

Spring 2019

The Effect of Birth Order on Behavior on Behavior and Academic Performance

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THE EFFECT OF BIRTH ORDER ON BEHAVIOR

AND ACADEMIC PERFORMANCE

A Capstone Experience/ Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

By

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May 2019

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I dedicate this thesis to my parents, Bob and Dana Long, who have always encouraged me to pursue my dreams. Also, I dedicate this work to all my friends who helped edit this work and supported me along the way.

ACKNOWLEDGEMENTS

First and foremost, I would like to acknowledge the assistance and mentorship of Dr. Claudia Strow and Dr. Stephen Locke. This paper would not have been possible without their guidance.

Additionally, I would also like to thank all my professors in the Economics Department of the Gordon Ford College of Business for always challenging me to go above and beyond.

Lastly, I would like to thank the staff of the Carol Martin Gatton Academy for inspiring my passion for research and providing me the opportunity to fall in love with Western Kentucky University.

ABSTRACT

This paper studies the effect of birth order on a child's math and reading comprehension aptitudes and likelihood of behavior problems. Numerous studies have been performed on this topic and the conclusions have varied. In this paper, I control for gender, race, number of siblings, mother's age at birth, mother's marital status at birth of child, and how often children argue with their parents about homework. I find evidence to suggest that first-born children will have significantly higher academic performance outcomes, last-born children will have significantly lower behavior issues, and the environment in which a child is raised will have a significant impact on behavior and academic performance of a child.

Keywords: Economics, Birth Order, Behavior, Academic Performance

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INTRODUCTION

The link between birth order and intelligence and personality was first analyzed by Sir Francis Galton, who noticed that there were “more firstborn sons in prominent positions than what he attributed to chance,” (Kristensen et al., 2007). Since Galton’s studies in 1874, numerous studies have questioned whether first-borns are more intelligent, and more specifically, what variables will lead to a child’s success. Birth order research is very convoluted and the lack of symmetry across different studies attributes to this.

This paper examines the effect of birth order on behavior problems and academic performance as measured by a behavioral problems index and the Peabody Intellectual Academic Math and Reading Comprehension tests. Using data from the National Longitudinal Survey of Youth (1979), my research aims to improve upon the existing literature by controlling for the various factors related to behavior and academic performance and by controlling for rules that a mother has for her child in the household. When other socioeconomic and household factors are controlled for, I find that being a first-born child has a statistically significant correlation with academic performance and being a last-born child has a statistically significant correlation with behavior. I find evidence that other influences in the household have a statistically significant impact on a child’s

behavior and academic performance. These findings are consistent with prior studies completed by Wichman et al. (2006) and De Haan (2009).

Birth order is an important topic for parents to be aware of and understand. A couple cannot have only first born children; if they have more than one child, the influences on a child's environment will change. Parents can be more aware of how to tailor the care they give to each child to ensure the highest outcome of success.

LITERATURE REVIEW

Society perceives that first-born children have different qualities than their latter born siblings. Whether the differences truly exist is up for debate, and if there are differences, are they more prevalent in personality or intellectual abilities of a child? Damian et al. (2015) study the link between birth order with personality and intelligence by examining at cognitive and verbal abilities. This study controls for how many siblings are older and household information. Damian et al. (2015) found that there was a very small correlation between birth order and personality traits.

While previous studies find that there is a small correlation between birth order and personality, Kristensen et al. (2007) focus on the correlation between birth order and IQ score. Their study uses information from first, second, and third order males born from 1967 to 1976 in Norway. The results provide evidence that first-born children have the highest IQ when family structure does not change due to a death within the family. However, if a first-order sibling died, the second-order child had a comparatively similar IQ to other first-born children. For a third-order child, if one sibling died, then the third-order child had a similar IQ to the second-order who had no siblings die. If the two older siblings of the third-order child died, then the third-order child had a similar IQ to a first-order child (Kristensen et al., 2007).

