

Sour Grapes in the Lab and Field: A Test Of Access-Based Beliefs

Vinayak Alladi

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- Under standard economic theory, any relationship between access and beliefs can only reflect learning \implies To test for access-based beliefs, learning must be precluded

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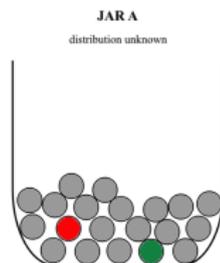
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- Beliefs provide a source of psychological utility that is traded off against the costs of reality distortion

Experimental Design

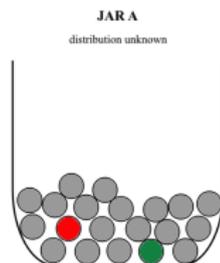
Experimental Design

- Consider a jar containing an unknown distribution of balls that can be one of two colors, red or green



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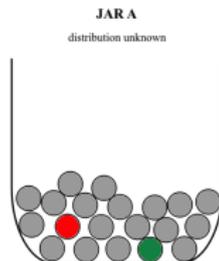
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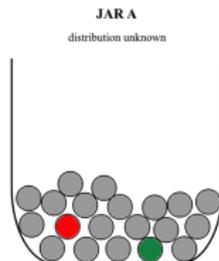
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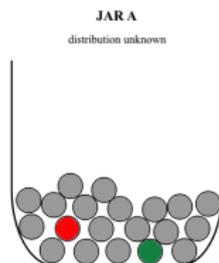
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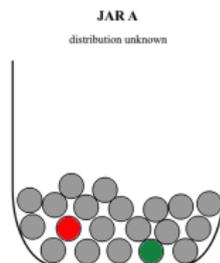
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- If 'access' to the jar is not realized, then the individual receives nothing

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- Vary the probability of participating in the lottery to be either low or high, call this probability the level of 'access' to the jar
- If 'access' to the jar is not realized, then the individual receives nothing
- After knowing the probability of access, but before uncertainty resolves, elicit beliefs of the jar's composition

Elicitation of Beliefs

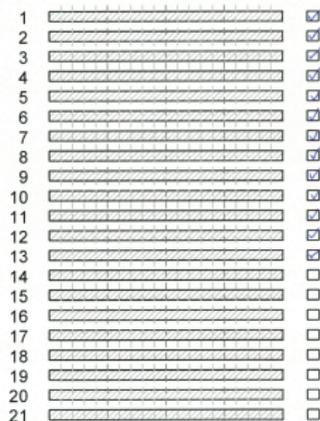
Elicitation of Beliefs

- For each pair of lotteries, participants state a preference between the two

TASK

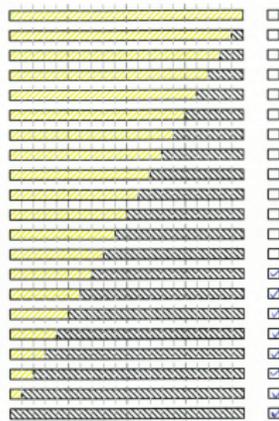
JAR A

Red Marbles worth 30 each
and
Green Marbles worth 10 each



JAR B

Yellow Marbles worth \$10 each
and
Black Marbles worth \$30 each.



Elicitation of Beliefs

- For each pair of lotteries, participants state a preference between the two
- At some point in the MPL, participants switch from preferring the JAR A lottery to the JAR B lottery



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- **Timing:**

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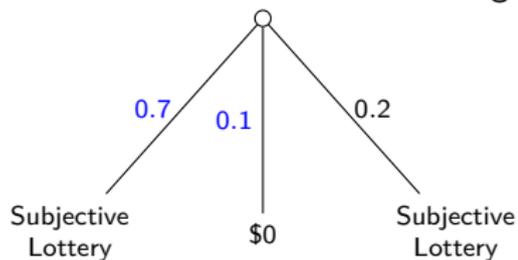
- **Timing:**

- Subjects are given an explanation of the lottery they face
- Before any uncertainty resolves, participants make ex-ante choices on the elicitation task
- Uncertainty resolves, and participants are paid out

