CFR Working Paper NO. 22-12

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

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

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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

*Authors are grateful for the comments and suggestions of Stephen Brown, Gerald Gay, Robert Campbell, Peter Limbach, Harald Hau, Jeong Ho Kim, Hadiye Aslan, Clifton Green, Russell Jame, Alexander Wagner, Stefano Ramelli, Jungsub Lee, Jungsuk Han, Y. Eser Arisoy, Sara Ain Tommar, Teodor Dyakov, Stephan Heller, Roger Loh, Tarun Chordia, Zoran Ivkovich, Gurdip Bakshi, Xiaohui Gao Bakshi, John Crosby, Jinming Xue, Oleg Rytchkov, and participants of the 9th ABFER annual conference, 2022 Monash FMCG conference, FIRRM Joint Finance Seminar, 2022 AsianFA annual conference, and seminar participants at the Seoul National University, Geneva Finance Research Institute, the University of Zürich, the EDHEC business school, the NEOMA business school, Temple University, and the University of St. Gallen. This paper received the best paper award at the 12th Financial Markets and Corporate Governance conference. Vikas Agarwal thanks the CFR in Cologne for its continued support. Vitaly Orlov thanks GFF for support of this project. Authors thank Zachary Matteucci, Simon Wettstein, and Vithujan Shanmugaratnam for excellent research assistance.

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1. Introduction

There exists an abundance of scholarly evidence on the relation between family structure and subsequent human capital formation, particularly on the role of birth order on the formation of personality attributes.[1] Adler (1927), Adler (1928) was the first to suggest that personality differences are systematically related to birth order. Since then, research in psychology has focused on developing theory and empirically testing birth order effects on common personality traits and subsequent outcomes these traits influence (Sulloway (1995); Paulhus, Trapnell, and Chen (1999); Healey and Ellis (2007); Black, Grönqvist, and Öckert (2018)). Importantly, studies have suggested that birth order influences an individual's propensity to take risks across different contexts, such that later-born individuals have been associated with relatively risky adolescent behaviors (Argys, Rees, Averett, and Witoonchart (2006); Averett and Rees (2011)), tendency to participate in risky sports and to take more risk during the game (Sulloway and Zweigenhaft (2010)), greater desire to have more sexual partners (Michalski and Shackelford (2002)), internal sensation novelty seeking behavior (Zweigenhaft (2002)), making risky decisions (Roszkowski (1999); Gilliam and Chatterjee (2011)), and engaging in self-employment (Black et al. (2018)). These studies provide support for suggesting that later-born individuals have higher propensity to take risks and are associated more with sensation seeking behavior relative to firstborns.

To elucidate the birth order-induced differences in personalities and outcomes, evolutionary theory has been proposed as an explanation for birth order effects (Sulloway (1995); Sulloway (1996)). This theory views family as a set of niches with limited parental resources to distribute across siblings, which causes siblings to compete for the most resource-rich niche. Growing up subject to such dynamics influences siblings' personalities, particularly risk tolerance. Competing with firstborns who occupy the niche with more resources, later-born managers develop a more pronounced propensity to take risks in order to differentiate themselves from their older siblings and eventually become more risk tolerant, sensation seeking individuals relative to first-born children (Sulloway (2001); Brown and Grable (2015)). Such birth order-induced behavioral tendencies are long-lived, persist into adulthood (Sulloway and Zweigenhaft (2010)), and are even observed in samples of individuals in their 90s (Jefferson, Herbst, and McCrae (1998)). Through the construct of birth order, our study investigates whether effects of competitive family dynamics on personality persist into the adult labor market. Specifically, we examine the effects of birth order and family domain experiences on managerial behavior in a professional business setting.

To do so, we construct a novel and comprehensive dataset of mutual fund managers,

[1] See work by Plomin and Daniels (1987) and Plomin (2011).

which offers a unique setting to study the potential effects of birth order in several respects. First, the actions of mutual fund managers are observable and measurable, including managers' risk choices that are multidimensional. In particular, we are able to capture risk choices in terms of portfolio composition, trading decisions, return volatility, and violations of professional business conduct. Second, fund managers are likely to be solely responsible for these risk choices for their funds. Third, fund managers are a relatively homogenous group of individuals (e.g., most of them have experience and training in finance), which allows for comparable counterfactuals.[2] Lastly, the distribution of managerial family structures and characteristics is very similar to that of the United States population allaying concerns about potential selection bias and generalizability of our findings.[3] Moreover, we observe no evidence that fund companies select managers based on their birth order and find no relation between observable fund characteristics and birth order of incoming fund managers.

Our primary findings indicate that mutual fund managers who are born later in their families take on more investment risks relative to those managed by individuals of lower birth ranks. Funds run by later-born managers take 0.84, 0.26, and 1.13 percentage points more total risk, idiosyncratic risk, and active risk, respectively, relative to funds managed by firstborns. Moreover, the later a manager is born in the sibling hierarchy, the higher is the propensity to take risks. We find that on average each one-unit increase in birth order, all else equal, translates to a 0.37, 0.15, and 0.65 percentage points per annum increase in total risk, idiosyncratic risk, and active risk, respectively. These results of within-manager analyses based on birth order are economically meaningful and are also of interest to the broad public as mutual funds account for a large fraction of financial wealth of an average household, e.g. mutual funds made up a significant portion of retirement assets over recent decades.[4]

By carefully compiling detailed data set on managers' biographical information and family background, we overcome main challenges of empirical estimation of birth order effects, outlined in the prior literature (Blake (1989)). Specifically, we show that economically sizeable effect of manager's birth order on risk-taking persists even after controlling for family's size and socioeconomic status, cohort effects of the parents, and a host of firm- and manager-specific attributes. We also find that birth order effects on managerial risk

[2]Our paper is among the first to examine the effects of birth order on managerial behavior in a professional business setting along with Campbell, Jeong, and Graffin (2019) study of 71 South Korean CEOs. In our study, mutual fund setting allows for better counterfactuals, provides unique opportunities to investigate manager's sensation-seeking behavior and sheds light on the mechanism through which birth order affects managerial behavior.

[3]Based on the data from Pew Research Center survey 2014, available at https://www.pewresearch.org.

[4]Mutual funds account for up to 58 percent in DC plan assets and up to 52 percent in IRA assets over the last two decades. See 2022 ICI factbook for details.

tolerance are not attenuated after controlling for a number of managerial attributes that prior literature has shown to influence a manager's behavior. These include controls for a manager's cultural origins, marital status, educational attainment, bereavement experience, growing up in depression era, and relative age. Moreover, results of a placebo experiment with a subsample of index funds show no birth order effects, further corroborating our main findings.

We next shed light on the mechanism through which birth order influences a fund manager's risk-taking behavior. We find that age gap moderates birth order effect, such that in the presence of competition for limited parental resources due to high density of birth spacing, birth order-related risk tendencies become more engrained, and thus the relation between birth order and risk-taking is more pronounced. To provide further support for the proposed sibling rivalry mechanism, we use parental resources, specifically wealth and attention, as conditioning variables to study how birth order affects the risk-taking behavior. We find that descendants of families with greater resource constraints reveal significant birth order-induced differences in risk-taking, while managers who grew up in a less constrained environment display less heterogeneities in their risk-taking propensity between first-born and later-born managers. Overall, these findings are consistent with the broad implications of evolutionary theory in psychology, which emphasizes the role of limited parental resources, specifically wealth and attention, in contributing to the sibling rivalry and influencing the development of risk attitudes that carry over much later into the professional lives of fund managers.

Long-lived effects of birth order on managers' risk-taking behavior manifest in multiple ways. First, we find that later-born managers trade in a manner that is consistent with greater risk tolerance as these managers choose extreme investment style positions and take large factor bets that generate higher volatility with respect to the fund's benchmark. Second, consistent with suggested relation between the birth order and sensation seeking, we find that later-born fund managers churn their stock portfolio more often and invest more in lottery stocks relative to firstborn managers. Lastly, we find that later-born managers exhibit higher propensity for non-pecuniary risk-taking such that they tend to more frequently fail to meet expected standards of managerial conduct and have more reported civil or regulatory violations compared to first-born managers. These findings are again consistent with the predictions from evolutionary psychology theory about later-born individuals exhibiting more rebellious, daring, and nontraditional behavior (Sulloway (1995)).

Finally, the observed birth order-induced heterogeneities in incremental risk-taking do not translate into a higher risk-adjusted performance. On the contrary, our results suggest that risk-adjusted performance decreases in a manager's birth order. Specifically, we observe

negative effect of birth order on fund performance for various modifications of risk-adjusted alphas, peer-adjusted alphas, Sharpe ratio, information ratio, and value-added measure of Berk and van Binsbergen (2015). Given that later-born managers fail to deliver better performance even after taking more financial and legal risks suggest that these managers display sensation-seeking behavior that has been previously documented for individual investors (Grinblatt and Keloharju (2009)) and hedge fund managers (Brown, Lu, Ray, and Teo (2018)) using driving records and sports car ownership, respectively.

Our findings add to the debate on the relative importance of environmental factors in explaining later life outcomes. Specifically, our paper enriches the literature on investor behavior. We complement studies on the origins of differences in investment behavior, i.e., Barnea, Cronqvist, and Siegel (2010) and Cronqvist, Siegel, and Yu (2015), by showing that environmental factors help explain later-life investment choices and risk preferences of professional fund managers. Our findings also complement the evidence in a contemporaneous study by Chaudhuri, Ivkovich, and Simonov (2022) who find that the birth order affects the stock market participation of individual investors in Sweden, their risk taking and performance, providing complementary evidence on the importance of birth order effect in a different context. Notwithstanding some of the similarities in the findings, the two studies also differ in several dimensions. The richness of our micro-level comprehensive data on portfolio managers' biographical information and their family background allows us to shed light on the mechanism that is behind sensation-seeking behavior of professional investors (Brown et al. (2018)), and to show that origins of such behavior are intricately linked to birth order. Further, to the extent that we study finance professionals, who should be above a certain threshold of financial literacy and cognitive ability, allows us to mitigate selection issues and confounding effects of priming literacy (Conley and Glauber (2006)) and cognitive abilities (Kristensen and Bjerkedal (2007)) as repercussions of being a later-born child. More broadly, our paper contributes to the literature that emphasizes the role of personality-forming effects of family environment on later life economic outcomes (e.g., Blake (1986); Hanushek (1992), among others). These studies mainly investigate outcomes such as educational attainment and wages. In contrast, our paper focuses on individuals' adult labor market performance and actions.