If there are less children in a household, more resources for a single child and can influence his/her outcome. De Haan (2009) studies how birth order links family size and educational attainment and focuses on biological children from married respondents. De Haan studies what causes birth order to have an effect on children such as the effect of child spacing and the allocation of the parent's resources. Her findings show that the tradeoff between child quantity and quality has a negative correlation. In De Haan's study, she uses the confluence model, which states that the environment that a later born child enters will not differ from that of the environment that the earlier born child entered if the spacing between the children is sufficiently large. The confluence model supports her hypothesis that child spacing can cause birth order effects. DeHaan concludes that the negative correlation between sibship size and educational attainment is due to unobserved family characteristics and that parental resources are correlated with birth order (DeHaan, 2009).

One of the most important resources a child can receive is quality time. Price (2008) researches how birth order influences the amount of parent quality time that each child receives. Price finds that for each additional child in a family, the next child would receive considerably less quality time. In a two-child family, the first-born child, on average, would receive 20-25 more minutes of quality activity time with the father and 25-30 more minutes with the mother. Price captures the time spent with children over a period and finds that first-born children spend approximately 2,200 more hours with one parent during their

childhood. The parental interaction time could lead to higher attainment levels in first-born children.

A major influence in the time and resources that a mother has available for her children is her job. To provide a higher living wage, many women put off having children until they have a stable job and salary. Wichman et al. (2006) use mathematics, reading recognition, and reading comprehension tests for their study. The study controls for between-family and within-family influences, and the mother's age at the birth of her first child. Researchers believe that the older a mother is, the more likely she is to have a higher level of education, a more stable career, and therefore will provide a more intellectually stimulating and stable environment for her child. Findings reveal that when the between-family structure is controlled for, birth order has no significance on intelligence, but when the between-family structure is not controlled for, birth order does have a correlation to intelligence (Wichman et al. 2006).

Prior research shows that home factors influencing a child have a higher correlation with intelligence and personality than birth order alone. Kristensen et al. (2007) show that a second-order raised as a first-order child will have approximately the same IQ score as other first-born children. This study, along with the research of Price and De Haan further supports the idea that parental influences are important. First born children spend ample more time with their parents at a young age, and parents are likely to devote more resources to a single child. Wichman et al. (2006) argues that the age of the mother could influence a

child's success since an older mother is more likely to have a stable career and a higher education level.

This paper addresses a similar question to prior research, but extends the study to focus on the effect of birth order on behavior and academic performance while controlling for aspects of the mother's background, the child's background, and the environment of the household that the child grows up in. This study has an advantage over previous studies due to the copious amounts of data available in the NSLY79 database and the information about the childhood of the mother, her adult life, and the childhood of her child.

DATA

This study uses data from the National Longitudinal Survey of Youth (NLSY79) Child sample to obtain information about the children along with information from the NLSY79 to gather data about the home and mother of the child. The NLSY79 survey is made up of 12,686 individuals who were originally surveyed in 1979 and were between the ages of 14 and 22. Respondents are interviewed annually or biannually and, as of 2014, all respondents were between the ages of 49 and 58. The NLSY79 database tracks and surveys the original cohorts' children, born between 1979 and 2009, on an annual/biannual basis, as well. Background data on the mother of the child, such as her number of siblings, her age at the birth of her child, her highest education level, and household income are controls in this study. Income is scaled to thousands of dollars to ease interpretation.

The Peabody Intellectual and Achievement Test (PIAT) scores for math and reading comprehension estimate a child's academic performance. The Behavior Problems Index estimates a child's likelihood to have behavior issues. Ultimately, the goal is to have a higher PIAT score and a lower BPI. Scores are from 1986 to 2014 and are percentile scores on a range from 0 to 100. To consolidate the data, the maximum score of the child between the years 1986 and

2014 is selected for both the BPI and the PIAT. The sample contains 30.9% of first-born children with latter born siblings, 14.5% only children, 27.8% black children, and 20.8% Hispanic children. Summary statistics for the data in this study are in Table 1.

