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Predicting Major League Talent through the First-year Player Draft

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Adopted Children's Outcome as Young Adults in Regards to Educational Attainment and Income

Research Honors Project

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Abstract: This study explains the differences between the outcomes for children adopted by the age of two in comparison to biologically raised children using the National Longitudinal Survey of Youth. It analyzes the educational attainment and income earned through a competing effects framework. The Family Background Effect measures the positive effects caused by higher than average socioeconomic status of the average family with adopted children. The Family Background Effect contrasted with the negative Adoption Effect caused by a number of different factors that could work against an adopted child. Using linear regression analysis, the study finds that the Family Background Effect prevails over the Adoption Effect. Then the Oaxaca Decomposition technique breaks down the effects of each family background variable on educational attainment for the adopted young adult. It is determined that the differences in the average level of education of the respondents' mother explains over 50% of the difference in educational attainment between adopted and biologically raised young adults.

I. Introduction

For years there has been debate among academic professionals across many fields about what forces are stronger: nature or nurture. Adoption provides a unique way to study these two forces. This study follows both adopted and biologically raised children into their young adulthood. Their success, measured by educational attainment and income, is compared by using regression analysis to determine which group has higher achievement levels as young adults and what influences cause the differences in achievement levels. The focus is on the differences or similarities in their family backgrounds. I find that family background characteristics have a large impact on adopted children's outcomes. Therefore, I conclude that the characteristics of the family have the strongest influence on the development and future performance of children. The family background variables overcome any negative affects that adopted children might face from their initial set of endowments and negative pre-birth environments.

Using outcome measures to understand the differences between the two groups differs from previous research studies. For example, many studies only focus on the correlations between the IQ scores of adopted children and their parents. Some of these studies were completed by Joseph Horn (1983), Bruce Sacerdote (2002), and by Sandra Scarr and Richard Weinberg (1978). By measuring educational attainment and income, this study focuses on human capital and economic achievement rather than raw skill or intelligence.

Studying the outcomes of adoption is important as adoption is becoming more prevalent in American society. International adoption is become increasingly popular in the past few decades. The National Council for Adoption (2007) reports that there were

4,323 international adoptions in 1973. This figure has dramatically increased to 22,911 inter-country adoptions in 2004. There were approximately the same number of unrelated domestic adoptions in 2004. So there are approximately 46,000 adoptions each year in the United States. This study does not differentiate between international and domestic adoptions due to the lack of data availability.

This paper proceeds as follows. Section II discusses the past research on adoption and predicts the outcomes of young adults. It reviews the traditional structure of many families with adopted children. This section also discusses the theoretical framework based on human capital theory. Section III describes the National Longitudinal Survey of Youth (NLSY) data set. Sections IV through Section VI explain the different types of analysis conducted and present the results. Section IV starts with the simple regression model which is expanded upon in Section V to incorporate more variables and multiple regressions. Section VI explores the differences in the outcomes of biologically raised and adopted children using an Oaxaca decomposition. Finally, Section VII concludes by discussing my results and suggesting policy implications.

II. Literature and Theoretical Model

A. Background

The research on adoptive children finds that adopted children's family structure differs from that of other families. Christine Bachrach (1983), a sociologist, reviews children in varying family types and paints the following picture of the American family with adopted children. Adoptive parents tend to be older than biological or step parents with a child of the same age; almost all of the children have a mother over the age of twenty five. Approximately 63% of adopted children live in households with two children or fewer,

while only 39% of households with biologically raised children have two or fewer children. Also, only 2.1% of the adopted children studied live below the poverty line while approximately 9.4% of biological children do. This financial difference could be related to the fact that more adoptive children live in two parent households (96%) and that adoptive parents tend to have higher levels of education (Bachrach, 1983). The selective placement by adoption agencies might explain why families with adopted children tend to be better off.

The statistics in the Bachrach study are consistent with the sample from the National Longitudinal Survey of Youth (1996) is used in this study. I discuss the data in greater depth in Section III, but I am able to conclude that the families that adopted do seem to be of a higher socioeconomic status than those which do not adopt.

Previous research on the difference between the intelligence of adopted children versus biological children often compares IQ scores. The Scarr and Weinburg (1978) study, conclude that “biology plays a larger role in determining intelligence than family variables.” A few studies have been able to gain access to some unique data that includes the IQ score of both the biological and adoptive mother as well as the child. For example, the Texas Adoption Project, conducted by Joseph Horn (1983), finds that no matter how scores are compared, children’s IQ scores are more similar to that of their biological parents. It seems that adopted children resemble “strangers” (their biological mothers) more than their adoptive mothers. Thus, the Horn study (1983) opposes a prevailing Family Background Effect which I will present below; or in other words the Horn study claims that the family inputs do not have much impact on the intelligence of the child.

