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Three Essays on the Economics of the Family

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THREE ESSAYS ON THE ECONOMICS OF THE FAMILY

by

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ABSTRACT

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The goal of this dissertation is to apply empirical methodologies to analyze various topics in economics of education and health economics, which have clear policy implications.

Chapter 1 presents evidence of heterogeneous labor market returns for children depending on the time intervals between sibling births. My empirical strategy exploits exogenous variation in child spacing stemming from whether there are twins in the family and an age difference between the mother and the father. Results show significant negative effects of spacing in children from well-resourced families, but I observe positive and insignificant effects of birth spacing on children's labor market earnings in the lower stratum.

Chapter 2 provides evidence of whether child spacing affects the likelihood of engaging in certain risky behaviors. Using data from the National Longitudinal Survey of Youth–1979, I investigate the association between birth spacing and engaging in risky or deviant behaviors, such as smoking, unprotected intercourse, theft, and violence. I attempt to identify exogenous variation in in child spacing stemming from whether one has a twin and parents' age difference, and my estimates show significant declines in engaging in risky behaviors for all these four risky activities as birth spacing increases.

In chapter 3 despite being widely accepted as a behavior damaging to one's future, we show that among girls engaging in sex while a teenager likely has no long-term economic consequences in terms of labor market earnings. In fact, once we control for teen childbearing and educational attainment, it is significantly correlated with positive earnings. The substantial positive outcomes appear to be concentrated among girls from higher socioeconomic strata, with little significant effects among those from less advantaged backgrounds. Only a small part of this difference seems to be explained by lower birth rates among the sexually active in higher socioeconomic strata. This leaves most due to either a causal effect of teenage sexual activity, which is unlikely, or the result of unobserved characteristics (to the researchers) among those from higher socioeconomic strata who are sexually active during adolescence. From a policy standpoint, these findings suggest that promoting teenage abstinence by touting long-term economic benefits may be misguided, particularly for those ages 15-17.

To

My Parents

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Chapter 1: Child Spacing and Children's Labor Market Outcomes

1.1. Introduction

How many children to have and when to have them is one of the most important issues that married couples face. Even though there is a large amount of literature showing the effects of family characteristics, such as family size, sex composition, and children ordering on children's outcomes (Conley 2000, Carlson and Corcoran 2001, Black, Devereux et al. 2005, Silles 2010), there is only one study dealing with spacing and children's future earnings (Nguyen, 2013). Parents have more control over the timing of births than the composition of sex, so more research in spacing is needed.

There are two main philosophies about child spacing and future outcomes for children. The traditional view says that parents have limited resources, both in terms of money and time, so smaller spacing between siblings leads to fewer resources for the family and causes poor outcomes; we know this as a "resource dilution model" (Kidwell 1981). Some studies especially focus on economic investments in children, as wider spacing between children permits "breathing room" for parents to rebuild income before having another child. A comparatively new school of thought talks not only about parents' resources but also siblings' resources. Closer spacing allows parents to pool child monetary and time costs (sharing toys/clothes or reading books); it also allows younger siblings to learn more from their older brother or sister, or even vice versa (Black, Devereux et al. 2010, Silles 2010).

The dual potential effects of birth spacing warrants more empirical attention. Although there are many studies on spacing and infant health (Smits and Essed 2001, Conde-Agudelo, Rosas-Bermúdez et al. 2006, Van Eijsden, Smits et al. 2008), there is no general agreement on the effects of spacing on education (Broman, Nichols et al. 1975, Zajonc 1976, Galbraith 1982, Powell and Steelman 1993). Moreover, birth ordering can be a significant variable in a child's production function, and there is a well-established literature on this subject. Zajonc (1976), Black, Devereux et al. (2005), Price (2008), and Price (2010) show its negative impact on future outcomes. Some studies, such as Zajonc (1976) and Price (2010), note that when spacing is longer, this ordering effect is larger. These all provide motivation to take both birth spacing and birth order into account in my study.

There are two challenges to studying the effect of birth spacing on future income. First, time gaps between children are likely correlated with unobserved family characteristics and are therefore endogenous. To solve this, I use instrumental variables measuring age difference between parents and a dummy variable that represents any twins in the family; both should decrease spacing. The second issue is data availability, as data on both siblings and future labor market incomes is not common in one data source. Perhaps this explains why just one study has linked spacing and income conducted by Nguyen (2013). That study does not explore the heterogeneity of the effects as I do, however.

My findings reveal that birth spacing has a heterogeneous effect on labor market outcome. The longer birth intervals are actually detrimental for the labor market outcome for the children from well-resourced families, while it has a positive and insignificant effect for the children from the lower-income families.

The paper is organized as follows: the next section describes the empirical literature related to my research question. Section three introduces the dataset and presents some descriptive statistics. The fourth section shows the econometric models in detail. Section five presents the results, and the conclusion suggests directions for future research.

1.2. Background

Although recent empirical interest in birth spacing and labor market outcomes is limited, the academic interest in age intervals between children dates back to the 19th century when Galton (1875) observed a preponderance of first-borns in the English scientific society. The role of birth order received renewed attention with the introduction of the confluence model which argued that first-borns are influenced by two adults, but second-borns are influenced by two adults with divided attention and one child (Zajonc and Markus 1975). Thus, first-borns should be more intelligent than second-borns on average. These findings would fit well with the resource dilution model (Blake 1981). That theory states that parents' material resources, energy, and attention are all finite and the amount of which can be allocated to any child not only depends on the amount of family resources (parental time and income), but also upon the number of siblings each child has. So, an increase in the number of siblings or a decrease in the time interval between births decrease allocated resources for each child, resulting in poorer future outcomes. The negative outcomes should be felt more by the youngest siblings.

Another model sharply contrasts those theories. The Admixture hypothesis suggests that there is no causal relationship between the number and spacing of children and child outcomes and that any apparent relationships are spurious (Page and Grandon 1979). Based on this theory, higher birth order children come from larger families and most of the larger family consists of less

intelligent parents, so it creates a negative relationship between birth order and children's outcomes. This raised the specter of endogeneity in the birth spacing literature with which each future study must contend.

I next consider three broad categories of outcomes that have been studied in the birth spacing literature.

1.2.1 Health Outcomes

Zhu, Rolfs et al. (1999) considered the effect of the interval between pregnancies on perinatal outcomes and found that the optimal interpregnancy interval for avoiding adverse perinatal outcomes is 18 to 23 months. Shorter and longer interpregnancy intervals were associated with higher risks. Conde-Agudelo, Rosas-Bermúdez et al. (2006) extended this interval to 18 months to 59 months. More recently, Angrist and Pischke (2008) showed that an inter-pregnancy interval longer than eleven months is an achievable and low-cost means to reduce multiple adverse perinatal outcomes.

Van Eijsden, Smits et al. (2008) used birth weight to show that depletion of nutrition creates inverse effects of spacing on birth outcomes. Cheslack-Postava, Liu et al. (2011) showed that those children born after shorter intervals between pregnancies are at an increased risk of developing autism. They showed pregnancy spaced less than one year as the highest risk. Taken as a whole, I read this evidence as suggesting that the negative health impacts are limited to very close spacing of children. Thus, the confounding influence of health should not be a strong determinant in my data, where most of timing intervals are well beyond a year.

1.2.2 Educational Outcomes

There is extensive theoretical literature linking siblings' characteristics and children's educational outcomes dating back to the confluence model presented by Zajonc and Markus (1975). Zajonc (1976) pointed out birth order effects "are mediated entirely by the age spacing between siblings" and longer time intervals between children can reverse the negative birth order effect. This point is highly debatable and has been studied empirically Moreover, Silles (2010) suggested first-borns have higher test scores and tend to be better behaved at school than last-borns. Black, Devereux et al. (2010) showed that earlier born children have higher IQs.

In relation to the impact of time intervals, Broman, Nichols et al. (1975) showed longer time intervals between children cause higher scores on the Stanford-Binet intelligence scale. Powell and Steelman (1993) found that the likelihood of dropping out of high school is increased by close spacing of siblings, but Galbraith (1982) showed that the time interval between siblings was not related to intellectual attainment in a sample of college students.

Price (2008) used data on the amount of time each child in a household spent with one of his or her parents and showed that first-borns receive more quality time each day with their parents, which can be a good explanation for the negative effect of birth order on educational outcomes. He considered spacing in another study, showing that birth order effects are even stronger when children are spaced further apart in age (Price 2010). Buckles and Munnich (2012) similarly showed that families with greater spacing see increased test scores for first-borns.

1.2.3 Labor Market Outcomes

There are some papers considering women's labor market participation and its effect on time intervals between their children (Heckman and Walker 1990, Angrist and Pischke 2008), but

Nguyen (2013) appears to be the first and the only study that looks at the relation between birth spacing and incomes of siblings. The results suggest that there are no significant effects of time interval between siblings and their labor income.

This belies the well-established trend that indicates family background has a strong effect on children's outcomes (Zajonc 1976, Smits and Essed 2001, Black, Devereux et al. 2005). One potential issue limiting the work of Nguyen (2013) is the lack of attention to particular subgroups that might be affected more by birth spacing. Other works on effects of family background suggest such heterogeneities matter greatly. For example, Mwabu and Schultz (1996) documented racial differences in returns to education, with blacks experiencing the higher rate of return. Cheslack-Postava, Liu et al. (2011) relaxed the assumption of a homogeneous rate of return to education and found the same results. Thus, I suspect such heterogeneities may exist in the returns to birth spacing.

1.3. Data

I use the National Longitudinal Survey of Youth, 1979 (NLSY79), which follows a sample of Americans born from 1957-64. I consider birth spacing as the shortest age difference between the index child and his or her older sibling. I restrict our sample to children who have at least one other siblings, which gives us 1,682 observations.

For the main results, I assign zero as the time interval to index children who are twins. For robustness check, I compute the time interval between twin index children and their younger and older non-twin siblings. Furthermore, I exclude all twin index children from the sample, and I use the presence of any twins in the family but focus on the non-twin children as sources of changing in birth spacing for another robustness check.

Descriptive statistics are shown in Table 1.1. For income, I used the average of total real income from wages and salary in the years 2001, 2003 and 2005. The average income for my sample is $11,800 annually, with an average birth spacing of three years. The mean age for my observations is 41 years old in 2001. There are a number of important variables for the analysis. *Parents* is a dummy variable that shows the child's mother and father were living together in 1979; 75% of respondents live with both parents in 1979. The spacing of children might affect parents' relationships with their children or with one (Christensen 1968).

