Deciding for others: An experimental investigation of preference for shared destiny

Antoine Nebout-Javal, Sabrina Teyssier

Deciding for others: An experimental investigation of preference for shared destiny

Antoine Nebout* & Sabrina Teyssier†

June 16^{th} 2015

*INRA, UR ALISS, Ivry-sur-Seine & HEC Business School.
†INRA, UMR GAEL-UPMF, Grenoble.

Introduction

Other-regarding decision

- ☐ Extensive literature on individual risk and social preferences

  ⇒ The decision maker is directly impacted by the consequences of his choices.

- ☐ Some decisions are made on behalf of others: social planner, parents, doctors, bankers.

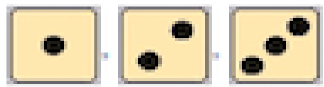
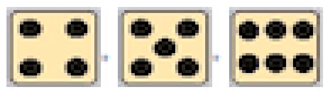
- ☐ These decisions may involve and impact more than a single individual and are often made under uncertainty
  → **Social choice under uncertainty**

⇒ How to measure attitudes toward risk and inequality when only others are concerned by the outcomes of own decisions?

⇒ What are the predictions of the models in social choice theory under uncertainty?

⇒ How to test these models in an incentive compatible way?

Social (public) risk allocation: an example

Option A			A
Tirage de dé	Gain du participant 1	Gain du participant 2	
	30 euros	15 euros	○
	15 euros	30 euros	

$$X = \begin{pmatrix} x & y \\ u & v \end{pmatrix}$$

Social welfare function, $V \rightarrow$ Social well being. E.g. Gini index under certainty.

Theoretical mapping between Decision Theory under Uncertainty and Inequality literature $\rightarrow$ Keeney (1980's), Fishburn (1990's).

$\Rightarrow$ **Social planner point of view**

Social risk allocation under uncertainty

A desirable ranking of public allocations is:

$$\begin{pmatrix} \frac{z+y}{2} & \frac{z+y}{2} \\ \frac{z+y}{2} & \frac{z+y}{2} \end{pmatrix} \succcurlyeq \begin{pmatrix} z & z \\ y & y \end{pmatrix} \succ \begin{pmatrix} z & y \\ y & z \end{pmatrix} \succ \begin{pmatrix} z & y \\ z & y \end{pmatrix} \text{ with } z > y$$

- Recent theoretical works have axiomatized a social welfare function that preference can account for this pattern: see Ben-Porath & al. (1997), Gajdos & al. (2009).
- In this paper, we rely on the functional proposed by Chew & Sagi (2012) because it offers an easy way to elicit shared destiny preferences.
- This ranking has been experimentally tested and confirmed by Rodhe & Rodhe (WP, 2013).

$\Rightarrow$ we want to go further and quantify these preferences within a new paradigm.

Collective Risk Attitude

Compensating representative income, ε, that makes two public risk allocation indifferent to the social planner.

Attitudes toward aggregate risk.

$$\begin{pmatrix} z & z \\ y & y \end{pmatrix} \sim \begin{pmatrix} \frac{z+y}{2} - \varepsilon_1 & \frac{z+y}{2} - \varepsilon_1 \\ \frac{z+y}{2} - \varepsilon_1 & \frac{z+y}{2} - \varepsilon_1 \end{pmatrix}$$

$\Rightarrow$ Collective Risk Premium

□ Risk neutrality is assumed: $(\lambda.z, \lambda.y) \rightarrow \lambda.\varepsilon_1$

Compensating representative income, ε, that makes two public risk allocation indifferent to the social planner.

Attitudes toward aggregate risk.

$$\begin{pmatrix} z & z \\ y & y \\ y & y \end{pmatrix} \sim \begin{pmatrix} \frac{z+y}{2} - \varepsilon_1' & \frac{z+y}{2} - \varepsilon_1' \\ \frac{z+y}{2} - \varepsilon_1' & \frac{z+y}{2} - \varepsilon_1' \\ y & y \end{pmatrix}$$

$\Rightarrow$ Collective Risk Premium

- ☐ Risk neutrality is assumed: $(\lambda.z, \lambda.y) \to \lambda.\varepsilon_1$

- ☐ Independence $\to \varepsilon_1 = \varepsilon_1'$

$\Rightarrow$ Descriptively invalid for individual risk, what about aggregate risk?

