The more... the better? The birth order effect on economic preferences in teenagers

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Motivation

- Economic preferences strongly predict real-life outcomes (Dohmen et al., 2011; Falk et al., 2018).
- The literature has identified different sources of heterogeneity:
  - Genetic variation (Cesarini et al., 2009; Zyphur et al., 2009).
  - Cultural transmission:
    - From parents to children (Samek et al., 2021; List et al., 2022; Stoklosa et al., 2018; Brañas-Garza et al., 2022).
    - During-school transmission (Andreoni et al., 2020; Sutter et al., 2018; Brocas and Carrillo, 2020, 2022).
    - Other variables as parents' socio-economic status (Dohmen et al., 2012).
- Less attention has been paid to family structure (#siblings and birth order)
  - Overwhelming evidence of the effect of siblings on IQ, education and labor outcomes (Black et al., 2005; Booth and Kee, 2009; Black et al., 2016; Lehmann et al., 2018).

Literature review

- Most of the literature have focused on adults and personal traits (Big five) $\rightarrow$ Null results (Dudek et al., 2022; Rohrer et al., 2015)
  - An exception are Damian and Roberts (2015); Golsteyn and Magnée (2020) who measure the effect of sibling gender and order on adolescents.
- Regarding the effects on economic preferences in adults, the evidence is even scarcer:
  - Risk preferences: laterborns are more risk lover than firstborns (Dohmen et al., 2012; Sulloway and Zweigenhaft, 2010; Lampi and Nordblom, 2009)
  - Time preferences: laterborns are less patience than firstborns (Lampi and Nordblom, 2009)
  - Social preferences: firstborns are less trustful and reciprocate less than laterborns (Courtiol et al., 2009).
- On adolescents, Detlefsen et al. (2018) find that second born children are typically less patient, less risk averse, and more trusting.

Caution: the magnitude and significance of birth order effects on economic preferences may vary among individuals, cultures, and socioeconomic contexts.

Motivation (cont.)

Some channels of the potential birth order effect on economic preferences:

- *Parental investment*: firstborns potentially receives more attention, time, and financial resources compared to later-borns (Sulloway, 1996; Detlefsen et al., 2018).
- *Sibling competition*: childrens compete over parental attention and resources, which drives younger siblings to differentiate from others (Sulloway, 1996, 2010; Conzo and Zotti, 2020) $\rightarrow$ "rebellion"
- *Socialization*: weak family ties increases motivation to deal with strangers in order to fulfill their need for social interactions (increasing trust) (Conzo and Zotti, 2020; Ermisch and Gambetta, 2010)
- *Imitation*: children learn from their siblings and copy their behavior (Detlefsen et al., 2018).

Caution: the different channels can coexist and affect the sign and magnitude of the coefficient of birth order.

Motivation (cont.)

- This paper analyze the birth order effect on economic preferences (risk, time and social preferences) in adolescents.
- We use data from a lab-in-the-field experiment: 15 schools, 3500 students and 172 classes.
- We control for potential omitted variables biased:
  - Cognitive abilities: measured using CRT and financial knowledge questions.
  - Class size and cohesion (difference between number of friendship and enemy relationships computed from the social network, following Ruiz-García et al. (2023)).
  - Social integration: *popularity* measured by the number of subjects that choose subject *i* as a friend.
- Social integration is an important control since adolescents without strong family ties may have stronger motivation to deal with classmates to fulfill their need for social interaction (Ermisch and Gambetta, 2010; Conzo and Zotti, 2020).

Why teenagers?

- Allow us to track developmental changes in behavior (Brocas and Carrillo, 2020).
- According to Sulloway (1996) the associations between birth order and personality arise from siblings competition.
- This association is expected to be larger in childhood and adolescence (Sulloway, 2010).
- Birth order effects could decrease once the child leaves the family environment (Harris, 2000 and 2006).