My sample consists of 53% females, while the mother and father's average years of education are 11 years. The *Number of Siblings* in each family is the total number of children they have. Because I limit the sample to observations which have at least one siblings, each family in the sample has at least two children and on average they have five children. I apply a dummy variable which indicates whether or not the child lived in an urban area during 2002. The *Twin* and *Age Difference between Parents* are two variables that I use to apply as instrumental variables in the model. Also, I consider four dummy variables for indicating birth order in the family. Since there is a literature stating that family characteristics influence first-borns differently from the higher birth order children, I exclude first-borns in some specifications and then focus on the higher birth order children and report their results separately (Blake 1981, Price 2010, Buckles and Munnich 2012). Moreover, first born children do not have siblings during their earliest years and would not necessarily be affected by some of the above-mentioned spacing hypotheses. Also, I consider the age of the mother at the first birth as an explanatory variable in the model.

1.4. Empirical methodology

I begin by estimating the effect of birth spacing on future labor market earnings by using the OLS method. For OLS, the model is as follows:

$$Log(Income_i) = \beta_1 + \beta_2 Birthspacing_i + X_i'\theta_1 + F_i'\theta_2 + u_i \quad (1)$$

The index *i* denotes observations at the individual level. The dependent variable is log of the average real income during 2001, 2003 and 2005. The *Birth Spacing* is considered as the shortest time interval between the index child and his or her younger or older sibling (in years). X_i is a vector of all individual characteristics outlined in Table 1.1. These include age, race, education, test score on the Armed Forces Qualification Test (AFQT), gender, birth order dummy variables, and their urban status in 2002.

F_i is a vector of all family characteristics for each child, including mother and father's education, log of family income (in 1979), ag of mother at the first birth and number of siblings in each family. Further, a dummy variable representing the index child living with both parents in 1979 is included.

Although I control some of the family characteristics, there are still some unobserved ones, which may be correlated with spacing and the child's future labor market outcome. So there remains a concern that birth spacing may be correlated with the error term (i.e. $E[Birthspacing_i U_i] \neq 0$). This might lead to inconsistent OLS estimators. For this reason, I apply 2SLS methodology by introducing two instrumental variables. Age differences between parents and a dummy variable that denotes the presence of twins.

Including these two dummies in a Z vector, the first stage in my 2SLS model can be written as

$$Birthspacing_i = \lambda_1 + Z_i'\delta_2 + X_i'\lambda_1 + F_i'\lambda_2 + v_i \quad (2)$$

and the second stage is as follows:

$$Log(Income_i) = \alpha_1 + \alpha_2 Birthspacing_i + X_i'\sigma_1 + F_i'\sigma_2 + \varepsilon_i \quad (3)$$

In order to have consistent IVs, they must be uncorrelated with the error term in equation (1). The first concern is the potential casual effect of unobserved family characteristics on the probability of having twins in the family. Black et al. (2005), who use twin births as an IV for family size, note that this effect is not testable. Nevertheless, they considered the simple regression for examining the effect of parental education on probability of having twins in the family. I follow their lead and also find no statistical significant effect of parental education on the probability of having twins in the family.

My second instrument, *Parents' Age Difference,* may be related to the probability of getting divorced. This is again untestable, but I add *Parents* as a dummy variable that shows the child's mother and father were living together in 1979 as an explanatory variable. Also, I simply run the regression for examining the effect of the age difference between parents on the probability of divorce. I find no significant effect of these variables on the probability of getting divorced. For these reasons, I am comfortable that these instrumental variables can be used to identify exogenous changes in birth spacing.

There is sizable literature on the different causal effects of education on child outcomes for different family background groups (Chiswick 1988, Barrow and Rouse 2005, Belley and Lochner 2007, De Silva 2009). Also, based on two main philosophies about child spacing and future outcomes for children, "breathing room" (Kidwell 1981) and sharing resources with siblings, birth spacing can have a positive or negative effect on children outcomes. These bring us to the fact that time intervals may have different effects on labor market outcomes for people who are born in the high income families vs low income families. So, I divide the sample based on family income.

Since the median of the annual family income at 1979 is 20,000 dollars, I considered families with a higher annual income than 20,000 dollars at 1979 as the *high-income family* group and families with less than 20,000 dollars annual income as belonging to the *low-income family* group. The expectation is that resource constraints should weigh more heavily on the low-income families. Because of different effects of family characteristics on first-borns and higher birth order children in the literature, I report results of the whole sample and the sample of second-born and higher birth order children separately for all these groups (Blake 1981, Price 2010, Buckles and Munnich 2012).

1.5. Result

The effects of birth spacing on labor market outcomes are reported in Table 1.2, which includes first borns. Comparing these results, which are based on different subsamples, reveals much heterogeneity across the sample. In each row, all results from OLS and 2SLS estimations are represented.

Row 1 shows the regression output for the whole sample. Column 1 presents that birth spacing has a negative and statistically insignificant effect on labor market income in the whole sample while the OLS method is applied. After using the Instrumental Variable method, this effect remains negative and statistically insignificant over the whole sample. The right two columns present Cragg–Donald statistic and the Hausman over-identification test. It indicates that the model with instrumental variables, the *Twin* and the *Parents' Age Difference*, does not have any sign of weak instrumental variable problems and passes over-identifications tests. Nguyen (2013) is the only other study looking at spacing and children's future earnings. She generally used Fixed Effect estimates and found positive but statistically insignificant effects of birth spacing on labor market outcomes.

Rows 2 and 3 present subsamples based on family income. As shown, birth spacing has a negative and significant effect on labor market income for well-resourced families while this effect is positive but insignificant for the low-income families. The selective nature of these subsamples should be kept in mind when interpreting these results.

As mentioned before, there are two conflicting philosophies about the effect of child spacing on the outcomes. The outcome of this effect of time intervals on labor market income depends on the strength of these effects. It sounds sensible that for this subsample that does not have enough resources (both in terms of money and time), the negative effect of the "breathing room theory" rules out the positive effect of sharing resources with siblings. Likewise, for the other subsample the positive effect of sharing resources with siblings cancels out the negative effect of the "breathing room theory". In other words, for those born in families with limited resources, shorter time intervals deplete the family resources severely and cancel out the positive effect of

sharing with or learning from close siblings. While for children from the *High Income Family* group, the positive effect of shorter birth spacing rule out the negative effect of depleting parents' resources.

Since there is literature that shows different effects of family characteristics on first-borns and higher birth order children, I excluded first-borns and report results for the second-borns and higher birth order children in Table 1.3 (Blake 1981, Price 2010, Buckles and Munnich 2012).

Table 1.3 represents the 2SLS results for the whole sample of second-borns and higher birth order children. There is statistically insignificant effects of birth spacing on labor market income for the whole sample and *low-income family* group, but longer birth spacing diminishes the labor market income for children of the well-resourced families. This negative effect of birth spacing indicates that for wealthier families, the resource constraint does not matter and closer siblings help each other. These results are consistent with the results of the whole sample (including first- borns). The calculated Cragg–Donald statistic for instrumental relevance for all of these subsamples well exceeds any critical value listed by Stock and Yogo (2005). This indicates that one can easily reject the null hypothesis of weak instruments.

There is a widespread belief that education is an essential determinant of economic success. This belief is supported by a number of recently published studies, each with its own approach to the topic. All of them proved that higher education increases labor market outcome (Psacharopoulos 1985, Card 1999, Psacharopoulos and Patrinos* 2004). In keeping with this literature, I use *Education* as an explanatory variable. To find out what portion of the gap's effect comes through schooling, I examine the model without *Education, AFQT* score and both of these

variables. Table 1.4 Shows results while I exclude both *Education* and *AFQT score* to assess whether that effect is working through human capital accumulation or something else. Results while I exclude these variables show same effects of *Birth spacing* on labor market income which indicates these effects are working through birth spacing and not human. Although models show that more years of schooling over all subsamples increases labor market income which is consistent with literature. All the results are for the case in which I assigned zero for twin index child's birth spacing.

Furthermore, I follow two other scenarios for examining link between birth spacing and labor market outcomes as the robustness check. In the first one, I calculated the shortest time interval between twin index child and her/his younger and older non-twin siblings as a measurement for birth spacing. Results for all subsamples based on this scenario are reported in tables A1.6 and A1.7, which follows the same pattern as we already have in tables A1.2-A1.5. I also, exclude twin index children from sample and only use presence of Twin in the family but not being twin children as Instrument variable along with *Parents' Age Difference*. Similarly, this gives me the same pattern for the effects of birth spacing on labor market income.

My results are the first and only one which shows significant effects of birth spacing on labor market outcomes. There is only one study on birth spacing and labor market outcomes which presents no significant effect of time intervals on labor market outcomes. My effects are more comprehensive in that I look across subsamples.

1.6. Conclusion

In this paper, I investigate the link of time intervals between children and their future labor market outcome. I use 2SLS regression, and my sample is based on data from NLSY. I consider *Birth Spacing* as the shortest age difference between the index child and his or her older and younger siblings. I also consider different subsamples regarding family income.

I applied OLS in the first model and found positive for all subsamples. Instrumental variables estimation, however, shows heterogeneity over the sample. Birth spacing has a positive and statistically insignificant effects on labor market income for the children from *the Low-Income Family*. Effects are negative and statistically significant for whom are born in the *High-Income Family*.

Since there is only one paper which studied the effect of birth spacing on labor market income and she found no significant effect for that (Nguyen 2013), my findings can be useful for policy makers and provides some guidelines for advising families about choosing time intervals between their children.

REFERENCES

Angrist, J. D. and J.-S. Pischke (2008). Mostly harmless econometrics: An empiricist's companion, Princeton university press.

Barrow, L. and C. E. Rouse (2005). "Do returns to schooling differ by race and ethnicity?".

Belley, P. and L. Lochner (2007). The changing role of family income and ability in determining educational achievement, National Bureau of Economic Research.

Black, S. E., et al. (2005). "The more the merrier? The effect of family size and birth order on children's education." The Quarterly Journal of Economics: 669-700.

Black, S. E., et al. (2010). "Small family, smart family? Family size and the IQ scores of young men." Journal of Human Resources **45**(1): 33-58.

Blake, J. (1981). "Family size and the quality of children." Demography **18**(4): 421-442.

Broman, S. H., et al. (1975). "Preschool IQ: Prenatal and early developmental correlates."

Buckles, K. S. and E. L. Munnich (2012). "Birth spacing and sibling outcomes." Journal of Human Resources **47**(3): 613-642.

Card, D. (1999). "The causal effect of education on earnings." Handbook of labor economics **3**: 1801-1863.

Carlson, M. J. and M. E. Corcoran (2001). "Family structure and children's behavioral and cognitive outcomes." Journal of Marriage and Family **63**(3): 779-792.

