Birth Order and Fund Manager's Trading Behavior: Role of Sibling Rivalry

Vikas Agarwal

Alexander Cochardt

Stephan Heller

Vitaly Orlow

Discussion by

Zoran Ivković

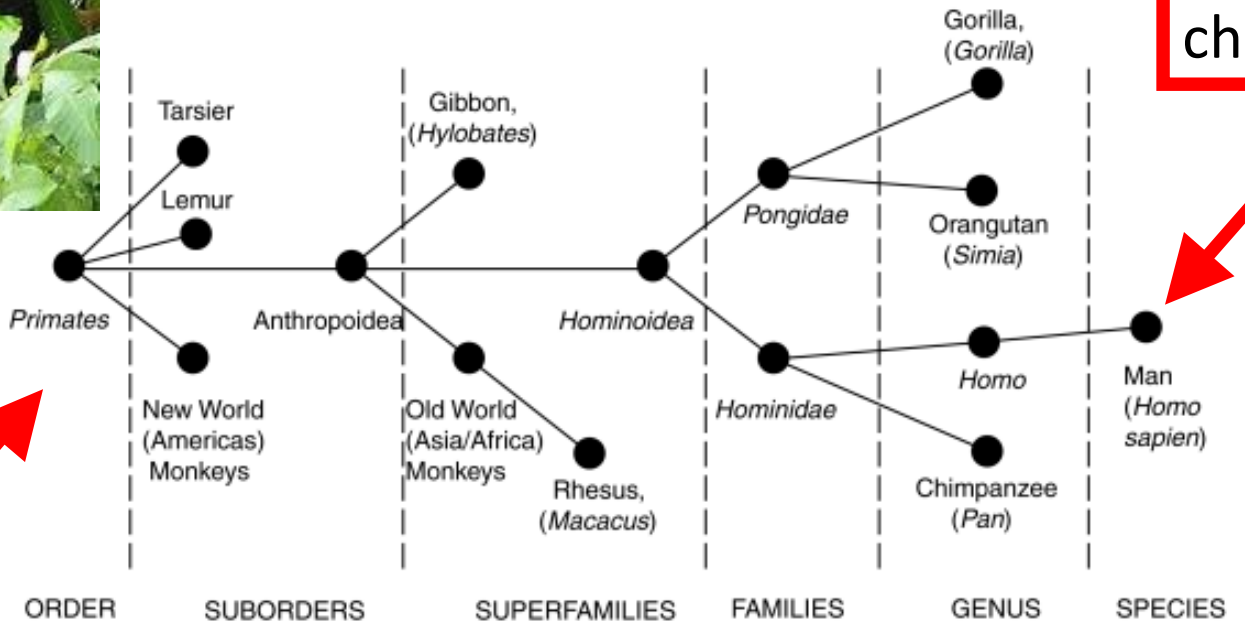
ABFER, May 2022

Why do humans behave the way they do?

- Investor behavior governed by preferences and beliefs
- Preferences and belief formation outcomes of natural selection
  - Jack Hirshleifer (1977), Becker (1976), Robson (1996, 2001), Netzer (2009), Robson and Samuelson (2009)
- Nature selects fitness-maximizing behaviors (reproductive advantage)
- Environment may facilitate activation of behavioral patterns (including tastes for risk, biases)
  - Loss Aversion: McDermott, Fowler, Smirnov (2008)
  - Over-confidence: Johnson and Fowler (2011)

Why do humans behave the way they do?

- This is a long, long story…



Millions of years later, we do not stand a chance!!!

This is when all the trouble started (if not earlier)