Per Black (2017), a common problem in birth order studies is that they are unable to account for both family size and birth order. To counteract this, I focus on the first-born child in each family, as well as the number of biological siblings the child has. There is a dummy variable for an interaction term representing only children. It can be difficult to account for the rules enforced in a household while a child is growing up; in this study, I use a dummy variable for if children argued with their parents about their homework for academic performance estimation. The variable has three levels for how much the child argues with their parents: hardly ever, sometimes, or often. The data for how often children argue with their parents about homework comes from the years between 1986 and 2014.

RESULTS

Table 2 contains the results for PIAT Math percentile scores. From the simple regression (1), being the first-born child, last-born child, and only child is all statistically significant. Birth order alone only explains 0.54% of the variability in PIAT Math scores. The data from regression (2) controls for the aspects of the child's environment. The larger the number of siblings, on average, the lower a child's PIAT scores will be. Minority children have, on average, statistically significant lower scores than those of a non-minority race. A first-born only child on average has higher PIAT math scores than other children.

The results provide evidence that in a household where children hardly ever argue about their homework, on average, a child's PIAT math scores will increase by 4.51 percentage points relative to those who argue sometimes, when all else is held constant. In a household where children hardly ever argue about their homework, it can be assumed that there is a clear set of rules and expectations set for that child or that the child is self-motivated, whereas in a household where children argue often about homework, those clear expectations may not be set and, therefore, the child just may not care as much about their academic performance. The results in column 2 are from the regression model with all control variables included. I estimate approximately 25.92% of the variability in PIAT Math Percentile scores.

Table 3 contains the results for PIAT Reading Comprehension percentile scores. Based on the simple linear regression in column 1, first-born children have higher PIAT reading comprehension scores than latter born children. Column 2 contains the results for all controls and fixed effects. First-born children, on average have a PIAT reading comprehension score about 4.88 percentage points above other children. The mother's age at birth, marital status, and education level are statistically significant at the 1% level. On average, children in a minority race and males have lower PIAT reading comprehension scores than the other children in the sample. Again, I find that children who argue about homework often will have significantly lower reading comprehension scores compared to those who only argue sometimes. I estimate approximately 25.97% of the variability in PIAT Reading Comprehension percentile scores.

Table 4 contains the results of the estimated BPI scores. In a simple linear regression, only child and last-born are statistically significant and results suggest that an only child will have higher BPI scores than other children. However, when the control variables are in regression (2), being an only child is no longer statistically significant. Last-born children will have BPI scores that are 1.38 percentage points lower than other children. The mother's age at the birth of her child is significant at the 5% level, and gender of the child, income, if the mother has a college degree, and mother's marital status are all statistically significant at the 1% level. The results in column 2 are from the regression model with all control variables included. I estimate approximately 7.86% of the variability in BPI percentile scores.

Findings from the analysis of equations 1, 2, and 3 are consistent with the research of Wichman et al. (2006) who proposed that birth order has little to no impact on outcomes. Furthermore, the higher the educational attainment of the mother and the older the mother is at the birth of her child, will lead to higher PIAT scores and lower BPI scores. In this study, the mother's highest level of education is relative to if the mother has a graduate degree. I find that for each increase in the education level group, the child will have higher test scores and lower BPI's on average, when all else is held constant.

CONCLUSION

The goal of this paper was to estimate the effects of birth order on behavior and academic performance. After controlling for the demographics of the child and the environment in which the child was raised, I find that the birth order of first born children is statistically significant when estimating academic performance through the proxies used in this paper, and that being the last-born child is statistically significant when estimating behavior.