Single Row in MPL

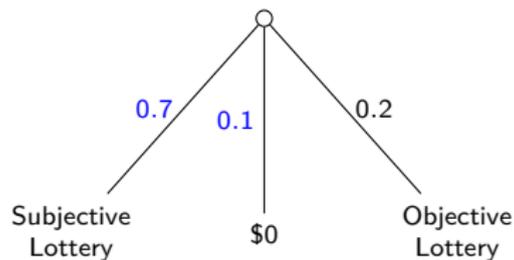
Single Row in MPL

High Access



Lottery 1

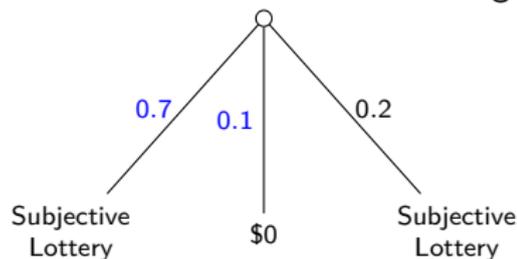
$\succ ?$



Lottery 2

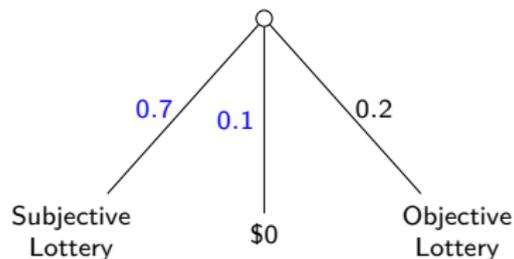
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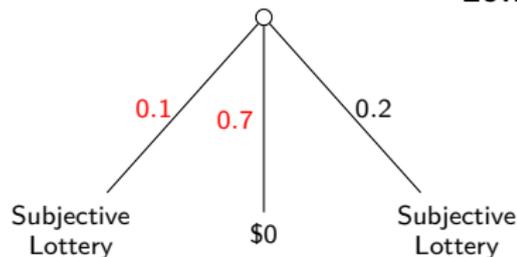
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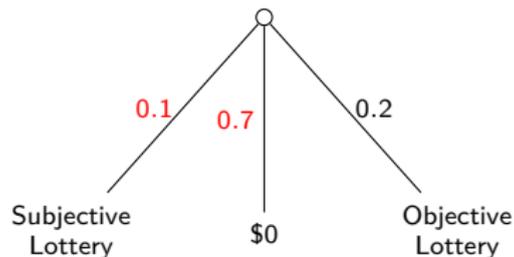
Lottery 2

Low Access



Lottery 3

$\succ?$



Lottery 4

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 - Intuition is that pessimistic individuals have low beliefs of the value the alternative and may have no need to exhibit sour grapes

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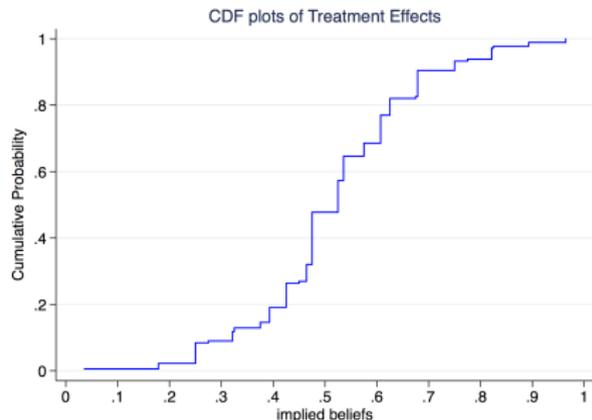
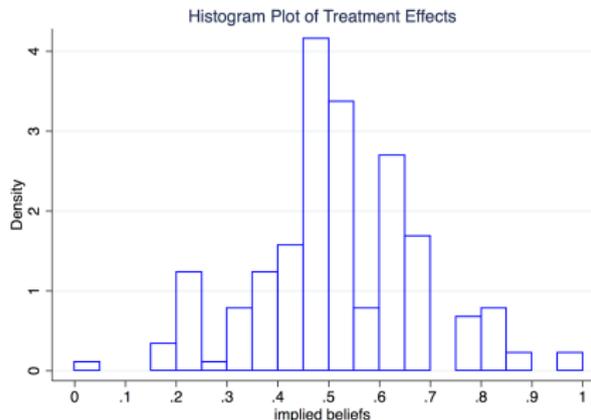
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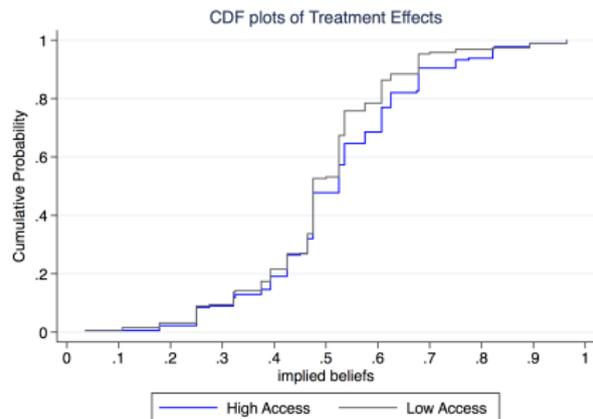
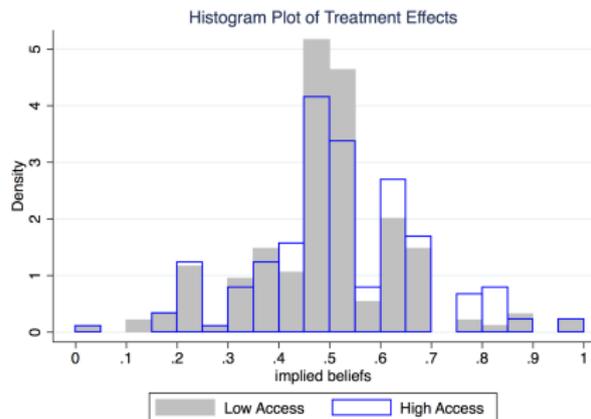
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- Multiple switchers are removed - cannot identify a revealed belief [▶ Multiple Switching](#)