Our study also contributes to the literature on the determinants of a fund manager's decision-making process and the role of various experiences in explaining managerial behavior, e.g., attending selective educational institutions (Chevalier and Ellison (1999); Li, Zhang, and Zhao (2011)); getting married or divorced (Lu, Ray, and Teo (2016); starting the career during a recession (Schoar and Zuo (2017)); being descendant of a wealthy family (Chuprinin and Sosyura (2018)); having prior professional experience (Cici, Gehde-Trapp,

Göricke, and Kempf (2018)); being relatively older during preschool education (Bai, Ma, Mullally, and Solomon (2019)); and living through family disruptions (Betzer, Limbach, Rau, and Schürmann (2021)). In our paper, we carefully consider alternative explanations of our results, find no confounding effects of birth order with those of previously identified determinants of managerial actions, and shed light on the mechanism through which birth order influences a fund manager's behavior.

2. Data and sample design

We obtain data on fund managers' families and mutual funds from multiple sources. This section provides the description of these data sources and discusses the processes of identifying managers' family background. In addition, an Appendix accompanies the paper, providing supplementary details on data collection and construction of main variables used in the empirical analysis.

2.1. Mutual fund data

We rely on the CRSP Survivor-Bias-Free U.S. Mutual Fund Database (henceforth CRSP MF) and Morningstar Direct Mutual Fund Database (henceforth MS Direct) to obtain data on core fund and manager characteristics. To do so, we aggregate share class characteristics from the CRSP MF at the fund level by weighting different fund share classes by their total net assets. Our sample is restricted to solo-managed domestic broadly-diversified equity-only U.S. mutual funds that have been actively managed by a single manager for at least twelve consecutive months (one full year).[5] We exclude index funds from the main sample and only use them in a placebo test. Additionally, to guard against the possibility of our results being affected by the incubation bias (Evans (2010)), we exclude funds with total net assets lower than $1 million. Moreover, we restrict our sample to funds with complete monthly return observations in a given year.[6] In total, our initial sample consists of 2,223 funds managed by 2,015 unique managers and the sample period spans from 1962 to 2017.

The main dependent variables in our study are the total risk, the idiosyncratic risk, and the active risk. Total risk is the time-series standard deviation of monthly mutual fund return observations in a given year. Idiosyncratic risk is the standard deviation of the

[5]Funds managed by anonymous managers are excluded. Following Agarwal, Ma, and Mullally (2018), we also remove cases where an individual simultaneously manages more than four funds as such cases are likely to have a senior person's name for administrative purposes, e.g., Bill Gross in the case of PIMCO funds. Sector funds are also excluded.

[6]Additionally, we considered other sample alterations by excluding funds with total net assets below $5 million and performing analyses with all-inclusive sample. The main results of our study remain unchanged.

monthly residuals from the four-factor model estimated for each year by regressing fund's monthly net-of-fee returns on the market, size, book-to-market factors of Fama and French (1993), and the momentum factor of Carhart (1997). Active risk is the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark.[7] For robustness, we also estimate risk variables using rolling windows of 24 months (minimum 20 observations) and 36 months (minimum 30 observations) and find qualitatively similar results. The vector of fund and manager control variables includes lagged fund size, lagged fund age, lagged expense ratio, lagged fund turnover, lagged fund family size, lagged fund flows, manager's age, manager's gender, manager's industry tenure, and manager's fund tenure. Table A.1 of the Appendix provides descriptions for each of these variables and details on other fund and manager characteristics used in the main part of the study.

To construct variables of managerial activeness, we obtain data on fund holdings. To do so, we match the CRSP MF with Thomson Reuters Mutual Fund Holdings Database (henceforth MF Holdings) using the MFLINKS tables. If the match is not established via MFLINKS, we manually merge funds using fund names. Finally, we only consider holdings of common stocks and obtain information on stocks from CRSP and Compustat databases.

2.2. Identifying a manager's family profile

Our primary sources of information on a mutual fund manager's family background are obituaries published in memory of deceased members of a manager's family. A typical obituary is an article offering a detailed biography of the person who died, including his or her life accomplishments, list of survivors, and those who preceded in death. To be able to locate obituaries of manager's family members, we first establish a manager's biographical profile by performing a cross-database search in the following order.

First, we obtain data on a manager's name, education, and fund management dates by cross matching data from MS Direct, Bloomberg, and FINRA. Second, based on this biographical information, we locate managers in a variety of data sources to obtain additional information, including their date of birth, work experience, and potential relatives. These data sources are LexisNexis, Marquis Who's Who Biographies, Morningstar descriptions, LinkedIn, Intelius, Ancestry.com, SEC filings, articles in U.S. newspapers, and fund company websites. For high accuracy, in the event of any conflicting information from these sources, we drop those observations from the sample. Finally, with a manager's biographical information at hand, we search for published obituaries of a manager's deceased family mem-

[7] We follow Petajisto (2013) and use the official benchmark index of each fund as stated in its prospectus. These benchmarks are 5 indices from Standard and Poors, 12 indices from Russell, and 2 indices from Dow Jones/Wilshire.

bers across over 10,000 U.S. newspapers from Newspapers.com and LexisNexis databases, online obituary resources (such as Legacy.com, Findagrave.com), and newsletters put out by local community organizations (such as churches, synagogues, employers, and local social groups).

To be included in our sample, we require an identified obituary to provide information on a manager's direct family structure, including parents' and siblings' names. Next, we perform an additional cross-database search with information on the manager's siblings to complete the family profile. We restrict our sample to families in which we observe dates of birth for all direct family members.[8] With this information available, we construct an indicator for a manager's *birth order*, which is a manager's rank by age among siblings and *family size* which is defined as the number of children born to the manager's parents. Additionally, using US census data and obituary-reported information, we include father's age at manager's birth, mother's age at manager's birth, parental educational attainment, military involvement, job, and family income in our analysis.

In total, we identify personal managerial characteristics for 1,905 managers (94.54% of all managers) that run 2,122 funds (95.46% of all funds), out of which we obtain detailed family background profiles of 1,403 managers who solo-managed 1,767 funds for at least one full year. Our final sample with family background profiles covers 69.62% of solo fund managers and 79.49% of funds.[9]

Panel A of Table 1 provides summary statistics for our sample of mutual fund managers and sample distributions of birth order and family size. First-born managers account for 40 percent of our sample, 34 percent are second-born, 15 percent are third-born, and 10 percent are fourth or later born. About 12 percent of fund managers in our sample grew up as a single child, 31 percent have one sibling, 27 percent have two, 16 percent have three, and 14 percent have four or more. The distribution of family sizes is very similar to that of the United States population over the past several decades. Sample characteristics are also similar to those reported in studies that use data on other developed countries (see Black, Devereux, and Salvanes (2005)). This suggests that the frequency of family sizes and birth

[8]We also include stepsiblings to family profiles if they lived in one household with the manager for at least nine out of first 18 years of a manager's life. Otherwise, stepsiblings are excluded. In unreported results, we find that results on birth order remain unchanged if we restrict our sample to family profiles without stepsiblings.

[9]Out of the remaining 612 managers without family background details in our sample, 298 managers (48.69%) have conflicting demographic profiles primarily due to very common names and demographics; 47 managers (7.68%) are females who have changed their last name (sometimes multiple times), thus we were unable to unequivocally identify their family profiles; 21 managers (3.43%) are foreign-born individuals and therefore their data is unavailable to us; 101 managers (16.50%) have only name disclosed but no other information in their MS Direct, Bloomberg, or FINRA profiles and essentially are "ghost" managers; finally, for the remaining 145 managers (23.69%), we are unable to identify their family profile for other reasons.

orders are mostly picking up general demographic patterns, rather than fund management companies selecting managers based on these characteristics. Panel B of Table 1 reports the descriptive statistics of fund managers' personal and family characteristics, while Panel C reports the same for fund characteristics.

3. Birth order and managerial risk-taking

3.1. Fund managers' birth order and risk-taking behavior

The existing literature relating birth order to risk tolerance indicates that propensities to take risks is a function of birth order, where younger siblings are more risk tolerant than first-born children (see Roszkowski (1999); Gilliam and Chatterjee (2011), and references therein). In this section, we explore the potential relation between fund managers' birth order and their risk-taking behavior.

To empirically test the conjecture of negative effects of birth order on managerial risk-taking, we conduct a series of tests. First, we perform regression analysis relating observed total risk, idiosyncratic risk, and active risk to the two birth order indicators, namely *Birth order* and *Laterborn* variables. Birth order is a manager's rank by age among siblings. *Laterborn* is an indicator variable that takes the value of one if a manager is born second or later in her family, and zero if a manager is firstborn. In these tests, we investigate the potential birth order effect while controlling for characteristics of managers and their funds. Importantly, we check that birth order effects are unlikely to be induced by unobservable factors or any heterogeneous trends by including period, segment (i.e., fund style), fund, fund family, and interaction fixed effects.

The results reported in Table 2 indicate that later-born mutual fund managers, all else being equal, exhibit higher propensity to take risks relative to firstborns. In Models (1) through (4) we relate mutual fund risk characteristics to a discrete *Birth order* variable, while Models (5) through (8) focus on a *Laterborn* binary indicator as the main explanatory variable. Regardless of the model specification, we find positive and statistically significant coefficient estimates on the birth order. In Models (1) and (5) we present the estimates after including time-varying fund and manager-specific control variables along with segment (i.e., fund style) and year fixed effects. Results in Model (1) indicate that on average being born by one birth order rank younger translates to a 0.37, 0.15, and 0.65 percentage points per annum increase in total risk, idiosyncratic risk, and active risk, respectively. The coefficients on the main variable of interest, the *Birth order*, are positive and statistically significant at the one percent level in all specifications. The coefficients on the *Laterborn* dummy in

Model (5) are also consistent with the conjecture that later-born managers, all else equal, take on more risk relative to their counterparts who are born first in the sibling hierarchy. Funds run by later-born managers take 0.84, 0.26, and 1.13 percentage points more total risk, idiosyncratic risk, and active risk, respectively, relative to funds managed by firstborns.[10]

Next, we augment the baseline specification with fund and year fixed effects in Models (2) and (6). Fund fixed effects allow us to identify the birth order effect from managerial turnover *within* funds, to control for unobservable factors at the fund level that could potentially influence fund risk profile while year fixed effects absorb temporal variation in risk choices. The coefficient estimates on the birth order indicator continue to be positive and significant at least at the five percent level across specifications. This outcome renders endogenous selection explanation unlikely.[11] In Models (3) and (7), by including segment-by-year fixed effects, we control for time-varying heterogeneous trends, and find similar results. Lastly, there is still a possibility that fund families which set specific risk targets may choose to attract managers with characteristics which fit their risk-related needs. To account for this, in Models (4) and (8) we include fund firm-by-year fixed effects to compare risk characteristics of the same-family funds with managers of different birth orders. Comparing within fund family-year, we find similar magnitude of the birth order effect with the point estimate being once again positive and statistically significant. Collectively, these results suggest that fund managers' birth order is positively related to the riskiness of their funds, while time-invariant unobserved heterogeneity at the segment, the fund firm, or the fund level does not drive our results.[12]

These results of within-manager analyses based on birth order are economically significant, such that a one unit increase in a manager's birth order increases total fund risk, idiosyncratic risk, and active risk by up to 6.25, 6.49, and 9.24 percent of standard deviations, respectively. The magnitudes of the coefficient estimates on *Laterborn* variable further suggest that birth order effect is economically meaningful and compare favorably to the annualized risk measures reported in Table 1.