On a larger scale, the factors that a child experiences while he or she is growing up will have an impact on their earnings later in life. A study performed on six-year-old boys in Canada showed that boys who show display high levels of inattention earned an average of about \$17,000 less per year than those who displayed lower inattention levels (Vergunst F, Tremblay RE, Nagin D, et al., 2019). If negative behavior problems are targeted, children will be given the potential to have higher outcomes later in life. High achieving students can also be provided with gifted education to mitigate behavioral issues caused by boredom in the classroom.

The results fail to fully explain the effect that birth order has on behavior and academic performance, but they do shed light on other factors that contribute to these attributes. As technology continues to become more and more prominent in society, it leads to the question of if more technology will be correlated with

more behavioral issues?

The results in this paper support the findings of Wichman et al. (2006) that an increase in the mother's age at birth leads to higher PIAT scores and lower BPI scores on average. In the past 40 years, there has been a shift in the distribution of the age that mothers are giving birth. Per Bui et al. (2018), the average age for a first-time mother has increased from 21 years old to 26 years old since 1972. Bui et al. (2018) attributes part of the increase in age to the legalization of abortion and the use of long lasting birth control measures. Now, there are more women attending college and marrying later.

As the average age for having children increases, we expect that BPI scores should decrease and PIAT scores should increase, yet we see an increase in the number of autism and ADHD cases in the U.S. This implies that there are unobservable variables that are influencing the behavior and academic performance of children. Based on the evidence presented in this paper, I propose that a new test be made for children to self-report their motivation to study and their own behavior problems to eliminate some of the bias from the mother reporting scores.

One limitation of this study is the inability to accurately predict test scores. There is a large amount of randomness in testing, so it is hard to accurately predict why a child does badly on a test when all signs say he/she

should do well. Behavior problem scores and how often a child argues with his/her parents are reported by the mother, so biases exist from the mother's influence. Those who are reporting behavior issues are more likely to be reporting that they argue with their children, *ceteris paribus*. Another limitation is that the data in this study only focused on the influences from the mother and not the father of the child. Future work should focus on child spacing and include data on step and half siblings, as well as a measure of the self-motivation of a child. Divorce is much more common than it has been and family structures are changing. These changes can have an impact on the outcomes of children. This research also faces the challenge that some children are simply self-motivated and will excel more without a parent's influence, and this study does not capture this.

TABLES

Table 1: Summary Statistics

Variable	N	Mean	Std Dev	Min	Max
Number of Siblings in Mother's Family	6325	4.104	2.755	0	19
Mother's Age at Birth	6325	26.56	5.761	14	46
Married at Birth of Child	6325	0.593	0.491	0	1
Mother did not complete high school	6325	0.123	0.328	0	1
Mother has a high school diploma	6325	0.317	0.465	0	1
Mother has some college education	6325	0.306	0.461	0	1
Mother has a college degree	6325	0.13	0.336	0	1
Black (Mother)	6325	0.278	0.448	0	1
Hispanic (Mother)	6325	0.208	0.406	0	1
Household Income (Thousands of Dollars)	6325	29.761	76.238	0	1057.45
Year of Birth of Child	6325	1987.74	5.964	1979	2009
Child is First Born	6325	0.309	0.462	0	1
Only Child	6325	0.146	0.352	0	1
Birth Order	6325	2.087	1.196	1	11
Number of Siblings in Child's Household	6325	1.704	0.934	1	10
Male (Child)	6325	0.508	0.499	0	1
Age PIAT Math taken (maximum score)	6325	9.332	2.656	4	14
PIAT Math Score (percentile)	6325	69.679	24.032	1	99
Year of Max PIAT Math	6325	1997.08	6.694	1986	2014
Age PIAT Reading Comprehension taken (maximum score)	6325	9.08	2.315	5	14
PIAT Reading Comprehension Score (percentile)	6325	68.047	25.154	1	99
Year of Max PIAT Reading Comprehension	6325	1996.82	6.427	1986	2014
Age of BPI score (maximum score)	6325	9.21	3.053	4	14
BPI Score (percentile)	6325	75.1	22.494	3	100
Year of Max BPI	6325	1996.95	6.699	1986	2014
Argue about Homework often	6325	0.216	0.411	0	1
Argue about homework hardly ever	6325	0.364	0.481	0	1
Argue about TV rules often	6325	0.141	0.348	0	1
Argue about TV rules hardly ever	6325	0.427	0.495	0	1