Preference toward ex-post fairness (Shared Destiny).

$$\begin{pmatrix} y & z \\ z & y \end{pmatrix} \sim \begin{pmatrix} z-\varepsilon_2 & z-\varepsilon_2 \\ y-\varepsilon_2 & y-\varepsilon_2 \end{pmatrix}$$

$\Rightarrow$ Collective Shared Destiny Premium

Under the axiomatization of Chew & Sagi, the same conditions than for collective risk attitude should hold for Shared destiny attitude.

- ☐ Scale invariance is assumed: $(\lambda.z, \lambda.y) \rightarrow \lambda.\varepsilon_2$

Preference toward ex-post fairness (Shared Destiny).

$$\begin{pmatrix} y & z \\ z & y \\ y & y \end{pmatrix} \sim \begin{pmatrix} z - \varepsilon_2' & z - \varepsilon_2' \\ y - \varepsilon_2' & y - \varepsilon_2' \\ y & y \end{pmatrix}$$

$\Rightarrow$ Collective Shared Destiny Premium

Under the axiomatization of Chew & Sagi, the same conditions than for collective risk attitude should hold for Shared destiny attitude.

- ☐ Scale invariance is assumed: $(\lambda.z, \lambda.y) \rightarrow \lambda.\varepsilon_2$
- ☐ "Comonotonic Independence" $\rightarrow \varepsilon_2 = \varepsilon_2'$

$\Rightarrow$ Attitudes towards Shared Destiny are defendable in both direction: no preconception here...

Collective Inequality Attitude

Preference toward ex-ante fairness.

$$\begin{pmatrix} z & y \\ z & y \end{pmatrix} \sim \begin{pmatrix} z-\varepsilon_3 & y-\varepsilon_3 \\ y-\varepsilon_3 & z-\varepsilon_3 \end{pmatrix}$$

⇒ Collective Inequality Premium Under the axiomatization of

Same conditions hold for ex-ante fairness...

- ☐ Scale invariance is assumed: $(\lambda.z, \lambda.y) \rightarrow \lambda.\varepsilon_3$

Collective Inequality Attitude

Preference toward ex-ante fairness.

$$\begin{pmatrix} z & y \\ z & y \\ y & y \end{pmatrix} \sim \begin{pmatrix} z - \varepsilon_3' & y - \varepsilon_3' \\ y - \varepsilon_3' & z - \varepsilon_3' \\ y & y \end{pmatrix}$$

⇒ Collective Inequality Premium Under the axiomatization of

Same conditions hold for ex-ante fairness...

- ☐ Scale invariance is assumed: $(\lambda.z, \lambda.y) \rightarrow \lambda.\varepsilon_3$
- ☐ "Comonotonic Independence" $\rightarrow \varepsilon_3 = \varepsilon_3'$

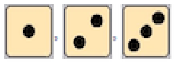
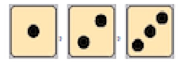
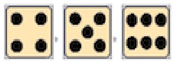
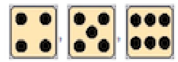
⇒ Let's elicit these ε_i premia! And burn these axioms to the ground

Or at least test them....