Trading and Evolution

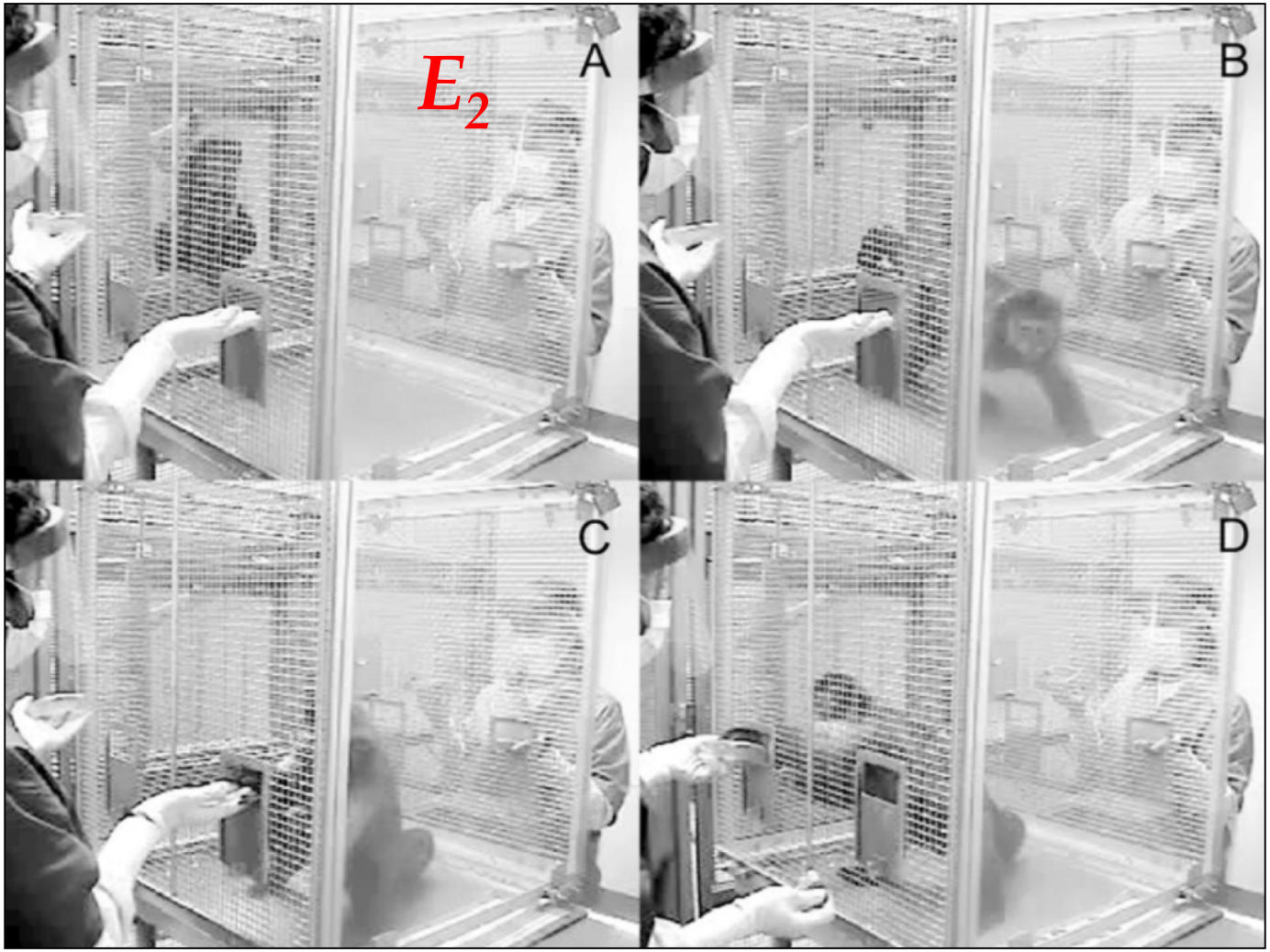
- Psychological mechanisms leading to tastes for risk and investment biases today optimal in the course of evolution (maximize fitness, reproductive advantage)

Q: How far into the past can we trace some behaviors?

- Chen, Lakshminarayanan, and Santos (JPE, 2006):
  - Capuchin monkeys (Yale University Monkey Business) ...
    - very smart
    - not exposed to markets and trading
    - subjects previously unexposed to experiments

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution



Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

Experiment #1: E_1: Offers and surely delivers 1 grape
E_2: Offers two grapes, but may withhold 1 grape

Conclusion: **1st order stochastic dominance**

TABLE 5
EXPECTED GAINS, LOSSES, AND VALUES FOR EACH EXPERIMENTAL CHOICE

	Experiment 1		Experiment 2		Experiment 3	
	E_1	E_2	E_1	E_2	E_1	E_2
Gamble offered	(1, 1, 1)	(2, 1, 2)	(1, 1, 2)	(2, 1, 2)	(1, 1, 1)	(2, 1, 1)
Gains	0	0	.5	0	0	0
Losses	0	.5	0	.5	0	1
Expected value	1	1.5	1.5	1.5	1	1
Trials chosen	13%	87%	71%	29%	79%	21%

NOTE.—The table is constructed pooling all subjects' last five sessions after choices stabilize (60 trials).

