Keeping it for yourself or your sister? Experimental evidence on birth order effects on resource distribution between kin and non-kin

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Electronic Supplementary Material

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These ESM are associated to the paper "Keeping it for yourself or your sister? Experimental evidence on birth order effects on resource distribution between kin and non-kin" published in the Journal of Economic Psychology.

1- Procedures

Both sisters simultaneously participated in the study, with at least one sister being physically present with the experimenter. If both sisters could not simultaneously be present, one of the two sisters completed the study using an online Qualtrics survey (receiving instructions from the experimenter by phone). By doing so we avoid any kind of communication of siblings during the experiment. The study lasted approximately 40 minutes. Overall 15 pairs of sisters presented themselves jointly for the study and 41 individuals participated alone while their sister participated at the same time online.

All participant pairs were compensated with 15 euros participation fee that could be shared as they wished. In addition, at the end of the experiment, one decision for each participating couple was selected for payout. Individuals could earn an additional 0 to 30 euros depending on their own decisions and the decisions of their interaction partner in the selected decision. Participants knew that they would not be informed which decision had been randomly selected. Since participants interacted both with a stranger and their sister, final earnings could therefore stem from either interaction. This method allows us to ensure even among sisters, anonymity of choices.

The instructions concerning the payout procedures to participants were the following (for an illustration of these procedures see also Figure S1):

> *Once the study is finished, in around February/March, we will determine through a lottery the total of your earnings. This lottery will consist of three steps to determine:*
>
> *- Which decision will count for your earnings (the first or the second)*
> *- Which player will decide for the earnings (you or your partner)*
> *- Which decisions among the 5 choices will be taken into account for the earnings*
>
> *For example, to determine your earnings, we will first roll a dice to know which decision will be taken into account. If the dice shows either a 1,2 or 3, it will be the decision 1, if it will be a 4,5 or 6, it will be decision 2. Once the decision is fixed, we will determine in the same way which player will decide concerning the earnings from the decision that was randomly selected. Once the decision and the player are determined, we will select one of the 5 choices by selecting one of five pieces of paper.*
>
> *To ensure anonymity, neither you, nor your partner will be informed about the outcome from the lottery nor your responses.*

