Further Examining the Relationship between Educational Attainment and Fertility:

Intervening Effects of Early Life Characteristics

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Defense Date: April 11, 2023

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Abstract

This paper analyzes the characteristics present in womens' adolescences and the ways in which these factors serve as precursory mechanisms which influence womens' propensities to become college educated, as well as their propensities to have children throughout their lifetimes. Using different specifications of linear regression models, this paper considers various categories of control variables to single out how different areas in adolescent life affect the relationship between college education and fertility. Results indicate that early life characteristics moderately explain (approximately 40%) the effect of college education on completed fertility, and a noticeable portion of this explanation is derived from parental education level. The findings within this paper corroborate a negative correlation between completing college and fertility.

I. Introduction

Large literature supports that women who are higher educated beyond a high school education tend to have less children overall than their female counterparts who are less educated overall (Brand and Davis, 2011). This effect may operate in part by delaying the timing of births: women postpone the responsibilities and constraints of childbearing and instead invest their energy into furthering their human capital through education (Brand and Davis, 2011). Once they complete their higher education, women may enter more demanding careers, so they birth less children overall given their time and career constraints. Large literature also corroborates an inverse relationship between higher education and childbearing (Klepinger, Lundberg, and Plotnick, 1995). Women who give birth at a younger age tend to be less likely to pursue higher education, and this effect is further influenced by young women's socioeconomic statuses and access to education opportunities (Brand and Davis, 2011).

This paper estimates how much of the relationship between college education and fertility can be explained by women's family background and early life characteristics. Rather than explore the effect of college education on fertility, this paper examines women's precursory circumstances which both affect their propensity to attend college and their propensity to have children throughout their lifetimes. *Throughout this paper, I will refer to the number of children birthed by 2020 as a woman's level of completed fertility.

In the U.S., for young women who are able to attend college and complete their degrees, their lives look different from other young women who do not take this same path. This is from where the motivation for my paper stems: to separate this out, and to try to make more sense of the differences in the early lives of women who do and do not attend college. Young women may face pressure, expectations, and norms that they should go on to earn their college degree- and these expectations may be instilled upon them by the household in which they grew up. Parents' levels of education, career, socioeconomic status, and childbearing decisions all play a role in the choices that their children will go on to make about their own futures. The environment in which young women are raised may factor into their understanding of what constitutes "achievement" and what social roles they expected to take on in their social spheres (Edin and Kafalas, 2005). For some young women, achievement may be understood to be success in building a large family, while others may be socialized to view achievement as a degree and starting a career (Edin and Kafalas, 2005). All of these factors present in womens' early lives play a role in their young adulthood decisions.

The dataset I will be using is the National Longitudinal Survey of Youth from 1997. I will incorporate the data acquired from approximately 3,800 females who re-interviewed from year to year, the most recent interview being in 2020. My key 'x' variable is a binary variable

representing: this woman completed college by 2020 (1), or she did not (0). My key ‘y’ variable is the number of children born to the respondent as of 2020.

Contemporary economic literature already supports that a correlational relationship exists between educational attainment and fertility in adult women. While this relationship is not necessarily causal, these concepts are certainly related. Some economic literature already considers the role of background factors and how these can explain in part the relationship between these two variables. Brand and Davis (2011) previously used the National Longitudinal Survey of Youth from 1979 to examine early life factors and quantify a propensity that women will attend college. Nisen et al (2014) used a cohort of Finnish women born in 1940-1950 to study the effect of early life factors on education and fertility. I extend and improve on these analyses by using a different and more recent dataset, as well as a more recent birth cohort. Additionally, the richness of my dataset provides me the ability to control for a higher and different array of early life background variables than the variables controlled for in the above papers. Thus, I will contribute results which potentially contain less omitted variable bias than existing literature.

My results show that when controlling for an extensive number of early life characteristics, a woman with a college degree is expected to have 0.346 less children in her lifetime than a woman without a college degree. Across my regression specifications, the coefficient on college becomes less negative when more early life factors are controlled for. When considering the implications of the youths’ mothers being college educated or not, generally I find that college educated youths whose mothers do not have a college education, have fewer children overall than youths without a college education. Overall, early life

characteristics of the family and household seem to moderately explain the effect of college education on completed fertility.