Procedure

- We made agreements with directors of different secondary schools.
- The experiment was integrated as an in-class activity.
- Removed the need of parental consent (age$\leq$ 14) and increase scalability.
- Tailored online platform by Kampal (BIFI/UZgz):
  - SAND: Social Analysis and Network Data.
  - Security, privacy, anonymity.
- Important remarks of our sample:
  - *Non self-selected subjects*: almost 0.5% opt-out and only 5.6% did not completed the experiment.
  - *Hypothetical incentives*: no differences in a previous validation of the study (see Alfonso et al. (2023)).
  - *Power:* six times the number of observation in Detlefsen et al. (2018) (MDE: 0.2SD).

Procedure

Measuring economic preferences

We use tailored tasks specifically designed for non-adult population:

1. Time preferences: visual version (*the truck task*) of the MPL task of Coller and Williams (1999) developed by Alfonso et al. (2022).
   - 6 consecutive decisions.
   - Choose between 10€ tomorrow or 10€+x (where x=0, 2, 4, 6, 8, 10 euros) one week later.
2. Risk preferences: visual version (*the gumball machine*) of Holt and Laury (2002) task introduced by Vasco and Vazquez (2023).
   - 6 consecutive decisions.
   - Choose between two paired lotteries (A and B) with high and low payoff.
3. Social preferences: We adapted the task from Fehr et al. (2008) and Cobo–Reyes et al. (2020).
   - Subjects faced three *mini* dictator games: pro-social, envy and sharing game.

Estimating equation

Our main estimating equation is:

$$EP_i^j = \beta_1 \times SibSize_i + \beta_2 \times BOI_i + \sum_k \beta_k X_i \quad (1)$$

Where:

- EP_i^j is vector of economic preferences (time, risk and social preference) of individual i
- $SibSize_i$ is the sibship size
- BOI_i is the Birth Order Index, which measures birth order independently from sibship size (following Booth and Kee (2009)) $\rightarrow$ $BOI_i = \theta / A$
- $Corr(Sibship; \theta)$=0.473 versus $Corr(Sibship; BOI)$=0.041
- We clusterized the SE at the class level ($clusters$=172)

Data

- We collected data from 15 schools in Spain.
- We excluded subjects that were only child (n=276, 7%) and has a number of siblings>3 (n=119, 3%)
- Final sample: n=3490 students from grades 7 to 10 (172 classes).
- In time and risk preferences we used only consistent subjects: n=2905 (85%) and n=2766 (81%)
- Robustness checks: we used the entire sample.

Data

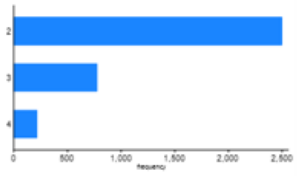
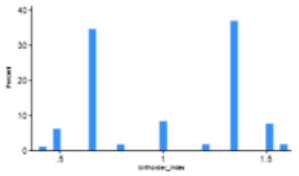
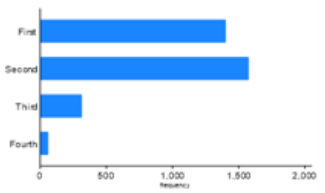
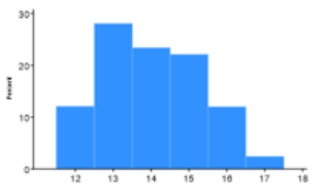
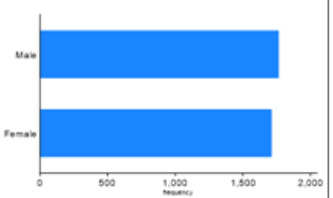
Variable	Note	Stats/values	Graph	Obs
Sibship	Sibship size (plus subject)	Mean: 2.346 Min: 2 Max: 4 SD: 0.592		3490
BOI	Birth order index	Mean: 1.019 Min: 0.4 Max: 1.6 SD: 0.362		3347
Rank	Absolute birth order	1: First 2: Second 3: Third 4: Fourth		3347
Age	In years	Mean: 14.01 Min: 12 Max: 17 SD: 1.296		3364
Female	Dummy	0: Male 1: Female Mean: 0.492		3475