Experimental design

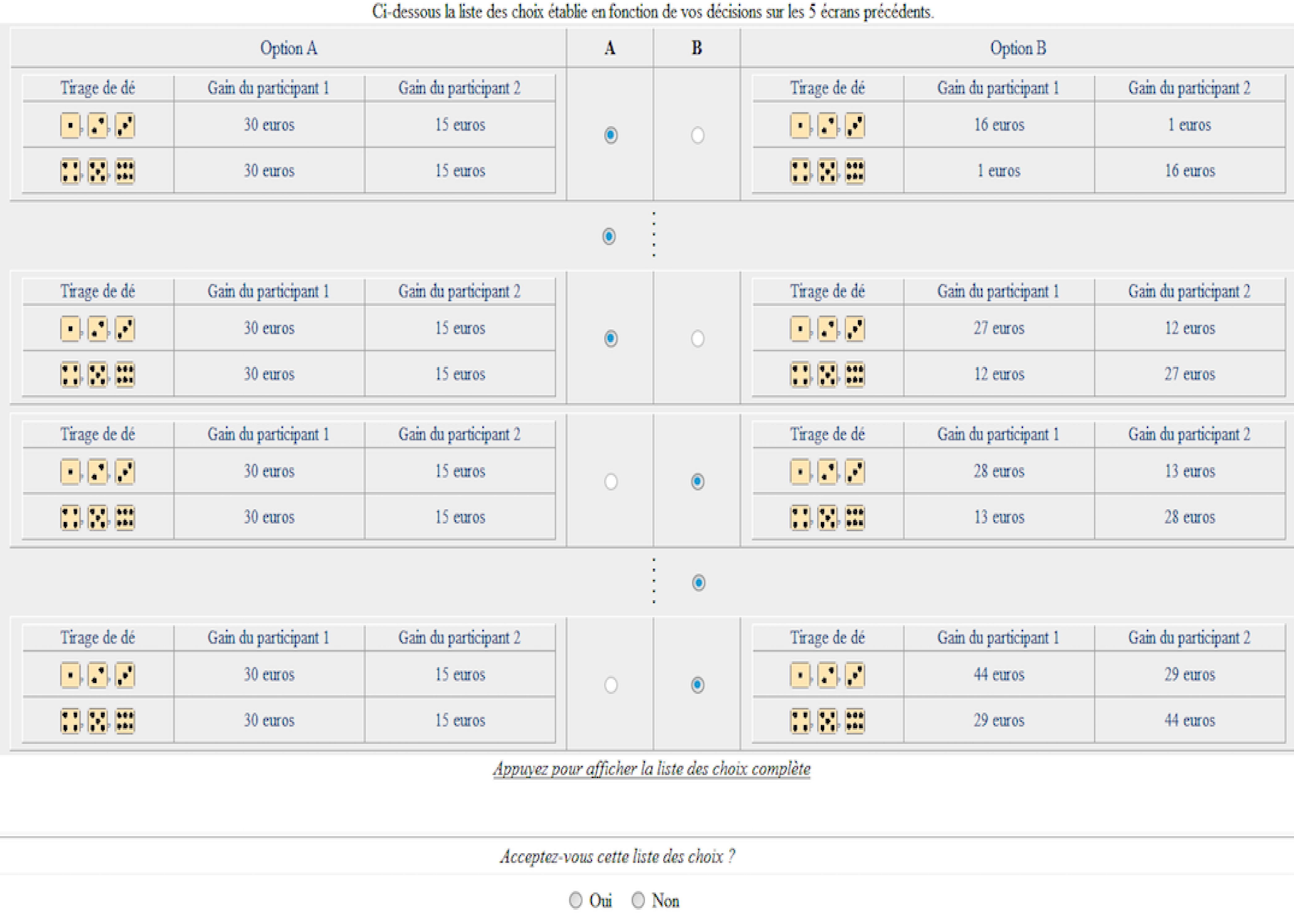
Decision task and equivalence elicitation

Binary social risk allocation choice

Option A			A	B	Option B		
Tirage de dé	Gain du participant 1	Gain du participant 2			Tirage de dé	Gain du participant 1	Gain du participant 2
	30 euros	15 euros				28 euros	28 euros
	15 euros	30 euros				13 euros	13 euros

- Sequence of 5 chained binary choice (dichotomic algorithm) → Validation of a choice list (29 choices)
- This final choice list is used for calculating the ε_i and for implementing the incentive scheme.
- Possibility of modifying response by going through the sequence again if unsatisfied with the list.
- All response times are recorded ;-)

Recap list



Ci-dessous la liste des choix établie en fonction de vos décisions sur les 5 écrans précédents.