However, one study completed in Norway uses school test scores and teacher responses instead of IQ tests (Dalen, 2006). Dalen compares internationally adopted children to all domestic children, adopted or not. She finds little difference in their intellectual ability as measured by government issued standardized tests. Also the teachers do not report any difference in the child's language ability, both academic and everyday (Dalen, 2006). In opposition to the studies that measure IQ, Dalen does not find any difference in the intelligence of internationally adopted children from the other children in the classroom. However, there are shortcomings in both ways in which the differences between adopted and biologically raised children has been studied. While intelligence and early classroom performance influence human capital accumulation, neither predetermine outcome which is the focus of this study.

B. Human Capital Model

To understand the achievement levels in regards to education and earnings, it is important to understand how people accumulate human capital and how adopted and biologically raised children might have accumulated human capital differently. The human capital model helps to explain how productive a person can be given many inputs such as education, language skills, physical abilities and technical skills. Education is an investment in human capital, which leads to increased productivity, and then higher income. Productivity is the output from people's work given their inputs, so this study examines both sides of the chain by considering both education and income as education is an initial human capital input and income is the final output. Gary Becker has written many classic studies on the family unit and its influences on the accumulation of human capital. His co-authored article with Nigel Tomes (1986) helps develop the primary theory

explaining how the childhood, family situations affect important outcomes like educational attainment and earnings.

Becker and Tomes (1986) assume that the amount of human capital one is able to accumulate later in life is proportionate to the amount received in childhood in the form of education, parental care, and genetics. Therefore, one will be able to gain more human capital from education or on-the-job training if he or she starts with better “genetic endowments.”

According to Becker and Tomes (1986), parents who have low innate abilities tend to have children with below average abilities based on genetics. However, the standard deviation of innate abilities is large for children with low ability parents. This suggests that many of these children have the potential of high achievement in terms of educational attainment and income. Thus, there is a lot of room for upward mobility which could possibly be influenced by family variables. I consider this possibility as I study the adopted children.

Mary Corcoran, Christopher Jencks, and Michael Olneck (1976) add some additional thought about the ways parents impact their children’s development. They believe that parents’ attitudes are the most influential. Parents may teach their children proper manners and ways to effectively interact with others. Parents can also pass down their work ethic, which is pivotal in achieving a certain level of education and earning a high income. These researchers report that these immeasurable characteristics such as interpersonal skills have a strong effect on success later in life (Corcoran, *et al* 1976). Thus they believe that the family has the most influence in human capital accumulation.

Parents not only show their children their own attitudes and motivations, but also influence their child's skills, learning, health, and other characteristics by their expenditures of time and money on their child. Becker and Tomas (1986) also argue that incomes, preferences, and number of children will affect parental expenditures. Parents are expected to maximize their children's welfare by providing optimum opportunities for learning and bettering themselves (human capital accumulation), given that it does not severely limit the parents' own consumption. Therefore, Becker and Tomas (1986) assume that children from better-endowed families will have higher levels of human capital.

C. Competing Effects

Anders Bjorklund and Katarina Richardson (2000) completed a study upon which I model mine except that they studied children adopted in Sweden. They explain that a person's family background is important in determining a young adult's outcome but it can be influenced by other variables such as genetics and adoption effects, which they find to dominate. They test which set of factors is strongest in explaining the levels of education and the income earned by young adults. They compare the results of two samples: adopted children and biologically raised children. They title these two competing effects the "Family Background Effect" and the "Adoption Effect" (Bjorklund *et al*, 2000). I carry these titles throughout my paper as well.

The Family Background Effect explains much what is discussed above in the human capital model. The more investment that is made in someone, the more productive that person should be. A higher level of family income gives the family more wherewithal to invest in children's educations. In addition, the level of parents' education is a major

part of the Family Background Effect. A higher level of education may lead to higher level of income. Furthermore, parents' own level of education influences children's attitudes towards education. Children adopted by parents with higher levels of educational attainment have an example to follow which might be very powerful in influencing their own educational decisions.

Further adding to the positive family environment, Bjorklund and Richardson (2000) suggest that adoptive families tend to be more stable than the average family with biological children. Such families undergo extensive screening before they are allowed to adopt, and testing the strength of the marriage is part of the screening. Additionally, the Family Background Effect might positively affect the families with adopted children because those families are usually smaller than families with biological children, and the parents are older so they might have more financial resources. This allows the family to put a larger amount of time and financial resources towards the investment in human capital (Bjorklund *et al*, 2000).

The Adoption Effect, on the other hand, might work against the Family Background Effect. Andres Bjorklund, Mikael Lindahl, and Erik Plug (2006) suggests that children who are adopted might have been subject to less than standard pre and post birth care, which can negatively their development and thus affect their outcomes as young adults. A mother who gives her child up for adoption might not have had the resources to obtain proper prenatal care such as regularly visiting a doctor or taking proper vitamins. Plus, she may be less able to provide proper care to insure the baby is healthy in general. A number of adopted children had biological mothers who abused drugs or alcohol during pregnancy. The negative Adoption Effect could continue to grow due to post-birth

circumstances. Some children are placed into institutions before they are adopted into families (Beckett, 2007). This type of care is not ideal because children often times do not receive enough attention and stimulation. Lastly, adopted children might emotionally suffer from a feeling of separation or lack of belonging (Bjorklund *et al* 2006).