[10]To ensure that birth order results are not solely driven by the subset of managers with very high birth order ranks, we also estimate risk regressions with birth order dummy variables representing second-born, third-born, fourth-born, and fifth-or-greater-born managers. We find that all coefficient estimates are positive, large in magnitudes, and 16 out of 18 pairwise differences in the coefficients on birth order dummies are statistically significant. Results are not tabulated for brevity, but available upon request.

[11]To further examine whether funds select certain types of managers (firstborn or laterborn) because of the specific fund situation, we investigate 491 events of managerial change to laterborn managers. Results indicate no relation between changes in birth order from manager to manager with any observable fund characteristics, specifically past risk, flows, performance, size, expenses, or turnover. Results are available upon request.

[12]In the remaining tests, we focus on the *Birth order* as the primary explanatory variable, but our results are qualitatively similar if instead we use binary *Laterborn* indicator variable. These unreported results are available upon request.

3.2. Controlling for family size and other demographic characteristics

In our results so far, family size may be confounding the effects of birth order. Previous studies suggest a negative relation between family size and status outcomes (Leibowitz (1977); Blake (1986); Hanushek (1992); Sandefur and Wells (1999); and Conley (2001)). More recently this consensus was challenged by studies showing that once birth order is controlled for, family size has small to no effect, while birth order appears to have the pervasive role in explaining the differences across a range of outcomes (Black et al. (2005); Kantarevic and Mechoulan (2006); and Gary-Bobo, Picard, and Prieto (2006)). Note that unlike the birth order, family size may be optimally chosen by parents and, hence, is more likely to be endogenous. Nonetheless, using detailed data on a manager's siblings, we next disentangle long-run effects of birth order from the potentially confounding effect of family size. Family size is defined as the number of children born to a manager's parents.

Our results indicate a negligible effect of family size and point to the predominant role of birth order among other family background characteristics. In other words, it is not that fund managers from larger families take more risk, but rather managers with higher rank by age among siblings are more risk tolerant. The coefficient estimates of family size are all statistically indistinguishable from zero across all specifications. In contrast, coefficient estimates on birth order are uniformly positive and significant for all risk measures.[13]

To further investigate whether family size has an effect on managerial risk-taking behavior, we follow Angrist and Evans (1998) and Angrist and Krueger (2001), exploit parental preferences for a mixed sibling-sex composition, and conduct the two-stage IV analysis using same sex of the first two children as a source of exogenous variation in family size.[14] The results of the first stage indicate that same sex composition of siblings is a strong predictor of family size, such that the likelihood of having an additional child is higher for families in which first two children are of the same sex. Importantly, the second stage regression results show that the instrumented family size variable is not statistically significant in all of the model specifications. Overall, the instrumental variable analysis results of this section provide evidence against the negative effect of manager's family size on managerial risk

[13]These results are reported in the Internet Appendix, Table B.1. In addition, our results on birth order remain unchanged when we include controls for a manager's family size at certain cutoff years during manager's childhood (at the ages of two, five, and ten), suggesting that the birth order effect is not subsumed by the size of the manager's family in early childhood.

[14]Butcher and Case (1994)) among others show that family sex composition has no effect on child outcomes. Although, we acknowledge that there may be indirect effects of having same sex sibling on economic outcomes, we check that the instrument has neither direct effect on fund risk metrics, thus satisfying exclusion restriction, nor on any of the observable family background characteristics beyond family size.

taking.[15] These results are consistent with evidence from large sample studies (e.g., Angrist and Evans (1998)) that find negligible family size effect on economic outcomes.

Introducing manager family-specific demographic controls to the regression specifications further reduces the birth order estimates by 30% and 13% for total risk and idiosyncratic risk (though not for active risk), but our inferences do not change qualitatively. Demographic controls include manager's mother's age, father's age, parent's education, parent's employment, and parental household wealth. Birth order estimates from all-inclusive models indicate that a unit increase in birth order rank translates to a 0.30, 0.13, and 0.72 percentage points per annum increase in total risk, idiosyncratic risk, and active risk, respectively.[16]

3.3. Controlling for other determinants of managerial behavior

3.3.1. Controlling for bereavement

The data availability in our paper mostly depends on the demise of a fund manager's family member. Therefore, it is possible that the birth order effect on risk-taking is confounded with bereavement effects on managerial investment decisions. Liu, Shu, Sulaeman, and Yeung (2020) show that parental death affects mutual fund managers' risk attitudes, and bereavement effects last for up to a year after parental death. Thus, we account for this possibility by estimating regressions with control for bereavement indicator, which takes the value of one for the year when death of a manager's parent occurs and for the following year of bereavement, and zero otherwise. In total, we have identified 736 bereavement fund-year observations that coincide with the active management period of affected managers. Results in Panel A, Table 3 indicate that bereavement does not materially affect the main inferences of our paper.

3.3.2. Controlling for marital status

Recent studies indicate that several other manager-specific background attributes may also affect managerial decision making. Roussanov and Savor (2014) show that marital status influences managerial attitudes toward taking strategic risks. Thus, we investigate if managerial marital status affects our results. In total, we are able to collect marital status information for 1,309 managers.[17] Results of tests with controls for a manager's marital

[15] Results of the two-stage IV analysis are reported in the Internet Appendix, Table B.2.

[16] Results of regressions with demographic controls are reported in the Internet Appendix, Table B.3.

[17] We rely on both obituaries and public records to obtain information on marital status. Note, however, that for most of the managers in our sample, we do not observe the dates of marriage, as only 13 states disclose marriage and divorce records publicly (see Lu et al. (2016) for details on data acquisition).

status reported in Panel B of Table 3 reveal no confounding effects of birth order with those of marital status.

3.3.3. Controlling for relative age

Bai et al. (2019) suggest that mutual fund managers that were older during their preschool education relative to other kids display more confident investment behavior. We are able to construct relative age indicator for 345 managers in our sample. To do so, we first collect information on a manager's place of birth via cross-database matching process and use obituaries to ensure that the manager's family did not move to another state during her childhood.[18] Noteworthy, we observe no statistically significant difference in relative age indicator between first-born and later-born managers in our sample and find that the inclusion of relative age control has little effect on the birth order coefficients and the main inferences of our paper (see Panel C of Table 3).

3.3.4. Controlling for depression experience

Malmendier and Nagel (2011) show that individuals who have experienced economic depression in their lives are less willing to take financial risk. In our sample, 724 managers have experienced prolonged negative stock market returns during their childhood.[19] Panel D of Table 3 report the results of tests with controls for depression experience. We continue to find positive and statistically significant coefficient estimates on birth order, implying that previously documented attributes related to a manager's background do not drive our findings.

3.3.5. Controlling for educational attainment

As noted earlier in the paper, the extant literature documents negative correlation between family characteristics, such as birth order and educational attainment. Therefore, it is possible that elder children simply receive better education, which may affect their risk preferences. To examine whether educational attainment affects our results, we additionally collect data on managers' education and selectiveness of educational institutions they attend. The information on a manager's educational background is obtained from Morningstar, Bloomberg, LinkedIn and fund companies' websites. The data on educational

[18] We calculate relative age based on state-specific cut-off dates for school eligibility as in Bai et al. (2019).

[19] To construct the indicator for "depression babies", we calculate the number of years of negative stock returns that fall within the first 18 years of a manager's life.

institutions is from College Entrance Examination Board.[20] Results in Panel E of Table 3 show that it is unlikely that the observed birth order effect is driven purely by educational attainment. The inclusion of education variables as controls has little effect on the birth order coefficients, which are almost identical to the baseline results in Table 2, indicating no attenuation effect of education on the relation between birth order and funds' risk-taking behavior.

4. Mechanism behind birth order effects: sibling rivalry

4.1. Age spacing and birth order effects

As discussed previously, evolutionary theory in psychology suggests that birth order effects may originate from sibling rivalry during childhood. That is, sibling rivalry – the competition of siblings for the niche with most resources – is a potential mechanism behind the birth order effects. In this section, we investigate whether age spacing influences the observed birth order effects. Research has suggested that wider age spacing between siblings may cause less dilution of parental resources, resulting in less competition for resource-rich niches (Sulloway (1996); Sulloway (2001)). Conversely, the closer in age the siblings are, the more likely they are to compete for scarce resources (Stocker, Lanthier, and Furman (1997)). It follows that if there is greater competition for resources during childhood, niche differentiation behaviors based on birth order become more engrained. Therefore, to the extent the age gap influences sibling rivalry, we should observe that managers further apart in age with their siblings should display less birth order-induced tendencies for risk taking.

To investigate how age spacing moderates the birth order effect on a fund manager's propensity to take risk, we augment total risk, idiosyncratic risk, and active risk regressions with an interaction term of birth order with age spacing indicator. Age spacing is measured by the number of full years to the closest sibling based on their birthdates. Thus, to identify age gap, we collect information on birthdates of the focal manager siblings. In total, we are able to collect age spacing variable for 552 managers (870 funds) in our sample. Results are reported in Table 4.

We find that age spacing negatively influences the relation between a manager's birth

[20] We use various editions of the College Handbook to obtain information on entry requirements. Results are unaffected if, instead, we use standardized scores from online resources, like https://www.prepscholar.com. In untabulated results, we find that the distribution of education across birth order groups is rather flat. This is not surprising, given that our sample is from an industry with steep barriers to entry, i.e., all individuals in our sample have at least undergraduate education.

order and risk taking. Regardless of the risk variable we choose, the moderating effect of closest sibling age gap is negative and significant. The coefficient estimates on *Birth order* × *Age gap* interaction term are –0.13 (t-stat = –2.31), –0.04 (t-stat = –1.96), –0.22 (t-stat = –2.70), for total risk, idiosyncratic risk, and active risk, respectively. These results provide support for the proposed sibling rivalry mechanism, such that in the presence of competition for resources due to high density of birth spacing, birth order-related risk tendencies become more engrained, and thus the relation between the birth order and risk-taking is more pronounced.

4.2. Limited parental resources and birth order effects

In this section, we posit that the extent to which managers were exposed to competitive family dynamics, namely sibling rivalry, influences the development of siblings' behavioral tendencies, particularly their risk tolerance. To capture facets of sibling rivalry, we consider parental financial resources and parental attention as moderators of the relation between a manager's birth order and investment risk.[21] To the extent parental resources influence childhood sibling rivalry, we should observe that individuals who grew up in a less constrained environment display less pronounced birth order-induced propensity to take risks. On the other hand, if an individual's childhood featured scarce financial resources and parental attention, thus more birth order-based niche differentiation among siblings, the birth order effect on risk tolerance should be more salient.

