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# Who is Better Off?: An Empirical Analysis of How Birth Order Effects Earnings

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**Abstract**
Ermich (2008) describes the economics of the family as a way to explain and understand the actions of the family and how they make decisions. One of the microeconomic methods used to explain the family is the human capital theory. Earnings are dependent on human capital investments - the more human capital invested in a person, the higher his earnings will be. The family will make human capital investments in their children, bettering the children later in life by increasing their chances of having higher earnings later in life. Another concept of family economics is that families will allocate the available resources optimally among everyone in the family. Even with efficient resource allocation, after each child is born there will be less and less resources available for the latter child. This applies to the human capital investments; the more children a family has the less human capital investments the parents will be able to make in the additional children.

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### I. Introduction

When you have siblings, almost everything turns into a competition to see who can do the best. I have two older brothers; as I grew up, we always tried to outshine one another. Now that we are all grown up and soon to be all in the workforce, this competition has extended into later life to see who is making the most money out of all the siblings. Not only is this topic interesting to me, it is important because by the end of this study I will have determined if birth order and family size are important determinants of earnings. And in concluding so, it is therefore feasible that birth order and family size can influence labor productivity and a country's standard of living. The purpose of this study is to get a better understanding of the relationship between birth order and earnings and how this relationship could affect a country's standard of living.

### II. Theoretical Framework

Ermich (2008) describes the economics of the family as a way to explain and understand the actions of the family and how they make decisions. One of the microeconomic methods used to explain the family is the human capital theory. Earnings are dependent on human capital investments - the more human capital invested in a person, the higher his earnings will be. The family will make human capital investments in their children, bettering the children later in life by increasing their chances of having higher earnings later in life. Another concept of family economics is that families will allocate the available resources optimally among everyone in the family. Even with efficient resource allocation, after each child is born there will be less and less resources available for the latter child. This applies to the human capital investments; the more children a family has the less human capital investments the parents will be able to make in the additional children.

Another microeconomic method used to explain the family economics theory is budget constraints and indifference curves. The family's budget constraint is determined by the quality of the children's life and the number of children the family has. The indifference curves show all the bundles of child quality and child quantity that the family is indifferent to on that curve, meaning they will be equally happy at any point on that certain curve. Figure 1 of the appendix shows the budget constraints and indifference curves for a family. The family has multiple indifference curves, shown as $IC_A$, $IC_B$, and $IC_C$, but there will be one the one that is tangent with their budget constraint. This will show where the family's optimal point for child quality and child quantity is and where they will maximize these two goods, shown in Figure 1 as point A The last microeconomic method used to explain the economics of the family is the utility possibilities frontier. Because the goal of the family is to maximize their resources of the dependents they will be on a utility possibilities frontier. This frontier will help the family determine their most optimal utility point. If a child is the first-born they will get more resources invested in them, and there will be less available resources to divide up among all the children as more and more children are added to the family. Thus, firstborn children should have higher earnings compared to lastborn children, all else being equal.

## III. Literature Review

While the relationship between birth order and earnings has not been exclusively analyzed, birth order effects have been a common topic for some economics papers. Birth order and the economics of the family is a relatively new topic coming about in the 1970s with the work of Gary Becker (1989). Behrman and Taubman (1986) studied the effects birth order had on schooling and earnings. They found that young adults have a difference in the ln(earnings) by birth order. When they control for family background of the child while growing up however, the birth order effects on ln(earnings) is not significant. When looking at the effects of birth order on schooling, the two found that schooling was significantly affected by birth order. Another study done to analyze the effect of birth order on earnings found that first born children do have higher earnings, but this differential slowly gets smaller and eventually disappears as the person ages (Bertoni 2016). Kessler (1991) looked at how birth order affects the child's environment and in extension their future success. He found that the growth rate of wages was not affected by birth order. Thus, the literature has not reached a consensus on whether birth order is a significant determinant of the salaries of siblings when they become adults. This paper will differ from these three studies in that I will be looking solely at birth order effects on earnings and not on schooling. Secondly, the Bertoni study looked at European earnings and people in Europe, this paper will be focused on people in the United States and their earnings. Lastly, I will be using wages at a point in time and not the growth rate of wages over a period of time. While there are a few articles about how birth order affects earnings, much of the literature is how child quality is affected by birth order or family size. Child quality and child quantity are substitutes of one another and child quality is heavily influenced by the number of children in the family (Blake 1981). So, the more children a family has, the worse off the children's life will be. Hanushek (1992) also looked at how child quality and quality are related. He found that within a larger family, achievements of the children decline as the family gets larger. He also found that firstborn children have an advantage because they are more likely to be in a smaller family and therefore have more resources available to them.