II. Literature Review

The research within this paper on the intervening effects of early life background on college educational attainment and lifetime fertility relate to a wider literature on the multi-directional relationships between these concepts.

Of all of the early life characteristics which may be present in a youth's childhood and adolescence, I have placed the two papers below into a category which consider the factor of time spent in early life schooling, (some considering if this schooling was compulsory by law), and how additional years in early schooling affect future fertility (DeCicca and Krashinky, 2016; Ali and Gurmu, 2018). Philip DeCicca and Harry Krashinsky's (2016) working paper on this topic explored compulsory schooling laws for minors in Canada; this factor they found increases the probability a woman births at least one child (DeCicca and Krashinky, 2016). Their results suggested that increased secondary education levels lead women to birth more than zero children, but lead these women to have generally fewer children than the number of children birthed by a less-educated woman (DeCicca and Krashinky, 2016).

Additionally, Fatma Romeh M. Ali and Shiferaw Gurmu (2018) explore a change in compulsory schooling laws in Egypt in 1977, which decreased primary education by one year (Ali and Gurmu, 2018). They concluded that the more educated the women in their sample, the less children these women had overall- but by way of postponing childbearing later ages, not because the women desired less children (Ali and Gurmu, 2018). The papers in the above category consider the effects had by the addition or subtraction of one year of schooling in the

primary level of schooling. My paper will consider the addition of schooling in the period of college-age schooling, and factors in the youth's early life that encourage this pursuit of college education. This will contribute more insight into understanding if the effect of one additional year of schooling at the college level on completed fertility is greater than one additional year of schooling at the primary or high school level on completed fertility.

A second major category of papers I have identified are those who look to other early life events (beyond number of early schooling years) and circumstances relating to socioeconomic positionality, such as background factors which either affect the propensity for one to become more educated or background factors which affect the number and timing of births (Klepinger, Lundberg, and Plotnick, 1995; Tropf and Mandemakers, 2017; Kramarz et al., 2019; Nisen et al., 2014; Brand and Davis, 2011). It is in this category I place the papers which suggest reverse causality as well, where it is suggested that early childbearing reduces the propensity to become college educated, and potentially have fewer children later in life (Klepinger, Lundberg, and Plotnick, 1995).

Klepinger, Lundberg, and Plotnick (1995) consider the effect of childbirth before the age of 18 as a factor which may decrease one's completion of college: they ultimately find that early childbearing does indeed decrease educational attainment by 1-3 years, and this effect varies slightly based on race (Klepinger, Lundberg, and Plotnick, 1995). Another specific literature on this topic is Tropf and Mandemakers' (2017) publication in which they examined identical twins' educational attainment and fertility, probing the common conception that the relationship between these education and fertility is causal (Tropf and Mandemakers 2017). After controlling for the twins' backgrounds, the researchers concluded that the causal-appearing relationship between education and fertility is spurious and inaccurate: rather education's correlation with the

delay of one's first birth is primarily explained by socioeconomic background rather than the genetic makeup of the individuals (Tropf and Mandemakers, 2017).

Similarly, Kramarz et al. (2019) "...used twin/sibling fixed effects to remove family background factors" on a Swedish sample of adult men and women. Controlling for such background factors resulted in observing that investment in human capital and one's completed fertility became more positively associated rather than negatively associated as seen before the background was controlled for (Kramarz et al., 2019). Thus, Kramarz et al. postulated that it is specifically the family-specific preferences which children were made aware of when they are younger, which influence the education decisions and fertility choices they make as they grow up (Kramarz et al., 2019).

Additionally, Nisen et al. (2014) controlled for a series of observed and unobserved early life factors to estimate the effect of differing education levels on fertility within a sample of Finnish women using poisson and logistic regression models (Nisen et al., 2014). Their findings indicate that family background moderately explains a negative correlation between educational attainment and fertility (Nisen et al., 2014). They ultimately found that observed family characteristics can explain about 3-28% of higher education and fertility outcomes (Nisen et al., 2014, page 322).