Cheslack-Postava, K., et al. (2011). "Closely spaced pregnancies are associated with increased odds of autism in California sibling births." Pediatrics **127**(2): 246-253.

Chiswick, B. R. (1988). "Differences in education and earnings across racial and ethnic groups: Tastes, discrimination, and investments in child quality." The Quarterly Journal of Economics: 571-597.

Christensen, H. T. (1968). "Children in the family: Relationship of number and spacing to marital success." Journal of Marriage and the Family: 283-289.

Conde-Agudelo, A., et al. (2006). "Birth spacing and risk of adverse perinatal outcomes: a meta-analysis." Jama **295**(15): 1809-1823.

Conley, D. (2000). "Sibship sex composition: Effects on educational attainment." Social Science Research **29**(3): 441-457.

De Silva, I. (2009). "Ethnicity and sheepskin effects in the returns to education in Sri Lanka: A conditional quantile analysis." International Journal of Development Issues **8**(1): 61-79.

England, P. (2005). "Gender inequality in labor markets: The role of motherhood and segregation." Social Politics: International Studies in Gender, State & Society **12**(2): 264-288.

Galbraith, R. C. (1982). "Sibling spacing and intellectual development: A closer look at the confluence models."

Galton, F. (1875). English men of science: Their nature and nurture, D. Appleton.

Heckman, J. J. and J. R. Walker (1990). "The relationship between wages and income and the timing and spacing of births: evidence from Swedish longitudinal data." Econometrica: journal of the Econometric Society: 1411-1441.

Huffman, M. L. and P. N. Cohen (2004). "Racial Wage Inequality: Job Segregation and Devaluation across US Labor Markets1." American Journal of Sociology **109**(4): 902-936.

Kidwell, J. S. (1981). "Number of siblings, sibling spacing, sex, and birth order: Their effects on perceived parent-adolescent relationships." Journal of Marriage and the Family: 315-332.

Lewin-Epstein, N. and M. Semyonov (1992). "Local labor markets, ethnic segregation, and income inequality." Social Forces **70**(4): 1101-1119.

McCall, L. (2001). "Sources of racial wage inequality in metropolitan labor markets: Racial, ethnic, and gender differences." American Sociological Review: 520-541.

Mwabu, G. and T. P. Schultz (1996). "Education returns across quantiles of the wage function: alternative explanations for returns to education by race in South Africa." The American Economic Review: 335-339.

Nguyen, N. (2013). "Birth Spacing and Outcomes in Adolescence, Young Adulthood and Adulthood."

Page, E. B. and G. M. Grandon (1979). "Family configuration and mental ability: Two theories contrasted with US data." American Educational Research Journal **16**(3): 257-272.

Powell, B. and L. C. Steelman (1993). "The educational benefits of being spaced out: Sibship density and educational progress." American Sociological Review: 367-381.

Price, J. (2008). "Parent-Child Quality Time Does Birth Order Matter?" Journal of Human Resources **43**(1): 240-265.

Price, J. (2010). "The effects of parental time investments: Evidence from natural within-family variation." Unpublished manuscript, Brigham Young University.

Psacharopoulos, G. (1985). "Returns to education: a further international update and implications." Journal of Human Resources: 583-604.

Psacharopoulos, G. and H. A. Patrinos* (2004). "Returns to investment in education: a further update." Education economics **12**(2): 111-134.

Silles, M. A. (2010). "The implications of family size and birth order for test scores and behavioral development." Economics of Education Review **29**(5): 795-803.

Smits, L. J. and G. G. Essed (2001). "Short interpregnancy intervals and unfavourable pregnancy outcome: role of folate depletion." The Lancet **358**(9298): 2074-2077.

Stewart, Q. T. and J. C. Dixon (2010). "Is it Race, Immigrant Status, or Both? An Analysis of Wage Disparities among Men in the United States1." International Migration Review **44**(1): 173-201.

Stock, J. H. and M. Yogo (2005). "Testing for weak instruments in linear IV regression." Identification and inference for econometric models: Essays in honor of Thomas Rothenberg.

Van Eijsden, M., et al. (2008). "Association between short interpregnancy intervals and term birth weight: the role of folate depletion." The American journal of clinical nutrition **88**(1): 147-153.

Zajonc, R. B. (1976). "Family configuration and intelligence: Variations in scholastic aptitude scores parallel trends in family size and the spacing of children." Science.

Zajonc, R. B. and G. B. Markus (1975). "Birth order and intellectual development." Psychological review **82**(1): 74.

Zhu, B.-P., et al. (1999). "Effect of the interval between pregnancies on perinatal outcomes." New England journal of medicine **340**(8): 589-594.

Table 1-0—1: Descriptive Statistics for the Whole Sample

Variable	Description	All	
		Mean	Std. Dev.
Log Income	Log of real annually income (average over 2001, 2003 and 2005)	9.38	0.96
Birth Spacing	The shortest time interval between the child index and his or her older and younger siblings	2.81	3.30
First Child	=1 if the index child is the first-born	0.22	0.41
Second Child	=1 if the index child is the second-born	0.22	0.42
Third Child	=1 if the index child is the third-born	0.25	0.44
Fourth Child	=1 if the index child is the fourth-born	0.14	0.34
Number of Siblings	Number of siblings in each family	4.64	1.81
Education	Year of schooling	13.27	3.24
AFQT Score	Armed Forces Qualification Test percentiles score at 1980	49.50	27.96
Age	Age of observation at 2001	41.32	2.23
Family Income	Log of family real income at 1979	9.64	0.81
Parents	=1 if mother and father lived in the same household at 1979	0.75	0.43
Mother's Age at First Birth	Age of mother at her first birth	22.00	5.13
Mother's Education	Mother's years of schooling	11.36	2.96
Father's Education	Father's years of schooling	11.41	3.73
Urban	=1 if index child lived in Urban area	0.75	0.43
Female	=1 if female	0.53	0.50
Black	=1 if Black	0.22	0.41
Hispanic	=1 if Hispanic	0.15	0.35
Twin	=1 if there is twin(s) in the family	0.02	0.15
Parents' Age Difference	Age difference between the Mother and the Father (Years)	4.39	5.10
N	Number of Observations	1,682	

Table 1-0—2: OLS and 2SLS Estimates of Effect of Birth Spacing on Income for the Whole Sample (Including First-Borns)

Samples	Birth Spacing		F Statistics (Weak IV)	P-Value Over Identification Test	Observations
	OLS	Second Stage			
Whole Sample	-0.006	-0.047	122.52	0.62	1,682
High-Income Family	0.007	-0.200***	26.79	0.64	662
Low-Income Family	-0.012	0.018	67.94	0.46	1,020

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table 1—0—3: OLS and 2SLS Estimates of Effect of Birth Spacing on Income for the Sample of Second-borns and Higher Birth Order Children

Samples	Birth Spacing		F Statistics (Weak IV)	P-Value Over Identification Test	Observations
	OLS	Second Stage			
Whole Sample	-0.009	-0.022	90.58	0.61	1,314
High-Income Family	0.010	-0.197***	22.22	0.60	513
Low-Income Family	-0.017*	0.025	71.73	0.36	801

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table 1—0—4: OLS and 2SLS Estimates of Effect of Birth Spacing on Income While Excluding AFQT and Education

Samples	Birth Spacing		F Statistics (Weak IV)	P-Value Over Identification Test	Observations
	OLS	Second Stage			
Including First-borns					
Whole Sample	-0.001	-0.014	122.89	0.68	1,682
High-Income Family	0.011	-0.211***	28.67	0.75	662
Low-Income Family	-0.007	0.024	69.94	0.89	1,020
Excluding First-borns					
Whole Sample	-0.003	-0.001	90.80	0.58	1,314
High-Income Family	0.016	-0.194**	25.12	0.65	513
Low-Income Family	-0.012	0.053	48.35	0.90	801

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Appendix

Table A1.1: Descriptive Statistics for the Whole Sample and Sub-samples based on Family Income

	Whole Sample		High-Income Family		Low-Income Family		Sample of Being Second Child or Higher Birth Order		High-Income Family and Being Second Child or Higher Birth Order		Low-Income Family and Being Second Child or Higher Birth Order	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Log Income	9.38	0.96	9.62	0.95	9.23	0.94	9.36	0.97	9.59	0.95	9.21	0.96
Birth Spacing	2.81	3.30	2.71	2.81	2.84	3.58	2.89	3.39	2.89	3.03	2.88	3.60
First Child	0.22	0.41	0.23	0.42	0.21	0.41						
Second Child	0.22	0.42	0.23	0.42	0.22	0.41	0.28	0.45	0.29	0.45	0.28	0.45
Third Child	0.25	0.44	0.29	0.45	0.23	0.42	0.32	0.47	0.37	0.48	0.30	0.46
Fourth Child	0.14	0.34	0.14	0.35	0.14	0.34	0.18	0.38	0.18	0.39	0.17	0.38
Number of Siblings	4.64	1.81	4.18	1.38	4.94	1.99	4.86	1.89	4.37	1.46	5.17	2.06
Education	13.27	3.24	14.08	2.21	13.08	2.17	13.43	2.24	14.05	2.16	13.03	2.20
AFQT Score	49.50	27.96	61.71	24.80	42.22	27.50	48.40	28.05	59.72	25.02	41.16	27.50
Age	41.32	2.23	41.32	2.13	41.32	2.28	41.29	2.25	41.22	2.13	41.33	2.32
Family Income	9.64	0.81	10.37	0.32	9.16	0.67	9.63	0.82	10.37	0.32	9.15	0.67
Parents	0.75	0.43	0.85	0.36	0.69	0.46	0.75	0.43	0.86	0.35	0.69	0.46
Mother's Age at First Birth	22.00	5.13	22.79	4.71	21.47	5.32	45.02	5.13	22.75	4.80	21.56	5.29
Mother's Education	11.36	2.96	12.35	2.70	10.67	2.97	11.31	3.01	12.30	2.79	10.67	2.98
Father's Education	11.41	3.73	12.84	3.46	12.56	3.60	11.26	3.81	12.72	3.60	10.33	3.65
Urban	0.75	0.43	0.76	0.43	0.76	0.43	0.76	0.43	0.76	0.43	0.75	0.43
Female	0.53	0.50	0.49	0.50	0.49	0.50	0.53	0.50	0.50	0.50	0.56	0.50
Black	0.22	0.41	0.08	0.27	0.08	0.27	0.22	0.42	0.08	0.27	0.32	0.47
Hispanic	0.15	0.35	0.10	0.29	0.10	0.29	0.14	0.35	0.10	0.30	0.17	0.37
Twin	0.02	0.15	0.02	0.12	0.02	0.12	0.03	0.16	0.02	0.14	0.03	0.17
Parents' Age Difference	4.39	5.10	3.57	3.91	4.92	5.68	4.40	4.96	3.59	3.91	4.91	5.47
N	1,682		662		1,020		1,314		513		801	