## IV. Empirical Design

This study differs from the previous work in that it looks at how birth order directly affects earnings at a point in time. The earnings model I will use to test my hypothesis is

$$\ln\_WAGES = \beta_1 + \beta_2(FIRST) + \beta_3(LAST) + \beta_4(SIBLINGS) + \beta_5(PARENTS) + \beta_6(POVERTY) + \beta_7(SEX) + \beta_8(RACE) + \beta_9(AGE) + \varepsilon$$

Note that all of these variables are defined in Table 1. The variables for SIBLINGS, PARENTS, POVERTY, SEX, RACE, and the variables used to determine the birth order were all measured in 1979 when the respondents were just finishing or about to finish high school. The variables AGE and the individual's total income were measured in 2012. This means that ln_WAGES is dependent on birth order and some other background variables from when the respondent was around high school age. Table 1 of the appendix explains all the variables used in the equation. FIRST and LAST are the two variables we will look closely at; all the other independent variables are control variables so the relationship between earnings and birth order are not affected by other outside influences. The MIDDLE variable will be the reference group for the FIRST and LAST variables. "Only" children were put into the category of FIRST because they have the same advantages that first born children have in terms of the available resources parents can give them. Earnings are the combination between both salary/wages and income from a business or farm

because some of the respondents said they had no salary/wages in 2012, but they owned a business or farm and that was where all their income was coming from. Income from a business or farm is included so people are not excluded from the regression just because they do not have a traditional income.

All the data used in this regression model is from The National Longitudinal Survey of Youth - 1979. This survey is a panel data set that follows the same cohort of individuals over a period of time starting in 1979 going through the most recent survey year of 2012. In 1979 the respondents' ages were between 14-22. In 2012 the respondents were between 47-56 years old. The respondents are asked some questions every year they are surveyed and some questions are asked just one year, or only a few years. This data set is appropriate for my study because I can look at how different factors from a person's past affects them now or at various points of time. It is also very appropriate because it has every variable I need for my study. The data have a few flaws, but the major one is that there are missing data points. They are missing because people were either dropped from the survey, died, could not be found, or just did not complete the survey. Even though there are missing data points, this data set is still appropriate for my study because it gives a more well-rounded group of individuals who give a better representation of the country.

**V. Results**

To get a better idea of how the data is divided up among each of the important variables we will look at the descriptive statistics. Table 2 shows the frequency of each birth order variable. For my regression, I combined ONLY with FIRST because when I originally ran the regression with ONLY in the equation I got an error because there was no correlation between ONLY and ln_WAGES. This could possibly be because there is such a small frequency for ONLY compared to the other variables. MIDDLE has the highest frequency because all middle children are included in that category, if I had a variable for every middle child birth order, there would be over twenty variables. FIRST and LAST are roughly the same, proving that the data set used is a good representation of the whole population.

Figure 2 of the appendix shows the frequency of the number of siblings in the family. Three siblings has the highest frequency, so a four-child family is the most common family size. There is one outlier that is not shown on this graph and that is 29 siblings, there was one person who recorded having one sibling. Looking at the frequencies of siblings will help understand the results of how number of siblings and birth order affect earnings. Since we can see that the number of siblings is more concentrated around smaller families, parents may already realize that having a smaller family is more beneficial for the children.

I used OLS estimation to estimate the model parameters which are used test my hypothesis. Table 3 of the appendix shows the OLS regression results. The variables related to this study are FIRST, LAST, and SIBLINGS. FIRST and LAST are statistically significant at the .05 level, meaning we can be 95% sure that the coefficient for FIRST and LAST is the real coefficient for these variables. SIBLINGS is statistically significant at .01 level, meaning we can be 99% sure that the coefficient for SIBLINGS is statistically different from zero. All the control variables were statistically significant. SEX, POVERTY, and the Constant term are statistically significant at the .01 level. AGE, RACE, and, PARENTS were statistically significant at the .05 level. Since all the variables are statistically significant I left them all in the regression equation. Since the dependent variable is the ln_WAGES the coefficients must be converted from the SPSS output value to the percentage change of earnings. This is done by raising e to the coefficient minus one, $e^{\beta} - 1 * 100$. I only converted FIRST, LAST, and SIBLINGS because these are the only variables

important to my research. I expected the percentage change of FIRST to be positive and the percentage change of LAST and SIBLINGS to be negative. However, the percentage change of LAST was positive and less than ten percent different than the percentage change of FIRST.