Table 2: PIAT Math Percentile Scores Results

	(1)	(2)
First Born Child	3.345*** (0.884)	1.95875** (0.911)
Last Born Child	4.626*** (0.75)	1.05 (0.778)
Only Child	-3.76*** -0.936	-0.857 (1.039)
Number of Siblings in Mother's Family		-0.333*** (0.106)
Number of Siblings in Child's Household		-1.062** (0.447)
Mother's Age at Birth of Child		0.31** (0.126)
Male Child		0.807 (0.527)
Income (Thousands of Dollars)		0.004 (0.003)
Black (Mother)		-12.839*** (0.722)
Hispanic (Mother)		-7.511*** (0.726)
Married at Birth of Child		2.222*** (0.645)
Argue about Homework often		-4.453*** (0.726)
Argue about homework hardly ever		4.512*** (0.596)
Mother did not complete high school		-17.495*** (1.131)
Mother has a high school diploma		-9.796*** (0.824)
Mother has some college education		-6.023*** (0.806)
Mother has a college degree		-1.67* (0.889)
Year Fixed Effects		X
Age Fixed Effects		X
Adjusted R ²	0.0054	0.2592

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Table 3: PIAT Reading Comprehension Percentile Scores Results		
	(1)	(2)
First Born Child	8.847*** (0.916)	4.881*** (0.957)
Last Born Child	4.906*** (0.92)	1.181 (0.805)
Only Child	2.106** (0.966)	1.054 (1.053)
Number of Siblings in Mother's Family		-0.294*** (0.112)
Number of Siblings in Child's Household		-2.092*** (0.444)
Mother's Age at Birth of Child		0.503*** (0.132)
Male Child		-2.66*** (0.549)
Income (Thousands of Dollars)		-0.002 (0.003)
Black (Mother)		-9.726*** (0.747)
Hispanic (Mother)		-3.829*** (0.76)
Married at Birth of Child		3.235*** (0.673)
Argue about Homework often		-6.886*** (0.788)
Argue about homework hardly ever		4.946*** (0.614)
Mother did not complete high school		-20.495*** (1.205)
Mother has a high school diploma		-10.038*** (0.869)
Mother has some college education		-6.672*** (0.847)
Mother has a college degree		-3.473*** (0.948)
Year Fixed Effects		X
Age Fixed Effects		X
Adjusted R ²	0.0156	0.2597
*** Significant at the 1% level		
** Significant at the 5% level		
* Significant at the 10% level		

Table 4: BPI Percentile Scores Results

	(1)	(2)
First Born Child	0.805 (0.79)	-0.555 (0.931)
Last Born Child	-4.185*** (0.82)	-1.379* (0.817)
Only Child	3.852*** (0.876)	0.229 (1.052)
Number of Siblings in Mother's Family		-0.074 (0.103)
Number of Siblings in Child's Household		-0.119 (0.461)
Mother's Age at Birth of Child		-0.301** (0.130)
Male Child		3.727*** (0.545)
Income (Thousands of Dollars)		-0.011*** (0.004)
Black (Mother)		1.580** (0.725)
Hispanic (Mother)		-0.061 (0.746)
Married at Birth of Child		-2.904*** (0.630)
Mother did not complete high school		8.244*** (1.129)
Mother has a high school diploma		2.697*** (0.964)
Mother has some college education		1.825* (0.957)
Mother has a college degree		-3.007*** (1.138)
Year Fixed Effects		X
Age Fixed Effects		X
Adjusted R ²	0.0088	0.0786
*** Significant at the 1% level		
** Significant at the 5% level		
* Significant at the 10% level		

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