Table A1.2: OLS and 2SLS Estimates of Effect of Spacing on Labor Market Income in the Whole Sample

	Whole Sample		High Income Family		Low Income Family	
	OLS	Second Stage	OLS	Second Stage	OLS	Second Stage
Birth Spacing	-0.006	-0.047	0.007	-0.200***	-0.012	0.018
	(0.008)	(0.037)	(0.011)	(0.075)	(0.009)	(0.039)
Being First	-0.085	-0.180	-0.004	-0.508	-0.102	-0.116
	(0.082)	(0.123)	(0.187)	(0.311)	(0.091)	(0.127)
Being Second	-0.145*	-0.267*	-0.124	-0.678**	-0.137	-0.157
	(0.087)	(0.147)	(0.185)	(0.321)	(0.101)	(0.166)
Being Third	-0.125	-0.185*	-0.140	-0.413	-0.101	-0.111
	(0.083)	(0.102)	(0.184)	(0.253)	(0.094)	(0.110)
Being Fourth	-0.084	-0.120	-0.167	-0.301	-0.022	-0.028
	(0.077)	(0.087)	(0.158)	(0.213)	(0.087)	(0.096)
Number of Sibling	-0.027	-0.049*	-0.025	-0.161*	-0.024	-0.027
	(0.017)	(0.028)	(0.049)	(0.084)	(0.016)	(0.027)
Education	0.112***	0.113***	0.127***	0.126***	0.099***	0.100***
	(0.011)	(0.011)	(0.019)	(0.024)	(0.014)	(0.014)
AFQT Score	0.006***	0.006***	0.001	0.003	0.008***	0.008***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Age	-0.000	-0.001	-0.008	-0.030	-0.000	-0.000
	(0.009)	(0.009)	(0.015)	(0.020)	(0.012)	(0.012)
Family Income	0.072***	0.063**	0.174	0.180	0.017	0.015
	(0.026)	(0.027)	(0.114)	(0.129)	(0.035)	(0.035)
Parents	0.011	0.003	0.121	0.086	-0.029	-0.030
	(0.050)	(0.050)	(0.108)	(0.118)	(0.054)	(0.054)
Mother's Age at First Birth	-0.011***	-0.012***	-0.016**	-0.020**	-0.009*	-0.009*
	(0.004)	(0.004)	(0.008)	(0.009)	(0.005)	(0.005)
Mother's Education	0.005	0.003	0.006	-0.014	0.002	0.002
	(0.009)	(0.009)	(0.015)	(0.021)	(0.011)	(0.011)
Father's Education	0.005	0.002	0.013	0.006	-0.001	-0.001
	(0.007)	(0.007)	(0.011)	(0.014)	(0.008)	(0.009)
Urban	0.085*	0.074	0.016	0.043	0.113*	0.110
	(0.051)	(0.052)	(0.078)	(0.090)	(0.067)	(0.069)
Female	-0.544***	-0.553***	-0.602***	-0.599***	-0.504***	-0.507***
	(0.041)	(0.042)	(0.066)	(0.078)	(0.052)	(0.053)
Black	-0.001	-0.001	0.012	0.091	0.027	0.026
	(0.061)	(0.061)	(0.131)	(0.177)	(0.072)	(0.072)
Hispanic	0.168***	0.135**	0.192**	0.095	0.161**	0.155*
	(0.062)	(0.068)	(0.097)	(0.118)	(0.080)	(0.086)
Constant	7.709***	8.219***	7.137***	9.875***	8.248***	8.316***
	(0.519)	(0.694)	(1.270)	(1.748)	(0.689)	(0.799)
Twin (First Stage)		-2.674***		- -2.493***		-2.809***
Parents' Age Difference (First Stage)		-0.032**		-0.002*		-0.042**
F Statistics (Weak IV)		122.52		26.79		67.94
Observations	1,682	1,682	662	662	1,020	1,020
P-Value Over Identification Test		0.62		0.64		0.46
R-squared	0.26	0.24	0.25	-0.082	0.24	0.24

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table A1.3: OLS and 2SLS Estimates of Spacing on Labor Market Income for the Second-borns and Higher Birth Order

	Whole Sample		High Income Family		Low Income Family	
	OLS	Second Stage	OLS	Second Stage	OLS	Second Stage
Birth Spacing	-0.009	-0.022	0.010	-0.197***	-0.017*	0.025
	(0.009)	(0.042)	(0.012)	(0.076)	(0.009)	(0.046)
Being Second	-0.151	-0.190	-0.122	-0.720**	-0.140	-0.000
	(0.093)	(0.166)	(0.196)	(0.350)	(0.106)	(0.192)
Being Third	-0.131	-0.151	-0.145	-0.464*	-0.102	-0.031
	(0.088)	(0.112)	(0.194)	(0.278)	(0.098)	(0.121)
Being Fourth	-0.088	-0.100	-0.166	-0.332	-0.016	0.031
	(0.080)	(0.092)	(0.164)	(0.224)	(0.090)	(0.105)
Number of Sibling	-0.031	-0.038	-0.031	-0.183*	-0.026	-0.003
	(0.019)	(0.033)	(0.054)	(0.095)	(0.018)	(0.032)
Education	0.109***	0.110***	0.122***	0.128***	0.102***	0.100***
	(0.013)	(0.013)	(0.022)	(0.029)	(0.015)	(0.015)
AFQT Score	0.006***	0.006***	0.001	0.004	0.009***	0.009***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Age	-0.004	-0.004	-0.004	-0.029	-0.005	-0.005
	(0.010)	(0.010)	(0.018)	(0.023)	(0.013)	(0.013)
Family Income	0.061**	0.058*	-0.005	0.022	0.037	0.049
	(0.030)	(0.031)	(0.142)	(0.163)	(0.039)	(0.042)
Parents	0.026	0.026	0.119	0.128	-0.007	-0.004
	(0.058)	(0.058)	(0.134)	(0.145)	(0.062)	(0.063)
Mother's Age at First Birth	-0.009*	-0.010*	-0.016*	-0.019**	-0.006	-0.004
	(0.005)	(0.005)	(0.008)	(0.010)	(0.006)	(0.006)
Mother's Education	0.005	0.005	0.018	-0.013	-0.001	0.001
	(0.010)	(0.010)	(0.018)	(0.026)	(0.013)	(0.013)
Father's Education	-0.002	-0.003	0.008	0.002	-0.008	-0.005
	(0.008)	(0.008)	(0.013)	(0.016)	(0.009)	(0.010)
Urban	0.083	0.081	-0.003	0.061	0.127	0.146*
	(0.059)	(0.059)	(0.092)	(0.105)	(0.079)	(0.083)
Female	-0.536***	-0.537***	-0.592***	-0.576***	-0.499***	-0.486***
	(0.048)	(0.047)	(0.078)	(0.093)	(0.060)	(0.060)
Black	-0.002	-0.004	-0.069	0.024	0.039	0.052
	(0.072)	(0.071)	(0.162)	(0.226)	(0.084)	(0.085)
Hispanic	0.143*	0.132	0.250**	0.119	0.090	0.131
	(0.074)	(0.081)	(0.102)	(0.130)	(0.099)	(0.109)
Constant	7.985***	8.153***	8.817***	11.468***	8.150***	7.635***
	(0.580)	(0.795)	(1.532)	(1.964)	(0.764)	(0.941)
Twin (First Stage)		-2.660***		-2.538***		-2.734***
Parents' Age Difference (First Stage)		-0.028*		-0.003*		-0.036*
F Statistics (Weak IV)		90.58		22.22		71.73
Observations	1,314	1,314	513	513	801	801
P-Value Over Identification Test		0.61		0.60		0.36
R-squared	0.25	0.250	0.22	-0.16	0.25	0.23

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table A1.4: OLS and 2SLS Estimates of Effect of Spacing on Labor Market Income in the Whole Sample (Excluding Education and AFQT Score)

	Whole Sample		High Income Family		Low Income Family	
	OLS	Second Stage	OLS	Second Stage	OLS	Second Stage
Birth Spacing	-0.001	-0.014	0.011	-0.211***	-0.007	0.024
	(0.009)	(0.039)	(0.013)	(0.074)	(0.011)	(0.040)
Being First	-0.070	-0.100	0.015	-0.514*	-0.092	-0.023
	(0.086)	(0.126)	(0.192)	(0.311)	(0.097)	(0.133)
Being Second	-0.140	-0.178	-0.079	-0.664**	-0.167	-0.066
	(0.092)	(0.153)	(0.189)	(0.322)	(0.110)	(0.174)
Being Third	-0.119	-0.138	-0.115	-0.397	-0.117	-0.068
	(0.087)	(0.104)	(0.187)	(0.256)	(0.100)	(0.116)
Being Fourth	-0.096	-0.107	-0.179	-0.316	-0.039	-0.007
	(0.081)	(0.089)	(0.162)	(0.219)	(0.094)	(0.104)
Number of Sibling	-0.040**	-0.047	-0.037	-0.183**	-0.040**	-0.023
	(0.018)	(0.029)	(0.049)	(0.084)	(0.018)	(0.028)
Age	0.020**	0.020**	-0.006	-0.026	0.030**	0.028**
	(0.009)	(0.009)	(0.016)	(0.020)	(0.012)	(0.012)
Family Income	0.110***	0.108***	0.281**	0.296**	0.032	0.039
	(0.029)	(0.029)	(0.119)	(0.135)	(0.038)	(0.039)
Parents	0.063	0.061	0.178	0.140	0.020	0.026
	(0.052)	(0.052)	(0.110)	(0.122)	(0.057)	(0.058)
Mother's Age at First Birth	-0.003	-0.003	-0.007	-0.010	-0.002	-0.001
	(0.005)	(0.005)	(0.008)	(0.009)	(0.006)	(0.006)
Mother's Education	0.033***	0.033***	0.021	0.003	0.034***	0.034***
	(0.009)	(0.009)	(0.016)	(0.021)	(0.011)	(0.011)
Father's Education	0.029***	0.029***	0.040***	0.036**	0.019**	0.022**
	(0.007)	(0.007)	(0.011)	(0.014)	(0.009)	(0.010)
Urban	0.119**	0.116**	0.036	0.062	0.160**	0.175**
	(0.053)	(0.054)	(0.081)	(0.094)	(0.070)	(0.073)
Female	-0.547***	-0.550***	-0.596***	-0.594***	-0.518***	-0.506***
	(0.044)	(0.044)	(0.069)	(0.082)	(0.056)	(0.057)
Black	-0.086	-0.088	-0.002	0.045	-0.110	-0.102
	(0.060)	(0.059)	(0.135)	(0.194)	(0.069)	(0.069)
Hispanic	0.155**	0.144*	0.171	0.052	0.142	0.173*
	(0.068)	(0.074)	(0.110)	(0.134)	(0.087)	(0.093)
Constant	7.327***	7.479***	6.815***	9.490***	7.693***	7.366***
	(0.527)	(0.702)	(1.282)	(1.691)	(0.702)	(0.823)
Twin (First Stage)		-2.705***		-2.842***		-3.181***
Parents' Age Difference (First Stage)		-0.033**		-0.001*		-0.043***
F Statistics (Weak IV)		122.89		28.67		69.94
Observations	1,682	1,682	662	662	1,020	1,020
P-Value Over Identification Test		0.68		0.75		0.89
R-squared	0.17	0.17	0.18	-0.011	0.13	0.11