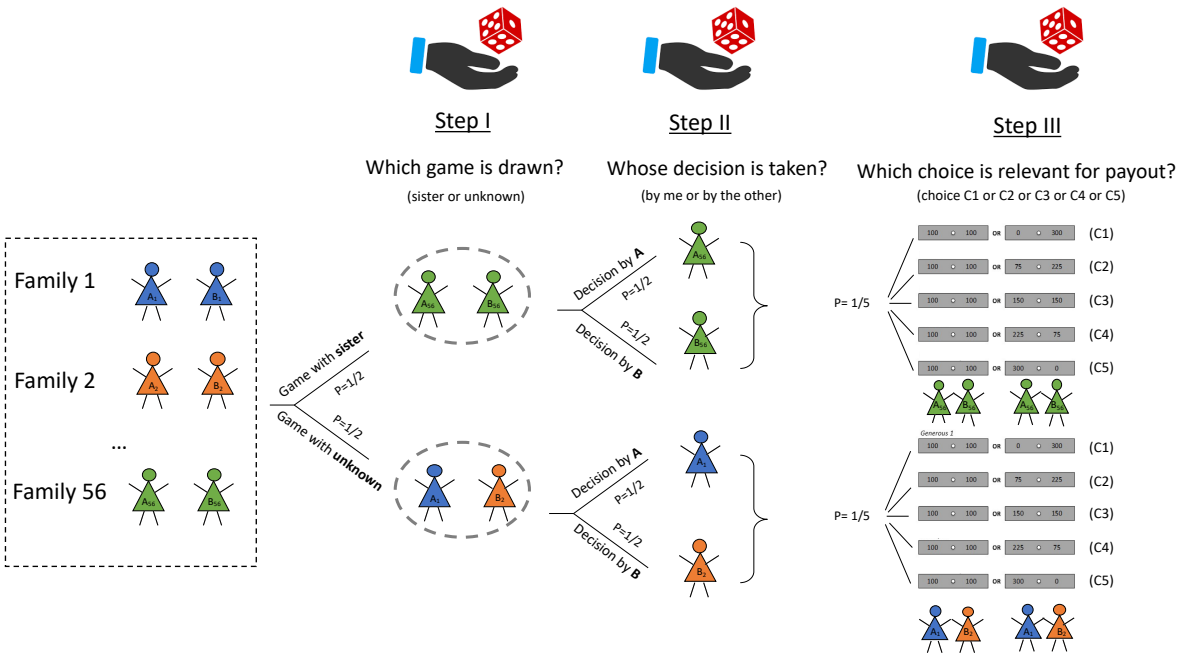

Figure S1: Illustration of the three random draws conducted at the end of the study to determine which choice would be payoff relevant for participants. Note that the labels A and B are not indicative of either first or laterborn but could be either of the two sisters of a family.

2- Instructions and questionnaires

We elicited information on emotional proximity to both parents and sister (current and during childhood), perceived parental investment (current and in childhood) towards themselves and their sister, monthly income (own and their sister's), the number of gifts or services given and received from parents, sister, best friend and an unknown individual (excluding Christmas and birthday gifts), and whether they would accept to undergo a heavy surgery if it was to save their parents, their sister, their best friend or an unknown individual. Participants were asked to provide this information on the visual analogue scales below (rated from 0 to 100):

Currently, do you feel emotionally close to your kin?

	No close at all	Extremely close
To your mother		
To your father		
To your sister		

During your childhood, did you feel emotionally close to your kin?

	No close at all	Extremely close
To your mother		
To your father		
To your sister		

Currently, comparing with your sister, your parents' financial and temporal investment in yourself is:

	Far lower than their investment in your sister	Far higher than their investment in your sister
Your mother's		
Your father's		

During your childhood, comparing with your sister, your parents' financial and temporal investment in yourself was:

	Far lower than their investment in your sister	Far higher than their investment in your sister
Your mother's		
Your father's		

According to you, your sister's and your monthly income are:

	Far insufficient	Far sufficient
Your monthly income is		
Your sister's monthly income		

During this year, how many gifts or services (excluding Christmas and birthday gifts) did you give to:

	None	Many
Your parents		
Your sister		
Your best friend		
An unknown individual		

During this year, how many gifts or services (excluding Christmas and birthday gifts) did you receive from:

	None	Many
Your parents		
Your sister		
Your best friend		
An unknown individual		

Would you accept to undergo a heavy surgery that could be lethal if it was to save:

	Not at all — Of course, yes
Your parents	
Your sister	
Your best friend	
An unknown individual	

3- Definition of profiles

We use answers from the distribution task to classify participants into five different preference profiles. As in Cochard et al., (2016), we will consider the following five profiles: altruist, efficient, equitable, reciprocal and selfish. A participant choosing the efficient option for every choice will be considered efficient. A participant choosing the equitable option for every choice will be considered equitable. A participant consistently maximizing his partners' earnings (i.e. selecting the efficient option in choices generous 1 and 2 and the equitable option in the two other choices) will be considered altruistic. A participant consistently maximizing his own earnings (i.e. selecting the equitable option for the two first choices and the efficient option in choices greedy 1 and 2) will be considered selfish. By extension, we take the sum of own payoffs of the individual and divide by the sum of payoffs for the pair. If this value is inferior to ½, we define them as altruistic, if the value is superior to ½, we define them as selfish. Finally, a participant whose choices were symmetric with respect to inequality will be considered as reciprocal.

4- Additional descriptive analyses

The majority of participants were students (67.9%; n=76) and was in a relationship (62.5%; n=70); 10.7% of participants (n=12) had at least one child. During their childhood, 100% of participants (n=112) lived with their mother and 94.6% (n=106) lived with their father.