Figure: Summary statistics

Data

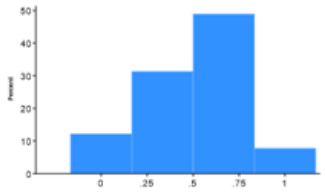
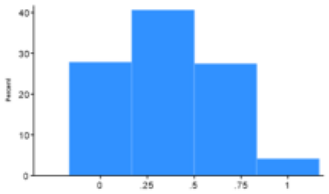
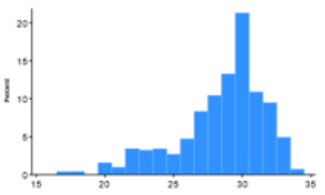
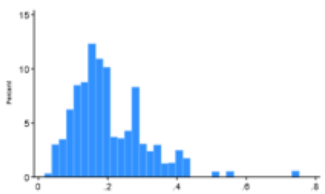
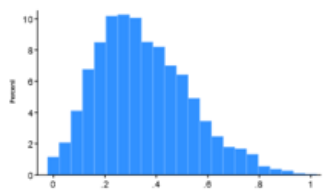
Variable	Note	Stats/values	Graph	Obs
CRT	Cognitive Reflexion Test (Standardized)	Mean: 0.507 Min: 0 Max: 1 SD: 0.268		3436
Fin	Financial abilities	Mean: 0.359 Min: 0 Max: 1 SD: 0.281		3424
Class_size	Class size	Mean: 28.52 Min: 17 Max: 34 SD: 3.177		3490
Cohesion	Class cohesion	Mean: 0.203 Min: 0.018 Max: 0.753 SD: 0.104		3486
Popularity	Indegree of friends newtworks (Standardized)	Mean: 0.345 Min: 0 Max: 1 SD: 0.180		3490

Figure: Summary statistics

Outcomes variables

Our outcome variables are:

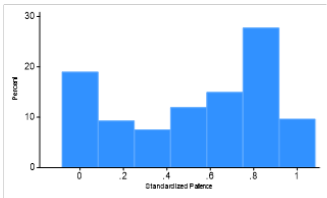
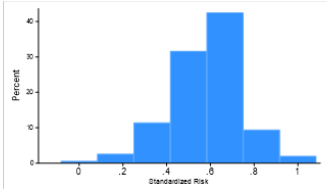
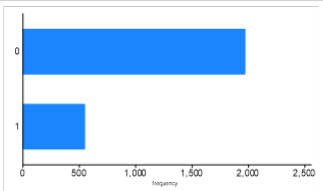
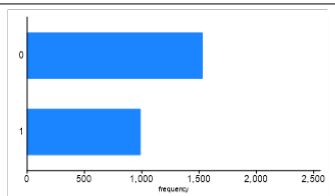
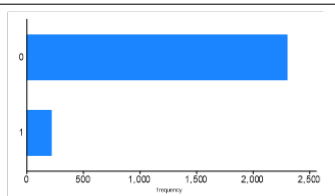
Variable	Note	Stats/value	Graph	Obs
Pantience	# Future allocations (Standarized)	Mean: 0.527 Min: 0 Max: 1 SD: 0.344		3439 Cons.: 2905
Risky	# Risky options (Standarized)	Mean: 0.582 Min: 0 Max: 1 SD: 0.362		3433 Cons.: 2766
Altruist	Dummy	0: No 1: Yes Mean: 0.218		2517
Egalitarian	Dummy	0: No 1: Yes Mean: 0.392		2517
Spiteful	Dummy	0: No 1: Yes Mean: 0.086		2517