In their research comparing biological and adopted children in Sweden, Bjorklund and Richardson (2000) find that the “Adoption Effect” seems to prevail over the “Family Background Effect” when comparing adopted children to their adopted siblings who are biologically related to their parents. In fact, the biological children of the family tend to achieve two more years of education than their adopted siblings. However, in general, they find that average Swedish biologically raised children tend to achieve the same amount of education attainment as adopted children. This means that adopted children in Sweden are achieving at an average level, but when compared with non adopted children in their same home, they are achieving less. Thus, the benefits that the adoptive families have, such as more access to financial resources, has a stronger affect on the biologically raised children in those families.

The human capital model and the competing effects theory work together to form my hypotheses. The human capital model suggests that adopted children, on average, have more access to resources which will increase their human capital investment and lead to a higher level of educational attainment and higher income. This explanation would be in support of the Family Background Effect over the Adoption Effect. On the other hand, there might be a higher percentage of adopted children that could have some disadvantages such as poor prenatal care, which causes them to have a lower level of achievement. These disadvantages might make it harder for adopted children to

accumulate human capital, especially within their first few years of life; thus the Adoption Effect would prevail over the Family Background Effect. This paper explores which set of circumstances dominates. The dominant Adoption Effect hypothesis is that, *ceteris paribus*, adopted children will have statistically significant lower educational attainment and income than biologically raised children. Or the opposite Family Background hypothesis might be true: *ceteris paribus*, adopted children will have statistically significant higher educational attainment and income than biologically raised children.

III. Dataset

The National Longitudinal Survey of Youth (NLSY) is used to complete this study. This dataset, compiled by the Bureau of Labor Statistics, started following a cohort of over 12,000 people between the ages of 14 and 21 in 1979. It asked them a number of questions about their jobs, education, families, and lives in general. It continues to follow this group as much as possible so that it can update the subject's information and ask them new questions every other year.

The sample of adopted children is restricted to those who were living with their adoptive parents at or before the age of two. In order to be counted as adopted, neither of the child's parents could be biologically related thereby eliminating children adopted by a step-parent. The age restriction gives children more time to acclimate to their family and provides a better long-term comparison between the Family Background and Adoption Effects. This restriction may also avoid some major developmental or emotional problems due to a late adoption which might cause the Adoption Effect to be overpowering.

IV. Descriptive Statistics

The adopted and biologically raised children in the National Longitudinal Survey of Youth are compared using basic descriptive statistics. In Table 1 below, the averages of education obtained and income earned in 1996 for the two groups are listed. Adopted young adults achieve at higher levels than biologically raised young adults. They have approximately .6 years more of education than biologically raised young adults and earn approximately \$3,000 more per year. A basic T-test determines that the difference in the mean value of education is statistically significant. The difference in the mean level of educational attainment is significant at the 5% level. However, the difference in income levels is not statistically significant.

The differences in the family background are consistent with the differences found by Christine Bachrach (1983). In Table 1, variables that give insight into the family in which the respondent was raised are presented. These variables are consistent with family background variables discussed in the literature and available in the National Longitudinal Survey of Youth (1979). As seen below in Table 1, the parents who adopt have, on average, over a year more of education than those parents who do not adopt. Also, fewer families that adopt are living in poverty in 1978 than families that do not adopt children. These two family background variables provide a measure of the socioeconomic status of the families in which the respondents were raised. Based on these descriptive statistics alone, the families that adopt are of a higher socioeconomic status than those who did not adopt. Also the adopted families are smaller than the average family with biologically raised children by approximately two children. The higher levels of achievement and the

family background differences which are in favor of adopted young adults allows me to conclude that the Family Background Effect dominates over the Adoption Effect.

Table 1: Descriptive Statistics for National Longitudinal Survey of Youth Sample

	Means of Descriptive Statistics		T-Value
	Adopted	Biological	
Dependent			
Highest Grade Completed	13.61	13.03	2.4156**
Income (full time workers only)	\$ 34,887	\$ 31,867	0.8
Independent			
Highest Grade Completed M	11.99	10.94	
Highest Grade Completed F	12.13	10.75	
Number of Siblings	1.89	3.83	
Poverty in 1978	11%	25%	
White	83%	69%	

*denotes significance at the .1 level

**denotes significance at the .05 level

***denotes significance at the .01 level

V. Regression Model

A. Empirical Model

Next, I run two linear regressions, one for educational attainment and one for income, with explanatory variables for family background and demographic control variables. Each variable included is described in greater detail below and in Table 2. These regressions will allow for analysis on the strength of the Family Background Effect and the strength of each variable. Since there is a statistically significant difference in educational attainment, I determine if adoption still affects the outcome of the young adults after controlling for family background and demographics. A regression predicting income is also run even though the difference was not statistically significant. The regression coefficients will still give insight as to the strength of the family background.