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table A1.5: OLS and 2SLS Estimates of Effect of Spacing on Labor Market Income for the Second-borns and Higher Birth Order (Excluding Education and AFQT Score)

	Whole Sample		High Income Family		Low Income Family	
	OLS	Second Stage	OLS	Second Stage	OLS	Second Stage
Birth Spacing	-0.003	-0.001	0.016	-0.194**	-0.012	0.053
	(0.010)	(0.045)	(0.013)	(0.076)	(0.012)	(0.049)
Being Second	-0.143	-0.136	-0.049	-0.641*	-0.181	0.041
	(0.098)	(0.176)	(0.199)	(0.349)	(0.117)	(0.207)
Being Third	-0.123	-0.119	-0.098	-0.405	-0.125	-0.013
	(0.092)	(0.116)	(0.198)	(0.278)	(0.105)	(0.131)
Being Fourth	-0.098	-0.096	-0.162	-0.323	-0.039	0.037
	(0.084)	(0.096)	(0.168)	(0.225)	(0.097)	(0.117)
Number of Sibling	-0.045**	-0.043	-0.034	-0.188**	-0.047**	-0.009
	(0.020)	(0.035)	(0.055)	(0.096)	(0.021)	(0.035)
Age	0.018*	0.018*	-0.002	-0.022	0.028**	0.026*
	(0.011)	(0.011)	(0.018)	(0.024)	(0.014)	(0.014)
Family Income	0.104***	0.105***	0.074	0.116	0.060	0.078
	(0.033)	(0.034)	(0.147)	(0.169)	(0.044)	(0.048)
Parents	0.076	0.076	0.158	0.166	0.044	0.048
	(0.061)	(0.061)	(0.136)	(0.149)	(0.067)	(0.069)
Mother's Age at First Birth	-0.001	-0.001	-0.006	-0.009	0.001	0.003
	(0.005)	(0.005)	(0.008)	(0.010)	(0.006)	(0.007)
Mother's Education	0.033***	0.033***	0.034*	0.007	0.032**	0.033**
	(0.011)	(0.011)	(0.019)	(0.027)	(0.013)	(0.013)
Father's Education	0.021***	0.021***	0.031**	0.029*	0.012	0.016
	(0.008)	(0.008)	(0.013)	(0.015)	(0.010)	(0.011)
Urban	0.114*	0.114*	0.015	0.079	0.175**	0.203**
	(0.062)	(0.062)	(0.093)	(0.107)	(0.084)	(0.090)
Female	-0.537***	-0.537***	-0.583***	-0.566***	-0.516***	-0.495***
	(0.051)	(0.050)	(0.081)	(0.096)	(0.065)	(0.066)
Black	-0.106	-0.105	-0.095	-0.046	-0.119	-0.092
	(0.070)	(0.069)	(0.169)	(0.240)	(0.080)	(0.082)
Hispanic	0.104	0.106	0.215*	0.061	0.041	0.107
	(0.082)	(0.090)	(0.116)	(0.147)	(0.108)	(0.119)
Constant	7.533***	7.507***	8.703***	11.102***	7.521***	6.730***
	(0.595)	(0.823)	(1.547)	(1.915)	(0.788)	(0.990)
Twin (First Stage)		-2.667***		-2.569***		-2.747***
Parents' Age Difference (First Stage)		-0.030**		-0.011**		-0.037**
F Statistics (Weak IV)		90.80		25.12		48.35
Observations	1,314	1.314	513	513	801	801
P-Value Over Identification Test		0.58		0.65		0.90
R-squared	0.14	0.15	0.16	-0.23	0.12	0.06

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1*

Table A1.6: OLS and 2SLS Estimates of Effect of Birth Spacing on Income for the Whole Sample While Computing Non-zero Birth spacing for Twin Child Index

Samples	Birth Spacing		F Statistics (Weak IV)	P-Value Over Identification Test	Observations
	OLS	Second Stage			
Including First-borns					
Whole Sample	-0.004	-0.046	98.87	0.56	1,682
High-Income Family	0.003	-0.154***	69.17	0.43	662
Low-Income Family	-0.009	0.007	55.06	0.43	1,020
Excluding First-borns					
Whole Sample	-0.007	-0.027	98.24	0.78	1,314
High-Income Family	0.09	-0.183**	71.94	0.67	513
Low-Income Family	-0.012*	0.050	55.96	0.90	801

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Chapter 2: Birth Spacing and Risky Behaviors

2.1. Introduction

There are two prominent theories that explain child spacing's effect on future outcomes. The resource dilution model argues that smaller spacing between siblings leads to the fewer resources for the family and poor outcomes. Therefore, a longer birth spacing improves children outcomes (Kidwell 1981). A comparatively new theory considers not only about parents' resources but also siblings' resources. Closer spacing allows parents to pool child monetary and time costs (sharing toys/clothes or reading books); it also allows younger siblings to learn more from their older brother or sister, or even vice versa (Black, Devereux et al. 2010, Silles 2010). Of course, the learned behavior of a brother or sister of similar age need not be positive.

These conflicting theories have motivated considerable interest in the role of birth spacing on child outcomes. A substantial literature has assessed the impact of birth spacing on child health (Zhu, Rolfs et al. 1999, Conde-Agudelo, Rosas-Bermúdez et al. 2006, Cheslack-Postava, Liu et al. 2011). A smaller literature has looked at the impact spacing on educational attainment and labor market outcomes, but the evidence has been mixed. There is no general agreement on the effects of birth spacing on education (Broman, Nichols et al. 1975, Zajonc 1976, Galbraith 1982, Powell and Steelman 1993). Nguyen (2013) found no significant effect of birth spacing on children labor market outcomes, but Motamedi (2016) shown that birth spacing has a positive and statistically insignificant effects on labor market income for the children from low-income families.

In this paper, I extend the literature on birth spacing to assess its impact on engaging in risky and/or deviant behaviors. This is a natural extension, as other family characteristics have

been linked to such behaviors (Widmer 1997, Rucibwa, Modeste et al. 2003, Lyerly and Huber 2013). Particularly, birth order has received considerable attention, and has been linked to smoking, substance abuse, and engaging in risky sexual intercourse (Rodgers, Rowe et al. 1992, Argys, Rees et al. 2006, Averett, Argys et al. 2011). Teenage smoking, substance abuse, involvement in property and violent crime, and involvement in risky sexual activity fluctuate, but remain at high levels (Pacula, Grossman et al. 2000, Gruber and Zinman 2001, Levitt and Lochner 2001, Grossman, Kaestner et al. 2004). There is a profound literature about the negative effects of these risky behaviors on the health or academic outcomes (Tobin and Sugai 1999, King, Schwab-Stone et al. 2001, Rector, Johnson et al. 2003, Riala, Hakko et al. 2004, Rector and Johnson 2005, Van Ours and Williams 2009, Grant, Potenza et al. 2011, Grant, Odlaug et al. 2015). To the best of my knowledge Nguyen (2013) is the first and only one who studied birth spacing and risky behaviors. She showed no significant effect of birth spacing on smoking cigarettes.

One reason for the relative absence of studies on birth spacing, particularly with regard to outcomes that occur later in adolescence, is that spacing is likely correlated with unobserved family characteristics and is therefore endogenous. The innovation of this paper is to correct for endogeneity of birth spacing using an instrumental variables approach. Specifically, I use whether a mother is older than the father and whether twins are in family to generate plausibly exogenous identifying information on birth spacing.

My main result is that the longer birth intervals consistently decrease the likelihood of engaging in risky behaviors in terms of underage smoking, unprotected underage intercourse , attacking someone to intent kill or injure, and stealing others' belongs.

The paper is organized as follows: the next section describes the empirical literature related to my research question. Section three introduces the dataset and presents some descriptive

statistics. The fourth section shows the econometric models in detail. Section five presents the results, and the conclusion suggests directions for future research.

2.2. Background and expected pathways

Research on birth spacing initially focused on its relationship with health outcomes of the parent and infants, with particular emphasis on the optimal amount of time that should pass between pregnancies. Zhu, Rolfs et al. (1999) found that the optimal interpregnancy interval for preventing adverse perinatal outcomes is 18 to 23 months. Conde-Agudelo, Rosas-Bermúdez et al. (2006) expanded this spacing to 18 months to 59 months. Van Eijsden, Smits et al. (2008) showed that increasing in the interpregnancy interval was associated with an increase in birth weight. Cheslack-Postava, Liu et al. (2011) showed that shorter intervals between pregnancies increases the likelihood of developing autism. The latter suggests that there are potential biological links between birth spacing and observed papers.

In addition to biological influences, there are additional ways birth spacing might affect the behaviors we observe. Sibling interactions represent another possible route through which birth spacing might be related to child behavior and subsequent achievement. For instance, Zajonc (1976) observed that older children may benefit from teaching younger ones, this effect may increase with spacing. Also older siblings could act as positive role models, their achievements adopted as goals and their failures serving as cautionary examples. Rodgers, Rowe et al. (1992) and Haveman and Wolfe (1995) highlighted the importance of role models, in the determination of desire and behavioral norms of children and adolescents. Cicirelli (1973) made it clear that there is a particular link between birth spacing and role model between the sibling. She proved that younger siblings are more likely to get effects from a sibling who is four years older than one who is two years older.