Distributional Treatment Effects - Pooled Across Locations



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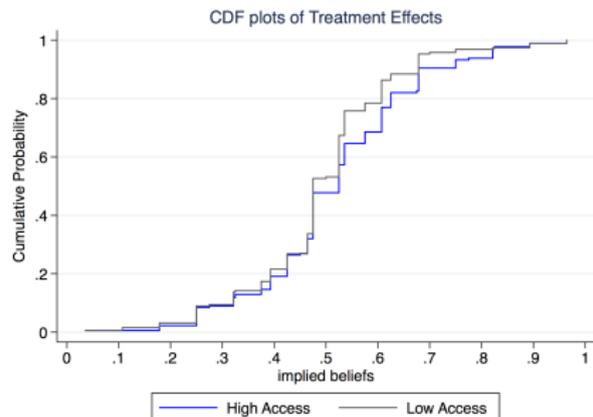
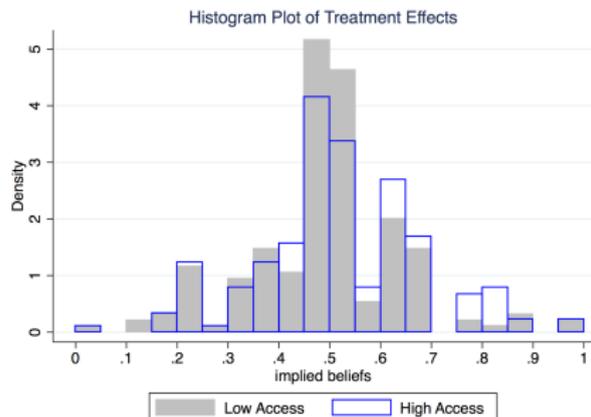
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Shift occurs only for higher valuations of the lottery

Average Treatment Effects

Dependent Variable : Beliefs

	Full Distribution		50 percent partition			
	(1)	(2)	Above 50		Below 50	
			(3)	(4)	(5)	(6)
Low Access	-0.026	-0.026	-0.031	-0.028	-0.015	0.003
	(0.016)	(0.016)	(0.013)**	(0.013)**	(0.019)	(0.014)
Female (=1)		-0.045		-0.019		0.046
		(0.016)***		(0.012)		(0.016)***
India (=1)		-0.061		-0.007		-0.009
		(0.032)*		(0.026)		(0.022)
Uncertainty Class (=1)		0.039		0.012		0.028
		(0.022)*		(0.019)		(0.029)
Constant	0.519	0.525	0.587	0.528	0.335	0.370
	(0.012)	(0.018)	(0.010)	(0.014)	(0.013)	(0.018)
Observations	368	354	269	258	99	96
Controls	No	Yes	No	Yes	Yes	Yes
R-squared	0.007	0.065	0.019	0.265	0.006	0.403
P-value TE = 0	0.100	0.102	0.024	0.033	0.436	0.851
Low Access Obs			139	133	51	50
High Access Obs			130	125	48	46

Robust SE in Parentheses. $p < 0.1^*$, $p < 0.05^{**}$, $p < 0.01^{***}$

- No significant differences in beliefs found for SEU violators

► Probability of Violating SEU

Access-Based Beliefs: Evidence from the Field

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- Another was to make the decision to signup either public to other students in the classroom or private
- Original purpose of the experiment was to separate models of social stigma in a low and high income school, this is orthogonal to access-based beliefs

Field Experiment Procedures

- Students were given a description of the package and then offered the following lottery, corresponding to the low access condition:

[Company Name] is offering a chance to win an SAT prep package intended to improve your chances of being accepted and receiving financial aid at a college you like. The package includes:

- Premium access to the popular [App Name] test prep app for one year;
- Diagnostic test and personalized assessment of your performance and areas of strength and weakness;
- One hour session with a professional SAT prep tutor, tailored to your diagnostic test.

This package is valued at over \$100, but will be provided completely free.

If you choose to sign up, your name will be entered into a lottery where you have a 25% chance of winning the package.

Both your decision to sign up and your diagnostic test score will be kept completely private from everyone, including the other students in the room.

Would you like to sign up for a chance to win the SAT prep package? (Please pick one option)

Yes / No

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- Probabilities privately known to each student and varied at the classroom level.

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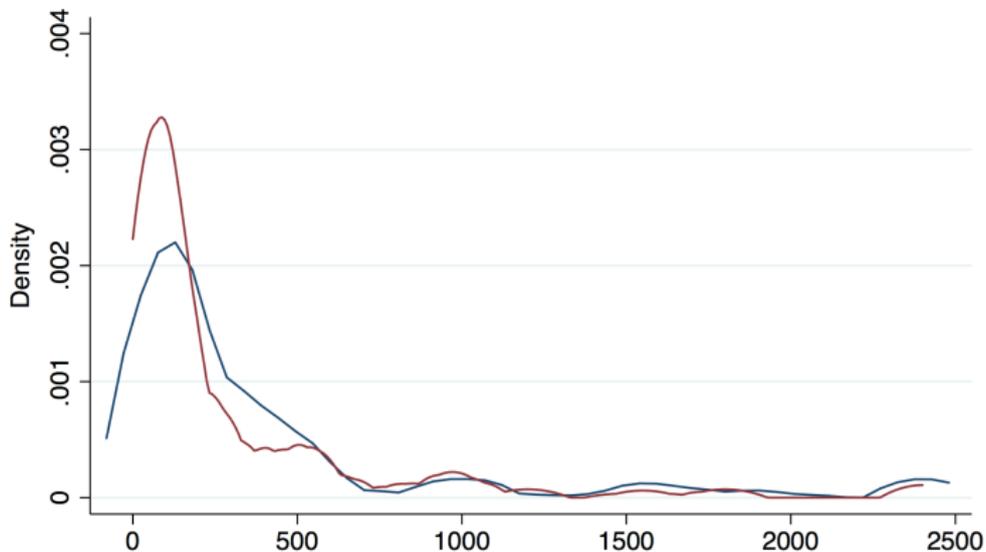
Both your decision to sign up and your diagnostic test score will be kept completely private from everyone, including the other students in the room.