To examine how parental financial resources moderate the observed birth order effect on risk taking, we follow the procedure in Chuprinin and Sosyura (2018) to collect data on parental wealth during a manager's childhood. Specifically, we obtain data on parental income reported in U.S. censuses and parental employment information from obituaries. We are able to identify parental income data for 234 managers (356 funds) and parental job information for 867 managers (1,274 funds) in our sample. Next, we use this data to identify managers that are descendants of wealthy families and those who grew up relatively poor and compare the birth order effects for the two subsamples.[22] Contrary to Chuprinin and Sosyura (2018), who study the effect of parental investment on fund performance and risk, we control for parental income and wealth in Table B.3 and use parental wealth as a

[21] Studies that embrace evolutionary theory often regard household wealth and parental attention as the key resources that spur sibling rivalry and affect child development (Pleck (1997); Amato and Rivera (1999); Zick, Bryant, and Österbacka (2001); and Price (2008), among others).

[22] The main source of data is the 1940 census. Due to statutory constraints on data availability (the latest available census is from 1940), parental income data covers relatively older managers. On the contrary, data on parental employment is from obituaries, which entails no such restrictions. In the event no parental income is reported, we rely on reported house/apartment value or rent amount to proxy for parental wealth.

conditioning variable to study how birth order affects the risk-taking behavior in Table 5.

In Table 5, Panel A, we report results of the pooled regressions in which we control for family size, fund, and manager characteristics. We find positive and significant birth order effect only for the subsamples containing funds run by managers who grew up relatively poor (managers in low-income families or with parents in low-paid jobs). Differences in coefficients between the two subsamples are all positive and significant. Further, when we interact birth order variable with low income and low-paid job indicators in Table 5, Panel B, we also find that growing up in a household with financial constraints positively moderates the relation between birth order and risk taking.

Next, we investigate the role of limited parental attention in contributing to greater risk-taking behavior among later-born managers. To test this, we rely on two proxies for parental attention which are based on physical presence of parent(s) during an individual's childhood. First, we stratify our sample into subsets of one-working-parent and dual-working-parents families. Second, we identify families in which the father has been engaged in a prolonged military service overseas. Building on the evidence in Howe, Fiorentino, and Gariépy (2003), we posit that in dual working families and in families with a military-involved parent, children need to compete more with their siblings for limited parental attention.[23] In total, we obtain information on parental employment for 416 managers (603 funds) and information on military service (absence of it) for 827 managers (1,203 funds).[24]

We report our findings from the analysis of parental attention in Table 6. Results in Panel A confirm that the coefficient estimates on birth order for managers with limited parental attention are all positive and significantly different from those estimated for the samples of managers who received relatively more parental attention during their childhood. Panel B further corroborates these inferences, as all interaction terms are positive and statistically significant at the 5% level or better.

Collectively, results in this section highlight that the limited parental resources (financial and attention) channel contributes to greater risk-taking behavior among later-born managers, providing an economic explanation for the observed birth order-induced heterogeneities in risk-taking behavior between first-born and later-born managers. These findings

[23]In addition, we also considered several alternative reasons for parental absence during an individual's childhood, including death of a parent and divorce of parents, but the sample size turned out to be too small, i.e., 49 managers were affected by parental death during childhood. Moreover, these events have been shown to bear long-lived repercussions for children (see, Betzer et al. (2021) for details) that can confound with our results.

[24]We restrict the sample to families for which we observe the exact dates of employment (clear evidence of unemployment) in obituaries for both parents. Therefore, number of managers with information on employment is smaller than in Table 5. We obtain dates of fathers' military service from the Department of Veteran Affairs and US military registries, available on https://www.ancestry.com.

are consistent with the broad implications of evolutionary theory in psychology, which emphasizes the role of limited parental resources in contributing to the sibling rivalry and influencing the development of risk attitudes. However, we acknowledge the potential existence of other mechanisms, e.g., simple parental preferences or differences in parenting style across siblings, which we are not able to address within our setting and leave for future research.

5. Additional evidence on managerial behavior and implications for fund performance

5.1. Trading behavior

Thus far, in our empirical analysis, we only considered different return volatility measures to capture a fund manager's risk-taking behavior. In this section, we extend our analysis to other dimensions of risk by examining the trading behavior of fund managers. We conjecture that if a manager's birth order is associated with greater propensity to take risk, we should observe that later-born managers deviate more from the average fund in the sector, trade more frequently, and invest more in lottery stocks.

To test this conjecture, we consider the following trading behavior metrics: Style extremity measures; *Turnover*; and measures of lotteryness of fund holdings, namely *MAX5*, *MAX5top*, and *LTRY* composite index. To construct style extremity measures, we follow Bär, Kempf, and Ruenzi (2011). Specifically, we compute for each fund and year, the absolute difference between a fund's style, as determined by the loadings on the four style factors (market, size, value, and momentum) from Carhart (1997) and the average style of all funds in the same segment and year, and normalize this figure by dividing it by the average absolute style difference in the corresponding market segment and respective year. *Turnover* is the annual portfolio turnover of a fund as reported in the CRSP mutual fund database. *MAX5* and *MAX5top* measures of lotteryness of fund's portfolio are from Agarwal, Jiang, and Wen (2022). *MAX5* is the average of the five highest daily returns of stocks in a fund's portfolio within a calendar month. *MAX5top* is the holding-weighted average lotteryness, measured by MAX5 for the top 10 (by assets invested) stocks held in a fund's portfolio within a calendar month. *LTRY* is the portfolio composite lottery index that is based on Kumar (2009) and Bali, Hirshleifer, Peng, and Tang (2021) and defines lottery stocks as those with low-price, high idiosyncratic volatility, and high idiosyncratic skewness. To construct *LTRY* index, each month we independently sort stocks into 50 portfolios by price per share (in descending order), and by idiosyncratic volatility and idiosyncratic skewness (in ascending

order).[25] Next, we sum up the ranks of the price, volatility, and skewness portfolios to construct the stock-specific lottery index. By construction, the resulting scores range from 3 to 150, and increase with a stock's lottery feature. Lastly, we calculate the fund lottery composite index by asset-weighting stocks based on fund holdings to create *LTRY* index. We subsequently convert all three lottery measures, *MAX5*, *MAX5top*, and *LTRY*, to annual fund-level measures.

Results in Panel A of Table 7 indicate that later-born managers behave in ways that are consistent with greater sensation seeking by choosing relatively risky investment styles. We find that later-born managers are more likely to take extreme style bets and deviate from their peers than first-born managers. In other words, greater risk tolerance of later-born managers converges into large factor bets, rather than a diversified portfolio. This result holds for all style dimensions: the influence of the birth order variable is always positive and statistically significant at the 1% level. These inferences remain qualitatively unchanged when we control for family size.

Consistent again with a positive relation between the birth order and managerial propensity to take risks, Panel B shows that later-born fund managers are more likely to engage in portfolio churning and hold more lottery stocks relative to firstborn managers. First, we find that later-born managers trade more frequently. Birth order estimates from turnover regressions after controlling for family size are 0.140 (t-stat = 1.97). Next, we find that later-born managers invest more in lottery stocks compared to their peers. Coefficient estimates on birth order indicator from regressions with lottery metrics, *MAX5*, and *MAX5top*, equal to 0.068 (t-stat = 1.98) and 0.071 (t-stat = 2.15), respectively. The coefficient estimates from the *LTRY* composite score regression further suggests that later-born managers prefer lottery-like stocks (*coef.* = 1.277; t-stat = 2.16).

5.2. Managerial violations

It is conceivable that non-pecuniary risk-taking induced by birth-order effects extends beyond the riskiness of the fund portfolio. In this section, we test whether later-born managers are also more likely to be associated with failures to meet expected standards of managerial conduct and have relatively more reported civil or regulatory violations compared to first-born managers. To test this conjecture, we estimate multivariate cross-sectional regressions on the determinants of managerial violations. Data on managerial violations is from FINRA BrokerCheck, including those on civil violations, regulatory events, total fines paid,

[25] Idiosyncratic volatility and idiosyncratic skewness of individual stocks are computed as the standard deviation of the residuals and the skewness of the residuals from the monthly time-series market regression, respectively.

and disclosed investigations.[26]

To explore the relation between the birth order and violations of expected standards of business conduct, we consider several dependent variables. *Violations* is an indicator variable that equals one if a manager is found liable in any violation case (civil or regulatory), and zero otherwise. *Regulatory* is an indicator variable that equals one if any regulatory disciplinary event(s), i.e., late or incorrect reporting, are disclosed, and zero otherwise. Customer disputes is an indicator variable that equals one if a manager has a record of resolved customer disputes not in his/her favor, and zero otherwise. *Number of violations* is the total number of all violations that are reported in FINRA BrokerCheck. *Fines paid* is the dollar amount of total fines and compensations paid by the manager at fault. Results are reported in Table 8.

Consistent with the baseline findings of the paper, we find that later-born managers, all else equal, are more likely to have records of past violations relative to first-born managers. Results of the cross-sectional logit regressions of *Violations* and *Customer disputes* reveal that birth order estimates are positive and significant at the 1% level. In accordance, results of the cross-sectional OLS regressions on the number of violations per manager and total paid fines (compensations) by a fund manager, further corroborate that greater risk-taking behavior of later-born managers. The risk-taking propensity extends beyond portfolio management, such that later-born managers have greater number of violations and end up paying more in total fines and compensations.

5.3. Performance

Next, we investigate whether birth order-induced heterogeneities in risk-taking translate into different risk-adjusted performance. To do so, we focus on several risk-adjusted measures of performance, namely *Sharpe ratio*, *information ratio*, *value-added*, *four-factor alphas*, and *peer-adjusted alphas*. Starting with the *Sharpe ratio* and *information ratio*, results in Table 9 are consistent with the conjecture that later-born individuals, all else equal, deliver lower risk-adjusted performance. The significant coefficient on the main variable of interest, the birth order, implies that a unit increase in the birth order rank reduces average annualized Sharpe ratio and information ratio by 0.06 and 0.07, respectively (see Models (1) and (2) in Panel A). Coefficient estimates for *value-added* and *peer-adjusted alpha* (Models (3) and (4) in Panel A) further support the notion of negative birth order effect on risk-adjusted performance. Results of regressions with alternative alpha specifications (Panel B) indicate that the birth

[26]FINRA BrokerCheck also reports criminal charges, but no manager in our sample has criminal records. We are able to collect data on individuals who solo-managed funds at any time from 2008 until 2018, because FINRA stores data for ten years. In total, we collect data for 303 fund managers.

order estimates remain statistically significant. This evidence is further strengthened by the results for four-factor net-of-fee and post-fee alphas estimated over longer horizons. The coefficients on birth order are once again uniformly negative and significant at the 10% level or better across all specifications.

Taken together, our findings that later-born fund managers take greater financial and regulatory/legal risk but do not deliver superior performance suggests that they are likely to be sensation seeking.

6. Robustness tests and additional results

In this section, we conduct additional tests and consider several alternative explanations for our baseline findings. Results are reported in the Internet Appendix.