Educational attainment will be measured by the highest grade completed as of 1996, and income will be measured by the total of wages and salaries in 1996. The respondents will be between the ages of 31 and 38. I restrict the sample in the income regression to those working full time, which I define as over 35 hours per week. Therefore, salaries of part time workers do not skew my results.

The two regressions used to predict the two outcome measures are as follows (the variables included in the model are defined in Table 2):

$$\text{Highest Grade Completed} = \alpha + \beta_1(\text{Adopted}) + \beta_2(\text{HGC_Mother}) + \beta_3(\text{Poverty}) +$$

$$\beta_4(\text{No_Siblings}) + \beta_5(\text{Age}) + \beta_6(\text{Male}) + \beta_7(\text{White}) + \mu$$

$$\text{Ln (Income)} = \alpha + \beta_1(\text{Adopted}) + \beta_2(\text{HGC_Mother}) + \beta_3(\text{Poverty}) +$$

$$\beta_4(\text{No_Siblings}) + \beta_5(\text{Age}) + \beta_6(\text{Male}) + \beta_7(\text{White}) + \beta_8(\text{Education}) + \mu$$

Highest grade completed by the respondent's mother is the measure of socioeconomic status and family resources. I considered using fathers' educational attainment as well, but I decided not to because previous literature generally favors the use of mother's education. Shelly Lundberg and Robert Pollak (2007) note that people tend to mate with those of similar education levels and background. Therefore, including only the mother's education is necessary because it will be strongly correlated with the father's. Also, there are many respondents who have a father who is absent from the household; therefore, father's education is a missing variable. Therefore, it is only necessary to include mother's education which is one of the best measures of the Family Background Effect.

Table 2: Variable Definition

DEPENDENT VARIABLES	
Highest Grade Completed	This is the highest grade completed by the young adult as of 1996
Ln(Income)	This is the natural log of income of full time workers in 1996
INDEPENDENT VARIABLES	
Family Background Variables	
Adopted	This is a dummy variable. A value of 1 means that the respondent was adopted by the age of 2 by both its mother and father.
HGC_Mother	This is the highest grade completed by the respondent's mother.
Poverty	This is a dummy variable. A value of 1 means that the family the respondent was raised in was below the poverty line in 1978.
No_Siblings	This variable indicates the number of siblings that the respondent had as of 1979. (This does not include the respondent)
Demographic Control Variables	
Male	This is a dummy variable. A value of 1 means that the respondent is male.
White	This is a dummy variable. A value of 1 means that the respondent is white.
Age	This is the age of the respondent.

Unfortunately, the NLSY does not provide a variable citing a numerical value for family income when the child was growing up in his or her parents' home. Since education will strongly affect income, mother's education will have to serve as a proxy for the resources available for investment in the child's human capital. However as an attempt to gain additional understanding of the economic environment in which the child was raised, a dummy variable indicating whether or not the respondent lived in poverty in 1978 is included. This is a good measure to determine if there are any excess resources available in the family to invest in education and other activities to better a child's human

capital accumulation. This is not a perfect measure, but it does provide some insight as to the financial situation of the family.

Bachrach (1983) finds that adopted children tend to come from smaller families than those made up of biological children. Additionally, Scarr and Weinberg (1978) conclude that a smaller family size leads to higher performance on IQ tests. Human capital theory suggests that having fewer children allows parents to make more resources available for each individual child.

Following many studies completed that measure educational attainment and income earned, I control for major demographic information (Corcoran et al 1976, Bjorklund, 1996). Therefore, I include race, gender, and age in my regression analysis.

In this step of the analysis, the independent dummy variable indicating whether the person is adopted is the main variable of focus. I determine whether family background variables has an impact on the significance and magnitude of the adoption dummy variable. The coefficient on this variable shows the strength of the Family Background Effect in determining the educational attainment and income of the adopted children.

B. Results

The most important finding from the two linear regressions, presented in Table 4, is that the adoption dummy variable is no longer significant. This signifies that including the family background controls in the regression capture the difference in attainment between biologically raised and adopted children as young adults. In other words, it appears that the Family Background Effect may be explained by mother's education, family's poverty status in 1978, and number of siblings in the regression. This leaves the adopted dummy variable to pick up the Adoption Effect. Since that adopted dummy

variable is insignificant, the Adoption Effect does not significantly affect this sample of adopted children.