Figure: Summary statistics

Results: Time and risk preferences

	(1) # Fut. Alloc.	(2) # Fut. Alloc.	(3) # Risky	(4) # Risky
Sibship size	-0.004	-0.005	0.009	0.010*
	(0.013)	(0.013)	(0.005)	(0.005)
BOI	0.005	0.007	-0.002	-0.001
	(0.019)	(0.019)	(0.009)	(0.009)
Age	0.009	0.004	-0.007***	-0.003
	(0.007)	(0.007)	(0.003)	(0.003)
Female	0.017	0.024	0.004	-0.001
	(0.015)	(0.015)	(0.006)	(0.006)
CRT		0.106***		-0.053***
		(0.028)		(0.011)
Finn		0.039		-0.036***
		(0.029)		(0.011)
Class size		0.004		0.001
		(0.004)		(0.002)
Cohesion		0.115		-0.027
		(0.110)		(0.044)
Popularity		0.018		0.003
		(0.051)		(0.025)
Constant	0.473***	0.316**	0.671***	0.636***
	(0.102)	(0.146)	(0.042)	(0.057)
Observations	2,762	2,743	2,624	2,612
Adjusted R-squared	0.038	0.048	0.019	0.033
School Fixed Effects	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. Asterisks denote significance levels: *** $p<0.01$, **$p<0.05$, *$p<0.1$.

Results: Time and risk preferences (cont.)

	(1)	(2)	(3)	(4)
	# siblings=1		# siblings=2	
	# Fut. Alloc.	# Risky	# Fut. Alloc.	# Risky
Second child	-0.003	0.001	-0.002	0.019
	(0.015)	(0.007)	(0.042)	(0.016)
Thrid child			0.008	-0.002
			(0.039)	(0.015)
Age	0.011	-0.004	0.002	-0.005
	(0.008)	(0.003)	(0.015)	(0.007)
Female	0.027	0.000	0.014	-0.013
	(0.017)	(0.007)	(0.032)	(0.013)
CRT	0.098***	-0.057***	0.128**	-0.027
	(0.034)	(0.013)	(0.056)	(0.028)
Finn	0.033	-0.037***	0.009	-0.041*
	(0.032)	(0.013)	(0.062)	(0.022)
Class size	0.003	-0.000	0.004	0.008**
	(0.004)	(0.002)	(0.009)	(0.003)
Cohesion	0.048	-0.019	0.300	-0.020
	(0.106)	(0.050)	(0.219)	(0.092)
Popularity	0.004	-0.007	0.083	0.018
	(0.056)	(0.028)	(0.115)	(0.044)
Constant	0.288*	0.694***	0.282	0.500***
	(0.152)	(0.060)	(0.328)	(0.113)
Observations	1,984	1,882	602	573
Adjusted R-squared	0.043	0.035	0.057	0.049
School Fixed Effects	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. Asterisks denote significance levels: *** $p<0.01$, **$p<0.05$, *$p<0.1$.

Results: Social preferences

	(1) Altruist	(2) Altruist	(3) Egalitarian	(4) Egalitarian	(5) Spiteful	(6) Spiteful
Sibship size	0.018	0.018	-0.018	-0.017	-0.008	-0.008
	(0.015)	(0.016)	(0.018)	(0.018)	(0.010)	(0.010)
BOI	0.050**	0.045*	0.004	0.003	-0.034**	-0.034**
	(0.025)	(0.027)	(0.029)	(0.029)	(0.015)	(0.015)
Age	-0.015*	-0.024***	-0.003	0.005	-0.006	-0.003
	(0.008)	(0.009)	(0.008)	(0.009)	(0.005)	(0.006)
Female	-0.124***	-0.117***	0.163***	0.155***	0.001	0.001
	(0.016)	(0.018)	(0.020)	(0.020)	(0.011)	(0.011)
CRT		0.069**		-0.066*		-0.038*
		(0.033)		(0.039)		(0.020)
Finn		0.063*		-0.087**		-0.012
		(0.037)		(0.036)		(0.021)
Class size		0.002		-0.001		0.002
		(0.005)		(0.005)		(0.003)
Cohesion		0.468***		-0.102		-0.076
		(0.125)		(0.147)		(0.073)
Popularity		-0.134*		-0.020		0.027
		(0.070)		(0.075)		(0.042)
Constant	0.429***	0.391**	0.487***	0.504**	0.168**	0.112
	(0.119)	(0.194)	(0.123)	(0.202)	(0.070)	(0.125)
Observations	2,503	2,107	2,503	2,486	2,503	2,486
Adjusted R-squared	0.034	0.039	0.037	0.040	0.015	0.015
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. Asterisks denote significance levels: *** $p<0.01$, **$p<0.05$, *$p<0.1$.