Option A			A	B	Option B		
Tirage de dé	Gain du participant 1	Gain du participant 2			Tirage de dé	Gain du participant 1	Gain du participant 2
⚀ ⚁ ⚂	30 euros	15 euros	●	○	⚀ ⚁ ⚂	16 euros	1 euros
⚃ ⚄ ⚅	30 euros	15 euros			⚃ ⚄ ⚅	1 euros	16 euros
			●	⋮			
Tirage de dé	Gain du participant 1	Gain du participant 2			Tirage de dé	Gain du participant 1	Gain du participant 2
⚀ ⚁ ⚂	30 euros	15 euros	●	○	⚀ ⚁ ⚂	27 euros	12 euros
⚃ ⚄ ⚅	30 euros	15 euros			⚃ ⚄ ⚅	12 euros	27 euros
Tirage de dé	Gain du participant 1	Gain du participant 2			Tirage de dé	Gain du participant 1	Gain du participant 2
⚀ ⚁ ⚂	30 euros	15 euros	○	●	⚀ ⚁ ⚂	28 euros	13 euros
⚃ ⚄ ⚅	30 euros	15 euros			⚃ ⚄ ⚅	13 euros	28 euros
			⋮	●			
Tirage de dé	Gain du participant 1	Gain du participant 2			Tirage de dé	Gain du participant 1	Gain du participant 2
⚀ ⚁ ⚂	30 euros	15 euros	○	●	⚀ ⚁ ⚂	44 euros	29 euros
⚃ ⚄ ⚅	30 euros	15 euros			⚃ ⚄ ⚅	29 euros	44 euros

Appuyez pour afficher la liste des choix complète

Acceptez-vous cette liste des choix ?

○ Oui ○ Non

Sample

303 participants , LEEP, Paris 1.
In average, 1h per session and 20€ per subject.

Protocol

In this experiment, we elicited 12 collective premia per subjects:

- The three ε_i with two pairs of (z, y):
  High: $(30€, 15€)$ and Low: $(10€, 5€)$→ $\boxed{\lambda = 3}$
- The three ε'_i with two pairs of (z, y):
  High: $(30€, 15€)$ and Low: $(10€, 5€)$.

Impossible to resist eliciting the 4 corresponding individual risk premia, i.e:

- Certainty equivalents of $(30€, 1/2; 15€)$, and $(10€, 1/2; 5€)$+premia for $(10€, 1/3; 5€)$ and $(30€, 1/3; 15€)$.

We also control for four different orders (collective risk always first and ε_i always before ε'_i)

Design: incentives and instructions

At the beginning of the experiment, participants were allocated to 3-persons groups and given a specific role:

- Role X: Real incentives.
- Role Y: Hypothetical incentives with monetary outcomes.
- Role Z: Hypothetical incentives with health outcomes.

Explanation of the decision tasks and of incentive scheme was crucial:

- One of the decisions of X was randomly selected and played for real for Y and Z $\Rightarrow$ Adapted RIS.
- Payment of X was randomly selected between 5 and 30 euros: no anchoring effect nor fairness considerations.
- 20 minutes of collective explanation of the instructions + comprehension questionnaire.