6.1. Manager's gender and birth order effects

Thus far, our baseline results indicate that inclusion of gender control has almost no effect on the observed birth order effects. Similar to other large sample mutual fund studies (e.g., Niessen-Ruenzi and Ruenzi (2019)), we find that only 7% of all managers in the sample are female. Next, we investigate whether there is a heterogenous birth order effect on risk-taking between male and female managers. Research in evolutionary psychology suggests that gender should have no impact on competitive sibling dynamics in the presence of birth order effect, i.e., firstborn children, regardless of whether they are male or female, emerge as relatively more dominant in their sibling hierarchy (Sulloway (1996)).

To provide more formal evidence on potential gender-based heterogeneity in birth order effect, in Table B.5, we estimate pooled regressions. We find positive and significant birth order effect for both subsamples of funds run by female and male managers. Differences in coefficients between male and female subsamples are small in magnitudes and are statistically indistinguishable from zero.

6.2. Sibling's gender structure

Findings in our paper point toward sibling rivalry– the competition among siblings– as the main mechanism behind the birth order effects. Next, we investigate whether gender structure of siblings influences the observed birth order effects. Specifically, we augment total risk, idiosyncratic risk, and active risk regressions with an interaction term of birth order with the indicator for same sex closest sibling by age and the number of same sex siblings. Growing up with same gender siblings may intensify the competition for scarce parental resources,

due to similarity in resource preferences and birth order induced risk attitudes may become more engrained. Therefore, to the extent the gender similarity influences sibling rivalry, we should observe that individuals who grew up in a less gender-diverse environment exhibit more birth order-induced tendencies for risk taking.[27]

Table B.6 reports the results. We find that sibling's gender similarity positively influences the relation between a manager's birth order and risk taking. The positive moderating effect of same sex closest sibling is particularly present for total risk variable. The coefficient estimates on Birth order × Same sex closest sibling interaction term are 0.58, 0.11, 0.25 for total risk, idiosyncratic risk, and active risk, respectively, but only statistically significant for total risk. These results provide further support for the proposed sibling rivalry mechanism. Birth order-related risk tendencies become more engrained in the presence of same-gender closest sibling, and thus the relation between the birth order and risk-taking becomes more pronounced. On the contrary, we find no moderating effect of the number of same sex siblings in the family.

6.3. Cultural origins and state of birth effects

Next, we investigate whether cultural heterogeneities, e.g., in culture-specific parenting style and origin-based parenting traditions, affect the observed relation between the birth order and risk taking. To do so, we additionally collect data on fund manager ancestry and identify managerial cultural background.[28] In order to map out the fund managers' family tree, we follow the same procedure as in Section 2.1 to locate the manager's ancestors in the census data. If a manager's parents were born in or before 1940, we retrieve ancestry information directly from the 1940 census records. We first locate the fund managers' parents census records and obtain information on their respective places of birth. If the father was born outside the U.S., we stop our search and collect data on cultural origins. Otherwise, we continue searching earlier generations of the fund manager's ancestors as far back as data availability allows. If a manager's parents are born after 1940, we rely on information from obituaries to identify cultural origins. In total, we are able to find cultural origins of 1,299 managers.

[27]Moreover, in unreported results we find no evidence that mixed-sex sibling dynamics affect our inferences on birth order. Specifically, we find no interaction effects between birth order and indicators for growing up with gender-diverse siblings or having younger/older sister/brother. Thus, we find no evidence that supports role-assimilation theory that posits that individuals who grew up in a mixed-gender sibling families assimilate traits more typically associated with the opposite gender. Our findings once again support Sulloway (1996) perspective on the effect of birth order, which is based on the notion of sibling competition.

[28]Data is from digital census records available on Ancestry.com, the world's largest genealogy database. We rely on the fund manager's paternal ancestry and exclude managers with mixed ancestry. Table B.7, Panel A presents descriptive statistics of managerial cultural origins.

Next, we augment the baseline specification with cultural origin fixed effects. Table B.7 reports the results. The coefficient estimates on the birth order indicator are positive and significant across all specifications and are similar in magnitudes to their counterparts in Table 2, ranging from 0.38 to 0.42 for total risk, from 0.14 to 0.17 for idiosyncratic risk, and from 0.79 to 0.80 for active risk regressions (see Panel B). In addition, some states in the US may have hierarchical culture where older children may get more favorable treatment from their parents. To check that our results are not driven by location-based heterogeneities in parenting style, we additionally include state of birth fixed effects in Panel C.[29] The main inferences of our paper remain unchanged. Overall, results of this section suggest that time-invariant unobserved heterogeneity in the manager's cultural origin or place of birth does not drive our results.

6.4. Fama and MacBeth (1973) risk regressions

To test the robustness of our findings to empirical methodology, we estimate Fama and MacBeth (1973) regressions. First, we estimate monthly cross-sectional regressions. Next, we report the time-series averages of the three risk measures and test the significance using the time-series standard errors of the average slopes. We adopt rolling windows of 24 months (minimum 20 observations) and 36 months (minimum 30 observations) and adjust for serial correlation using Newey and West (1987) standard errors adjusted for 24- and 36-months lags, respectively. We ensure that the sample is restricted to observations in which rolling windows match single management period of a corresponding manager, i.e., there is no manager change. Results reported in Panels A and B of Table B.8 confirm our previous findings on the birth order effect, i.e., fund managers' birth order is positively related to a fund's total risk, idiosyncratic risk, and active risk.

6.5. Placebo test and alternative birth order specification

Table B.8, Panel C presents supplementary empirical findings on the robustness of the birth order effect under various modifications. First, we conduct a placebo test using a subsample of index funds. The idea is that since index funds simply mimic their benchmarks, birth order of managers should have no effect on the risk characteristics of index funds. Results confirm this conjecture, as re-estimating baseline regression of total risk on the birth order for the subsample of index funds reveals no significant coefficients on birth order. Next,

[29] We collect information on a manager's state of birth from vital records (if available) and from obituaries. In total, we obtain exact place of birth for 432 managers. In this test, we assume that the manager's family did not change their place of residence during the manager's upbringing period.

we alternatively define birth order variable from a full set of manager families by additionally including managers who grew up as single child. Coefficient estimates show same signs and are similar in magnitudes to their counterparts in the baseline analyses. Taken together, the findings of this section show that the positive relation between the birth order and manager's risk-taking behavior is unlikely to be due to plausible alternative explanations.

7. Conclusion

This paper provides the first empirical test of the role of birth order and familial background on adult life outcomes using professional business data from the mutual fund industry. Through the construct of birth order, we find that behavioral tendencies established in childhood continue into the adult labor market, such that the manager's birth order is positively related to sensation seeking behavior. The later a manager is born in the sibling hierarchy, greater investment risk she undertakes, without being compensated with better performance. Results indicate that fund manager birth order is positively related to various measures of fund's risk (total risk, idiosyncratic risk, and active risk).

Drawing on evolutionary theory arguments, we suggest that sibling rivalry for parental resources is a potential mechanism behind the observed birth order effects. To capture facets of sibling rivalry, we consider limited parental financial resources, limited parental attention, and age spacing as moderators of the relation between a manager's birth order and risk-taking. Results reveal that the more sibling rivalry is present during childhood, the more birth order-related niche differentiation behaviors become engrained.

Long-lived effects of birth order also shape the trading behavior of fund managers. Later-born managers are more likely to take extreme style bets than first-born managers. Motivated by sensation seeking, later-born fund managers are more likely to engage in portfolio churning and invest more in lottery stocks relative to first-born managers. The incremental risk-taking by later-born managers extends beyond portfolio management, as they are also more likely to report civil or regulatory violations of expected standards of managerial conduct.

To the extent that birth order effects are time invariant, we observe long-lived effects of family environment on personality. This adds to the debate on the relative importance of environmental factors in explaining later life outcomes. Moreover, we find the effects of birth order on adult labor market outcomes in a highly competitive business setting, pointing to the pervasive nature of birth order as one of the most fundamental life experiences and engrained determinant of behaviors. Finally, the results of our study on fund risk and performance should be of interest to the broad public as mutual funds account for a large fraction of financial wealth of an average household.

Although our findings are consistent with the broad implications of evolutionary theory in psychology, which emphasizes the role of limited parental resources in contributing to the sibling rivalry and influencing the development of children, we acknowledge the potential existence of other mechanisms, e.g., parental preferences or differences in parenting style across siblings, which we are unable to address within our setting and leave for future research.

Appendix A.

Table A.1. Descriptions of main variables
This table provides descriptions and sources of variables used in this paper. The following abbreviations are used: OBIT - Obituaries; CRSP: CRSP - CRSP Survivorship Bias Free Mutual Fund Database; MS - Morningstar Direct Database; BL - Bloomberg; MQ - Marquis Who's Who Database; INT - Intelius Database; ANC - Ancestry.com; LEG - Legacy.com; FW - Fund company websites; LN - LexisNexis; NP - Newspapers.com; AE - Authors' estimations; MC - manually collected.

Variables	Description	Source
Panel A: Dependent variables		
Total risk	The time-series standard deviation of monthly mutual fund return observations in a given year. Alternatively, we calculate it using rolling window of 24 and 36 months.	CRSP, AE
Idiosyncratic risk	The standard deviation of the monthly residuals from the four-factor model. Calculated with monthly observations in a given year or using rolling window of 24 and 36 months.	CRSP, AE
Active risk	The standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. Calculated with monthly observations in a given year or using rolling window of 24 and 36 months. We follow Petajisto (2013) and use the official benchmark index of each fund as stated in its prospectus. The benchmarks are 5 indices from S&P, 12 indices from Russell, and 2 indices from Dow Jones / Wilshire.	CRSP, AE
Panel B: Main independent variables		
Birth order	Manager's rank by age among siblings.	OBIT, MQ, LN, NP, MC
Laterborn	Indicator variable equal to 1 if a manager is born second or later, and 0 if a manager is firstborn.	OBIT, MQ, LN, NP, MC
Family size	Number of children born to a manager's parents.	OBIT, MQ, LN, NP, MC
Panel C: Fund variables		
Fund size	Natural logarithm of a fund's total net assets in $million.	CRSP, AE
Fund family size	Natural logarithm of combined fund family total net assets.	CRSP, AE

Continued on next page...

Table A.1 – continued from previous page.