Would you like to sign up for a chance to win the SAT prep package? (Please pick one option)

Yes / No

- Only change in the high access condition form was that 25% was changed to 75%.
- Probabilities privately known to each student and varied at the classroom level.
- Survey question included: "How many points do you think this SAT prep package could improve your SAT test scores by?"

Impact of Access on SAT Prep Package Expected Effectiveness



How many points do you think this SAT prep package could improve your SAT test score?



kernel = epanechnikov, bandwidth = 80.2931

Impact of Access on SAT Prep Package Expected Effectiveness

Dependent Variable : Expected Returns of Package (units - SAT Points)

	Mean Effects		Quantile Effects					
			25th percentile		50th percentile		75th percentile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low Access	-102*	-125**	-30***	-25***	-100***	-50***	-120	-100
	(58)	(52)	(9)	(5)	(15)	(1)	(75)	(80)
Hispanic = 1		-9		-50***		-50***		-0
		(61)		(7)		(2)		(87)
Male = 1		-39		-5		-0		-100
		(55)		(5)		(1)		(81)
Student age		-4		20***		39***		-33
		(45)		(5)		(1)		(77)
Constant	399	509	90	-165	200	-413	420	1033
	(45)	(743)	(7)	(80)	(11)	(19)	(54)	(1268)
Observations	316	316	316	316	316	316	316	316
R-squared	0.010	0.240						
Student Demographics	No	Yes	No	Yes	No	Yes	No	Yes
Classroom FE	No	Yes	No	Yes	No	Yes	No	Yes
P-value: Low Access = 0	0.079	0.017	0.001	0.000	0.000	0.000	0.110	0.213

Robust Standard Errors in Parentheses. $p < 0.1^*$, $p < 0.05^{**}$, $p < 0.01^{***}$

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- Access-based beliefs may contribute to understanding the positive and wide-ranging psychological effects being documented in these interventions

Our Evidence of Access-Based Beliefs And Poverty?

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[lab heterogeneity table](#)
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- **Field:** High-achieving students in the low-income school in the private condition responded to low access by signing up less for the SAT prep package (18% difference in sign-up rate)

[lab heterogeneity table](#)
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 - How do individuals with access-based beliefs respond to information? Do they learn?

Thank you!

Summary of Predictions

Predictions of Different Models

Model	Prediction on Revealed Beliefs if a changes	Reason for prediction
▶ Subjective Expected Utility	No Effect	Valuation is linear in probabilities
▶ Gilboa-Schmeidler Max-min	No Effect	Certainty Independence
▶ KMM Smooth Ambiguity	Grass-is-greener	Individuals are ambiguity averse
▶ Reference Dependence	No Effect	No impact on gain-loss utility of changing choice
Optimal Beliefs	Sour Grapes	Individuals have anticipatory utility. Low access leads to lower, but still inflated beliefs

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- agents choose a reference point to balance anticipatory and gain-loss utility
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- Then, the agent's long-run utility function is:

$$U = \gamma \cdot \underbrace{E_{\tilde{p}}(u(c))}_{\text{Anticipatory Utility}} + (1-\gamma) \left[\theta \cdot \underbrace{E_p(u(c))}_{\text{Consumption Utility}} + (1-\theta) \cdot \underbrace{E_p[\mu(u(c)|r)]}_{\text{Gain-loss Utility}} \right] \quad (1)$$

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- model limitation : effect does not depend on relative payoffs, i.e. "how much you like" the alternative

Presentation Outline

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- 1 **Conceptual Framework**
- 2 Lab Experiment: Design and Evidence
- 3 Field Experiment: Design and Evidence
- 4 Heterogeneity by Poverty Indicators
- 5 Proposed Model of Motivated Beliefs
- 6 Conclusion and Policy Implications
- 7 Further Work and Future Research

[back to model predictions](#)

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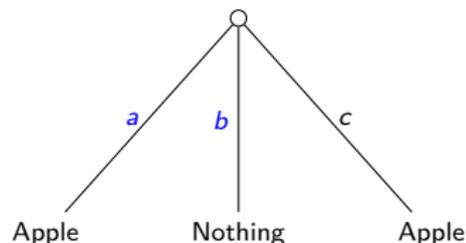
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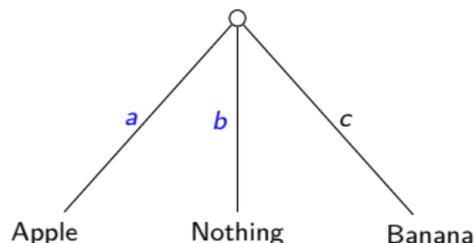
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Lottery 1