Table S1: Age and age difference of sisters (by family ID).

ID pair	Age: Firstborn	Age: Laterborn	diff.
1	27	24	3
2	23	20	3
3	26	23	3
4	21	19	2
5	27	23	4
6	39	36	3
7	37	35	2
8	35	31	4
9	37	34	3
10	41	40	1
11	33	31	2
12	27	23	4
13	20	18	2
14	24	20	4
15	24	19	5
16	22	20	2
17	28	24	4
18	24	20	4
19	25	21	4
20	23	20	3
21	25	22	3
22	25	21	4
23	23	21	2
24	26	20	6
25	23	19	4
26	22	20	2
27	22	20	2
28	22	19	3
29	23	19	4
30	21	19	2
31	24	21	3
32	25	19	6
33	25	22	3
34	23	19	4
35	24	19	5
36	23	21	2
37	27	21	6
38	21	19	2
39	22	20	2
40	21	20	1
41	24	22	2
42	30	25	5
43	24	20	4
44	23	18	5
45	22	19	3
46	23	20	3
47	21	19	2
48	25	23	2
49	34	30	4
50	21	19	2
51	34	30	4
52	28	26	2
53	24	21	3
54	22	18	4
55	23	19	4
56	27	23	4

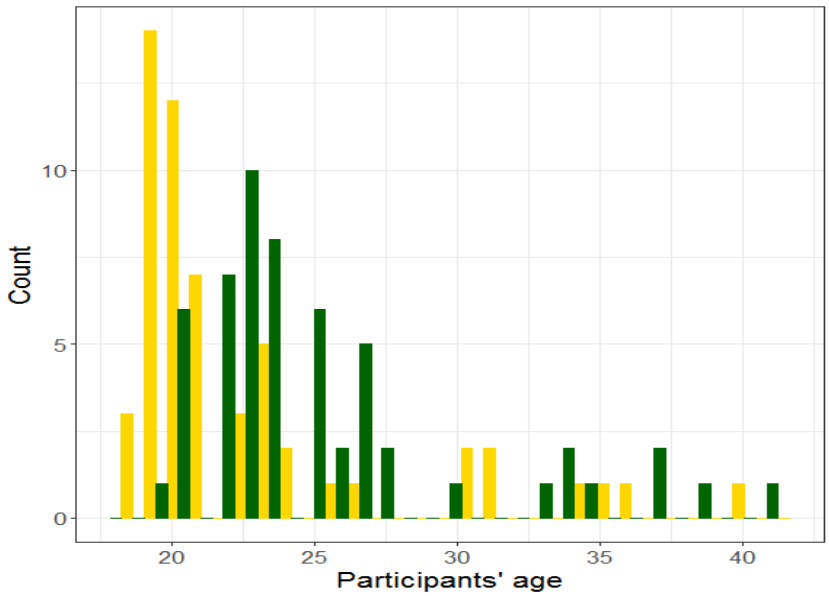

Figure S2: Age distribution among participants (firstborns' age depicted in white and laterborns' age depicted in gray).

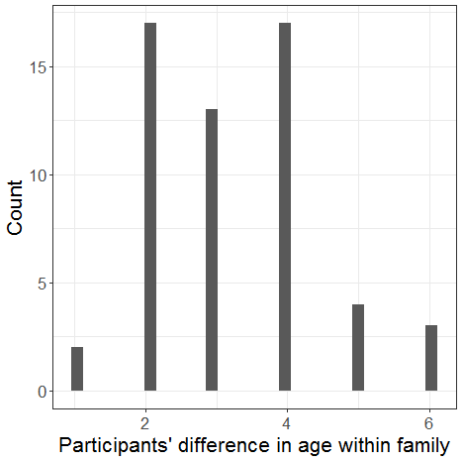

Figure S3: Difference in age within family distribution.