Now since SIBLINGS and the birth order terms interact with each other they need to be added together to get the true percentage change of earnings based on place in birth order and family size. The combined results and the equation used to get the results are shown in table 4 of the appendix. The actual percentage change on earnings determined by birth order and family size is calculated by adding the respective birth order percentage change plus the SIBLINGS percentage change multiplied by the number of siblings. Table 4 shows that the firstborn child has an advantage when compared to the middle or last born children even after controlling for family size (SIBLINGS). Likewise, last born children have an advantage when compared to the middle child. The middle child always has a negative percentage change on earnings, meaning that middle children will always have lower earnings in relation to their siblings. Once a family gets larger than four children, the percentage change on earnings will be negative for all siblings, no matter where they fall in the birth order.

## VI. Conclusion

This paper found that being a first born has an advantage over middle and last born children and that being in a smaller family has an advantage over being in a large family. Families with four or less children have a positive percentage change on earnings for the first and last born children, any family larger than that, all the children will have a negative percentage change on earnings. Middle children always have a negative percentage change on earnings. The last born child having a positive percentage change is inconsistent with what I expect. My expectation is for them to have a large negative percentage change because there would be very little resources available for the later-born children because they would have already been invested into the older children. One possible explanation for the last born children having a positive percentage change on earnings could be that the parents have already raised their other children and now know what to do with the last child, a learning by doing way of thinking. Another possible explanation for these results could be that the older siblings help the parents out taking care of the last child. These findings are consistent with Behrman and Taubman (1986) who found that young adults have a difference in the ln(earnings) by birth order. My findings are however different from Kessler (1991) because they found that growth rates of wages were not affected by birth order.

As discussed earlier, birth order and family size could be important factors of a country's standard of living. Based on these results countries with smaller families, will have a higher standard of living because people would generally have a higher percentage change on earnings. On the other hand, countries with larger families would have a lower standard of living. One way to get a better understanding of this relationship would be to look at how birth order and family size affect earnings in different countries, especially countries with different standards of living and see if the relationship exists.

There are few policy implications that can be implemented. There is one already in place, parents get a tax break for each child they can claim as a dependent on their taxes so they would have more money to spend on their children. This study was not done to implement change, but to analyze the relationship of two things and get a better understanding of this relationship. To understand this relationship on a greater level one can analyze the relationship between birth order and earnings at specific ages, such as 20, 30, 40, and 50 instead of just at a specific point in time. This would allow us to see if the difference in percentage change on earnings exists among siblings

throughout their lives or if it disappears after a certain age as Bertoni and Brunello (2016) found in their research.

**Appendix**

**Table 1: Variable Definitions**

| | |
|---|---|
| **Dependent Variables** | |
| ln_WAGES | The natural log of the combination of total income from wages and salary and total income from a farm or business in 2012. If the total income was zero, it was left as zero. |
| **Independent Variables** | |
| FIRST | Dummy variable, 1 if the respondent is the firstborn child; 0 if not the firstborn |
| MIDDLE | Reference group for the FIRST and LAST dummy variables |
| LAST | Dummy variable, 1 if the respondent is the lastborn child; 0 if not the lastborn |
| SIBLINGS | The number of siblings the respondent had |
| AGE | How old the respondent was in 2012 when they reported their earnings |
| SEX | Dummy variable for respondent's gender, 1 if female, 0 if male |
| RACE | The respondent’s race |
| POVERTY | Dummy variable, 1 if the respondent’s household while growing up was below the poverty line in 1979; 0 if they were not below the poverty line in 1979 |
| PARENTS | If both parents lived in the household with the respondent until the respondent turned 18. Dummy variable, 1 if they both lived in the household; 0 if they did not both live in the household |

**Figure 1: Budget Constraint and Indifference Curves of The Family**

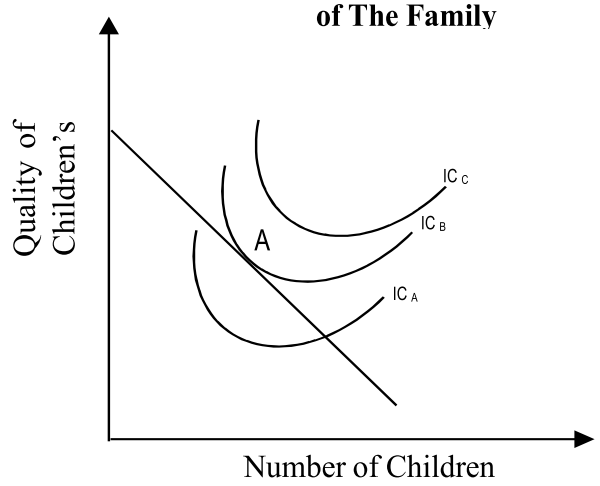


**Table 2: Descriptive Statistics**

| Variable | Frequency |
|---|---|
| ONLY | 362 |
| FIRST | 3000 |
| MIDDLE | 6343 |
| LAST | 2981 |