$\succ ?$



Lottery 2

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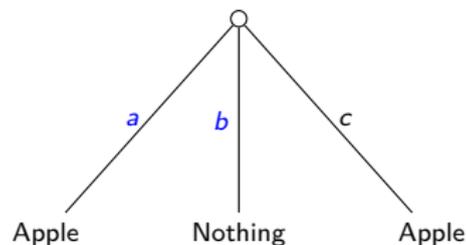
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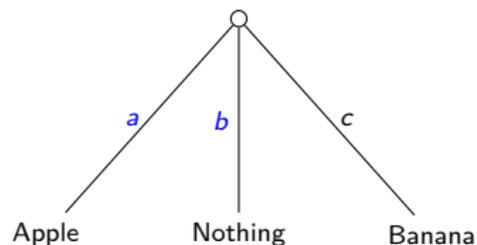
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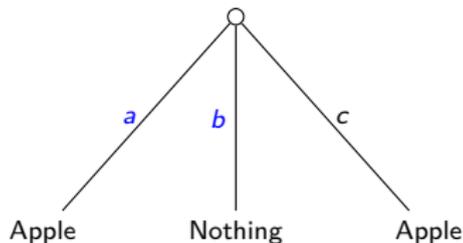
$\succ?$



Lottery 2

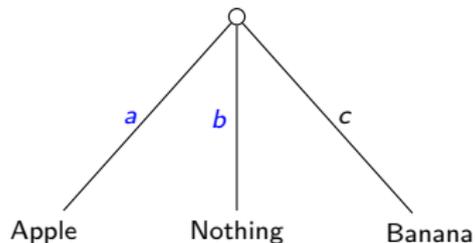
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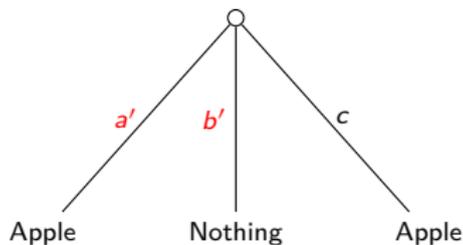


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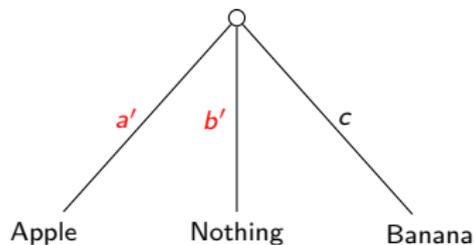


Lottery 2



Lottery 3

$\succ?$

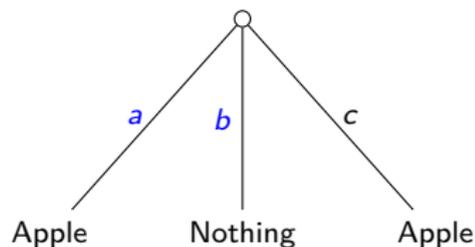


Lottery 4

Expected Utility

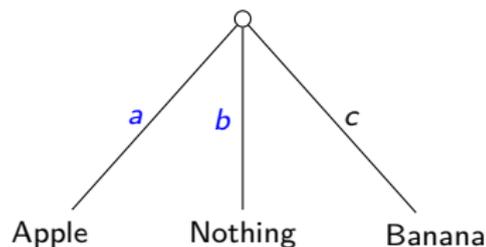
Expected Utility

- Under expected utility, an individual who prefers Lottery 1 to Lottery 2, also prefers Lottery 3 to Lottery 4

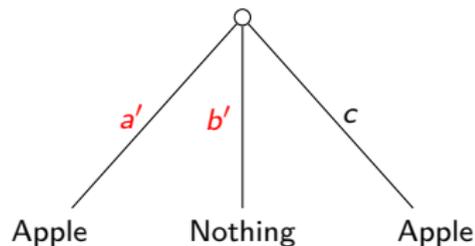


Lottery 1

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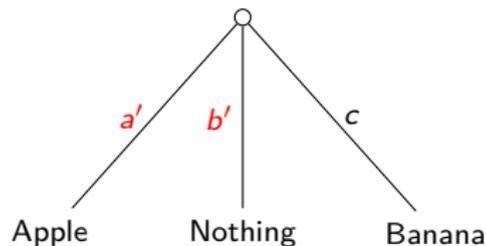


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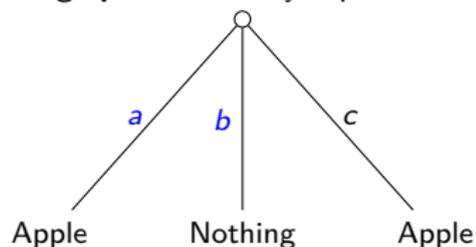


Lottery 4

Sour Grapes

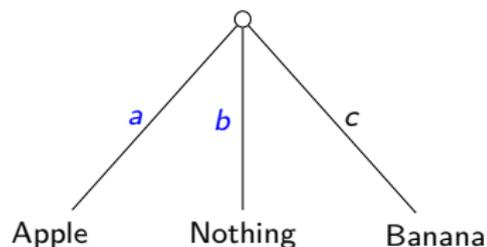
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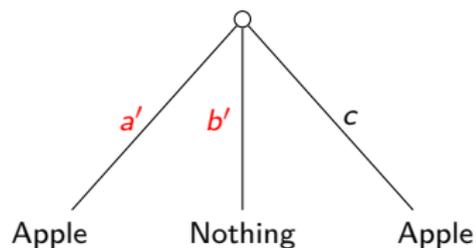