Regarding behavior towards the family, we find a significant difference concerning the fact that laterborns thought their older sibling (*i.e.* the firstborn) received more investment from their parents (Table S2). Further, in line with the literature, firstborns report to be more involved into their family when it comes to giving gifts and underestimate their sister's income (Zajonc, Markus & Markus, 1979; Zajonc & Sulloway, 2007). Also in line with the literature we observe

no birth order difference concerning answers with respect to survival situations (Burnstein, Crandall & Kitayama, 1994).

Table S2: Results regarding the influence of birth order on descriptive data about our sample; Z-values and p-values are Wilcoxon's.

Descriptive variables	**Firstborn**		**Laterborn**		**Difference**	
	M	SD	M	SD	*Z*	*p*
Closeness to the family	79.70	13.69	77.63	15.74	-0.80	*.42*
Global parental investment in me	74.49	21.50	73.07	19.12	-0.71	*.48*
Global parental investment in my sister	47.87	9.51	51.16	7.85	**-2.49**	***.01***
My financial income	42.77	19.58	49.71	22.81	**-2.13**	***.03***
My sister's financial income	37.23	23.47	52.16	23.08	**-4.02**	***<.001***
Gifts or services given (excluding Christmas and birthday gifts)						
To their family (parents and sister)	57.73	17.64	49.76	22.48	**-3.49**	***<.001***
To their best friend	45.68	23.09	40.36	27.26	-1.43	*.15*
To an unknown individual	20.00	23.50	15.50	21.05	-1.33	*.18*
Endorse a heavy surgery to save						
Their family (parents and sister)	89.5	16.27	88.49	17.79	-0.17	*.86*
Their best friend	71.91	26.56	65.95	27.97	-1.74	*.08*
An unknown individual	22.64	24.80	25.71	28.88	-0.49	*.62*

5- Statistical analyses

Regarding the distributive preferences, our response variable was a dummy variable for having selected the *efficient option* (*i.e.* 1 if the *efficient option* was selected, else 0). To account for the binomial nature of the date, we use a mixed logistic regression. Explanatory factors for this model included: birth order (firstborn *versus* laterborn), game partner (sister *versus* unknown) and the choice tasks (*control*, *generous 1* and *2*, *greedy 1* and *2*). All predictors were considered fixed-effects except for participants, and sibling pairs' identification which were considered random-effects.

Regarding the five profiles, we performed thus a log-logistic regression with birth order and game partner variables as explanatory factors.

Regarding the beliefs, we performed two multinominal mixed logistic regressions. Factors for the regression on the first variable (*belief_difference_partner*) included birth order (firstborn *versus* laterborn), choice task (*control*, *generous 1* and *2*, *greedy 1* and *2*) and game partner (sister *versus* unknown). Factors for the regression on the second variable (*belief_difference_norms*) include birth order (firstborn *versus* laterborn) and the choice task (*control*, *generous 1* and *2*, *greedy 1* and *2*). For these two regressions, participants, and sibling pairs' identification were considered as random-effects and both dependent variables have three modalities (-1, 0 and 1).

6- Additional results

Table S3. Effect of the game partner (sister *versus* unknown) on the behaviors regarding sharing money.