Lastly, the most closely related paper in this category to my own is a 2011 publication in *Demography,* entitled "The Impact of College Education on Fertility: Evidence for Heterogeneous Effects" by Jennie E. Brand and Dwight Davis. In this paper, the authors create a control variable in which they include a variety of early background factors which are all contributory to the propensity to attend college: and the researchers use these "pre-college covariates" to give each individual a propensity score (Brand and Davis, 2011). They predict that

a lower propensity-to-attend-college score will bring about "larger fertility-decreasing effects of college" than women with a higher propensity score (Brand and Davis, 2011). Ultimately, this research suggests that women from more "disadvantaged socioeconomic backgrounds" experience a lower propensity to attend college; and for those who do attend college, their fertility is postponed and overall less (Brand and Davis, 2011).

The papers in the above category all have a control term in common which contains a set of prominent early life factors. My dataset provides me the access and ability to control for additional and different background factors than in the above papers. Additionally, I am using a different and more recent dataset than the above two papers, thus contributing results brought about by a more recent birth cohort of women. My approach will also involve categorizing background characteristics, so as to see which sets of early life factors matter more than others- and explain more of the effect between education and fertility.

III. Methodology

i. Data and Sample

To answer my research question, I am using the 1997 cohort of the National Longitudinal Survey of Youth. This dataset follows a cohort of 8,984 males and females who were born between 1980 and 1984, and were living in the U.S. When the cohort was assembled in December 1996, these individuals were between the ages of 12-16. The current cohort has been re-interviewed 18 times since the first interview in 1997. The most recent data year available is 2020. In 2020, the youngest women in my sample are 36. Ideally, I would have restricted my sample to women aged 40 or older in 2020- an age where women are likely to have attained all the education they ever will and to have already had all the children they ever will by this year.

However, using age 40 as a minimum would have restricted my sample size too greatly. The sample size of women who provided data in 2020 is approximately 3,800. The unit of observation is individual women. In constructing my analysis sample, I am excluding women who are not native-born in the United States. I made this decision in an effort to exclude the influence of immigration processes and stressors on how these women's adolescences developed and shaped.

ii. Descriptive statistics of data

Before I describe my key variables and regression specifications, it is useful to examine some trends in this sample of women in terms of the commonness of being college educated and the distribution of children birthed.

Table 1 below shows the relationship between college degree attainment and the number of children the women in my sample birthed in their lifetimes as of 2020 by way of cross-tabulation. I included column percentages to display that for women who did not earn a college degree, a certain percentage had zero children, one child, etc. Likewise, for women who did earn a college degree, a certain percentage birthed no children, one child, etc.

Table 1. The number of children birthed by women with and without a college degree.

Number of children	No college degree	Have college degree	Total
0	591 (24%)	444 (34%)	1,035
1	423 (17%)	252 (19%)	675
2	624 (25%)	381 (29%)	1,005
3	488 (20%)	165 (13%)	653
4	244 (10%)	43 (3%)	287
5	78	13	91
6	35	3	38
7	10	1	11
8	6	0	6
9	4	1	5
Total and percentage	2,503	1,303	3,806

In first examining the lower number of children section (zero or one child): 41% of the women who do not have a college degree had zero or one child. Whereas 53% of the women with a college degree have zero or one child. Additionally, in looking at the fields which display a greater number of children: 30% of those women without a college degree have three or four children. Whereas 16% of college-educated women have three or four children. This displays a pattern that women *with* a college degree cluster around having less children overall compared to their counterparts without a college degree.

iii. Variables

My key ‘x’ variable is whether the respondent completed college by 2020. This is a binary variable: completed college (1), did not complete college (0). This will indicate that for those women with (0) in this value spot, their highest education level is high school or less. Women with a (1) value have earned at least a Bachelor’s degree, and potentially higher degrees beyond this. I obtained the data for this variable from this question asked in the 2020 re-interview: “highest degree ever received”, then differentiated between those who earned at least a Bachelor’s degree and those who did not. My key ‘y’ variable is the number of children born to the respondent as of 2020, per the question asked on the number of biological births as of 2020. In this paper, I will refer to this value of total births by 2020 as the woman’s “completed fertility” level.

Since my objective is to investigate how much of the relationship between college education and fertility can be explained by family background and early life factors, I am including multiple categories of control variables. I have divided my dataset’s rich set of personal background data into blocks, such that related variables can be inserted into my regression specification, and removed, to examine the intervening effect on ‘y’. A great deal of early life background characteristics are confounding in nature- meaning that they may affect the likelihood of the youth attending college, and may affect the youth’s fertility decisions. Thus, by way of controlling for these varieties of confounding variables, I eliminate bias by making the women in my sample otherwise identical except for college completion. Thus, if there is any difference in completed fertility, I can attribute the difference to those who completed a college degree and those who did not.

