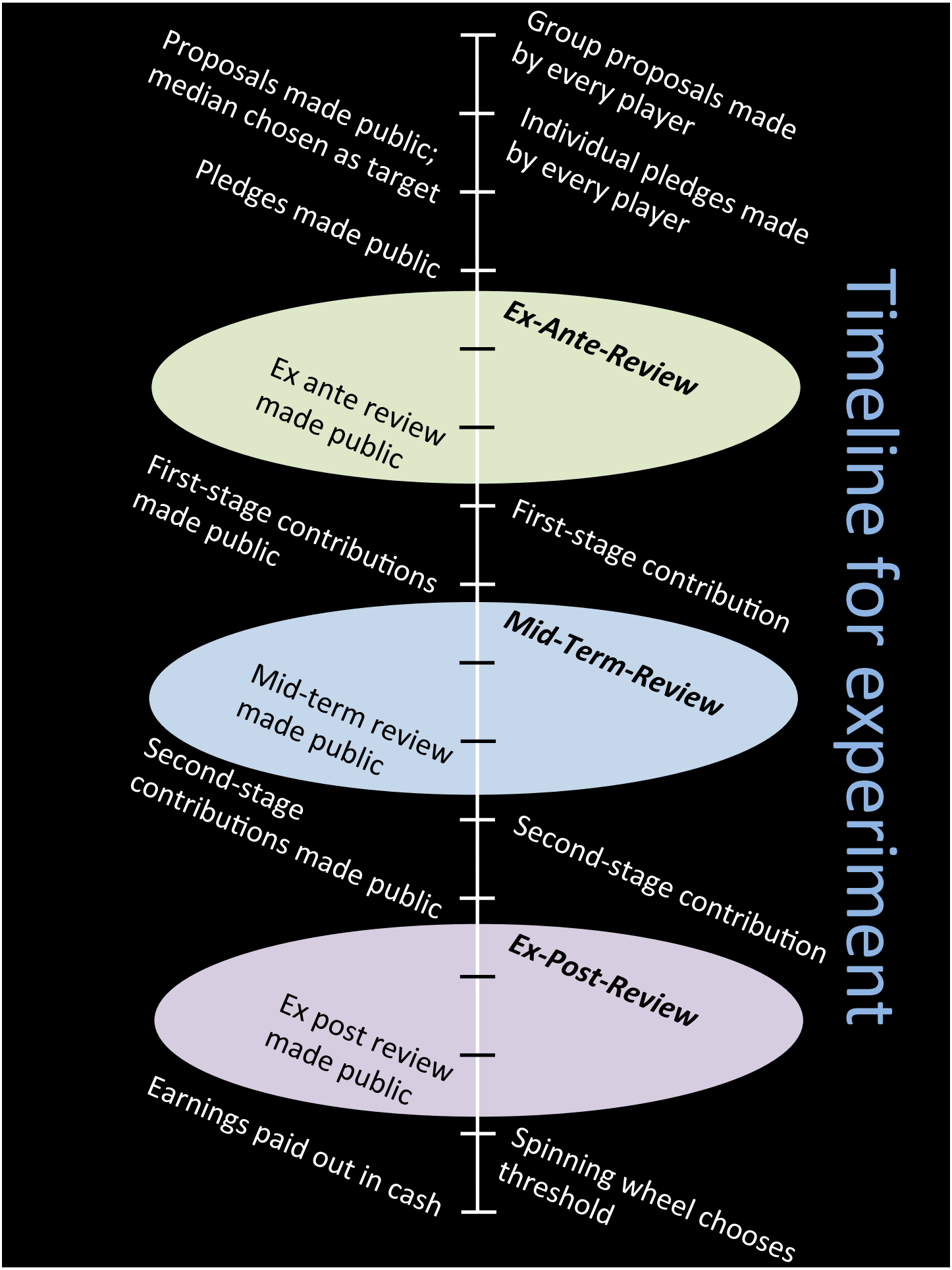
- The worst case for an individual player: she gives all her chips, and the others give none.
  - She gets €.05×20 -€20 + €19 = €0.
- The best case for an individual player: others give all their chips, she gives no chips, and the group gets lucky (no "catastrophe"):
  - She gets €.05×80 + €.1×5 €1×15 + €19 = €38.50.
- In this game, players can get a *very low* or a *very high* payoff.

Groups

- Each treatment was played by 10 groups with the exception of *Mid-Point*, which was played by 9 groups.