Lottery 1

\succ

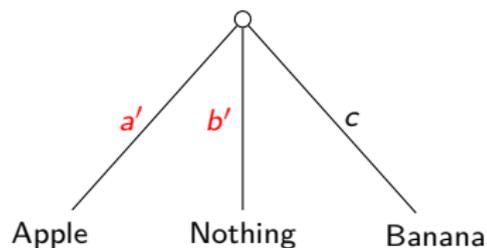


Lottery 2



Lottery 3

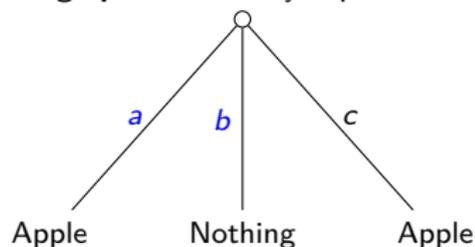
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Lottery 4

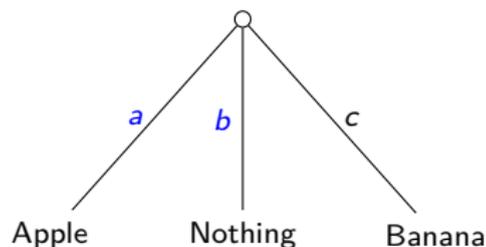
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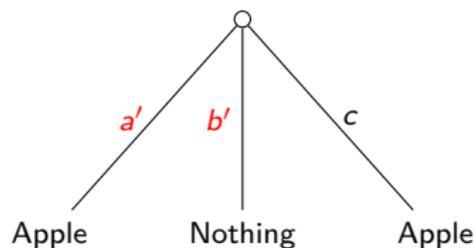


Lottery 1

\succ

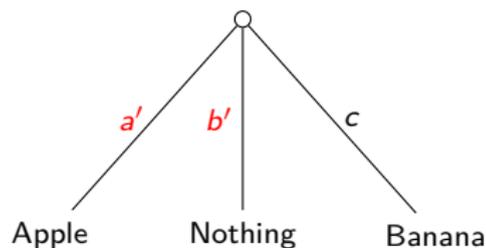


Lottery 2



Lottery 3

\succ



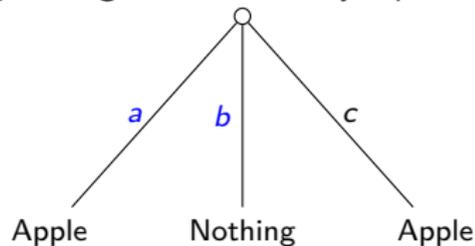
Lottery 4

- Lowering access to the apple from 'a' to 'a'', might lead individuals to believe that the apples are sour

Grass is Greener

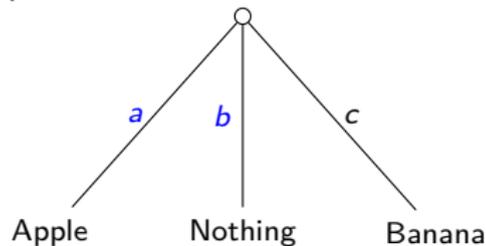
Grass is Greener

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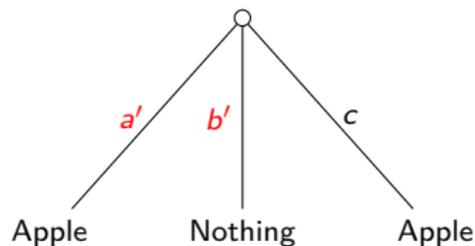


Lottery 1

\succ

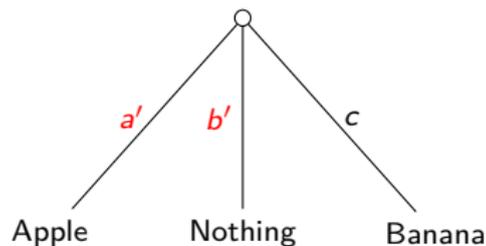


Lottery 2



Lottery 3

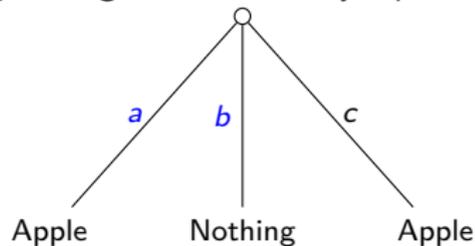
\succ



Lottery 4

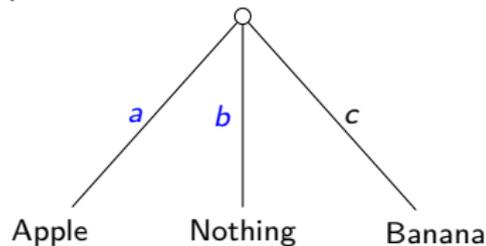
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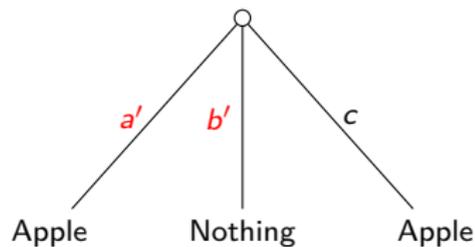