Variables	Description	Source
Fund age	Natural logarithm of fund age in years in a given year. Calculated using the Inception Date variable from MS Direct.	CRSP, AE
Turnover	A fund's turnover ratio.	CRSP
Expense ratio	A fund's expense ratio in %.	CRSP
Fund flows $F_{i,t}$	Monthly net percentage mutual fund flows, computed as $[TNA_{i,t} - TNA_{i,t-1}(1 + r_{i,t})]/TNA_{i,t-1}$,where $TNA_{i,t}$ is the fund i's total net assets in month t and $r_{i,t}$ stands for the net return in month t.	CRSP, AE
Panel D: Manager-specific variables		
Age	Biological age of a manager in years in a given month.	MS, BL, INT, FW, NP, MC
Female	Indicator variable equal to 1 if a manager is a female and 0 if male.	MS, BL, INT, FW, NP, MC
Fund tenure	Tenure of a manager in years, computed as difference between a current date and the date when the manager started managing the fund.	MS, AE
Industry tenure	Tenure of a manager in years, computed as difference between a current date and the date when the manager joined the fund management industry.	MS, AE

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Table 1. Descriptive statistics - Full Sample

This table reports descriptive statistics. Sample consists of fund managers who single-managed U.S. domestic equity non-index funds for at least one full year between 1962 and 2017. Panel A describes the sample by birth order and family size. Panel B reports individual manager and family-related characteristics. Panel C reports annualized fund risk and performance characteristics. All variables are described in Table A.1 in the Appendix.

Panel A: Distribution of birth order and family size

	Birth order (2+ children)		Family size	
	Frequency	Percentage	Frequency	Percentage
1	304	40	102	12
2	261	34	277	31
3	113	15	236	27
4	48	6	141	16
5+	34	4	126	14
Total	760	100	882	100

Panel B: Fund managers' personal and family characteristics

Variable	Mean	Median	Std. Dev.	N of obs.
Manager's personal characteristics				
Age	48.38	47.45	9.79	13644
Manager female (0/1)	0.07	0	0.26	16783
Industry tenure (years)	11.41	8.17	12.12	16783
Fund tenure (years)	6.59	4.67	6.44	16783
Marital status (0/1)	0.96	1	0.18	11882
Graduate degree (0/1)	0.69	1	0.46	15729
Manager's family background				
Birth order (2+ children)	1.97	2.00	1.10	7112
Laterborn (0/1)	0.52	1	0.50	8432
Family size	2.91	3.00	1.49	8370
Age gap	3.65	3.00	2.02	5355
Father's year of Birth	1921.40	1923	15.17	10611
Father's age at Birth	31.56	30.92	6.55	10368
Mother's year of Birth	1923.63	1925	14.08	8609
Mother's age at Birth	28.65	28.33	4.86	8441
Parents' college degree (0/1)	0.63	1	0.48	7910
Parents' graduate degree (0/1)	0.23	0	0.42	7910
Father's military service (0/1)	0.77	1	0.42	8041
Father at war during childhood (0/1)	0.19	0	0.39	6103
Parents executive job (0/1)	0.17	0	0.38	8811
Parents low paid job (0/1)	0.17	0	0.38	8811
Parents' monthly income ($)	2244.88	1800.00	1733.71	2307

Panel C: Fund risk and performance characteristics

Total risk, %	16.20	14.58	7.62	16783
Idiosyncratic risk, %	3.97	3.34	2.62	16783
Active risk, %	18.23	16.35	8.93	16325
Sharpe ratio	0.89	0.84	1.36	16783
Information ratio	-0.14	-0.13	1.31	16783
Gross 4-factor alpha, %	0.48	0.34	9.24	16783
Net 4-factor alpha, %	-0.62	-0.69	9.28	16783

Table 2. The effect of birth order on managerial risk-taking

This table relates a manager's birth order to a fund's total risk, idiosyncratic risk, and active risk. *Birth order* is a manager's rank by age among siblings. *Laterborn* indicator takes the value of one if a manager is born after the firstborn in a family, and zero if a manager is firstborn. *Total risk* is the time-series standard deviation of monthly mutual fund return observations in a given year. *Idiosyncratic risk* is the standard deviation of the monthly residuals from the four-factor model. *Active risk* is the tracking error, i.e., the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. Panels A, B, and C report regression results. The dependent variable is either total risk, idiosyncratic risk, or active risk. Dependent variables are annualized. The set of fund control variables include: Fund size as the natural logarithm of the fund's total net assets in $million; Fund family size as the natural logarithm of combined fund family total net assets; Fund age measured as the natural logarithm of fund age in years in a given year; Turnover ratio; Expense ratio; Fund flows are the net percentage flows of the fund. All fund control variables are lagged. The set of manager controls is comprised of manager age, gender, fund tenure, and industry tenure. Regressions include year, fund, segment , fund firm , and/or interaction fixed effects . Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***.

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

Panel B: Regression results: *Idiosyncratic risk*

Variable	*Idiosyncratic risk*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Birth order	0.154***	0.170**	0.144***	0.144***				
	(3.05)	(2.55)	(2.86)	(2.60)				
Laterborn					0.255**	0.320**	0.249**	0.316**
					(2.00)	(2.73)	(2.01)	(2.17)
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.	0.31	0.41	0.41	0.45	0.34	0.55	0.36	0.45
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

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Table 2 – continued from previous page.

Panel C: Regression results: *Active risk*								
Variable	*Active risk*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Birth order	0.650***	0.826***	0.670***	0.549**				
	(3.02)	(3.49)	(3.31)	(2.02)				
Laterborn					1.129***	1.307**	1.067***	1.650**
					(2.75)	(2.24)	(2.71)	(2.51)
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.	0.57	0.38	0.63	0.46	0.59	0.69	0.64	0.48
N of funds	1,006	810	1,006	771	1,137	928	1,137	888
Observations	6,099	5,904	6,078	3,913	7,237	7,028	7,229	4,649

Table 3. Robustness tests: Other determinants of managerial behavior

This table reports results of regressions with additional control variables for managerial attributes. Panels A through E show estimates of birth order for *Total risk*, *Idiosyncratic risk*, and *Active risk* regressions, but, depending on the robustness test, regressions include additional control variables. Additional control variables for managerial attributes include bereavement periods (Panel A), manager's marital status (Panel B), relative age (Panel C), and economic downturn experiences (Panel D). Panel E reports results of regression with additional controls for educational degree, average admission SAT score, university size (ln) and undergraduate acceptance rate. All regressions include family size, fund, and manager controls along with segment and year fixed effects. Dependent variables are annualized. All fund control variables are lagged. Segment is defined by the Morningstar fund category. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***.

	Total risk		*Idiosyncratic risk*		*Active risk*	
Panel A: Controlling for Bereavement						
Birth order	0.371***	0.294**	0.155***	0.110*	0.654***	0.635***
	(2.99)	(2.12)	(3.10)	(1.85)	(3.01)	(2.70)
Family size		–0.123**		0.075		0.030
		(–0.50)		(1.34)		(0.29)
Panel B: Controlling for Marital status						
Birth order	0.360***	0.369***	0.158**	0.137*	0.716***	0.750***
	(3.22)	(2.76)	(2.46)	(1.83)	(2.68)	(2.76)
Family size		–0.013		0.030		–0.050
		(–0.18)		(0.49)		(–0.51)
Panel C: Controlling for Relative Age						
Birth order	0.371***	0.489**	0.154***	0.278***	0.650***	0.756**
	(2.99)	(2.49)	(3.05)	(3.13)	(3.02)	(2.49)
Family size		0.005		–0.035		–0.006
		(0.03)		(–0.30)		(–0.04)
Panel D: Controlling for Depression experience						
Birth order	0.402***	0.300*	0.169***	0.122**	0.566***	0.515**
	(3.09)	(2.07)	(3.32)	(1.96)	(2.82)	(2.30)
Family size		0.174*		0.080		0.086
		(1.72)		(1.42)		(0.83)
Panel E: Controlling for Educational Degree and University Selectiveness						
Birth order	0.481***	0.399***	0.167***	0.117*	0.776***	0.734***
	(3.56)	(2.69)	(2.96)	(1.73)	(3.41)	(3.01)
Family size		0.134		0.082		0.067
		(1.39)		(1.47)		(0.65)

Table 4. Age spacing and birth order effect

This table relates sibling rivalry to birth order. Panel A shows the estimates of birth order for *total risk*,*idiosyncratic risk*, and*active risk* regressions, which include an interaction term of birth order with age gap between children. *Age gap* is measured as the number of years between the focal manager and a manager's closest sibling. Regressions include family size, fund, and manager controls along with segment and year fixed effects. All variables are described in Table A.1 of the Appendix. Standard errors are double-clustered by fund and year. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively

	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

Table 5. Parental household wealth and birth order effects

This table relates parental household wealth characteristics and birth order. Parents' income is based on 1940 census records (median split). Parent's employment information is from obituaries. Dependent variables are annualized. All regressions include family size, fund, and manager controls along with segment and year fixed effects.Fund and manager controls is comprised of variables described in the Appendix. Fund and manager control variables are lagged. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Panel A: Pooled regression analysis

Variable	High income family	Low income family	*Difference Low– High income*	Parent's executive job	Parent's low-paid job	*Difference Low-paid – Exec. job*
	(1)	(2)	(3)	(4)	(5)	(6)
			Total risk			
Birth order	0.267	1.494***	1.227***	–0.233	0.920***	1.153**
	(1.43)	(4.45)	(3.22)	(–0.72)	(3.01)	(2.53)
			Idiosyncratic risk			
Birth order	0.065	0.499***	0.434**	–0.091	0.205**	0.296**
	(0.73)	(2.64)	(2.00)	(–0.94)	(2.23)	(2.22)
			Active risk			
Birth order	0.671**	2.660***	1.989***	–0.109	1.589***	1.698***
	(2.24)	(3.88)	(2.72)	(–0.39)	(2.62)	(2.64)

Panel B: Interactions

	Total risk		*Idiosyncratic risk*		*Active risk*	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.156	0.192	0.238***	0.081**	0.441	0.357
	(0.71)	(1.30)	(3.01)	(2.43)	(1.52)	(1.63)
Birth order x Low income	1.201***		0.404***		1.957***	
	(3.01)		(3.60)		(2.84)	
Birth order x Low-paid		0.798**		0.250***		1.442**
		(2.09)		(3.62)		(2.33)
Low income	–1.968***		–0.470*		-2.928**	
	(–2.52)		(–1.89)		(-2.45)	
Low-paid father		–0.649		0.245		–1.586
		(–0.84)		(1.54)		(–1.57)
Family size	Yes	Yes	Yes	Yes	Yes	Yes
Fund and Man. controls	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.60	0.60	0.35	0.33	0.53	0.59
Observations	1,578	5,564	1,578	5,564	1,435	5,357

Table 6. Limited parental attention and birth order effects

This table relates limited parental attention and birth order. Parent's employment information is from obituaries. Father's military service records are from Department of Veteran Affairs and US military registries. Dependent variables are annualized. Fund and manager controls is comprised of variables described in the Appendix. Regressions include family size control, segment and year fixed effects, and standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Panel A: Pooled regression analysis

Variable	One parent works	Both parents work	*Difference Both work – One works*	Father no war conflict	Father war conflict	*Difference War– No war*
	(1)	(2)	(3)	(4)	(5)	(6)
			Total risk			
Birth order	0.190*	0.886***	0.696***	0.353**	0.712***	0.359*
	(1.66)	(4.68)	(3.15)	(2.41)	(3.35)	(1.90)
			Idiosyncratic risk			
Birth order	0.158***	0.327***	0.168	0.085	0.301***	0.216*
	(2.92)	(3.65)	(1.22)	(1.60)	(2.98)	(1.74)
			Active risk			
Birth order	0.673**	1.320***	0.646**	0.759***	1.552***	0.793**
	(2.22)	(2.62)	(2.22)	(3.79)	(5.36)	(2.23)