My first block of control variables I have labeled as “basic”. My second control of interest is the respondent’s parents’ level of education. My third block of controls are composed of the respondents’ parents’ characteristics beyond their education level. My fourth block of control variables are the respondents’ family and household characteristics. My final block is composed of some of the respondent’s individual characteristics entitled “youth”. I have provided labels to each block of these controls in my baseline regression specification. In the chart below, I have detailed the specifics of every control variable in each of these blocks.

Table 2a. List of Each Control Variable included within each Block

Basic	● Race ● Living in an urban or rural place at the age of 12
Parent’s Education	● Mother completed college ● Father completed college
Other parental	● Age of mother’s first child ● Degree to which mother is supportive of father ● Degree to which father is supportive of mother ● Degree to which mother monitors youth ● Degree to which father monitors youth ● Parent report of youth breaking limits ● Parent report of setting limits for youth ● Mother’s parenting style ● Father’s parenting style ● Parent’s religiosity
Family	● Youth ever experienced hard times ● Youth experienced frequent non-parent childcare as a young child ● Household gross income in 1997 ● Household net worth in 1997 ● Degree to which family engages in cohesive routines ● Family risk index ● Household physical environment risk index
Youth	● Youth report on their breaking of limits ● Youth report on their setting of limits ● Youth level of delinquency ● Youth’s substance use

I will insert these blocks one at a time to examine the ways in which 'y' changes. This will help me understand which control variables have the greatest effect on the relationship between college education and completed fertility. Each of the control variables above are pulled from the data acquired at the first interview in 1997. In 1997, each respondent (or youth as I will frequently refer to them) answering the survey questions was between the ages of 12-16. Since I am aiming to represent the most accurate information on the respondent's characteristics of their adolescences, using the data reported in this year where the youths are actively within their adolescent years seemed to accomplish this most strongly.

iv. Regression Specifications

The baseline regression specification is:

$$Completed\ fertility_i = \beta_0 + \beta_1(College_i) + \beta_2(Basic)_i + \beta_3(Parental\ Education)_i + \beta_4(Other\ parental)_i + \beta_5(Family)_i + \beta_6(Youth)_i + \varepsilon_i$$

The "*i*" subscripts denote individual women in my sample. β_1 estimates how completed fertility (y) changes in response to college completion. As I detail above, "Basic", "Parental Education", "Other parental", "Family", and "Youth" represent each block of control variables. The betas in front of each block estimate how completed fertility (y) changes in response to the inclusion of these control variables. I ran three regression specifications (with each set of control variables added in overtime) to assess how much early live factors explained the difference between college education and fertility. The first specification I ran, I eventually included **all** control variables listed in Table 2a. However, as you will see in my results below, adding in all of these control variables greatly decreased my sample size across the columns from 3,806 to 427.

Due to the private nature of many of the questions asked in the NLSY survey, some respondents chose to not answer certain questions. These omissions of answers are coded in the dataset as missing data. Thus, when I included the answers to these survey questions as certain control variables, Stata ran the regression with the data with which it had access. This explains why we see such a decrease in sample size. If I had had more time, I would have run an additional regression where I included only the 427 respondents across the columns.

To remedy this number of observations problem, I ran the same baseline regression specification as above, but I ran it with a subset of control variables that I detail below in Table 2b. I call this Specification (2). I eliminated the inclusion of control variables with a lot of missing data, so as to not skew my sample size. The crossed-off control variables indicate those with a large amount of missing data. I only included in each block the control variables listed.