Parents' resources is another link trough that birth spacing may effect children's outcomes. as mentioned before there are two conflicting theories, the resource dilution model and sharing model. Broman, Nichols et al. (1975) proved that the longer birth spacing between sibling leads to higher scores on the Stanford-Binet intelligence scale. Moreover, Price (2010) and Buckles and Munnich (2012) similarly showed that families with greater spacing experience higher test scores for first-borns. There is a well stablished literature which says non-monetary parents' resources could have an essential effect on children outcomes. Zick, Bryant et al. (2001) showed that children whose parents read or play with them more often have fewer behavioral problems and better grades. Some other studies showed that children who spending more time with their parents have significantly higher cognitive achievements (Leibowitz 1977, Hill and O'Neill 1994, Griffin, Burns et al. 1998).

Along with parents' resources linkage some studies declared that a first-born child may have better outcomes because he or she gets to be an only child for the first few years of life (Lindert 1977, Hanushek 1992). Price (2008) limited his analysis to years in which the second sibling is already present. He proved that the first-born child continues to get more time at each age even after additional siblings are born. Silles (2010) showed first-borns have higher test scores than last-borns. Also, Black, Devereux et al. (2010) suggested that earlier born children have higher IQs. In addition, there is well established that middle-borns are consistently less risk averse than others regardless of the type of risk (Argys, Rees et al. 2006, Averett, Argys et al. 2011, Power 2012). This reflects the role model and parents' resources effects on children's outcomes.

Previous research on the family characteristics and risky behaviors has generally focused on birth order and engaging in risky behaviors. This goes back to some early works in the field of sociology, Benin and Johnson (1984) and Rodgers and Rowe (1988), who introduced modeling

and opportunity as two types of sibling influence models. Rodgers, Rowe et al. (1992) stated that younger siblings are sexually more active at earlier ages than their older siblings. Moreover, Morgan (2009) showed that younger siblings had higher hazards of initiation into the activities of smoking, marijuana usage, sexual intercourse, and drinking compared to oldest children. Also, Averett, Argys et al. (2011) found the same results for a variety of risky behaviors, such as smoking cigarettes, drinking alcohol, having sexual intercourse, stealing, running away from home, and driving a car without permission. Bajczyk (2011) stated that adolescents with older siblings more likely to engage into drug use, sexual activity and violent or antisocial offenses than adolescents who did not have older siblings (eldest and only children). Farivar (2011) considered dropping out of high school as a risky behavior and examined its' relation with birth order. She found that teens with older siblings are more at the risk of dropping out of school. All these may be explained via

There is a belief that engaging in early risky behaviors, like underage smoking, underage intercourse, fighting and robbing, could lead to poor educational attainment, subsequent failure in the labor market, and without a good job to anchor their lives, an unhappy future (Sosin, Koepsell et al. 1995, Rector, Pardue et al. 2004, Blanco, Grant et al. 2008). Viewed within a human capital framework, this scenario may find resonance. For example, this could lead teenagers to substitute time spent on involving in those risky behaviors for time spent studying, resulting in poor academic achievement and an early exit from education. There is substantial evidence of the long-terms health costs associated with adolescent smoking. Van Ours and Williams (2009) and Robst and Weinberg (2010) examine the relationship between early childhood behaviors and dropping out of high school. They show that those who become involved in drug use are much more likely to drop out of school. Riala, Hakko et al. (2004) indicate that teenage smoking is an important predictor for substance-use-related problems later in adolescence.

Another potentially dangerous activity we assess is sex while a minor, particularly as it relates to human capital accumulation. There are two explanations for this. First, teens who do not engage in sexual intercourse will be subject to less emotional trouble and fewer psychological distractions; this will lead them to better focus on schoolwork. Second, abstinence and academic achievement are inspired by common underlying characteristics (Rector, Johnson et al. 2003). Teens who abstain are more likely to have greater impulse control, greater perseverance, greater resistance to peer pressure, and more respect for parental and societal values. These elements are likely to result in higher academic performance (Rector and Johnson 2005). There is a long standing literature suggesting that initiating sexual intercourse at a young age, particularly prior to age 16, has a negative effect on subsequent academic goals and achievement (Billy, Landale et al. 1988, Miller and Sneesby 1988, Meilman 1993, Brook, Balka et al. 1994, Schvaneveldt, Miller et al. 2001, Rector and Johnson 2005).

Furthermore, stealing appears to begin mainly in childhood or adolescence, with approximately 66 percent of individuals reporting lifetime stealing beginning before they were 15 years of age (Blanco, Grant et al. 2008). Since stealing may be fairly common, a large number of social scientists have attempted to define the effects of this risky behaviors on the outcomes of children's' lives. Grant, Potenza et al. (2011) study a large sample of high school students for addressing this relationship. They prove that stealing behavior can lead to poor grades, sadness and hopelessness. Grant, Odlaug et al. (2015) also find that stealing behavior can increase the levels of perceived stress and a number of psychiatric disorders.

Finally, violence is an important issue affecting the health and academic outcomes of adolescents. There are some studies showing that young people who fight frequently will turn out to be less educated. Tobin and Sugai (1999) prove that students who are more involved in fighting

are more likely to drop out of school. Some social scientists show that physical fighting strongly increases other problem behaviors like psychosomatic disorders and risk of suicidal ideation and attempts (Sosin, Koepsell et al. 1995, Grufman and Berg- Kelly 1997, King, Schwab-Stone et al. 2001).

There is only one study dealing with time intervals and probability of involving in risky behaviors (Nguyen 2013). Her findings indicate that birth spacing does not have an impact on smoking cigarettes. That study does not address birth order endogeneity however.

2.3. Data and Methodology

To examine the link between birth spacing and engaging in risky or deviant behaviors, I use the National Longitudinal Survey of Youth, 1979 (NLSY79), which follows a sample of Americans born from 1957-64 and contains ample information on a variety of individual, family, and geographic characteristics. I am interested in studying siblings in pairs of two. Each child is represented two times in the data set. In the first one, I consider the age difference between the index child and his or her older sibling. In the second one, I examine the birth spacing as the time interval between the index child and his or her younger sibling. In each pair, I apply a dummy variable which shows whether the index child is the older one in the pair. Prior research shows that adolescents with older siblings are more likely to engage in risky activities than their first-born counterparts (Argys, Rees et al. 2006, Lampi and Nordblom 2010, Averett, Argys et al. 2011, Gilliam and Chatterjee 2011). Also, there is a rich literature shows that first-borns have higher test scores and Higher IQs and tend to be better behaved at school, than later-borns (Black, Devereux et al. 2010, Silles 2010). So, I exclude first-borns and limit my sample two second or higher birth order children. This leaves me with 1,141 observations.

Table 2.1 shows the sample statistics associated with the outcome variables, as well as the explanatory variables I use. The dependent variables are a series of dummy variables. *Unprotected Underage Sex* shows that individuals had their first sexual intercourse before or at 17 and indicated if that was an unprotected intercourse. Similarly, *Underage Smoking* is equal to one if individuals report they have had the first smoking experience at age of 17 or less; 29% of the observations have had unprotected underage intercourse experience and 12% have had underage smoking experience. Also, *Stealing* is equal to one if index observation has stolen others' belongs during past year. Furthermore, if the observation has attacked someone with intend to injure or kill in the past year, I assign one to *Attacking.* 10% and 20% of the sample have attacked someone and have stolen others' belongs last year, respectively.

There are a number of additional explanatory variables in this analysis. Kanoy and Miller (1980) showed that the spacing of children might affect parents' relationships with their children or with one. Therefore, I include *Parents* as a dummy variable that shows the child's mother and father were living together in 1979. The sample consists of 28% respondents who lived with both parents in 1979. While mother's average years of education is 11 years. Also, average number of siblings are five in the sample. Moreover, I consider four dummy variables for indicating birth order in the family. Since living in the urban or rural area plays an important role in making habits (Griffin, Moon et al. 2015), I include a dummy variable which shows whether index child lived in urban area at 1979. I Include *Female* as an explanatory variable since gender makes huge difference in engaging in risky behaviors (Kreiter, Krowchuk et al. 1999, Blum, Beuhring et al. 2000). Furthermore, regarding to modeling and opportunity models, siblings' effects should be more substantial for same-sex than for opposite-sex siblings, so I apply two dummy variables

which indicating having two boys or two girls in the pair of study (Benin and Johnson 1984, Rodgers and Rowe 1988).

The goal of this research is to explore the potential influence of birth spacing on the probability of engaging in certain risky behaviors. I begin by estimating the effect of birth spacing on engaging in risky behaviors by using the Probit method as follows:

$$Risky\_Behavior_i = \beta_1 + \beta_2 Birthspacing_i + X_i'\theta_1 + F_i'\theta_2 + u_i \quad (1)$$

The index *i* denotes observations at the individual level. The dependent variable is propensity to engage in a particular risky activity which are equal to one if child index has engaged to any of these risky activities such as underage smoking, unprotected underage sex, stealing other's belongs, and attacking someone with intent to injure or kill.

The *Birth Spacing* is considered either as a time interval between the index child and his or her younger sibling and/or his or her older sibling in each family (in years). X_i is a vector of all individual characteristics outlined in the Table 2.1. These include age, race, education, test score on the Armed Forces Qualification Test (AFQT), gender, being the older one in each pair of siblings, being in the same-sex pair of study, birth order dummy variables, and their urban status in 2002.

F_i is a vector of all family characteristics for each child, including mother's education, log of family income (in 1979), age of mother at the first birth and number of siblings in each family. Further, a dummy variable representing the index child living with both parents in 1979 is included.

Although I control for many of family characteristics, there are still some unobserved ones, which may be correlated with spacing and the engaging in risky behaviors. So the key issue to be tackled is the potential endogeneity which might lead to inconsistent estimators. For this reason, I apply the IV-Probit methodology. The NLSY data set offers the advantage of having two instrumental variables for birth spacing. More pointedly, we introduce two variables showing parents' age difference when the mother is older than the father and a dummy variable indicates that whether there are twins in the family as instrumental variables.

Including these two Instrumental Variables in a Z vector, the first stage in my model can be written as

$$Birthspacing_i = \lambda_1 + Z_i'\delta_2 + X_i'\lambda_1 + F_i'\lambda_2 + \nu_i \qquad (2)$$

and the second stage is as follows:

$$Risky\_Behavior_i = \alpha_1 + \alpha_2 Birthspacing_i + X_i'\sigma_1 + F_i'\sigma_2 + \varepsilon_i \qquad (3)$$

For reaching consistent IV estimates, the excluded instruments should be uncorrelated with the error term in equation (1). My first concern is that *Parents' Age Difference* may be related to the probability of getting divorced (Gentleman and Park 1993). This is unprovable, but I simply run the regression for examining the effect of having the mother older than the father and *Parents' Age Difference* on the probability of divorce and find no significant effect. Also, I add a dummy variable, *Parents*, to the explanatory variables which shows whether child index lived with both parents in 1979.