(A, B, C) : Experimenter offers A grapes, delivers a random 50/50 choice between B and C grapes

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

Experiment #2: E_1: Offers 1, delivers 50/50 prospect of 1 or 2
E_2: Offers 2, delivers 50/50 prospect of 1 or 2

Conclusion: **Reference dependence (with uncertainty)**

TABLE 5
EXPECTED GAINS, LOSSES, AND VALUES FOR EACH EXPERIMENTAL CHOICE

	Experiment 1		Experiment 2		Experiment 3	
	E_1	E_2	E_1	E_2	E_1	E_2
Gamble offered	(1, 1, 1)	(2, 1, 2)	(1, 1, 2)	(2, 1, 2)	(1, 1, 1)	(2, 1, 1)
Gains	0	0	.5	0	0	0
Losses	0	.5	0	.5	0	1
Expected value	1	1.5	1.5	1.5	1	1
Trials chosen	13%	87%	71%	29%	79%	21%

NOTE.—The table is constructed pooling all subjects' last five sessions after choices stabilize (60 trials).

(A, B, C) : Experimenter offers A grapes, delivers a random 50/50 choice between B and C grapes

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

Experiment #3: E_1: Offers 1, surely delivers 1
E_2: Offers 2, surely delivers 1 (same, but sure loss)

Conclusion: **Reference dependence (with certainty)**

TABLE 5
EXPECTED GAINS, LOSSES, AND VALUES FOR EACH EXPERIMENTAL CHOICE

	Experiment 1		Experiment 2		Experiment 3	
	E_1	E_2	E_1	E_2	E_1	E_2
Gamble offered	(1, 1, 1)	(2, 1, 2)	(1, 1, 2)	(2, 1, 2)	(1, 1, 1)	(2, 1, 1)
Gains	0	0	.5	0	0	0
Losses	0	.5	0	.5	0	1
Expected value	1	1.5	1.5	1.5	1	1
Trials chosen	13%	87%	71%	29%	79%	21%

NOTE.—The table is constructed pooling all subjects' last five sessions after choices stabilize (60 trials).

(A, B, C) : Experimenter offers A grapes, delivers a random 50/50 choice between B and C grapes

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

Experiment #3 - #2: Pick E_1 in #3 (79%) more often than in #2 (71)%

Interpretation: Sure loss pinches more than ½ loss / ½ gain gamble

Conclusion: $|\text{loss}| > \frac{1}{2}|\text{loss}| + \frac{1}{2}|\text{gain}| \Leftrightarrow |\text{loss}| > |\text{gain}|.$ **=> Loss aversion**

TABLE 5
EXPECTED GAINS, LOSSES, AND VALUES FOR EACH EXPERIMENTAL CHOICE

	Experiment 1		Experiment 2		Experiment 3	
	E_1	E_2	E_1	E_2	E_1	E_2
Gamble offered	(1, 1, 1)	(2, 1, 2)	(1, 1, 2)	(2, 1, 2)	(1, 1, 1)	(2, 1, 1)
Gains	0	0	.5	0	0	0
Losses	0	.5	0	.5	0	1
Expected value	1	1.5	1.5	1.5	1	1
Trials chosen	13%	87%	71%	29%	79%	21%

NOTE.—The table is constructed pooling all subjects' last five sessions after choices stabilize (60 trials).

(A, B, C) : Experimenter offers A grapes, delivers a random 50/50 choice between B and C grapes

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

My reflections:
(2) I will never view Capuchin monkeys,

Source: Chen, M. K., V. Lakshminarayanan, and L. R. Santos, 2006, How Basic Are Behavioral Biases? Evidence from Capuchin Monkey Trading Behavior. *Journal of Political Economy* 114(3) 517-537.