Table 2b. Each control variable within each block that I am including in Specification #2

Basic	● Race ● Living in an urban or rural place at the age of 12
Parent's Education	● Mother completed college ● Father completed college
Other parental	● Age of mother's first child ● ~~Degree to which mother is supportive of father~~ ● ~~Degree to which father is supportive of mother~~ ● ~~Degree to which mother monitors youth~~ ● ~~Degree to which father monitors youth~~ ● Parent report of youth breaking limits ● ~~Parent report of setting limits for youth~~ ● ~~Mother's parenting style~~ ● ~~Father's parenting style (drops to 1595 when included)~~ ● ~~Parent's religiosity (drops to 1597 when included)~~
Family	● Youth ever experienced hard times ● Youth experienced frequent non-parent childcare as a young child

	• Household gross income in 1997 • ~~Household net worth in 1997~~ • ~~Degree to which family engages in cohesive routines~~ • ~~Family risk index~~ • ~~Household physical environment risk index~~
Youth	• Youth report on their breaking of limits • ~~Youth report on their setting of limits~~ • Youth level of delinquency • Youth's substance use

Finally, I then ran a third regression specification which includes an interaction term. This interaction term is between the respondent completing college and their mother completing college. Interacting these variables will help uncover if the effect of college education on completed fertility is different if the respondent's mother is college educated. If I had more time, I would have included additional interesting interaction terms between the respondent's college education and other early life factors.

Specification (3):

$$Completed\ fertility_i = \beta_0 + \beta_1(Momcollege_i) + \beta_2(Youthcollege)_i + \beta_3(Youthcollege * Momcollege)_i + \beta_4(Basic)_i + \varepsilon_i$$

I ran this regression specification without basic controls, then with basic controls.

IV. Results

i. Baseline regression specification results

Table 3. The Effect of College Education on Completed Fertility, factoring in All Control Variables

	1	2	3	4	5	6	7
College	-0.578*** (-11.48)	-0.495*** (-8.54)	-0.392*** (-6.03)	-0.382*** (-3.16)	-0.383* (-2.58)	-0.346* (-2.26)	-0.360** (-2.97)
Basic	X	Yes	Yes	Yes	Yes	Yes	Yes
Parental Education	X	X	Yes	Yes	Yes	Yes	X
Other parental	X	X	X	Yes	Yes	Yes	Yes
Family	X	X	X	X	Yes	Yes	Yes
Youth	X	X	X	X	X	Yes	Yes
N	3,806	2,775	2,235	598	441	427	621

Notes: Column 1 only regresses college education on fertility with no controls. Each additional column factors in an additional control block, as described in Table 2a. Column 6 includes all control variables described in Table 2a. Column 7 includes all control variables except parental education.
*, **, and *** indicates significance at the 90%, 95%, and 99% level respectively.

As Column 1 shows, a woman with a college degree is expected/predicted to have 0.578 less children in her lifetime than a woman without a college degree. When controlling for only the youth's parents completing college, a woman with a college degree is then expected to have 0.495 less children in her lifetime than a woman without a college degree. When the remaining blocks of control variables are added in, the coefficient remains approximately -0.39 across the remainder of the columns. This indicates that when controlling for other parental characteristics, family characteristics, and the youth's personal characteristics, a woman with a college degree is

expected to have 0.39 less children in her lifetime than a woman without a college degree. This magnitude only slightly becomes less negative when all variables are controlled for as shown in Column 6. When all factors I included in this research were controlled for, a woman with a college degree is then expected to have 0.346 less children in her lifetime than a woman without a college degree. Overall, across the columns, the coefficient on college becomes less negative when more early life factors are controlled for. Additionally, all of these results are statistically significant at varying levels of significance.

One notable piece to point out is when examining Column 2 specifically, controlling for only parental education level noticeably dropped the coefficient magnitude from Column 1. Beyond that, in Columns 3-6, about 25 control variables weren factored in, yet there were very marginal differences among the magnitudes of the coefficients. This suggests that it is parental education specifically which has a greater effect on explaining the relationship between college education and fertility, relative to the other early life factors I included in my set of controls. This is not to say that the other control variables I included do not have at least some significance in explaining the relationship between college education and fertility, because we can observe a noticeable difference in the magnitudes between columns 1 and 6, but perhaps these early life factors play less of a role overall in explaining this negative correlation. To prove this point even further, I ran Column 7, where all control variables are included except for parental college education. We can observe the coefficient on college becomes slightly more negative, increasing to -0.36, relative to Column 6. This corroborates the point that it is parents' education level, controlling for it versus not controlling for it, which may have a more important effect in this relationship relative to the other background characteristics.

ii. Regression specification (2) results

Table 4. The Effect of College Education on Completed Fertility, factoring in a Smaller Subset of Control Variables to make more Consistent My Sample Size:

	1	7	8	9	10	11	12
College	-0.578*** (-11.48)	-0.495*** (-8.54)	-0.392*** (-6.03)	-0.355*** (-5.34)	-0.373*** (-5.15)	-0.313*** (-4.29)	-0.365*** (-5.33)
Basic	X	Yes	Yes	Yes	Yes	Yes	Yes
Parental Education	X	X	Yes	Yes	Yes	Yes	X
Other parental	X	X	X	Yes	Yes	Yes	Yes
Family	X	X	X	X	Yes	Yes	Yes
Youth	X	X	X	X	X	Yes	Yes
N	3,806	2,775	2,235	2,129	1,803	1,800	2,122

First, it is important to notice how large the sample size now remains across columns. I am controlling for less early life variables now, so I will discuss the potential for omitted variable bias in the discussion section below. However, having a more consistent and large sample size may improve the validity of these results overall. Columns 8-11 slowly introduce the subset of each control variable block. Generally, with each addition of more control variables, the coefficient magnitude remains fairly constant across the columns. Column 11 indicates that when controlling for the smaller subset of all the control variables, a woman with a college degree is then expected to have 0.313 less children in her lifetime than a woman without a college degree.

Similarly, Column 12 controls for all variables in the subset **except** for parental education. We can observe a more negative coefficient on college, meaning that when not controlling for parental education, a college educated youth is expected to have 0.365 less children in her lifetime relative to a non-college-educated counterpart. These results are all statistically significant as well. Perhaps the difference between Column 11 and 12, corroborates the meaning derived from the results in Table 3, that parental education plays an important role in explaining the effect of youth college education on fertility. Table 4 may offer a more accurate depiction of what is at play however due to the larger sample size. Table 4 may still contain omitted variable bias, but it contains less bias in the sense of a small, potentially misrepresentative sample size.

iii. Interaction model results

My next results are derived from the interaction between the youth being college educated and her mother being college educated. First, I ran the regression with no controls. Below are the coefficients attached to each term.

Y_hat = [2.02 - 0.349(*Mothercollege)* - 0.600(*Youthcollege)* + 0.277(*Youthcollege*Mothercollege)*]

Y_hat = [2.02 - 0.600*Youthcollege*] if *Mothercollege* = 0

Y_hat = [(2.02 - 0.349) + (-0.600 + 0.277)*Youthcollege*] if *Mothercollege = 1*

	1
Mother completed college	-0.349*** (-5.25)
Youth completed college	-0.600*** (-7.71)
Youth*Mother	0.277* (2.54)

N = 3,519

For youths whose mothers' do not have a college education, a college educated youth on average has had 0.6 fewer children by 2020 than youths without a college education. Being a college educated youth **decreases** the total number of children birthed by 2020 by 0.277 **less** for youths whose mothers have college degrees, than for youths whose mothers do not have college degrees. Among youths without college degrees, those whose mothers have college degrees, have had 0.349 less children by 2020 than those youths whose mothers do not have college degrees. All of these results are statistically significant at varying levels.

Interaction model results with basic controls:

Y_hat = [1.975 - 0.314(*Mothercollege)* - 0.544(*Youthcollege)* + 0.222(*Youthcollege*Mothercollege)*]

Y_hat = [1.975 - 0.544*Youthcollege*] if *Mothercollege* = 0

Y_hat = [(1.975 - 0.314) + (-0.544 + 0.222)*Youthcollege*] if *Mothercollege = 1*

	1
Mother completed college	-0.314*** (-4.13)
Youth completed college	-0.544*** (-6.01)
Youth*Mother	0.222 (1.81)

N = 2,624

Once controlling for our basic variables: for youths whose mothers' do not have a college education, a college educated youth on average has had 0.544 fewer children by 2020 than youths without a college education. Being a college educated youth **decreases** the total number of children birthed by 2020 by 0.222 **less** for youths whose mothers have college degrees, than for youths whose mothers do not have college degrees. Among youths without college degrees,

those whose mothers have college degrees have had 0.314 less children by 2020 than those youth whose mothers do not have college degrees. The magnitudes on mother's college and youth's college are overall less than when we did not include basic controls. The coefficient on the interaction term is not statistically significant.