Table 3: Regression Results for Entire Sample

	Highest Grade Completed	Ln(Income)
Adopted	-.030 (-.118)	-.078 (.360)
Highest Grade Completed by Mother	.257*** (30.455)	.012*** (3.728)
Family in Poverty in 1978	-.383*** (-5.889)	-.143*** (-6.008)
Number of Siblings	-.099*** (-9.198)	-.004 (-1.078)
Age	.024** (2.100)	.012*** (2.945)
White	.125** (2.230)	.133*** (6.671)
Male	-.221*** (-4.396)	.330*** (18.249)
Highest Grade Completed	N/A	.099*** (24.4483)
Sample Size	7620	4547
R Squared	.186	.234

The values in parentheses are t-statistics
 *denotes significance at the .1 level
 **denotes significance at the .05 level
 ***denotes significance at the .01 level

In the regression estimating highest grade completed, all of the family background control variables behave as expected and are highly significant. The highest grade completed by the mother is a measure of the importance of education in the home, as well as a measure of socioeconomic status as education leads to a greater opportunity for a high income. The coefficient means that for every additional year of education the young adult's mother has, the young adult has an additional .257 years of education. The poverty status of the family in 1978 is the best measure of financial resources available to invest

when the young adult was a child. As predicted, if the family was in poverty in 1978, it would have had few resources available to invest in education and other human capital inputs, which explains the negative and significant coefficients in both the education regression and the income regression.

It is hypothesized that more siblings would translate into less human capital inputs per child as parents must allocate their total resources between the children.

Economically, more children would create smaller pieces of the pie for the total amount of time and financial resources a parent can give to each child. Theoretically, this division would translate into less time and resource inputs for each child and thus should result in lower educational attainment. The lower number of inputs would also transfer to less education and then less income. This hypothesis, spurred by Becker and Tomas (1986), is supported by the education regression since the coefficient for the variable indicating that number of siblings is negative and significant. However, since the variable indicating the number of siblings is not significant in the income regression, the same pattern can not be concluded.

All of the control variables are also significant. Both the age and race variables act similarly in the income and education regressions for both groups in that their signs are consistent. The positive coefficient on the age variable means that income and educational attainment increase with age. This pattern makes very clear, intuitive sense. Also, the positive coefficient on the dummy variable for race shows that white people tend to achieve higher levels of education and make more money. The most unusual result from the control variables is that the coefficient for males is different for the education and income regression. It shows that males usually have less education than females but earn

more income. This could be explained by a number of societal preferences and stigmas. It is now common knowledge that more women are attending college than males, but males earn more money (Lenhrer, 2002).

In summary, the main finding in the regression analysis is that the Family Background Effect still dominates the Adoption Effect in explaining the educational attainment and earnings of adopted children relative to biologically raised children. It is important to note that this finding does not contradict all previous research presented in Section II which finds that family effects are very weak in comparison to natural, biological ability. Celia Beckett (2007) finds in a study of children adopted from Romania that the problems faced from abandonment and poor institutionalized care are not ongoing. The problems only show up in the first few months of being in the adopted home. If the outcomes for the young adults in the NLSY sample follow the outcome of those in the Beckett study, then the young adults should not be negatively affected by what I title the Adoption Effect. Her results, however, only attribute one sixth of a child's outcome to a parental variable. This conclusion is not consistent with the results of this study as family variables explain most of the variation. The size of the effects of the family background variables in my sample will be further explored using the Oaxaca decomposition technique later in Section IV.

There is also a study completed by Monica Dalen (2006) that solicited teachers' evaluations of adopted children from China. The teachers did not report any major differences from domestically born children in their language ability. While, the Dalen study is of young children, it adds some explanation of the lack of significance of adoption on educational attainment after controlling for family background. The possible

negative effects on development that I predict to be caused by the Adoption Effect did not impact the NLSY sample just as it did not have a sizable influence on the Dalen sample.

VI. Decomposition Model

A. Empirical Model

Since the regression models indicate that family background explains the difference in achievement levels between adopted and biologically raised adults, it is important to uncover the size of the role that each family background variable plays in determining education. To gain this understanding separate regressions predicting educational attainment for each group are run, because I split my sample into adopted children and biologically raised children. These regression results are used to perform an Oaxaca decomposition. The purpose of the decomposition is to further explain the difference in the mean education level between biologically raised and adopted young adults. The amount of the difference attributable to each family background variable is established.

Unfortunately, the Oaxaca decomposition cannot be used to analyze the income regressions. After initial runs of the regression with two samples split into adopted and biologically raised young adults I find that the coefficients for the family background variables for adopted children are not significant. Therefore, I cannot rely upon them in the decomposition. The sample of adopted children is only 62 full time, working, adopted, young adults. This sample is too small to run regressions with large numbers of independent variables. Additionally since the T-test reported in Table 1 showed that the means are not significantly different, the Oaxaca decomposition is unnecessary. However,

I think that future research should re-explore this analysis of income because a large sample might provide significant results.

Even though the analysis of the difference in earnings between adopted and biologically raised children is dropped, much insight about the importance of family background can be obtained by studying the differences in educational attainment. In the National Longitudinal Survey of Youth sample, the difference in the average years of education obtained between biologically raised and adopted young adults is .58 years in favor of the adopted young adults. The Oaxaca decomposition technique as presented in his 1979 paper about wage discrimination explains how to break down the difference in means of the dependent variable into the amount attributable to each variable included in the regression. The 2008 edition of the George Borjas' textbook also explains the decomposition model which explains the total difference in means, .58 years of education, by determining the amount attributable to each independent variable's difference in means and the difference in returns.