Panel B: Interactions

	Total risk		*Idiosyncratic risk*		*Active risk*	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.169	0.110	0.154*	0.062	0.660**	0.438
	(0.95)	(0.56)	(1.75)	(0.76)	(2.21)	(1.39)
Birth order x Both work	1.109***		0.309**		0.905**	
	(3.57)		(2.06)		(1.98)	
Birth order x Father war		0.776**		0.346***		1.573**
		(2.34)		(2.25)		(2.00)
Both work	-1.807***		–0.445		–1.609*	
	(–2.65)		(–1.30)		(–1.79)	
Father war		–2.132***		–1.117***		–3.001**
		(–3.05)		(–3.44)		(–2.40)
Family size	Yes	Yes	Yes	Yes	Yes	Yes
Fund and Man. controls	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.62	0.59	0.35	0.31	0.59	0.55
Observations	3,067	4,164	3,067	4,164	2,885	3,972

Table 7. Trading behavior and birth order

This table relates a manager's birth order to trading behavior metrics. Panel A reports the results for style extremity measures. Style extremity is computed as the normalized absolute difference between a fund's style, as determined by the four loadings on the style factors from Carhart (1997) and the average style of all funds in the same segment and year. Panel B reports the results for *Turnover*, *MAX5*, *MAX5top*, and *LTRY* metrics. *Turnover* is from the CRSP MF database. *MAX5* and *MAX5top* are a fund's portfolio's lottery measures and computed as in Agarwal et al. (2022). *MAX5* is the average of the five highest daily returns of stocks in a fund's portfolio within a calendar month. *MAX5top* is the holding-weighted average lotteryness, measured by *MAX5* for the top 10 (by assets invested) stocks held in a fund's portfolio within a calendar month. Both measures are converted to an annual fund-level measures. *LTRY* is a fund's portfolio composite lottery index that defines lottery stocks as those with low-price, high idiosyncratic volatility, and high idiosyncratic skewness and is based on Kumar (2009) and Bali et al. (2021). The trading behavior metrics of Panel B are defined such that an increase in any one of them represents a more frequent trading or greater lotteryness of a fund's portfolio. All regressions include fund and manager controls along with segment and year fixed effects. Fund and manager controls is comprised of variables described in the Appendix. Standard errors are double-clustered by fund and year. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Panel A: Style Extremity

	Market		*Size*		*Value*		*Momentum*	
Birth order	0.043***	0.033*	0.039***	0.041**	0.044***	0.040**	0.038**	0.049**
	(2.94)	(1.88)	(2.59)	(2.02)	(3.16)	(2.37)	(2.10)	(2.06)
Family size		0.017		–0.002		0.006		–0.018
		(0.98)		(–0.14)		(0.31)		(–1.00)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Man. controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Segment FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.05	0.05	0.07	0.07	0.06	0.06	0.06	0.06
N of funds	1,009	1,009	1,009	1,009	1,009	1,009	1,009	1,009
Observations	6,312	6,309	6,312	6,309	6,312	6,309	6,312	6,309

Panel B: Measures of turnover and lottery holdings

	Turnover		*MAX5*		*MAX5top*		*LTRY*	
Birth order	0.140*	0.140**	0.082**	0.068*	0.087***	0.071**	1.277**	1.131*
	(1.85)	(1.97)	(2.43)	(1.98)	(2.71)	(2.15)	(2.16)	(1.90)
Family size		0.001		0.024*		0.026		0.233
		(0.04)		(1.72)		(1.59)		(0.91)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Man. controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Segment FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.15	0.15	0.67	0.67	0.64	0.64	0.55	0.55
N of funds	1,009	1,009	773	773	773	773	772	772
Observations	6,315	6,311	4,352	4,348	4,352	4,348	4,346	4,342

Table 8. Managerial violations and birth order

This table reports the coefficient estimates from multivariate cross-sectional logit regressions on whether a fund manager has violations, regulatory violations, and customer disputes, and multivariate cross-sectional OLS regressions on the number of violations per manager and total paid fines (compensations) by fund managers. Data on violations is from FINRA BrokerCheck, including these on civil (customer disputes), regulatory events, total fines paid, and disclosed investigations. Data covers individuals who single-managed funds at any time from 2008 until 2018. *Violations* is an indicator variable that equals one if manager is found liable in any violation case (civil, regulatory, or criminal), and zero otherwise. *Regulatory* is an indicator variable that equals one of any regulatory disciplinary event(s) are disclosed, and zero otherwise. *Customer disputes* is an indicator variable that equals one if a manager has a record of resolved customer disputes not in his/her favor, and zero otherwise. *Number of violations* is the total number of all violations that are reported in FINRA BrokerCheck. *Fines paid* is the dollar amount of total fines and compensations paid by the manager at fault. Regressions include manager-specific controls, namely a manager's gender, year of birth, father's age at manager birth, parental employment, and parental household wealth. The last row of the table reports the number of managers. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are marked by *, **, and ***, respectively.

	Dependent Variable:				
	Violations	*Regulatory*	*Customer disputes*	*Number of violations*	*Fines paid (USD)*
Birth order	0.547***	0.174	0.791***	0.057**	14677.43***
	(2.89)	(0.68)	(3.44)	(2.49)	(3.51)
Manager controls	Yes	Yes	Yes	Yes	Yes
Pseudo/Adj. R-squared	0.12	0.09	0.15	0.03	0.03
Managers	303	303	303	303	303

Table 9. The effect of a manager's birth order on fund performance

This table relates a manager's birth order to fund's risk-adjusted performance. *Sharpe ratio* is the average monthly fund excess returns divided by standard deviation of monthly fund returns. *Information ratio* is the average monthly fund returns in excess to the market divided by the tracking error. *Value-added* is the product of AUM and gross alpha, as in Berk and van Binsbergen (2015). *Peer-adjusted 4-factor alpha* is the fund's alpha from Carhart (1997) 4-factor model minus the average 4-factor alpha in the corresponding style segment (excluding the fund itself) in a given year. *Net and gross 4-factor alphas* are calculated with Carhart (1997) model, *net 3- and 5-factor alphas* with Fama and French (1993) and Fama and French (2015) models. Fund and manager controls include those of Table 2, *Family size* (the number of children born to the manager's parents), and *Fund risk* (time series standard deviation of the fund returns). Fund control variables are lagged and are described in the Appendix. Regressions include segment and year fixed effects. The dependent variables in Panel C are monthly gross alpha and net alpha. Panel C reports the results of Fama and MacBeth (1973) performance regressions, where dependent variables are estimated using rolling window of 24 months (min. 20 obs.) and 36 months (min. 30 obs.). Newey and West (1987) standard errors are adjusted for 24- and 36-month lags, respectively. The sample is restricted to observations where rolling windows exactly match single management period of a corresponding manager. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. *, **, and *** denote 10%, 5%, and 1% significance levels.

Panel A: Performance metrics

Variable	*Sharpe ratio*	*Information ratio*	*Value-added*	*Peer-adjusted 4-factor alpha*
	(1)	(2)	(3)	(4)
Birth order	–0.052***	–0.068***	–2.603*	–0.052***
	(–3.88)	(–4.23)	(–1.73)	(-3.21)
Fund and Man. controls	Yes	Yes	Yes	Yes
Segment and Year FEs	Yes	Yes	Yes	Yes
Adj. R-squared	0.70	0.12	0.01	0.08
N of funds	1,009	1,009	1,009	1,009
Observations	6,312	6,312	6,312	6,312

Panel B: Gross and Net alphas, alternative specifications

Variable	*Net 4-factor alpha*	*Gross 4-factor alpha*	*Net 3-factor alpha*	*Net 5-factor alpha*
	(1)	(2)	(3)	(4)
Birth order	–0.636***	–0.641***	–0.598***	–0.800***
	(–3.21)	(–3.24)	(–3.89)	(–4.16)
Fund and Man. controls	Yes	Yes	Yes	Yes
Segment and Year FEs	Yes	Yes	Yes	Yes
Adj. R-squared	0.09	0.08	0.10	0.09
N of funds	1,009	1,009	1,009	1,009
Observations	6,312	6,312	6,312	6,312

Panel C: Gross and Net alphas, 24 months, 36 months rolling

Variable	*Gross 4-factor alpha*		*Net 4-factor alpha*	
	FMB(24), N-W(24)	FMB(36), N-W(36)	FMB(24), N-W(24)	FMB(36), N-W (36)
	(1)	(2)	(3)	(4)
Birth order	–0.012*	–0.015***	–0.012*	–0.015***
	(–1.91)	(–2.76)	(–1.88)	(–2.69)
Observations	48,266	39,578	48,266	39,578

Appendix B. Internet Appendix

Table B.1. The effect of birth order: Family size controls

This table relates a manager's birth order to a fund's total risk, idiosyncratic risk, and active risk using alternative regression specifications and including family size as an additional control variable. *Family size* is defined as the number of children born to the manager's parents. The dependent variable is either total risk, idiosyncratic risk, or active risk. Dependent variables are annualized. *Total risk* is the time-series standard deviation of monthly mutual fund return observations in a given year. *Idiosyncratic risk* is the standard deviation of the monthly residuals from the four-factor model. *Active risk* is the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. *Birth order* is a manager's rank by age among siblings. Fund and manager controls are identical to that of Table 2 of the main paper. Regressions include year and segment fixed effects. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Variable	*Total risk*		*Idiosyncratic risk*		*Active risk*	
Controlling for family size	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.329**	0.290**	0.120**	0.111*	0.641**	0.625***
	(2.02)	(2.10)	(1.96)	(1.85)	(2.44)	(2.67)
Family size	–0.014	0.133	0.025	0.072	–0.138	0.040
	(–0.09)	(1.32)	(0.43)	(1.29)	(–0.83)	(0.39)
Fund and Manager controls	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FE	No	Yes	No	Yes	No	Yes
Adj. R-squared	0.04	0.59	0.12	0.31	0.08	0.58
N of funds	1,009	1,009	1,009	1,009	1,006	1,006
Observations	6,312	6,312	6,312	6,312	6,095	6,095