**Figure 2: Number of Siblings**

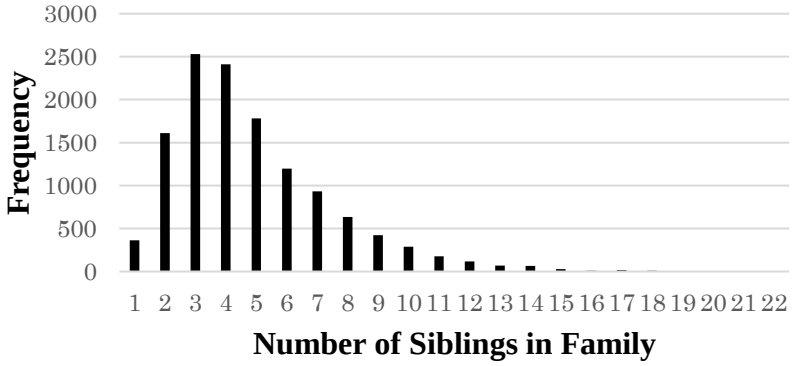

**Table 3: Birth Order Effects on ln_WAGES**

| Variable | Coefficient | Percentage Change |
|---|---|---|
| Constant | 10.487*** | |
| **FIRST** | **.430**** | **53.7%** |
| **LAST** | **.366**** | **44.2%** |
| **SIBLINGS** | **-.148***** | **-13.8%** |
| PARENTS | .343** | |
| POVERTY | -1.457*** | |
| RACE | .179** | |
| SEX | .867*** | |
| AGE | -.059** | |

level *** statistically significant at the .01
level ** statistically significant at the .05
level * statistically significant at the .10

**Table 4: Birth Order in Different Sized Families Effects on Earnings**

| Family Size | Equation | Percentage Change on Earnings |
|---|---|---|
| first in one child family | $\beta_2+(\beta_4*0)$ | 53.7% |
| first in two child family | $\beta_2+(\beta_4*1)$ | 39.9% |
| last in two child family | $\beta_3+(\beta_4*1)$ | 30.4% |
| first in three child family | $\beta_2+(\beta_4*2)$ | 26.1% |
| middle in three child family | $(\beta_4*2)$ | -27.6% |
| last in three child family | $\beta_3+(\beta_4*2)$ | 16.6% |
| first in four child family | $\beta_2+(\beta_4*3)$ | 26.1% |
| middle in four child family | $(\beta_4*3)$ | -41.4% |
| last in four child family | $\beta_3+(\beta_4*3)$ | 2.8% |
| first in a five child family | $\beta_2+(\beta_4*4)$ | -1.5% |
| middle in a five child family | $(\beta_4*4)$ | -55.2% |
| last in a five child family | $\beta_3+(\beta_4*4)$ | -11.0% |
| first in a six child family | $\beta_2+(\beta_4*5)$ | -15.3% |
| middle in a six child family | $(\beta_4*5)$ | -69% |
| last in a six child family | $\beta_3+(\beta_4*5)$ | -24.8% |

**References**

Becker, G. S. (1989). On the Economics of the Family: Reply to a Skeptic. *American Economic Review*, 79(3), 514.

Behrman, J. R., & Taubman, P. (1986). Birth Order, Schooling, and Earnings. *Journal of Labor Economics*, 3.

Bertoni, M., & Brunello, G. (2016). Later-borns Don't Give Up: The Temporary Effects of Birth Order on European Earnings. *Demography*, 53(2), 449. doi:10.1007/s13524-016-0454-1

Blake, J. (1981). Family Size and The Quality of Children. *Population Association of America,* 4, 421.

Ermich, J. (2008). Family Economics. *The New Palgrave Dictionary of Economics,* Retrieved from http://www.dictionaryofeconomics.com/article?id=pde2008_F000292

Fleisher, B. M. (1970). *Labor Economics* (5. printing ed.). Englewood Cliffs, NJ: Prentice-Hall.

Hanushek, E. A. (1992). The Trade-Off Between Child Quantity and Quality. *The University of Chicago Press,* 1, 84.

Kantarevic, J., & Mechoulan, S. (2006). Birth Order, Educational Attainment, and Earnings: An Investigation Using the PSID. *Journal of Human Resources,* 41(4), 755-777.

Kessler, D. (1991a). Birth Order, Family Size, and Achievement: Family Structure and Wage Determination. *Journal of Labor Economics, 4, 413.*

Samuelson, P., & Nordhaus, W. (2010). *Economics* (19e ed.). New York, NY: McGraw-Hill Irwin.

U.S. Bureau of Labor Statistics. (1979). *National Longitudinal Survey of Youth 1979*. Retrieved from https://www.nlsinfo.org/investigator/pages/search.jsp