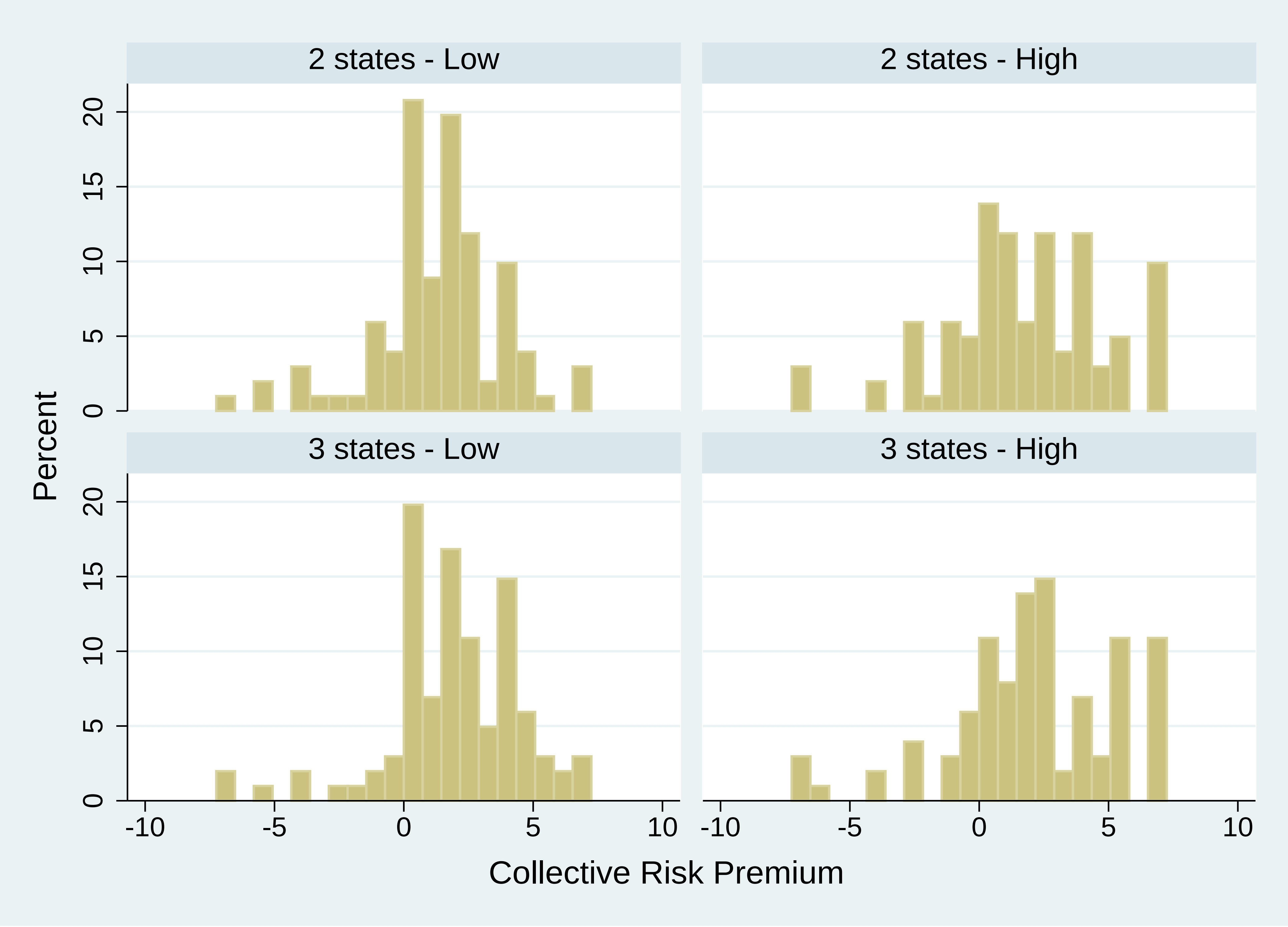
Preliminary results

		Coll. Risk		*Shared Destiny*		*Inequality*		*Ind. Risk*	
		Low	High	Low	High	Low	High	Low	High
Mean	ε_i	0.41	1.73	0.64	1.87	0.83	3.83	0.31	2.08
	ε_i'	0.61	2.11	0.53	2.22	1.17	3.87	0.57	2.31