Pattern	Item	Birth-order	OR	t-test	Adjusted p-values
Generous	Generous 1	Firstborn	**28.3 [7.4 – 107.8]**	**4.91**	**<.0001**
		Laterborn	**7.1 [1.8 – 27.7]**	**2.84**	**.013**
		All	**14.9 [5.9 – 37.7]**	**5.71**	**p<0.001**
	Generous 2	Firstborn	**8.1 [2.9 – 22.5]**	**4.03**	p<0.001
		Laterborn	**9.8 [2.8 – 34.2]**	**3.58**	**.0011**
		All	**8.4 [3.8 – 18.4]**	**5.32**	**p<0.001**
	Generous 1 & 2	Firstborn	**15.2 [6.5 – 35.4]**	**6.3**	**<.0001**
		Laterborn	**8.3 [3.3 – 21.3]**	**4.45**	**<.0001**
		All	**11.2 [6.1 – 20.7]**	**7.71**	**p<0.001**
Greedy	Greedy 2	Firstborn	0.7 [0.3 – 1.6]	- 0.85	.99
		Laterborn	**0.2 [0.1 – 0.6]**	**- 2.93**	**.011**
		All	**0.4 [0.2 – 0.8]**	**-2.62**	**p<0.001**
	Greedy 1	Firstborn	1.3 [0.5 – 2.8]	0.44	.99
		Laterborn	0.5 [0.2 – 1.4]	- 1.31	.57
		All	0.9 [0.4 – 2.1]	-0.5	.62
	Greedy 2 & 1	Firstborn	0.9 [0.5 – 1.7]	- 0.27	.99
		Laterborn	**0.3 [0.2 – 0.7]**	**- 2.92**	**.011**
		All	**0.6 [0.4 – 0.9]**	**-2.16**	**.031**

OR: Sister > unknown

Table S4. Effect of the birth-order (firstborn *versus* laterborn) on the behaviors regarding sharing money.

Pattern	Item	Game partner	OR	t-test	Adjusted p-values
Generous	Generous 1	Sister	**4.6 [1.6 – 13.5]**	**2.78**	**.016**
		Unknown	1.2 [0.2 – 6.8]	0.17	.87
	Generous 2	Sister	1.9 [0.6 – 5.3]	1.23	.65
		Unknown	2.3 [0.5 – 9.9]	1.13	.77
	Generous 1 & 2	Sister	**2.9 [1.3 – 6.8]**	**2.55**	**.033**
		Unknown	1.6 [0.5 – 5.5]	0.79	.43
Greedy	Greedy 2	Sister	1.8 [0.6 – 5.3]	1.09	.83
		Unknown	0.6 [0.2 – 1.7]	- 0.89	.99
	Greedy 1	Sister	2.9 [0.9 – 9.1]	1.86	.19
		Unknown	1.2 [0.4 – 3.5]	0.33	.99
	Greedy 2 & 1	Sister	2.3 [0.9 – 5.5]	1.88	.18
		Unknown	0.9 [0.4 – 1.9]	- 0.32	.99

OR: Firstborn > Laterborn

Table S5. Effect of the birth-order (firstborn *versus* laterborn) and game partner on the proportion of participants adopting the *altruistic* profile.

Birthorder	Game partner	OR	t-test	Adjusted p-values
Firstborn	Sister *vs*. Unknown	**12.0 [1.6 – 92.2]**	**2.39**	**0.0170**
Laterborn	Sister *vs*. Unknown	*7.0 [0.8 – 56.9]*	*1.82*	*0.0687*
-	Sister *vs*. Unknown	**9.1 [2.1 – 39.5]**	**2.97**	**0.0089**
Firstborn *vs*. Laterborn	Sister	1.7 [0.7 – 4.3]	1.13	0.2571
Firstborn *vs*. Laterborn	Unknown	1.0 [0.1 – 15.9]	0.01	1.0000
Firstborn *vs*. Laterborn	-	1.3 [0.3 – 5.6]	0.36	0.7179

Table S6. Effect of the birth-order (firstborn *versus* laterborn) and game partner on the proportion of participants adopting the *efficient* profile.

Birthorder	Game partner	OR	t-test	Adjusted p-values
Firstborn	Sister *vs*. Unknown	**7.5 [1.7 – 32.8]**	**2.68**	**0.0074**
Laterborn	Sister *vs*. Unknown	**5.0 [1.1 – 22.8]**	**2.08**	**0.0377**
-	Sister *vs*. Unknown	**6.1 [2.1 – 17.6]**	**3.36**	**0.0024**
Firstborn *vs*. Laterborn	Sister	1.5 [0.7 – 3.3]	0.99	0.3206
Firstborn *vs*. Laterborn	Unknown	1.0 [0.1 – 7.1]	0.00	1.0000
Firstborn *vs*. Laterborn	-	1.2 [0.4 – 3.5]	0.38	0.7074

Table S7. Effect of the birth-order (firstborn *versus* laterborn) and game partner on the proportion of participants adopting the *equitable* profile.