V. Discussion

My first key takeaway from my results is assigning a numerical value to how much of the effect of college education on fertility can be explained by early life characteristics. I calculate this amount by considering the percent change between my Table 3 Column 1 model with no control variables and my Table 3 Column 6 model which factors in all of the control variables I included. This percent change is 40.14%. This percentage change is also negative. This means that when we controlled for early life characteristics, we can understand that 40.14% of the negative effect of college education on fertility can be explained by early life characteristics present in the youth's adolescences. This is not to say that early life characteristics *cause* 40.14% of the effect, this value represents how much background factors can explain and make sense of the effect. In repeating the same process with Table 4's Column 1 and 12, I calculate that 45.85% of the effect of college education on fertility can be explained by early life factors. This number is likely greater because it is produced from fewer control variables and may contain more bias.

Furthermore, out of the control variables I included in my work, my results suggest it is the youth's parents' completion of a college degree which may play an important role in explaining the effect of the youth's college education on their lifetime fertility outcomes. Similarly, I calculated a percentage change between Table 3 Column 3 (basic plus parental education controls) and Table 3 Column 7 (all controls except parent's education) to investigate:

of the amount explained by early life characteristics, how much of this amount is attributed to parental education. This percentage change comes out to be 8.16%. Thus, 8.16% of the effect of college education on fertility can be explained specifically by the respondents' parents' college education. This is how the picture changes when you only control for parental education then add in all the other control variables on top of that. When I repeated the same process but with Table 4's data on parental education, I calculated that 6.89% of the effect can be explained by parental education level.

Relative to existing literature, my findings are consistent with that of other studies on these topics. The Nisen et al. (2014) paper I discussed earlier calculated that background characteristics explained about 3 - 28% of the education-fertility association in their sample of older Finnish women. My analysis corroborates that family background moderately explains the well-supported overall negative relationship between higher education and completed fertility. Perhaps the implications of these findings are that the socioeconomic background in which a youth is born into undoubtedly influences their access and expectation to attend college and their future fertility choices, but that there are certainly other factors that play a significant role as well beyond their family and household. When just considering my 40-45% value, there is still at least 50% of the relationship between college and fertility to be explained. Perhaps other factors which may explain this effect are the personal preferences of the youth, their genetic disposition, peer influence, social media influence, and so on. These factors play a role in college education and fertility preferences, but are more associated with the autonomy of the youth. Furthermore, there are many pieces of literature which support that it is parental educational achievement which has a very strong predictive effect in their children's completion of college (Dubow et al, 2009).

If I had had more time to develop this project, I would have pulled many additional socioeconomic factors from the respondents in the NLSY. Thus, there is omitted variable bias in my results. In particular, I would have liked to have controlled for more characteristics about the youth's high school performance including their cognitive abilities, standardized test scores, grade point averages, and so on- to factor in the ways in which academic success in high school influenced their propensity to attend college. Since there is a positive correlation between high school academic success and completing college, and likely a negative correlation between academic success and fertility, there is potential for high school academic success to be a source of negative bias in my analysis. Those youth who perform more highly in high school may be provided scholarship opportunities to attend college for example, then may follow the track of delaying later childbearing to focus on career aspirations, and have less children overall.

I am also concerned about my lack of controlling for early childbearing in my sample, or excluding altogether respondents who had teen births. As Klepinger, Lundberg, and Plotnick (1995) detail, adolescent childbearing reduces the likelihood that teen parents pursue a higher education. In terms of omitted variable bias from failing to include presence of teen childbearing, with a negative correlation between teen childbearing and completing college, and a positive correlation between teen childbearing and completed fertility level, I would expect negative bias to be present in my analysis. The presence of negative omitted variable bias may be causing an underestimation of the effect of college education on fertility.

VI. Conclusion

All in all, this paper considers the intervening effects of early life socioeconomic and family factors on explaining the negative relationship between college education and completed

fertility. Using a linear regression model with the inclusion and exclusion of various control variables, I ultimately find that about 40-45% of the effect of college education on fertility can be explained by background characteristics during adolescence, and a notable portion of this explanatory effect can be attributed to parental college educational attainment. For future research on this topic, it would be beneficial to account and control for more situational variables present in the youth's adolescence such as high school academic performance and teen childbearing decisions. Ultimately, the findings within this paper shine light on how youth's adulthood decisions on how they will invest in their human capital and make career and family decisions are certainly dependent on the nature of the environment in which they grew up.

VII. Works Cited

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