Concerning twins as an instrument, there is a concern about potential casual effect of unobserved family characteristics on probability of having twins in the family. Black, Devereux

et al. (2005), who use twin births as an IV for family size, note this effect is not testable. Nevertheless, they considered the simple regression for examining effect of parental education on probability of having twins in the family. I follow their lead and also find no statistical significant effect of parental education on the probability of having twins in the family. For these reasons, I am comfortable that these instrumental variables can be used to identify exogenous changes in birth spacing.

2.5. Result

The effect of birth spacing on engaging in risky behaviors when I apply Probit models for the whole sample are reported in Table 2.2 which shows that birth spacing has statistically insignificant effects on engaging in risky behaviors for all samples while the Probit is applied. Since there is literature showing that first-borns individuals have different risk preferences than later-born children, I excluded first-borns and report results for the second-borns and higher birth order children in Table 2.3 (Argys, Rees et al. 2006, Averett, Argys et al. 2011, Power 2012). Also, there are well-established finding showing that education is an essential determinant of engaging in risky behaviors (Escobedo and Peddicord 1996, Zhu, Giovino et al. 1996, Schiaffino, Fernandez et al. 2003) . In keeping with this literature, I use *AFQT score* and *Education* as explanatory variables. To find out what portion of the gap's effect comes through schooling, I examine the model without *Education* and *AFQT* score in tables 2.4 and 2.5.

Columns 2, 4, 6, and 8 in Table 2.2 present birth spacing's effects on these risky behaviors for the whole sample while an IV-Probit method is applied. These columns show that birth spacing has a negative and statistically significant effect on probability of engaging in *all* four risky behaviors in the whole sample, in presence of *Education* and *AFQT Score* as explanatory variables. The lower part of table presents P-Value Wald test for Exogeneity and the Ln Sigma. It indicates that

the model with instrumental variables, the *Twin* and the *Parents' Age Difference*, does not have any sign of weak instrumental variable problem and passes over-identification tests.

I exclude the first-borns from the model and report the results for the Probit and IV-Probit models in Table 2.3. Results for the second born and higher birth order children following same pattern as the whole sample's results. Which means longer birth spacing decreases the probability of engaging in those four risky activities.

Table 2.4 and 2.5 show results while I exclude both *Education* and *AFQT score* to assess whether that effect is working through human capital accumulation or something else. Results excluding these variables show same effects of *Birth spacing* on engaging in risky behaviors, which indicates these effects are working through birth spacing and not human capital acquisition for both whole and higher birth order children samples.

Comparing Probit and IV-Probit results in tables 2.2-2.5 reveals the positive bias in the Probit results. In fact, most researchers working on family characteristics assumed that children are particularly sensitive to parental time investments and the home environment at young ages. However, certain nonmonetary parental inputs, such as monitoring and supervision, may become increasingly important as a child matures, especially in the determination of risky behaviors. Another possible route through which birth spacing might be related to child behavior and subsequent achievement is sibling interactions. For instance, having an older sibling with closer spacing may provide more opportunities to interact with, and perhaps copy the behavior of, a different set of friends. Having children with longer spacing gives the opportunity to use their help for monitoring younger siblings (Rodgers, Rowe et al. 1992). I also, exclude all twins of sample and report the results for the non-twin child indexes as robustness check in Table 2.6. In this case

I use presence of any twin and parents' age difference when the mother is older than the father as instrumental variables. Table 2.6 shows that results presenting in tables 2.2-2.5 are robust.

As mentioned before, there are two conflicting philosophies about the effect of child spacing on the outcomes. The outcome of this effect of time intervals on engaging in risky activities depends on the strength of these effects. It sounds sensible that one of these forces may cancel out the other one. Results show that the resource model's effect cancel out the sharing resources' one which means that the longer birth spacing allows parents to rebuilt their resources, both money and time, which able them to support their children better. Also, they can supervise them better than the parents with the shorter time interval between children.

My results show that non-whites have higher probability of experiencing unprotected underage intercourse. This finding is consistent with the literature on heterogeneity across ethnicity for engaging in risky activities which shows non-whites are more likely to experience underage intercourse than whites (Kim, Marmor et al. 1993, Blum, Beuhring et al. 2000). Also,HarrelL, Bangdiwala et al. (1998) showed that boys has a higher prevalence of experimental smoking than girls at all time points. I found that girls have lower probability for engaging in risky behaviors in all these risky activities across all sub-samples (except perhaps in the case of engaging in underage intercourse).

This paper is the first and only one which shows significant effects of birth spacing on engaging in risky behaviors. There is only one study on birth spacing and labor underage smoking which presents no significant effect of time intervals on this risky activities (Nguyen 2013). My effects are more comprehensive in that I examined four different risky activities and found significant effect for all of them.

2.6. Conclusion

In this paper, I investigate the link of time intervals between children and engaging in certain risky behaviors. I use IV-Probit regression and my sample is based on data from NLSY. I am interested in studying siblings in pairs of two. Each child is represented two times in the data set. In the first, I consider age difference between the index child and his or her older sibling. While in the second, I examine the birth spacing as the time interval between the index child and his or her younger sibling.

I applied the Probit model in the first model and found insignificant effects for all subsamples. Instrumental variables estimation, however, shows negative and significant effect for all these risky activities over all sub-sample.

Since there is only one paper which studied the effect of birth spacing on risky behaviors which found no significant effect (Nguyen 2013), my findings can be useful for policy makers and provide some guidelines for advising families about choosing time intervals between their children.

REFERENCES

Argys, L. M., et al. (2006). "Birth order and risky adolescent behavior." Economic Inquiry **44**(2): 215-233.

Averett, S. L., et al. (2011). "Older siblings and adolescent risky behavior: does parenting play a role?" Journal of Population Economics **24**(3): 957-978.

Bajczyk, J. A. (2011). Rate changes In risky behavior & the role of sibling influence, Rowan University.

Benin, M. H. and D. R. Johnson (1984). "Sibling similarities in educational attainment: A comparison of like-sex and cross-sex sibling pairs." Sociology of Education: 11-21.

Billy, J. O., et al. (1988). "Effects of sexual activity on adolescent social and psychological development." Social Psychology Quarterly: 190-212.

Black, S. E., et al. (2005). "The more the merrier? The effect of family size and birth order on children's education." The Quarterly Journal of Economics: 669-700.

Black, S. E., et al. (2010). "Small family, smart family? Family size and the IQ scores of young men." Journal of Human Resources **45**(1): 33-58.

Blanco, C., et al. (2008). "Prevalence and correlates of shoplifting in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)." American Journal of Psychiatry.

Blum, R. W., et al. (2000). "The effects of race/ethnicity, income, and family structure on adolescent risk behaviors." American Journal of Public Health **90**(12): 1879.

Broman, S. H., et al. (1975). "Preschool IQ: Prenatal and early developmental correlates."

Brook, J. S., et al. (1994). "Sequence of sexual behavior and its relationship to other problem behaviors in African American and Puerto Rican adolescents." The Journal of Genetic Psychology **155**(1): 107-114.

Buckles, K. S. and E. L. Munnich (2012). "Birth spacing and sibling outcomes." Journal of Human Resources **47**(3): 613-642.

Cheslack-Postava, K., et al. (2011). "Closely spaced pregnancies are associated with increased odds of autism in California sibling births." Pediatrics **127**(2): 246-253.

Cicirelli, V. G. (1973). "Effects of sibling structure and interaction on children's categorization style." Developmental Psychology **9**(1): 132.

Conde-Agudelo, A., et al. (2006). "Birth spacing and risk of adverse perinatal outcomes: a meta-analysis." Jama **295**(15): 1809-1823.

Escobedo, L. G. and J. P. Peddicord (1996). "Smoking prevalence in US birth cohorts: the influence of gender and education." American Journal of Public Health **86**(2): 231-236.

Farivar, L. (2011). Three essays on family structure and school dropout among adolescents, University of Illinois at Urbana-Champaign.

Galbraith, R. C. (1982). "Sibling spacing and intellectual development: A closer look at the confluence models."

Gentleman, J. and E. Park (1993). "Age differences of married and divorcing couples." Health Reports **6**(2): 225-240.

Gilliam, J. and S. Chatterjee (2011). "The Influence of birth order on financial risk tolerance." Journal of Business & Economics Research (JBER) **9**(4): 43-50.

Grant, J. E., et al. (2015). "Characteristics and correlates of stealing in college students." Criminal Behaviour and Mental Health.

Grant, J. E., et al. (2011). "Stealing among high school students: prevalence and clinical correlates." Journal of the American Academy of Psychiatry and the Law Online **39**(1): 44-52.

Griffin, E., et al. (2015). "Examining the significance of urban–rural context in tobacco quitline use: does rurality matter?" International journal of public health **60**(3): 327-333.

Griffin, P., et al. (1998). Preventing reading difficulties in young children, National Academies Press.

Grossman, M., et al. (2004). "Get high and get stupid: The effect of alcohol and marijuana use on teen sexual behavior." Review of Economics of the Household **2**(4): 413-441.

Gruber, J. and J. Zinman (2001). Youth smoking in the United States: evidence and implications. Risky behavior among youths: An economic analysis, University of Chicago Press**:** 69-120.

Grufman, M. and K. Berg- Kelly (1997). "Physical fighting and associated health behaviours among Swedish adolescents." Acta Paediatrica **86**(1): 77-81.

Hanushek, E. A. (1992). "The trade-off between child quantity and quality." Journal of political economy: 84-117.

HarrelL, J. S., et al. (1998). "Smoking initiation in youth: the roles of gender, race, socioeconomics, and developmental status." Journal of Adolescent Health **23**(5): 271-279.

Haveman, R. and B. Wolfe (1995). "The determinants of children's attainments: A review of methods and findings." Journal of economic literature **33**(4): 1829-1878.

Hill, M. A. and J. O'Neill (1994). "Family endowments and the achievement of young children with special reference to the underclass." Journal of Human Resources: 1064-1100.

Kanoy, K. and B. C. Miller (1980). "Children's impact on the parental decision to divorce." Family Relations: 309-315.

Kidwell, J. S. (1981). "Number of siblings, sibling spacing, sex, and birth order: Their effects on perceived parent-adolescent relationships." Journal of Marriage and the Family: 315-332.

Kim, M. Y., et al. (1993). "HIV risk-related sexual behaviors among heterosexuals in New York City: associations with race, sex, and intravenous drug use." AIDS **7**(3): 409-414.