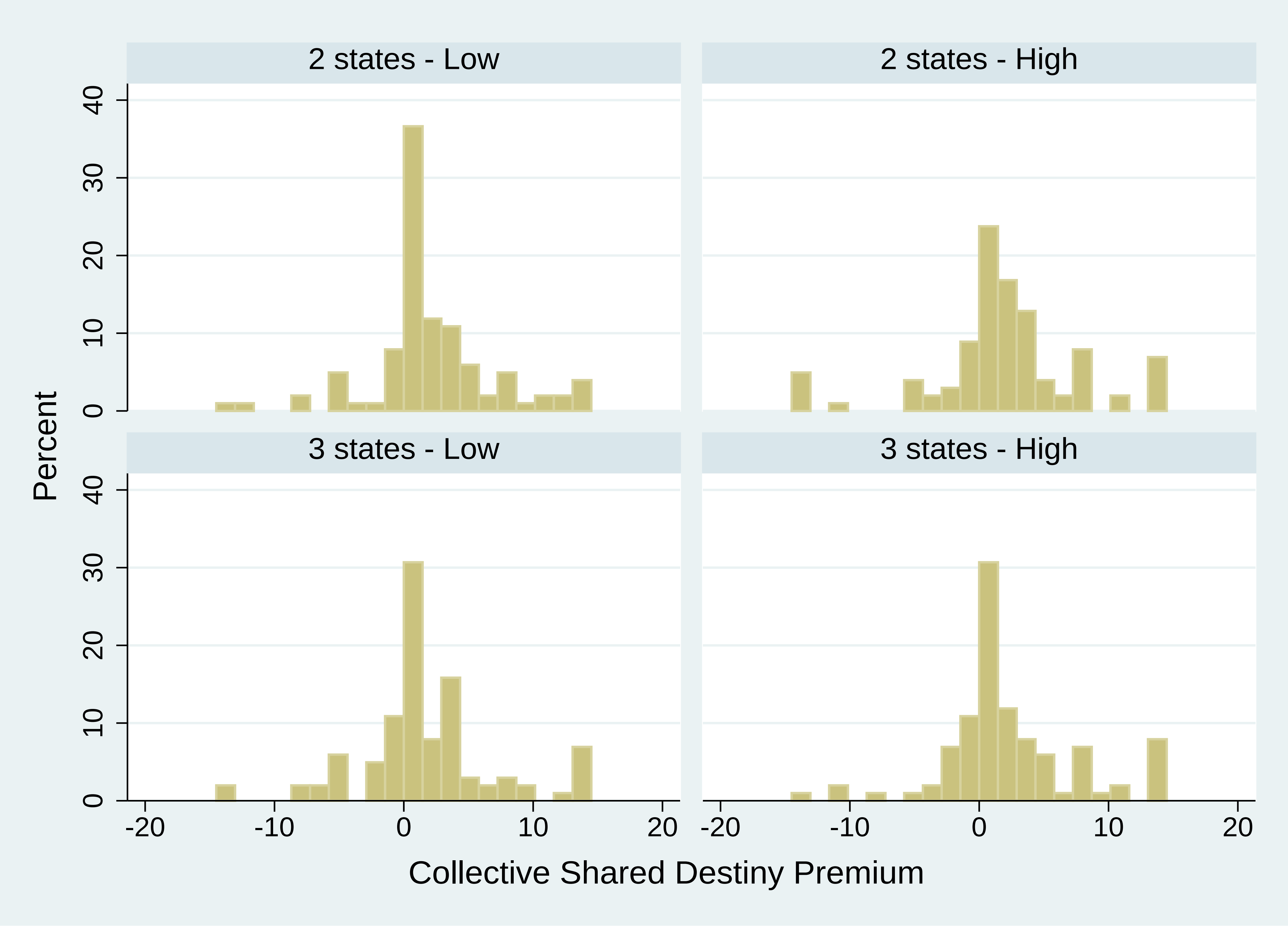
Table 1: Mean of the collective premia for X type participants

- All ε_i and ε_i' are significantly non-null and positive $\rightarrow$ collective risk aversion and preference for ex-ante and ex-post fairness.
- Except for collective risk ε_i and ε_i' do not significantly differ and homogeneity is not rejected.
- No significant difference is found between collective and individual risk $\rightarrow$ Unsurprisingly risk neutrality is not observed and independence not satisfied.