Birthorder	Game partner	OR	t-test	Adjusted p-values
Firstborn	Sister *vs*. Unknown	1.6 [0.8– 2.9]	-1.49	0.1351
Laterborn	Sister *vs*. Unknown	0.6 [0.4 – 1.1]	1.56	0.1193
-	Sister *vs*. Unknown	1.0 [0.7 – 1.5]	-0.01	0.9890
Firstborn *vs*. Laterborn	Sister	*1.76 [0.9 – 3.2]*	*-1.87*	*0.0613*
Firstborn *vs*. Laterborn	Unknown	0.7 [0.4 – 1.3]	1.17	0.2406
Firstborn *vs*. Laterborn	-	1.1 [0.7 – 1.7]	-0.51	0.6115

Table S8. Effect of the birth-order (firstborn *versus* laterborn) and game partner on the proportion of participants adopting the *selfish* profile.

Birthorder	Game partner	OR	t-test	Adjusted p-values
Firstborn	Sister *vs*. Unknown	**0.2 [0.1 – 0.6]**	**-2.83**	**0.0046**
Laterborn	Sister *vs*. Unknown	**0.1 [0.1 – 0.3]**	**-3.16**	**0.0016**
-	Sister *vs*. Unknown	**0.1 [0.1 – 0.3]**	**-4.12**	**<.0001**
Firstborn *vs*. Laterborn	Sister	4.0 [0.4 – 35.8]	1.24	0.2150
Firstborn *vs*. Laterborn	Unknown	0.8 [0.4 – 1.4]	-0.90	0.3672
Firstborn *vs*. Laterborn	-	1.7 [0.6 – 5.4]	0.96	0.3373

Table S9. Effect of the birth-order (firstborn *versus* laterborn) and game partner on the proportion of participants adopting the *symmetric* profile.

Birthorder	Game partner	OR	t-test	Adjusted p-values
Firstborn	Sister *vs*. Unknown	0.7 [0.1 – 3.9]	-0.44	0.6569
Laterborn	Sister *vs*. Unknown	2.0 [0.3 – 10.9]	0.80	0.4235
-	Sister *vs*. Unknown	1.2 [0.3 – 3.9]	0.23	0.8192
Firstborn *vs*. Laterborn	Sister	0.5 [0.1 – 2.7]	-0.80	0.4235
Firstborn *vs*. Laterborn	Unknown	1.5 [0.3 – 8.9]	0.44	0.6569
Firstborn *vs*. Laterborn	-	0.9 [0.3 – 2.9]	-0.23	0.8192

Regarding the beliefs variables

In addition to the two decision tasks involving the participants' sister or an unknown woman, we also elicited participants' beliefs about behavior by others. Each participant completed a total of four belief elicitation scales. Two of these concerned the behavior of their own sister, and two the behavior of an unrelated non-specified participant.

The first variable (*belief_difference_partner*) constructed from these scales is addressed in the main manuscript. It concerns the difference between the participant's own actions with respect to her interaction partner (either sister or unknown) and her beliefs concerning the actions of this interaction partner (either sister or unknown).

The second variable (*belief_difference_norms*) concerns the relationship between the participants own behavior with respect to her sister, and what she thinks about the interaction between two unknown sisters.

Both variables are positive when the participant choses the *efficient option* while she believed that her partner or sisters in general, won't.

Notably, when doing a similar analysis to the one realized for *belief_difference_partner*, for the variable indicating a difference between own behavior with their sister and their beliefs of what other sisters chose in sibling interactions (*belief_difference_norms*), we observe no effect of birth order. Participants independent of birth order ($p=0.5$) thought that they were in their own sibling interaction "more generous" than other siblings would be.