Choices made independently

The sequence


Timeline for experiment
Group proposals made by every player
Individual pledges made by every player
Proposals made public; median chosen as target
Pledges made public
Ex-Ante-Review
Ex ante review made public
First-stage contribution
First-stage contributions made public
Mid-Term-Review
Mid-term review made public
Second-stage contribution
Second-stage contributions made public
Ex-Post-Review
Ex post review made public
Spinning wheel chooses threshold
Earnings paid out in cash

Review grades

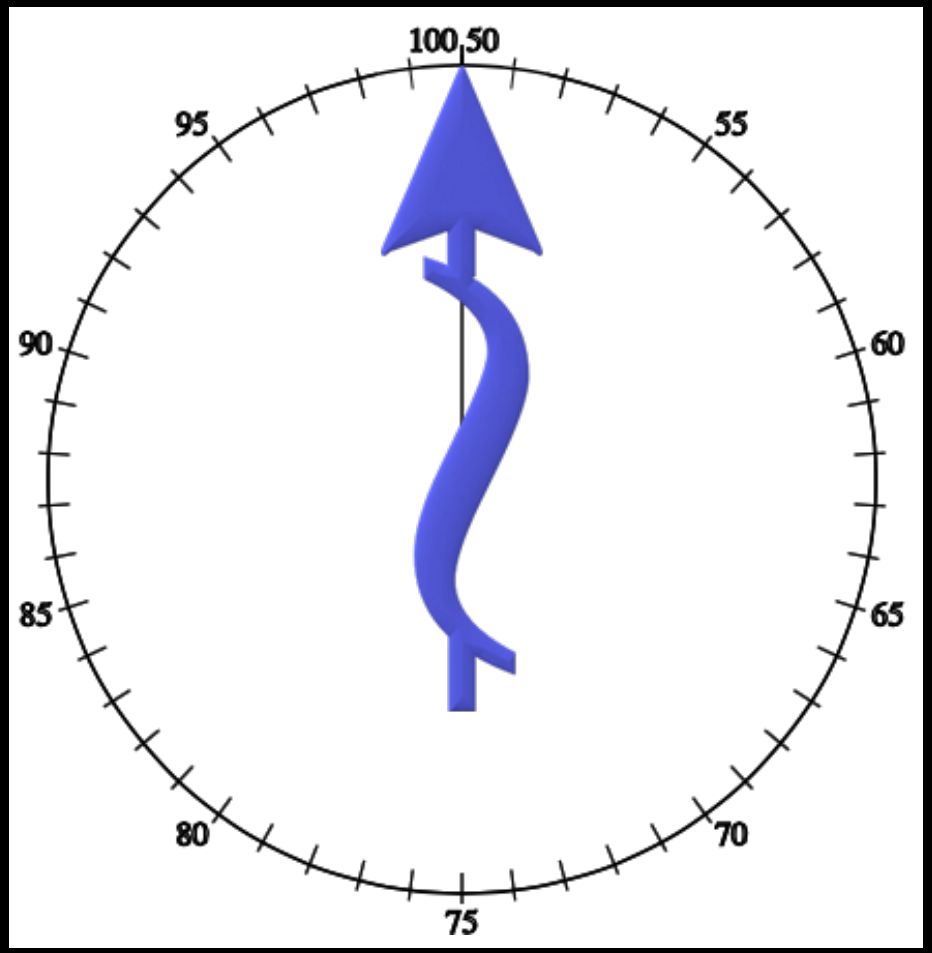
- 1-6, with 1 being “very good” and 6 being “insufficient.”

Expectations

In every treatment, just before contributions are chosen, the players are asked to answer a question:

- "How much do you think your co-players will contribute on average?"
- Players get a reward of €1 for correct guesses.
- This gave us an estimate of each player's expectations for how the game would be played subsequently.

How Nature plays



The spinning wheel

Incentives!


INKIESS
MODELL
2 EURO
1 EURO
10 CENT
5 CENT
2 CENT
500 €
5 EURO
10 EURO
20 €
25 x 2 €
40 x 0,50 €
50 x 0,05 €

Results

Group averages

1. Targets > Pledges > Contributions
2. Values are a little higher for the Review treatments.

Summary statistics

Treatment	Mean target	Mean pledge	Mean group contribution	Min / max group contribution
No-Review	84 (8.43)	74.7 (11.64)	58.1 (14.36)	35 / 78
Ex-Ante-Review	95.2 (6.36)	90 (5.33)	64.2 (9.46)	54 / 85
Mid-Point-Review	88.22 (8.44)	83.55 (10.27)	63.56 (20.01)	30 / 92
Ex-Post-Review	96.7 (6.67)	91.5 (15.53)	69 (19.46)	25 / 95

Note: Mean values across groups per treatment; standard deviations in parentheses.

1. The standard errors are very large. There is a lot of variation behind the mean values for all treatments.
2. The range of values is also very large.

Significance of treatment differences

	Target	Pledge	Contribution	Target	Pledge	Contribution	Target	Pledge	Contribution
Ex-Ante-Review	.009 (.394)	.001 0.125)	.325 (.174)						
Mid-Point-Review	.262 (.941)	.060 (.770)	.512 (.413)	.055 (.317)	.153 (.188)	.838 (.069)			
Ex-Post-Review	.004 (.242)	.002 (.942)	.112 (.533)	.594 (.492)	.048 (.284)	.211 (.108)	.030 (.215)	.008 (.782)	.513 (.874)
	No-Review			*Ex-Ante-review*			*Mid-Point-Review*		

Note: P-values from a Mann-Whitney Wilcoxon rank-sum test of treatment differences in mean values; in parentheses P-values from a Levene test of treatment differences in variances.