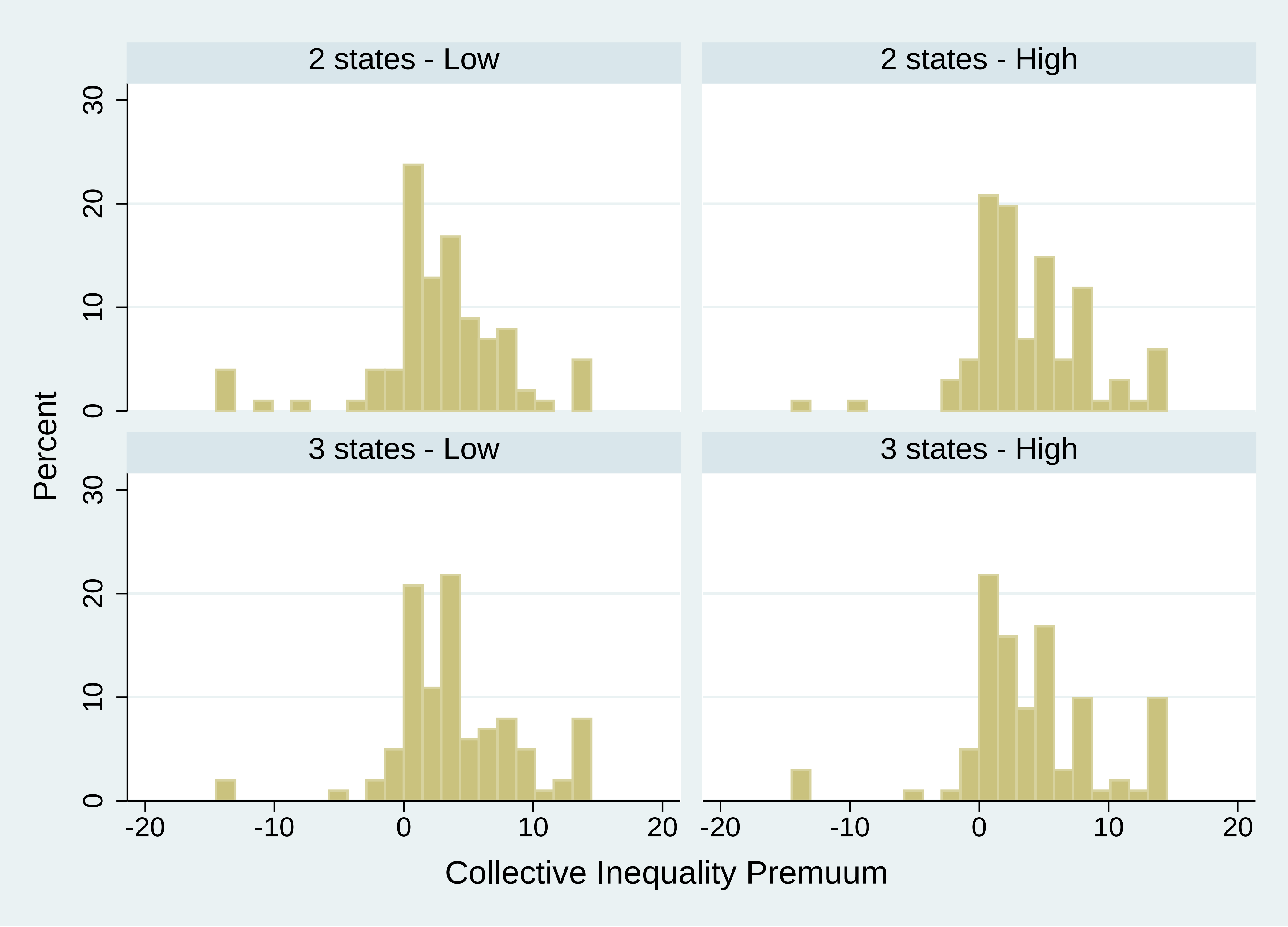
Collective risk premia



Collective Shared destiny premia



Collective Inequality premia



Next step results

- Comparison with the Y and Z participants: spoiler → no major effect of incentives between X and Y but always good to check...

- Calibration of a shared destiny parameter for Chew & Sagi social welfare function:

$$\varphi = \frac{\varepsilon}{\varepsilon + \frac{(z-y)^2}{2(z+y)}}$$

- Individual choice pattern analysis and potential link between the three attitudes.

- Suggestions are welcome

Conclusion

- Innovative protocole with real incentives (RIS) for other-regarding decisions.

- Paris 1 students are collective risk averse and display preference for shared destiny and for ex-post fairness.

- Reassuring results for existing and up to date social welfare functions.

- Necessity to relax the collective risk neutrality and to introduce a CPT for collective risk attitudes.

⇒ follow-up experiments:

- Decisions for others under the veil of ignorance - Decisions for others in different cultural environment.

Thank you for your attention!

Chew & Sagi functional

$$V\begin{pmatrix} x & y \\ u & v \end{pmatrix} = \sum_{i=1}^{2} \left(\gamma_i - \varphi \frac{\bar{x}_i}{2}\right) E\left[\tilde{w}_i\right] + \varphi \sum_{i=1}^{2} Cov\left(\frac{\tilde{x}_i}{2}, \tilde{w} - \tilde{w}_i\right) \quad (1)$$