Trading and Evolution

My reflections:
(2) I will never view Capuchin monkeys, human evolution,

Trading and Evolution

My reflections:

(2) I will never view Capuchin monkeys, human evolution, and this graph the same way …

Investor behavior: Nature versus nurture

- Investor behavior governed by
  - Nature (genetic factors)
  - Nurture (common environment; parenting)
- Nature results from the literature
  - Decomposition of variance in behavior into nature and nurture components
    - Significant fraction of variation explained by genetic traits
      - Participation: 1/3 (Barnea, Cronqvist, and Siegel (2010))
      - Risk: 1/4 (Cesarini, Johannesson, Lichtenstein, Sandewall, & Wallace (2010))
  - IQ studies
    - Positive relation between participation & IQ, performance & IQ (Grinblatt, Keloharju, and Linnainmaa (2011, 2012))

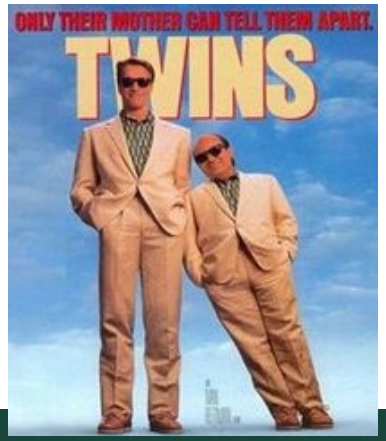
Variance decomposition approach

- Cronqvist and Siegel, Investment Biases (2014)
  - Covariance structure:

MZ

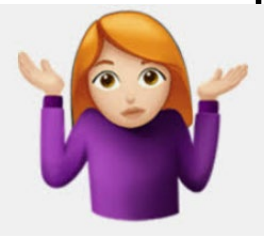
$$\mathrm{Cov}(\mathbf{a}) = \sigma_a^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1/2 \\ 0 & 0 & 1/2 & 1 \end{bmatrix}, \mathrm{Cov}(\mathbf{c}) = \sigma_c^2 \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}, \mathrm{Cov}(\mathbf{e}) = \sigma_e^2 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

DZ



Birth order

- Popular sources:
  - Older/eldest siblings
    ... responsibility and achievement (presidents, astronauts)
  - Middle siblings
    ... occupations that emphasize negotiating skills
  - Youngest siblings
    ... humor, creativity (entertainment, entrepreneurship)



- Scientific merit of these claims?
- They might well be right…
  - Primogeniture (1st born inherits) => present to date in countries as diverse as India and Denmark
  - Other siblings decrease scope and ambition of career plans, become less sensitive to risk => riskier activities and careers

Birth order

- Siblings typically did not receive the same amount of parental attention and other resources
  - Assuming parents treat their children equally, no child mortality
    - Firstborn:
      - 100% of parental attention for as long as there are no siblings
      - That percentage declines to 50%, 33%, 25%, and so on as each new sibling is born
    - Secondborn:
      - As of the moment of birth, only 50% of parental attention
      - The percentage declines to 33%, 25%, 20%, and so on as each new siblings is born
    - Thirdborn:
      - As of the moment of birth, only 33% of parental attention
      - The percentage declines to 25%, 20%, 17%, and so on as each new sibling is born
  - Take this with a grain of salt (likely underestimates attention to subsequent siblings in their infancy to some extent); the pattern nonetheless compelling

Birth order

- Simplified formula describing the paper:

CRSP | CENTER FOR RESEARCH IN SECURITY PRICES, LLC
An Affiliate of the University of Chicago Booth School of Business

+

+

=

Birth order and fund manager's trading behavior: Role of sibling rivalry*

VIKAS AGARWAL†
ALEXANDER COCHARDT‡
STEPHAN HELLER§
VITALY ORLOV¶

ABSTRACT

This paper investigates the role of birth order on managerial behavior using rich data on familial background of US mutual fund managers. We find that managers who are born later in the sibling hierarchy take on more investment risks relative to first-born managers, but perform worse. Motivated by sensation seeking, later-born managers take extreme style bets, hold more lottery stocks, and report more civil and regulatory violations compared to lower-birth-order managers. Taken together, our findings suggest that birth order-induced sensation seeking tendencies originate from sibling rivalry for limited parental resources during childhood, shape trading behavior, and extend beyond portfolio management.