Lottery 1

\succsim

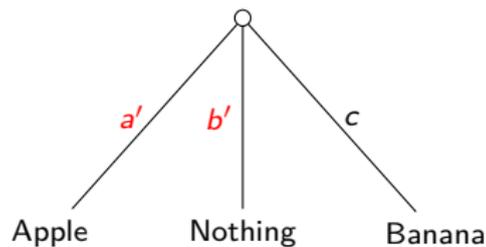


Lottery 2



Lottery 3

\succsim



Lottery 4

- Lowering access to the apple from 'a' to 'a'', might lead individuals to believe the apples are sweeter

Summarize

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- Under expected utility, an individual who prefers Lottery 1 to Lottery 2, also prefers Lottery 3 to Lottery 4
- A **sour-grapes effect** may explain the following preferences: Lottery 1 \succ Lottery 2 and Lottery 4 \succ Lottery 3
- Lowering access to the apple from 'a' to 'a'', might lead individuals to believe that the apples are sour.
- A **grass-is-greener effect** may explain the following preferences: Lottery 2 \succ Lottery 1 and Lottery 3 \succ Lottery 4

Operationalizing Lotteries

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 - In each successive row, the value of JAR B increases, as one yellow ball is replaced by a black ball

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$$\tilde{p} \cdot u(H) + (1 - \tilde{p}) \cdot u(L) = q^* \cdot u(H) + (1 - q^*) \cdot u(L_0)$$

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Implied Beliefs Under Subjective Expected Utility

- Denote beliefs of outcome H and L in the subjective lottery as \tilde{p} and $(1 - \tilde{p})$ respectively, and the probabilities in the objective lottery of outcome H and outcome L_0 as q and $(1 - q)$, u is a well-behaved utility function
- Under SEU, the subjective lottery and objective lottery have the same utility when:

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Experimental Design

	JAR A (Ambiguous Prospect)	JAR B (Risky Prospect)	Fixed Payout
Version 1	H and L	H and L' $0 = L$	$F = L$
Version 2	H and L	H and L' $0 = L$	$F < L$
Version 3	H and L	H and L' $0 \neq L$	$F < L$

[back to design](#)

Controlling for Learning

- Subjects get to choose the color that pays the high amount, H , controls for suspicion of rigging in the experiment

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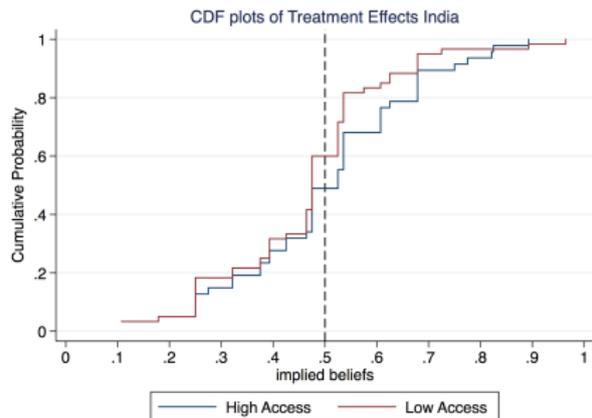
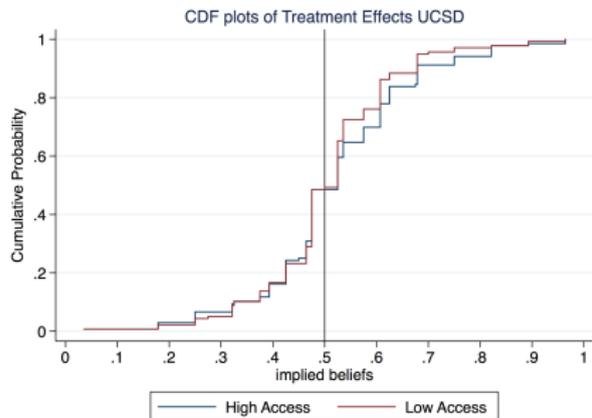
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- No learning about the contents of the jar is possible (a possible area of further work)

[further details](#)

Distributional Treatment Effects - Separated By Location



back to access-based beliefs and poverty

Heterogeneity By Poverty In the Lab

Treatment Effects By Poverty Indicators : Lab Results

Dependent Variable : Beliefs of a High Payout from Subjective Lottery						
Covariate :	Developing Country (1)	(2)	Log Parental Income (3)	Allowance β 40th percentile (4)	Household Head Graduate (5)	Poverty Index (6)
Low Access	-0.013 (0.017)	-0.013 (0.017)	-0.197* (0.115)	-0.040 (0.060)	-0.065 (0.051)	-0.036 (0.059)
Covariate	-0.007 (0.030)	-0.033 (0.038)	-0.027 (0.032)	-0.009 (0.064)	-0.015 (0.099)	-0.032 (0.041)
Low Access \times Covariate	-0.045 (0.040)	-0.052 (0.041)	0.056 (0.043)	-0.060 (0.092)	-0.076 (0.120)	-0.067 (0.061)
Constant	0.521 (0.013)	0.519 (0.019)	0.629 (0.129)	0.611 (0.116)	0.588 (0.085)	0.644 (0.054)
Observations	368	354	72	72	72	72
R-squared	0.020	0.071	0.182	0.165	0.165	0.207
Controls	No	Yes	Yes	Yes	Yes	Yes
P-value Interaction = 0	0.254	0.204	0.198	0.512	0.525	0.273