For example, the mothers' average educational attainment for adopted children is 11.99 years while it is 10.94 years for biologically raised children. These differences in the means of the independent variables (e.g., mother's education) could explain some of the difference in the means of the young adults' educational attainment. The decomposition also includes the returns to the family background variables. The difference in the returns is "simply" the differences in coefficients for each family background variable across the two regressions predicting educational attainment. Additionally, the difference in the constant from each regression can explain part of the difference in average educational attainment between the two groups.

The Oaxaca decomposition can be explained more formally in the following steps. First, estimate the separate education regressions labeled 1 and 2 below for each group of young adults. It should be noted that due to sample limitations, only the family background variables are included in the decomposition because in initial runs of the split sample regressions, the demographic variables did not have statistically significant coefficients in both regressions. Including demographic variables would lead to an unstable and unreliable decomposition.

$$1) \text{ Highest Grade Completed}_{BR} = \alpha + \beta_1(\text{HGC_Mother}_{BR}) + \beta_2(\text{Poverty}_{BR}) + \beta_3(\text{No_Siblings}_{BR}) + \mu$$

$$2) \text{ Highest Grade Completed}_A = \alpha + \beta_1(\text{HGC_Mother}_A) + \beta_2(\text{Poverty}_A) + \beta_3(\text{No_Siblings}_A) + \mu$$

Then the steps explained in the textbook by Borjas, 2008 show that we need to subtract Equation 2 from Equation 1 and insert the mean values. In the equation below, mean values are indicated by bars above the variable name. The subtraction and some algebraic manipulation of terms yields (Borjas, 2008):

$$\begin{aligned} \overline{\text{HGC}}_{BR} - \overline{\text{HGC}}_A &= \alpha_{BR} - \alpha_A + \beta_1(\overline{\text{HGC_Mother}}_{BR}) - \beta_1(\overline{\text{HGC_Mother}}_A) + \\ &(\beta_{1BR} * \overline{\text{HGCM}}_A) - (\beta_{1BR} * \overline{\text{HGCM}}_A) + \beta_2(\overline{\text{Poverty}}_{BR}) - \beta_2(\overline{\text{Poverty}}_A) + \\ &(\beta_{2BR} * \overline{P}_A) - (\beta_{2BR} * \overline{P}_A) + \beta_3(\overline{\text{No_Siblings}}_A) - \beta_3(\overline{\text{No_Siblings}}_A) + (\beta_{3BR} \\ &* \overline{S}_A) - (\beta_{3BR} * \overline{S}_A) \end{aligned}$$

Further simplification yields:

$$\begin{aligned} \Delta\text{HGC} &= (\alpha_{BR} - \alpha_A) + \beta_{1BR} (\overline{\text{HGCM}}_{BR} - \overline{\text{HGCM}}_A) + (\beta_{1BR} - \beta_{1A})\overline{\text{HGCM}}_A \\ &+ \beta_{2BR} (\overline{P}_{BR} - \overline{P}_A) + (\beta_{2BR} - \beta_{2A})\overline{P}_A + \beta_{3BR} (\overline{S}_{BR} - \overline{S}_A) + (\beta_{3BR} - \beta_{3A})\overline{S}_A \end{aligned}$$

These terms can be defined as follows:

- ΔHGC is the difference in mean educational attainment between adopted and biological respondents.
- $\beta_{\text{IBR}} (\overline{\text{HGCM}}_{\text{BR}} - \overline{\text{HGCM}}_{\text{A}})$ is my estimate of the amount of the ΔHGC that is due to the differences in the mean educational attainment of mothers.
- $(\beta_{\text{IBR}} - \beta_{\text{IA}})\overline{\text{HGCM}}_{\text{A}}$ is my estimate of the amount of the ΔHGC that is due to the difference in the returns to mother's education. In terms of the education, the difference in the returns is simply the difference in coefficients $(\beta_{\text{IBR}} - \beta_{\text{IA}})$.
- The terms relating to the poverty and sibling variables can be explained in the same way as mother's education.
- $(\alpha_{\text{BR}} - \alpha_{\text{A}})$ is the difference in the constants in the two regressions which is an unexplained amount in the decomposition.

It is not possible to fully explain the difference in the means of educational attainment between biologically raised and adopted young adults. This unexplained amount is a major weakness of the Oaxaca decomposition technique. However, to be fully comfortable with the decomposition analysis, we would have to control for all the dimensions in which these two groups of children differ which is very unlikely to ever be able to determine. The difference in the constant terms represents part of this unexplained amount.