JEL classification: G11; G23.
Keywords: birth order; mutual fund manager; sensation seeking; sibling rivalry

Birth order, family size (1)

- Family size chosen endogenously: Too important for Appendix only
  - ➢ Table II (no family size control), Appendix table B1 (with family size control)

Panel A: Regression results: *Total risk*

Variable	*Total risk*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Birth order	0.371***	0.476**	0.358***	0.312*				
	(2.99)	(2.19)	(2.99)	(1.87)				
Laterborn					0.836***	0.742***	0.802***	0.510**
					(2.82)	(2.72)	(3.02)	(2.39)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seg. & Year	Yes	No	No	No	Yes	No	No	No
Fund & Year	No	Yes	No	No	No	Yes	No	No
Seg. x Year	No	No	Yes	No	No	No	Yes	No
Firm x Year	No	No	No	Yes	No	No	No	Yes
Adj. R-sq.	0.59	0.71	0.64	0.63	0.57	0.71	0.62	0.62
N of funds	1,009	813	1,009	771	1,142	931	1,142	893
Observations	6,316	6,120	6,268	4,034	7,488	7,277	7,451	4,802

Variable	*Total risk*	
Controlling for family size	(1)	(2)
Birth order	0.329**	0.290**
	(2.02)	(2.10)
Family size	–0.014	0.133
	(–0.09)	(1.32)
Fund and Manager controls	Yes	Yes
Segment and Year FE	No	Yes
Adj. R-squared	0.04	0.59
N of funds	1,009	1,009
Observations	6,312	6,312

  - ➢ Be careful—simply adding the family size control does not alleviate concerns about family size endogeneity
  - ➢ Need to consider an IV strategy

Birth order, family size (1)

- Approach # 1: Twin births
  - Earliest discussion in the literature …

    Rosenzweig, M. R., and K. I. Wolpin, 1980, Testing the Quantity-Quality Fertility Model: The Use of Twins as a Natural Experiment, *Econometrica* XLVIII, 227–240.
  - Used in Black et al. (2005) … see p. 681

    Black, S. E., Devereux, P. J., & Salvanes, K. G., 2005, The more the merrier?: The effect of family size and birth order on children's education. *The Quarterly Journal of Economics* 120(2), 669-700.

Our general estimation strategy is as follows:

$$ED = \beta_0 + \beta_1 FAMSIZE + X\beta_2 + \varepsilon \quad (1)$$

$$FAMSIZE = \alpha_0 + \alpha_1 TWIN + X\alpha_2 + v. \quad (2)$$

In this case, *ED* is the education of the child, and *FAMSIZE* is the total number of children in the family. *X* is the full vector of control variables used in columns 5 and 6 of Table IV. Equation (2) represents the first stage of the two-stage least squares estimation, where equation (1) is the second stage.

The *TWIN* indicator is equal to 1 if the *n*th birth is a multiple birth and equal to 0 if the *n*th birth is a singleton. We restrict the sample to families with at least *n* births and study the outcomes of children born before the *n*th birth.[20] In practice, we estimate the specification for values of *n* between 2 and 4. By restricting the sample to families with at least *n* births, we make sure that, on average, preferences over family size are the same in the families with twins at the *n*th birth and those with singleton births. In addition, we avoid the problem that families with more births are more likely to have at least one twin birth. By restricting the sample to children born before birth *n*, we avoid selection problems that arise because families who choose to have another child after a twin birth may differ from families who choose to have another child after a singleton birth. This also allows us to avoid the problem that a twin birth both increases family size and shifts downwards the birth order of children born after the twins.[21]

Birth order, family size (1)

- Approach # 2: Same sex (Two Boys, Two Girls)
  - Earliest use in the literature …

    Angrist, J. D. and W. N. Evans, 1998, Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size, *The American Economic Review* 88(3), 450-477.

either child. To see this, let s_1 and s_2 be indicators for male firstborn and second-born children. The instrument can be written as

$$(3) \quad \textit{Same sex} = s_1 s_2 + (1 - s_1)(1 - s_2).$$

plus race and Hispanic indicators. In the just-identified model where *Same sex* is the only instrument, the first-stage equation relating *More than 2 children* to sex mix is

$$(5) \quad x_i = \pi_0' \mathbf{w}_i + \pi_1 s_{1i} + \pi_2 s_{2i} + \gamma(\textit{Same sex}_i) + \eta_i,$$

where γ is the first-stage effect of the instrument.

The following regression models are used to link labor-supply variables for husbands and wives to the endogenous *More than 2* variable, x_i, and the list of exogenous covariates, including additive effects for the sex of each child:

$$(4) \quad y_i = \alpha_0' \mathbf{w}_i + \alpha_1 s_{1i} + \alpha_2 s_{2i} + \beta x_i + \varepsilon_i,$$

Birth order, family size (1)

- Approach # 2: Same sex (Two Boys, Two Girls)
  - Earliest use in the literature …

    Angrist, J. D. and W. N. Evans, 1998, Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size, *The American Economic Review* 88(3), 450-477.