[back to access-based beliefs and poverty](#)

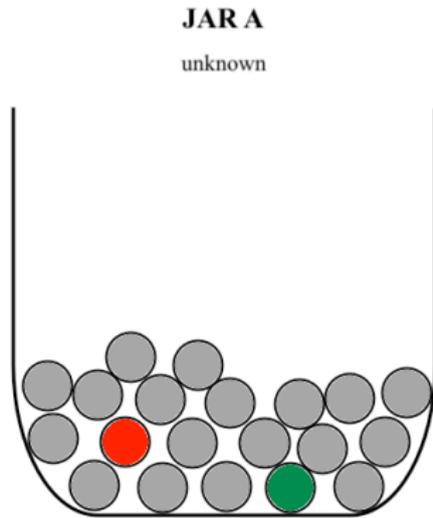
Heterogeneity By Poverty In the Field

Treatment Effects By Poverty Indicators: Field Results

Dependent Variable :	Expected Returns Package		Signup	
	All Schools	Only Poor Schools	All Schools	Only Poor Schools
Covariate :	Low-Income School	High Grades	Low-Income School	Public Condition
				High Grades
	(1)	(2)	(3)	(4)
Low Access	-16.667* (9.113)	-70.000*** (21.184)	0.011 (0.070)	-0.179** (0.085)
Covariate	91.667*** (9.767)	80.000*** (28.567)	-0.006 (0.082)	-0.448*** (0.124)
Low Access × Covariate	-83.333*** (12.097)	-30.000 (42.024)	-0.010 (0.101)	0.013 (0.178)
Constant	66.667 (92.236)	-746.667 (276.426)	3.161 (0.992)	-1.807 (1.537)
Observations	316	181	257	72
R-squared			0.030	0.370
Includes Public Treatment Classroom FE	Yes No	Yes Yes	No No	Yes Yes
P-value Low Access = 0	0.068	0.069	0.871	0.039
P-value Interaction = 0	0.000	0.476	0.921	0.943

JAR A figure

grey use to represent unknown balls, red and green to indicate the possible colors of the unknown balls [back to elicitation](#)

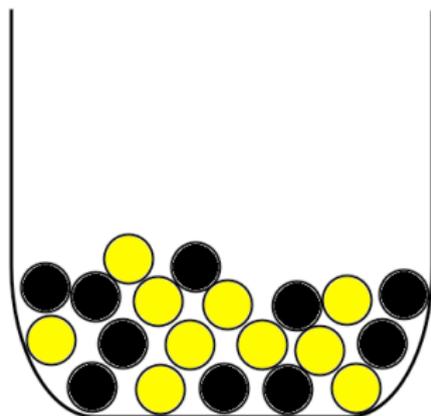


JAR B figure

back to elicitation

JAR B

50/50



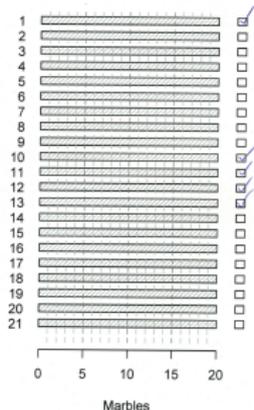
Multiple Switchers

back to collection

TASK

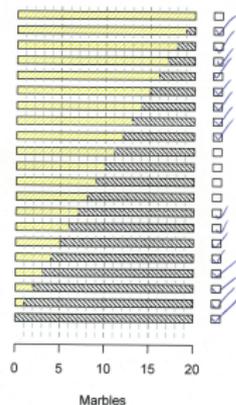
JAR A

Red Marbles worth 10 each
and
Green Marbles worth 20 each



JAR B

Yellow Marbles worth \$10 each
and
Black Marbles worth \$30 each.



Probability of Violating SEU

Dependent Variable: Probability of Violating SEU

	Below 50 perc		Below 46 perc	
	Without Controls	With Controls	Without Controls	With Controls
	(1)	(2)	(3)	(4)
Low Access	0.049	0.052	-0.001	0.007
	(0.052)	(0.052)	(0.046)	(0.047)
version 2 = 1		-0.084		-0.176
		(0.128)		(0.113)
version 3 = 1		-0.186***		0.049
		(0.061)		(0.054)
India = 1		0.130		0.142*
		(0.079)		(0.077)
Constant	0.478	0.462	0.270	0.134
	(0.038)	(0.073)	(0.033)	(0.063)
Observations	368	354	368	354
R-squared	0.002	0.060	0.000	0.060
P-value TE = 0	0.351	0.319	0.979	0.876

Robust Standard Errors in Parentheses. $p < 0.1^*$, $p < 0.05^{**}$, $p < 0.01^{***}$.

[back to average TE](#)