Results: Social preferences (cont.)

	(1)	(2)	(3)	(4)	(5)	(6)
		# siblings=1			# siblings=2	
VARIABLES	Altruist	Egalitarian	Spiteful	Altruist	Egalitarian	Spiteful
Second child	0.048**	0.004	-0.039***	0.055	0.005	-0.033
	(0.021)	(0.025)	(0.013)	(0.041)	(0.047)	(0.033)
Thrid child				0.042	-0.002	-0.024
				(0.047)	(0.056)	(0.033)
Age	-0.020**	0.012	0.001	-0.031*	-0.019	-0.007
	(0.009)	(0.012)	(0.008)	(0.018)	(0.021)	(0.010)
Female	-0.117***	0.167***	-0.004	-0.139***	0.152***	-0.008
	(0.020)	(0.023)	(0.014)	(0.036)	(0.045)	(0.023)
CRT	0.066*	-0.065	-0.054**	0.059	-0.015	0.005
	(0.037)	(0.044)	(0.025)	(0.078)	(0.083)	(0.042)
Finn	0.014	-0.071*	-0.017	0.216***	-0.187**	-0.008
	(0.035)	(0.041)	(0.027)	(0.080)	(0.085)	(0.041)
Class size	-0.004	-0.002	0.002	0.011	0.011	-0.003
	(0.006)	(0.007)	(0.004)	(0.010)	(0.012)	(0.007)
Cohesion	0.575***	-0.182	-0.065	0.078	0.175	-0.099
	(0.126)	(0.196)	(0.103)	(0.253)	(0.353)	(0.163)
Popularity	-0.143**	0.015	-0.012	-0.088	-0.155	0.130
	(0.067)	(0.090)	(0.051)	(0.159)	(0.162)	(0.080)
Constant	0.571***	0.400	0.038	0.214	0.416	0.201
	(0.210)	(0.257)	(0.169)	(0.372)	(0.430)	(0.216)
Observations	1,797	1,797	1,797	543	543	543
Adjusted R-squared	0.042	0.044	0.019	0.046	0.033	-0.008
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. Asterisks denote significance levels: *** $p<0.01$, **$p<0.05$, *$p<0.1$.

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Conclusions

The results of our analysis suggest:

- Birth order has no correlation with time and risk preferences.
- Birth order affects social preferences:
  - Laterborns are more altruist than firstborns: they maximizes the partner's payoff and at the same time the joint payoff.
  - Laterborns are also less spiteful than firstborns: they do not maximizes the positive difference in own versus partners payoff.
- We also finds that class cohesion strongly predicts altruism.

Thank you for your time!!!

Elicitation of time preferences

- We used a Multiple Price Lists (MPL) task (Coller and Williams, 1999).
- Subjects made 6 hypothetical decisions:
  - Option A they obtained a payoff in 1 day.
  - Option B they obtained a payoff in 8 days.