The alternative identification strategy uses the two components of *Same sex—Two boys* and *Two girls*—as instruments for *More than 2 children*. In this case, however, either s_{1i} or s_{2i} must be dropped from the list of covariates because s_{1i}, s_{2i}, $s_{1i}s_{2i}$, and $(1 - s_{1i})(1 - s_{2i})$ are linearly dependent. We chose to drop s_{2i}

The first-stage relationship between x_i and sex mix is

$$(7) \quad x_i = \pi_0'\mathbf{w}_i + \pi_1 s_{1i} + \gamma_0(\textit{Two boys}_i) + \gamma_1(\textit{Two girls}_i) + \eta_i,$$

where $\textit{Two boys}_i = s_{1i}s_{2i}$ and $\textit{Two girls}_i = (1 - s_{1i})(1 - s_{2i})$.

show below). In this case, the equation of interest becomes

$$(6) \quad y_i = \alpha_0'\mathbf{w}_i + \alpha_1 s_{1i} + \beta_i x_i + \varepsilon_i.$$

Birth order, sibling rivalry (2)

- Smaller age gap => more sibling rivalry => more risk (Table III)

	Total risk	*Idiosyncratic risk*	*Active risk*
	(1)	(2)	(3)
Birth order	0.694***	0.278***	1.183***
	(2.88)	(3.02)	(2.66)
Birth order x Age gap	–0.132**	–0.042**	–0.221***
	(–2.31)	(–1.96)	(–2.70)
Age gap	–0.334**	–0.205***	–0.156
	(–2.47)	(–3.90)	(–1.09)
Family size	Yes	Yes	Yes
Fund and Manager controls	Yes	Yes	Yes
Segment and Year FEs	Yes	Yes	Yes
Adj. R-squared	0.60	0.36	0.59
Observations	4,844	4,844	4,663

  - ➢ Nice result; supports evolutionary adaptive divergence theories (Sulloway)

- In many contexts (sports, performing arts, money management?), more competition yields better performance

Q: Are (risk-adjusted) performance and age gap (negatively) related?

Meet the Lundenberg family (Astrid, Gustaf)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Astrid (1971)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Clara (1978)								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Gustaf (1979)									x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Martha (1944)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Johan (1942)	x	x	x	x	x	x	x	x	x	x																	

Average **# Siblings**

1.21 Astrid	o	o	o	o	o	o	o	x	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx								
1.53 Gustaf									xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x	x	x	x	o

Average **# Adults**

1.53 Astrid	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x	x	x	x	x	x	x	x								
1.11 Gustaf									xx	xx	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Average **Adults/Child**

1.02 Astrid	2	2	2	2	2	2	2	1	0.67	0.67	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33								
0.46 Gustaf									0.67	0.67	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1

Birth order, resources (parental attention) (3)

- What is the ultimate interpretation of BO variation?
- Unquestionably, resources parents (can afford to) devote to children vary with birth order
- I agree with the authors: parental preferences or differences in parenting style across siblings are difficult to capture
- There may be one simple thing the authors can consider
  - Identify managers raised by single parents (or by parents widowed early on)
  - Predictions regarding the **risk levels, birth order** gaps of managers raised by **single parents**?
    - ***Higher?*** … Even more intense competition for scarce resources
    - ***Lower?*** … Children, especially firstborns, may engage in a collaborative role with the single parent and behave less competitively towards siblings

Birth order, behavioral niches (4)

❖ Middle siblings

... occupations that emphasize negotiating skills

- Consider team-managed funds
- If middle siblings occupy behavioral niches that emphasize the art of negotiating and compromising, the funds they manage should have superior performance relative to the funds managed by teams that feature firstborn or lastborn managers
- This would be perhaps the cleanest setting in which to test the popular hypothesis attributing negotiating skill to middle siblings

Conclusion

- **Very nice paper**
  - ➢ Creative, carefully executed
  - ➢ Speaks to several birth order issues with precision

- **Suggestions**
  1) Address endogeneity of family size
  2) Explore effects of sibling rivalry on performance
  3) Conduct a few more analyses related to single parents (risk, performance)
  4) Team-managed funds: better performance if co-managed by middle siblings than by other combinations?