1. Targets and pledges are significantly higher in the *Ex-Ante*- and *Ex-Post-Review* treatments than in *No-Review*.
2. Pledges are also significantly higher in these Review treatments.
3. Contributions are *not* higher with statistical significance.

Linear regressions of individual proposals and pledges

	(1)	(2)
VARIABLES	Proposal	Pledge
Treatment dummies (Baseline: *No-review*)		
Ex-Ante-Review	12.94**	0.718
	(3.111)	(0.792)
Mid-Point-Review	5.922	0.888
	(4.790)	(0.728)
Ex-Post-Review	13.14**	0.704
	(4.037)	(1.239)
Target		0.209**
		(0.0525)
Constant	79.10**	-2.627
	(2.761)	(4.577)
Observations	195	195
R-squared	0.082**	0.251**

Robust standard errors in parentheses ** P < .01, * P < .05.

1. Proposals are higher in Ex-Ante- and Ex-Post-Review than in No-Review
2. Pledges are higher when targets are higher.

Linear regression: individual contributions

	(1)
VARIABLES	Contribution
Treatment dummies (Baseline: *No-Review*)	
Ex-Ante-Review	-0.937
	(1.251)
Mid-Point-Review	0.0976
	(1.309)
Ex-Post-Review	-0.381
	(1.396)
Target	-0.0995
	(0.0553)
Others average pledge	0.0426
	(0.248)
Own pledge	0.310**
	(0.105)
Belief	0.772**
	(0.111)
Constant	4.675
	(3.917)
Observations	195
R-squared	0.357**

Robust standard errors in parentheses: ** P < .01, * P < .05.

1. Contributions in the Review treatments are *not* higher than *No-Review* with statistical significance.
2. Contributions do increase with pledges.
3. Recall that pledges increase with targets, and targets with the Review treatments. So the effect of the Review process is very indirect.
4. The effect weakens along the chain, eventually losing significance.
5. Contributions increase with expectations about others' contributions, but what determines these expectations?

Linear regressions of individual beliefs

	(1)
VARIABLES	Belief
Treatment dummies (Baseline: *No-Review*)	
Ex-Ante-Review	0.734
	(0.890)
Mid-Point-Review	-0.0847
	(0.918)
Ex-Post-Review	1.088
	(0.827)
Target	0.0495
	(0.0564)
Others average pledge	0.507**
	(0.183)
Constant	1.266
	(2.890)
Observations	195
R-squared	0.214**

Robust standard errors in parentheses ** P < .01, * P < .05.

1. Expectations about others' contributions increase with the pledges made by these people, but expectations are not affected directly by the Review process.

Summary so far

- Review process:
  - causes players to set a higher target;
  - the higher target causes players to announce higher pledges; and
  - the higher pledges lead to higher contributions.
  - However, the effect of the Review process becomes diluted over this chain; in the final analysis, it has no statistically significant effect on what matters—contributions.
  - Contributions are well below full cooperative level.

Groups matter more than reviews

- Reviews do not increase contributions, but contributions vary widely among groups.
- What makes for a successful or unsuccessful group?

Comparison between groups with different performance

Group performance	Definition	No. of groups (%)	Target	Sum of pledges	Average belief	Average first-step contribution	Average no. of 1st-stage free-riders (max no.)
Successful	Q>=75	11 (28%)	93.6	91.4	16.8	12.6	.09 (1)
Intermediate	50<Q<75	22 (56%)	91.4	84.6	14.6	9.2	.41 (2)
Unsuccessful	Q<=50	6 (15%)	85.3	74.5	11.9	5.8	1.66 (3)

1. Compared with Unsuccessful groups, Successful groups had higher targets, higher sum of pledges, higher beliefs, and higher first-stage contributions. These are "conditional cooperators."
2. Define a "free rider" as someone who contributes 5 or fewer chips in the first stage. In the Successful groups, free riders were rare. In the Unsuccessful groups, free riders were common.

Do we have "the right" group?

- "With INDCs submitted so far, and the planned energy policies in countries that have yet to submit, the world's estimated remaining carbon budget consistent with a 50% chance of keeping the rise in temperature below 2 °C is consumed by around 2040—*eight months later than is projected in the absence of INDCs*…
- "If stronger action is not forthcoming after 2030, the path in the INDC Scenario would be consistent with an average temperature increase of around 2.6 °C by 2100 and 3.5 °C after 2200."

International Energy Agency (2015: 2)

Clubs

- Why not ***choose*** a better group?
- Why not create "climate clubs?"
- To be effective, clubs need to leverage *global* collective action.
- Two plausible models:
  - Nordhaus (2015). Tariffs imposed on non-parties.
  - Barrett (2003). Negotiate coordination treaties.
- These approaches should be pursued after Paris.