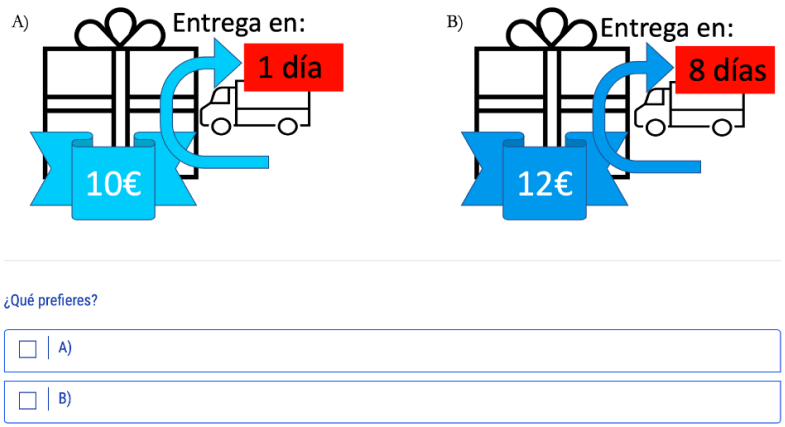


Figure: Example of a decision screen for the time preference task

- Hypothetical monetary payoffs are represented as a gift and waiting time by a van.

Elicitation of time preferences

- The amount of money in option A was always 10€ while in option B it increased from decision to decision.

Figure: Monetary values in option B

- Ribbon darkens proportionally to the increase in the monetary value (interest rate).

Outcome variables: number of future allocations (patience).

Elicitation of risk preferences

- We used a modified version of the Holt Laury task.
- Subjects were asked to make six decisions between two paired lotteries (A or B).
- They had a probability of p_l to obtain the lowest payoff and $(1 - p_l)$ the highest payoff.

Decision	p_l	Lottery A	Lottery B
1^{st}	1.0	1.0*8€ + 0.0*10€	1.0*2€ + 0.0*20€
2^{nd}	0.8	0.8*8€ + 0.2*10€	0.8*2€ + 0.2*20€
3^{rd}	0.6	0.6*8€ + 0.4*10€	0.6*2€ + 0.4*20€
4^{th}	0.4	0.4*8€ + 0.6*10€	0.4*2€ + 0.6*20€
5^{th}	0.2	0.2*8€ + 0.8*10€	0.2*2€ + 0.8*20€
6^{th}	0.0	0.0*8€ + 1.0*10€	0.0*2€ + 1.0*20€

Elicitation of Risk Preferences

- We represented risk as a gumball machine.