B. Results

My first attempt at running two full regressions, one for each group, with all three family background variables and three demographic control variables produced

insignificant coefficients for the demographic variables. Therefore, I eliminate them from the decomposition as the results cannot be relied upon for further analysis. The decomposition only includes family background variables. Given the small sample size of adopted children, fewer variables will allow for a more stable regression. Below the results of regressions used for the decomposition are presented. The same regression is run separately for adopted and biologically raised young adults. The results of the regression analysis are presented in Table 4, along with the mean values for each variable.

$$\text{Highest Grade Completed} = \alpha + \beta_1(\text{Adopted}) + \beta_2(\text{HGC_Mother}) + \beta_3(\text{Poverty}) + \beta_4(\text{No_Siblings}) + \mu$$

Table 4: Highest Grade Completed Regression Results with only Family Background Variables and Means Presented

	Adopted		Biologically Raised	
	Regression Results	Mean	Regression Results	Mean
Constant	10.234		10.783	
Highest Grade Completed by Mother	.251*** (3.331)	12.13	.256*** (30.203)	10.75
Family Poverty Status 1978	-1.232 (-1.593)	.11	-.423*** (-6.732)	.25
Number of Siblings	.238** (2.073)	1.89	-.103*** (-9.719)	3.83
Highest Grade Completed by Young Adult		13.61		13.03
Sample Size	76		7544	
R Squared	.186		.183	

The values in parentheses are t- statistics

*denotes significance at the .1 level

**denotes significance at the .05 level

***denotes significance at the .01 level

The total difference to explain in the decomposition is the difference between the average level of education completed by the young adult which is 13.61 years for adopted

and 13.03 years for biologically raised young adults. The difference is .58 years in favor of adopted children. Table 5 below presents the key numbers from the decomposition after subtracting the regression for highest grade completed for adopted young adults from the regression for biologically raised young adults. Each number is the difference in education due to the differences in the means of the education level of each group.

Table 5: Results from Decomposition for Highest Grade Completed

Mean Difference for Young Adult's Highest Grade Completed (total amount to explain)	-.58	
Differential Due to Means		
Differential Due to Mother's Education Level	-.353	
Differential Due to Poverty Status in 1978	-.059	
Differential Due to Number of Siblings	-.200	
<i>Sum of Differential Due to Means</i>	-.612	
Differential Due to Returns (Coefficients)		
Differential Due to Mother's Education Level	-.061	
Differential Due to Poverty Status in 1978	.182	N/A
Differential Due to Number of Siblings	-.645	
<i>Sum of Differential to Returns (not including poverty)</i>	-.706	
Unexplained Part of the Difference		
Difference in the Constant	.549	
Further Difference	.063	

Table 5 presents the results of the full Oaxaca decomposition. It demonstrates the importance of the family background variables (HGC_Mother, Poverty, No_Siblings) in increasing the educational attainment of adopted children relative to biologically raised children. For example, since adopted children have higher mean values for each family background variable, their educational attainment is .612 years more than biologically raised children. In Table 5, this is the sum of the differential due to means. Also, adopted children have higher returns to two of the three family background variables (HGC_Mother and No_Siblings), and the third, (Poverty) is statistically insignificant.

Table 5 also shows that these differences in coefficients also add to the educational attainment of adopted children relative to the biologically raised children by .706 years of education. This is the sum of the differential due to returns. I conclude from the Oaxaca decomposition that the three family background variables add approximately 1.318 years of education attainment to the adopted children (excluding the returns to poverty status). Thus, more than the entire gap in educational attainment between the two groups is explained. This suggests that the Family Background Effect dominates the Adoption Effect.

The mother's education level is the most influential family background variable in determining the young adults' own educational attainment. It accounts for over .35 years difference in educational achievement between the two groups which is 61% of the mean difference. Mothers of adopted children have a higher average level of education than mothers of biologically raised children; the means have an actual difference of 1.41 years of education. Mothers' education level gives insight into the environment in which the child was raised. It serves as a proxy for the socioeconomic status of the family as that is often determined by education and income which education plays a powerful role in determining. It also provides a measure of the amount of human capital the mother is able to directly invest in her child as she will be able to pass along more if she has more of it to pass along. Lastly, her educational attainment gives a possible measure of the attitudes towards education in the home. A mother with more education may expect the same of her child and give that child more opportunities to get education. Therefore, mothers' education is a very powerful variable in explaining the possible opportunities for human capital accumulation. This theory is supported because statistically the strong effect of

mothers' education is very apparent. Note, that while the mean difference has the strongest effect on the young adults; the returns to mother's education are close to the same. Thus, I can conclude that those with higher educated mother's will be more likely to have a higher education level themselves.

There is a negative effect on the educational attainment of biologically raised children due to the larger average numbers of siblings. This supports the theory because it is hypothesized that additional siblings take away from a person's human capital accumulation. The mean difference of approximately two more siblings for biologically raised young adults has a negative effect on their educational attainment of .200 years of education in comparison to adopted young adults. The difference in the average number of siblings accounts for 33% of the total difference in educational attainment.