Table B.2. The effect of family size on risk-taking: Same-sex children instrument
This table reports results of the two-stage IV analysis. In the first stage, we perform OLS regression of endogenous family size variable on all exogenous variables and the instrument. The dependent variable in the second regression stage is either total risk, idiosyncratic risk, or active risk and the independent variables include exogenous variables and the fitted values for family size obtained in the first stage. The *instrument* is equal to one if the first two children are of the same sex and zero otherwise. *Family size* is defined as the number of children born to the manager's parents. *Total risk* is the time-series standard deviation of monthly mutual fund return observations in a given year. *Idiosyncratic risk* is the standard deviation of the monthly residuals from the four-factor model. *Active risk* is the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. Fund and manager controls are identical to that of Table 2 of the main paper. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Variable		*Total risk*	*Idiosyncratic risk*	*Active risk*
	First stage	Second Stage	Second Stage	Second Stage
Instrument: Same sex of the first two children (Sample of families with 2+ children)	0.152***			
	(4.30)			
Family size		0.441	0.560	-3.019
		(0.35)	(1.29)	(-1.03)

Table B.3. The effect of birth order: Demographic controls

This table relates a manager's birth order to fund's total risk, idiosyncratic risk, and active risk using alternative regression specifications with demographic controls. Demographic controls include fund manager's mother's age, father's age, parent's education, parent's employment, and parental household wealth. All controls are defined in Table B.4. *Family size* is defined as the number of children born to the manager's parents. The dependent variable is either total risk, idiosyncratic risk, or active risk. Dependent variables are annualized. *Total risk* is the time-series standard deviation of monthly mutual fund return observations in a given year. *Idiosyncratic risk* is the standard deviation of the monthly residuals from the four-factor model. *Active risk* is the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. *Birth order* is a manager's rank by age among siblings. Fund and manager controls are identical to that of Table 2 of the main paper. Regressions include year and segment fixed effects. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Variable	*Total risk*		*Idiosyncratic risk*		*Active risk*	
Controlling for demographics	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.295**	0.297*	0.126**	0.115*	0.719***	0.774***
	(2.30)	(1.93)	(2.03)	(1.66)	(2.87)	(2.96)
Family size		–0.003		0.107		–0.078
		(–0.02)		(0.26)		(–0.77)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes
Manager controls	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.60	0.61	0.34	0.34	0.58	0.58
N of funds	685	685	685	685	683	683
Observations	4,467	4,467	4,467	4,467	4,299	4,299

Table B.4. Descriptions of main variables

This table provides descriptions and sources of variable used in Table B.3. The following abbreviations are used: OBIT - Obituaries; MQ - Marquis Who's Who database; INT - Intelius database; ANC - Ancestry.com; LEG - Legacy.com; LN - LexisNexis; NP - Newspapers.com; AE – Authors' estimations; MC - manually collected.

Variables	Description	Source
Mother's/Father's age	Mother's/Father's age at a manager's birth.	MQ, ANC, LN, NP, MC
Parents' college degree (0/1)	Dummy variable equal to 1 if a manager's parents (father and/or mother) have a college degree as the highest degree earned and 0 otherwise	OBIT, MQ, ANC, LEG, LN, NP, MC
Parents' fund manager (0/1)	Dummy variable equal to 1 if a manager's parents (father and/or mother) have worked in the asset management industry and 0 otherwise.	OBIT, MQ, ANC, LEG, LN, NP, MC
Father's military service (0/1)	Dummy variable equal to 1 if a manager's father has served in the military and 0 otherwise.	OBIT, MQ, ANC, LEG, LN, NP, MC
Father at war during childhood (0/1)	Dummy variable equal to 1 if a manager's father has served has done a prolonged military service overseas during a manager's childhood and 0 otherwise. Father's military service dates are from Department of Veteran Affairs and US military registries available on ancestry.com.	OBIT, MQ, ANC, LEG, LN, NP, MC
Parents' executive job (0/1)	Dummy variable equal to 1 if a manager's father or mother had an executive position in a publicly traded company and 0 otherwise.	OBIT, MQ, ANC, LEG, LN, NP, MC
Parents' low paid job (0/1)	Dummy variable equal to 1 if a manager's parents were either unemployed, worked in a relatively low paid jobs, or otherwise are reported to have low income and 0 otherwise.	OBIT, MQ, ANC, LEG, LN, NP, MC
Parents' monthly income (USD)	Parental income reported in U.S. censuses.	ANC, MC

Table B.5. Pooled regressions: Male vs. Female managers

This table relates a manager's gender and birth order. Dependent variables are annualized. All regressions include family size, fund, and manager controls along with segment and year fixed effects. Fund and manager control variables are lagged. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Variable	Male managers	Female managers	diff. Male–Female
	Total risk		
Birth order	0.360***	0.322	0.038
	(2.72)	(1.20)	(0.22)
Observations	5,807	503	6,310
	Idiosyncratic risk		
Birth order	0.153***	0.190**	–0.037
	(2.76)	(2.15)	(–1.22)
Observations	5,807	503	6,310
	Active risk		
Birth order	0.647***	1.055**	0.480
	(2.66)	(2.55)	(0.48)
Observations	5,597	497	6,094

Table B.6. Birth order and gender composition of a manager's siblings

This table relates the gender structure of siblings within a manager's family and a manager's birth order. *Birth order* is a manager's rank by age among siblings. *Same sex closest sibling* indicator takes the value of one if the closest sibling by age has the same gender as the manager in question, and zero otherwise. *Number of same sex siblings* is the number of siblings of that have the same sex as the manager. Dependent variables are annualized. All regressions include family size, fund, and manager controls along with segment and year fixed effects. Fund and manager control variables are lagged. Standard errors are double-clustered by fund and year. The main effects of birth order and siblings-related variables are included, but not reported. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***, respectively.

Variable	*Total risk*		*Idiosyncratic risk*		*Active risk*	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth order x Same sex closest sibling	0.576***		0.108		0.249	
	(2.61)		(1.14)		(0.84)	
Birth order x Number of same sex siblings		0.010		–0.001		0.036
		(0.27)		(–0.09)		(0.48)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes
Manager controls	Yes	Yes	Yes	Yes	Yes	Yes
Family size control	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.59	0.59	0.31	0.31	0.57	0.57
N of funds	963	1,008	963	1,008	960	1,005
Observations	6,048	6,309	6,048	6,309	5,834	6,093

Table B.7. Controlling for Cultural Origin and State of Birth effects

This table relates a manager's birth order to a fund's total risk, idiosyncratic risk, and active risk while controlling for cultural origin and state of birth effects. The dependent variable is either total risk, idiosyncratic risk, or active risk. Dependent variables are annualized. *Total risk* is the time-series standard deviation of monthly mutual fund return observations in a given year. *Idiosyncratic risk* is the standard deviation of the monthly residuals from the four-factor model. *Active risk* is the standard deviation of monthly mutual fund returns in excess of the fund-specific benchmark. Birth order is a manager's rank by age among siblings. Fund and manager controls are identical to that of Table 2 of the main paper. Panel A reports descriptive statistics. Regressions in Panel B include cultural origin fixed effects. Regressions in Panel C include state of birth fixed effects. All regressions include year and segment fixed effects. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***.

Panel A: Descriptive statistics

Cultural origin	Manager	Obs.	State of birth	Manager	Obs.
United Kingdom	273	2,820	New York	63	746
Germany	264	2,429	Massachusetts	33	416
Ireland	140	1,397	Pennsylvania	32	575
Russia	101	1,130	California	28	284
Italy	80	869	Illinois	26	371
Poland	59	588	Texas	23	190
Austria	37	279	Ohio	23	266
Canada	34	219	Minnesota	20	187
India	31	222	New Jersey	19	230
Sweden	28	255	Michigan	14	104
France	26	217	Wisconsin	11	123
Netherlands	23	236	Missouri	11	120
Norway	17	129	Connecticut	11	134
Switzerland	15	119	Washington	10	269
Other origins	171	1,436	Other states	108	1,244

Panel B: Regressions with cultural origin FEs

Variable	*Total risk*		*Idiosyncratic risk*		*Active risk*	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.425***	0.376***	0.171***	0.144**	0.789***	0.797***
	(3.29)	(2.58)	(3.51)	(2.56)	(3.48)	(3.33)
Family size		0.080		0.046		–0.015
		(0.78)		(0.83)		(–0.14)
Fund and Man. controls	Yes	Yes	Yes	Yes	Yes	Yes
Cultural origin FE	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.61	0.61	0.35	0.35	0.58	0.58
N of funds	1,009	1,009	984	984	981	981
Observations	6,097	6,097	6,101	6,101	5,899	5,899

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Table B.7 – continued from previous page.

Panel C: Regressions with state of birth FEs						
Variable	*Total risk*		*Idiosyncratic risk*		*Active risk*	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth order	0.509**	0.476**	0.215***	0.217**	0.787***	0.782***
	(2.45)	(2.38)	(2.65)	(2.15)	(3.02)	(2.66)
Family size		0.530		0.046		0.009
		(0.34)		(0.83)		(0.06)
Fund and Man. controls	Yes	Yes	Yes	Yes	Yes	Yes
State of birth FE	Yes	Yes	Yes	Yes	Yes	Yes
Segment and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.62	0.62	0.34	0.34	0.60	0.60
N of funds	463	463	463	463	461	461
Observations	3,054	3,054	3,054	3,054	2,901	2,901

Table B.8. Robustness tests: Additional results and placebo test

Panels A and B report the results of Fama and MacBeth (1973) risk regressions. Dependent variables are estimated using rolling windows of 24 months (minimum 20 observations) and 36 months (minimum 30 observations). Newey and West (1987) standard errors are adjusted for 24- and 36-month lags, respectively. The sample is restricted to observations where rolling windows match single management period of a corresponding manager. In Panel C, birth order is defined using full set of families, including single-child families and results for the placebo experiment with the sample of index funds. All regressions include family size, fund, and manager controls along with segment and year fixed effects. Dependent variables are annualized. All fund control variables are lagged. Segment is defined by the Morningstar fund category. Standard errors are double-clustered by fund and year. The corresponding t-statistics are reported in parentheses. 10%, 5%, and 1% significance levels are denoted by *, **, and ***.

	Total risk		*Idiosyncratic risk*		*Active risk*	
Panel A: Fama-MacBeth, 24m window, N-W 24m lags						
Birth order	0.090***	0.087***	0.091***	0.088***	0.069**	0.080***
	(3.52)	(3.34)	(3.66)	(3.46)	(2.40)	(3.02)
Family size		0.004		0.003		–0.020**
		(0.89)		(0.84)		(–2.00)
Observations	48,295	48,266	48,295	48,266	48,131	48,102
Panel B: Fama-MacBeth, 36m window, N-W 36m lags						
Birth order	0.074***	0.075**	0.074***	0.076***	0.059*	0.071**
	(2.72)	(2.56)	(2.82)	(2.65)	(1.74)	(2.22)
Family size		–0.004		–0.004		–0.023**
		(–0.66)		(–0.75)		(–2.31)
Observations	39,595	39,578	39,595	39,578	39,218	39,201

Panel C: Alternative Birth order specification and Placebo test

	Specification with single-child families			Placebo test: Index funds
	Total risk	Idio. risk	Active risk	Total risk
Birth order	0.445***	0.150***	0.652***	–0.027
	(3.65)	(3.12)	(3.38)	(–0.95)
Observations	7,376	7,376	7,376	569

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