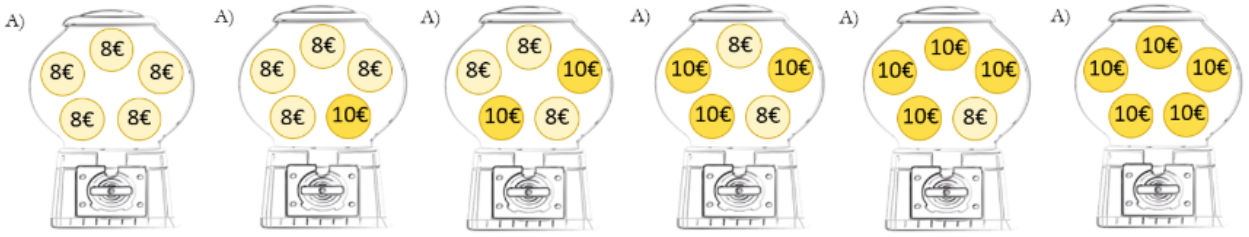


Figure: Lottery A used in the experiment

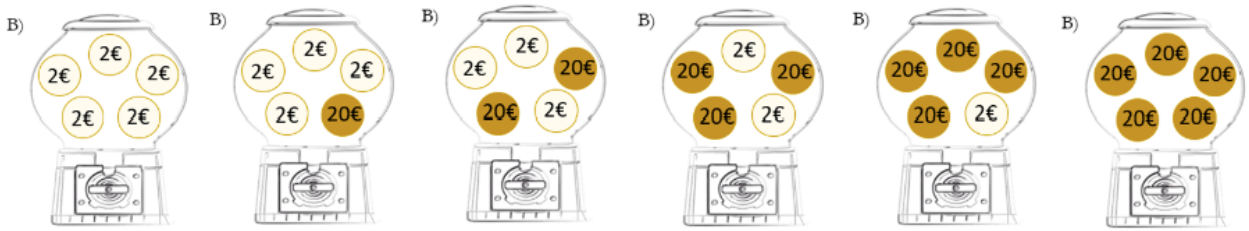
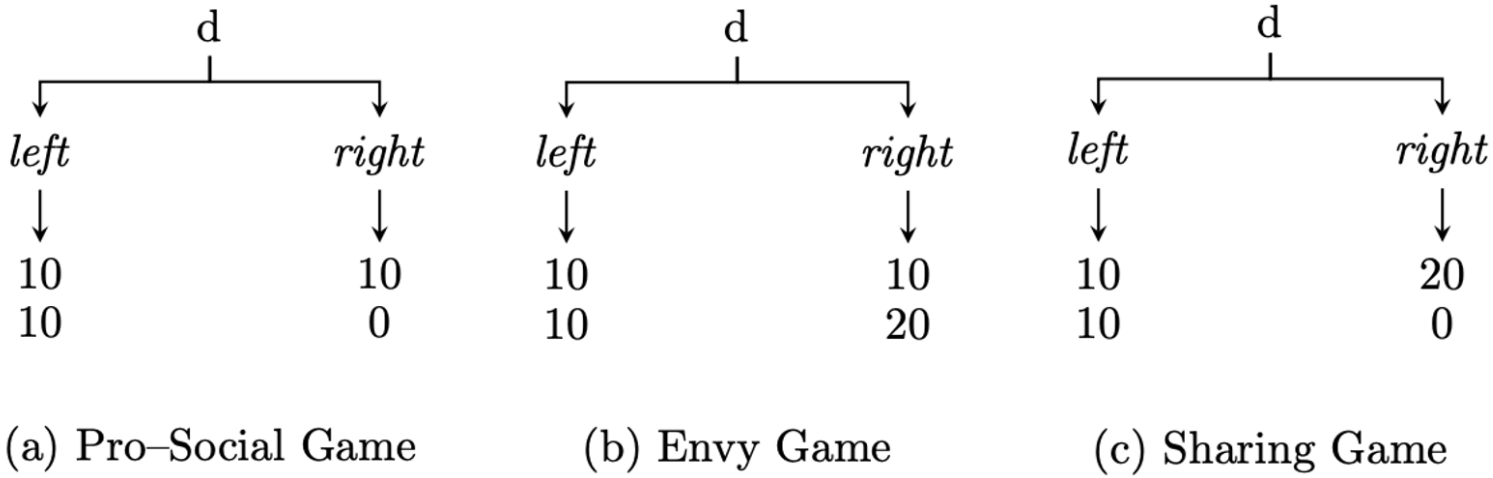


Figure: Lottery B used in the experiment

Outcome variables: number of risky options chosen.

Elicitation of social preferences

- We adapted the task from Fehr et al. (2008) and Cobo–Reyes et al. (2020). Subjects faced three *mini* dictator games:



(a) Pro–Social Game (b) Envy Game (c) Sharing Game

Figure: Dictator Games

- Comments on hypothetical payoffs. **Outcome:** Egalitarian, altruist and spite behavior.

Previous results

The adventure of running experiments with teenagers

Alfonso, A., Brañas-Garza, P., Jorrat, D., Lomas, P., Prissé, B., Vasco, M.., Vázquez M. J.
Mimeo 2022

FOUR important results from waves I, II and III:

- R1: Agreements with schools are CRITICAL $\rightarrow \bigtriangledown$ attrition.
- R2: Hypothetical incentives (vs BRIS) are NOT RELEVANT $\rightarrow \bigtriangledown$ *ethics*.
- R3: The use of tailored visual tools is CRITICAL $\rightarrow \bigtriangleup$ *consistency*.
- R4: The use of mobiles are NOT RELEVANT $\rightarrow =$ *outcomes*.

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