Interestingly though, through some additional explanatory research there appears to be a non linearity in the effects of siblings on adopted children and biologically raised young adults. Unlike mothers' education, the coefficients presented in Table 5 shows that siblings affect each group differently. The sign of the two coefficients show that siblings have a positive effect on educational attainment for adopted young adults and a negative effect on biologically raised young adults' education. Thus, the hypothesized pattern of siblings having a negative effect on education does not hold true for adopted young adults. Adopted children are better off if they have at least one additional sibling. Future research could explore the difference in the returns to siblings and the effects of each additional sibling on education in greater detail.

However, one possible explanation is that families that choose to adopt have more income and considerably fewer children as shown in the descriptive statistics presented in

Table 1. It is plausible that nearly all families that choose to adopt have enough resources to properly invest in the human capital of their children, or they would not have chosen to adopt. Plus, there is an outside agency that ensures that the family looking to adopt will be able to support the child. Therefore, there is a built in assurance system that it will be probable that there is not a large need to divide resources in a way that is harmful to the development of children in adopted families. Additional siblings might be beneficial to adopted children because they can learn more about proper interactions with other people, which Corcoran *et al* (1976) noted is important in determining outcomes for young adults. Again though, further research should pursue this discrepancy more as the results for adopted children might be skewed by the small sample of adopted children. Additionally, a few outliers exist as the only adopted children whose educational attainment is twenty years or greater happen to have two siblings.

Surprisingly the poverty status of the family in 1978 does not have as large of an effect on the average educational attainment of the groups. In fact, it only explains about 10% of the difference in the means. The regression includes poverty status because it serves as a measure of the ability of the family to invest in the children's human capital. However, future research that has a better measure of the financial resources available during childhood might find that the resources play a larger role in determining the educational attainment of the children. A sample with a financial resources variable and more adopted children will make the entire decomposition even better. As I have discussed through the entire paper, the small sample of adopted children makes stable results harder to obtain. This problem plagues the analysis of the coefficients to poverty

status as well. The difference in the coefficients cannot be determined because the coefficient for adopted young adults is not significant.

VI. Conclusion

The results of this study indicate that adoption does not significantly affect the educational attainment of young adults when family background effects are controlled. Even though adoption has always been a supported practice, there have been a number of studies that show that the children are still at a greater disadvantage than they would be if they were biologically related to their parents. However, a majority of these studies, like The Texas Adoption Project, measure IQ scores and conclude that biology has the largest impact in determining intelligence (Horn, 1983). While this may be true, this study found that the attainment levels, of adopted children are above biologically raised children. Instead, the family characteristics are the biggest determinants in the outcomes of children, whether or not they are biologically raised. We can assume that the family is able to encourage the best application of children's natural intelligence through proper accumulation of human capital. This a major push for the direction of nurture over nature in the everlasting debate between the two.

Parents that have the ability to invest more in their children's human capital will see the results in higher levels of educational attainment and higher income for their children. Their ability to invest in their children's human capital, titled the Family Background Effect in this paper, outweighs the Adoption Effect. Again, the Adoption Effect captured the possible negative effects of being adopted such as poor pre and post birth care and psychological damage. The Adoption Effect might have been stronger if the sample in this study was not limited to children adopted before the age of two. Examining

the effects of different ages at which children are adopted could be an avenue in which to expand upon this study.

The size of the Family Background Effect was further explored using the Oaxaca Decomposition technique which determines the strength of each family background variable on the educational level of the family. I find that the education level of the mother has the most influence on the educational attainment of the young adult. In fact, the higher average level of education that mothers who adopt their children have accounts for over half of the difference in the average level of education between adopted and biologically raised children. The other two family background measures, poverty status and number of siblings, contribute to explain the close to the full difference in the mean values of educational attainment between adopted and biologically raised young adults. For reasons that are not fully understood, the presence of additional siblings has a positive effect on adopted young adults and a negative effect on biologically raised young adults.

The measures of the Family Background Effect are not perfect. It is impossible to measure the entire effect and this study is limited by some variable selection. Mainly, there is not an ideal way to measure the financial resources of the family. Instead, the mother's education and poverty level in 1978 serve as proxies. A good expansion of examining the competing effects would include data on the financial resources of the family and a larger data sample which would encourage more stable results. It is important to note, though, that realistically the Family Background Effect is controlled for in more ways than the three variables (mother's education, poverty status, and number of siblings) which are included in this study. In actuality, the selection process of adoption agencies is controlling for family background. Families must prove that they are stable and capable of

taking care of children, something to which parents having biological children are not subjected.

It is important, then, that adoption agencies and the government consider the strength of the Family Background Effect when placing children in homes. They should take all steps necessary to insure that the family has the ability and attitude that will give the child the best opportunity for achieving high levels of education, since high levels of education and the resources of parents translate into higher earning for the young adults. With so many potential parents waiting to adopt in the United States, these agencies have the opportunity to be selective.

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