King, R. A., et al. (2001). "Psychosocial and risk behavior correlates of youth suicide attempts and suicidal ideation." Journal of the American Academy of Child & Adolescent Psychiatry **40**(7): 837-846.

Kreiter, S. R., et al. (1999). "Gender differences in risk behaviors among adolescents who experience date fighting." Pediatrics **104**(6): 1286-1292.

Lampi, E. and K. Nordblom (2010). "Risk-taking middle-borns: A study on birth-order and risk preferences." rapport nr.: Working Papers in Economics 438.

Leibowitz, A. (1977). "Parental inputs and children's achievement." The Journal of Human Resources **12**(2): 242-251.

Levitt, S. D. and L. Lochner (2001). The determinants of juvenile crime. Risky behavior among youths: An economic analysis, University of Chicago Press**:** 327-374.

Lindert, P. H. (1977). "Sibling position and achievement." Journal of Human Resources: 198-219.

Lyerly, J. E. and L. R. B. Huber (2013). "The role of family conflict on risky sexual behavior in adolescents aged 15 to 21." Annals of epidemiology **23**(4): 233-235.

Meilman, P. W. (1993). "Alcohol-induced sexual behavior on campus." Journal of American College Health **42**(1): 27-31.

Miller, B. C. and K. R. Sneesby (1988). "Educational correlates of adolescents' sexual attitudes and behavior." Journal of Youth and Adolescence **17**(6): 521-530.

Morgan, E. M. (2009). The heir and the spare: Impact of birth order on risk attitudes, discount rates, and behaviors, University of South Carolina.

Motamedi, M. (2016). "Child Spacing and Children's Labor Market Outcomes." Unpublished **Working Paper**.

Nguyen, N. (2013). "Birth Spacing and Outcomes in Adolescence, Young Adulthood and Adulthood."

Pacula, R. L., et al. (2000). Marijuana and youth, National Bureau of Economic Research.

Powell, B. and L. C. Steelman (1993). "The educational benefits of being spaced out: Sibship density and educational progress." American Sociological Review: 367-381.

Power, M. (2012). "Identifying Birth Order Effects on Adolescent Risky Behaviour."

Price, J. (2008). "Parent-Child Quality Time Does Birth Order Matter?" Journal of Human Resources **43**(1): 240-265.

Price, J. (2010). "The effects of parental time investments: Evidence from natural within-family variation." Unpublished manuscript, Brigham Young University.

Rector, R. and K. A. Johnson (2005). Teenage sexual abstinence and academic achievement. Ninth Annual Abstinence Clearinghouse Conference.

Rector, R. E., et al. (2003). "Sexually Active Teenagers Are More Likely To Be Depressed and To Attempt Suicide. A Report of the Heritage Center for Data Analysis."

Rector, R. E., et al. (2004). What Do Parents Want Taught in Sex Education Programs?, Heritage Foundation.

Riala, K., et al. (2004). "Teenage smoking and substance use as predictors of severe alcohol problems in late adolescence and in young adulthood." Journal of Adolescent Health **35**(3): 245-254.

Robst, J. and C. Weinberg (2010). "Childhood behavioral problems and dropping out of school." Eastern Economic Journal **36**(4): 523-538.

Rodgers, J. L. and D. C. Rowe (1988). "Influence of siblings on adolescent sexual behavior." Developmental Psychology **24**(5): 722.

Rodgers, J. L., et al. (1992). "Sibling differences in adolescent sexual behavior: Inferring process models from family composition patterns." Journal of Marriage and the Family: 142-152.

Rucibwa, N. K., et al. (2003). "Exploring family factors and sexual behaviors in a group of Black and Hispanic adolescent males." American Journal of Health Behavior **27**(1): 63-74.

Schiaffino, A., et al. (2003). "Gender and educational differences in smoking initiation rates in Spain from 1948 to 1992." The European Journal of Public Health **13**(1): 56-60.

Schvaneveldt, P. L., et al. (2001). "Academic goals, achievement, and age at first sexual intercourse: Longitudinal, bidirectional influences." Adolescence **36**(144): 767.

Silles, M. A. (2010). "The implications of family size and birth order for test scores and behavioral development." Economics of Education Review **29**(5): 795-803.

Sosin, D. M., et al. (1995). "Fighting as a marker for multiple problem behaviors in adolescents." Journal of Adolescent Health **16**(3): 209-215.

Tobin, T. J. and G. M. Sugai (1999). "Using sixth-grade school records to predict school violence, chronic discipline problems, and high school outcomes." Journal of Emotional and Behavioral Disorders **7**(1): 40-53.

Van Eijsden, M., et al. (2008). "Association between short interpregnancy intervals and term birth weight: the role of folate depletion." The American journal of clinical nutrition **88**(1): 147-153.

Van Ours, J. C. and J. Williams (2009). "Why parents worry: initiation into cannabis use by youth and their educational attainment." Journal of health economics **28**(1): 132-142.

Widmer, E. D. (1997). "Influence of older siblings on initiation of sexual intercourse." Journal of Marriage and the Family: 928-938.

Zajonc, R. B. (1976). "Family configuration and intelligence: Variations in scholastic aptitude scores parallel trends in family size and the spacing of children." Science.

Zhu, B.-P., et al. (1996). "The relationship between cigarette smoking and education revisited: implications for categorizing persons' educational status." American Journal of Public Health **86**(11): 1582-1589.

Zhu, B.-P., et al. (1999). "Effect of the interval between pregnancies on perinatal outcomes." New England journal of medicine **340**(8): 589-594.

Zick, C. D., et al. (2001). "Mothers' employment, parental involvement, and the implications for intermediate child outcomes." Social Science Research **30**(1): 25-49.

Table 2—0—1:. Descriptive Statistics for the Sample

Variable	Description	Whole Sample		Excluding First-borns	
		Mean	Std. Dev.	Mean	Std. Dev.
Birth Spacing	Time interval between the oldest child and the youngest one adjusting by the number of children	2.95	2.25	3.17	2.41
Underage Smoking	=1 if the index child have had the first smoking experience at age of 17 or less	0.89	0.32	0.89	0.31
Unprotected Underage Sex	=1 if the index child have had the first intercourse experience at age of 17 or less	0.29	0.45	0.29	0.45
Stealing	=1 if the index child has stolen others' belongs during past year.	0.20	0.40	0.20	0.40
Attacking	=1 if the index child has stolen others' belongs during past year.	0.10	0.30	0.10	0.30
First Child	=1 if the index child is the first-born	0.28	0.45		
Second Child	=1 if the index child is the second-born	0.30	0.46	0.42	0.49
Third Child	=1 if the index child is the third-born	0.20	0.40	0.20	0.45
Fourth Child	=1 if the index child is the fourth-born	0.10	0.30	0.14	0.35
Two Girls in the Pair	=1 if there are two girls in the pair of study	0.26	0.44	0.26	0.44
Two Boys in the Pair	=1 if there are two boys in the pair of study	0.23	0.42	0.20	0.40
Being Older Sibling in the Pair	=1 if child index is the older sibling in the pair of study	0.28	0.45	0.01	0.08
Number of Siblings	Number of siblings in each family	4.74	1.800	5.09	1.89
Education	Year of schooling	13.43	2.16	13.35	2.14
AFQT Score	Armed Forces Qualification Test percentiles score at 1980	48.75	28.84	46.82	28.73
Age	Age of observation at 2001	41.44	2.22	41.47	2.26
Family Income	Log of family real income at 1979	9.64	0.77	9.61	0.79
Parents	=1 if mother and father lived in the same household at 1979	0.72	0.45	0.73	0.44
Mother's Age at First Birth	Age of mother at her first birth	44.67	4.80	44.64	4.74
Mother's Education	Mother's years of schooling	11.76	2.46	11.65	2.52
Urban	=1 if index child lived in Urban area	0.73	0.44	0.73	0.44
Female	=1 if female	0.54	0.50	0.55	0.50
Black	=1 if Black	0.30	0.46	0.32	0.47
Twin	=1 if there is twin(s) in the family	0.02	0.13	0.10	0.14
Parents' Age Difference	Age difference between the Mother and the Father if mother is older than father in the family	1.15	5.10	0.97	4.70
N	Number of Observations	1,141		822	

Table 2—2: Probit and IV-Probit Estimates for Engaging in Risky Behaviors for the Whole Sample

	Underage-Smoking		Unprotected Underage Intercourse		Stealing Other's Belongs		Attacking Someone with Intent to Injure or Kill	
	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage
Birth Spacing	0.008	-0.379***	-0.005	-0.157*	0.019	-0.143*	0.008	-0.235***
Being First	-0.307	-1.224***	0.875	0.348	-0.600	-0.890*	-0.182	-0.780
Being Second	-0.167	-0.452**	-0.013	-0.200	0.200	-0.004	0.167	-0.131
Being Third	-0.032	-0.205	-0.053	-0.158	0.036	-0.081	0.103	-0.070
Being Fourth	0.107	-0.060	0.237	0.165	0.202	0.133	0.174	0.059
Same Sex Female	0.035	-0.002	0.001	0.012	0.138	0.162	0.131	0.170
Same Sex Male	0.203	0.213	-0.016	0.035	-0.048	-0.007	0.119	0.164
Older Sibling in a Pair	0.076	0.405*	-0.852	-0.649	0.709	0.645	0.389	0.445
Number of Sibling	0.069	0.211***	0.005	0.081*	0.016	0.067*	0.035	0.091*
Education	-0.088**	-0.053	-0.135***	-0.125***	-0.034	-0.033	-0.031	-0.028
AFQT Score	0.001	0.002	0.000	0.000	-0.004*	-0.004*	-0.006**	-0.004
Age	-0.076***	-0.044	-0.187***	-0.177***	-0.017	-0.016	0.026	0.020
Family Income	-0.029	-0.014	0.109*	0.098	0.096	0.080	0.044	0.025
Parents	-0.068	-0.166	0.248**	0.181*	-0.149	-0.180*	-0.110	-0.151
Mother's Age at First Birth	-0.024*	-0.020*	0.036***	0.029***	0.018*	0.009	0.001	-0.010
Mother's Education	0.047*	0.015	-0.003	-0.005	-0.011	-0.013	0.001	-0.001
Urban	0.026	-0.025	-0.232**	-0.249***	0.343***	0.296***	0.019	-0.023
Female	-0.473***	-0.169*	-0.214*	-0.183	-0.643***	-0.570***	-0.456***	-0.341**
Black	-0.010	0.115	0.213*	0.244**	-0.181	-0.148	-0.103	-0.052
Constant	6.896***	6.673***	2.621**	3.840***	-1.562	0.047	-2.284*	0.304
Twin (First Stage)		-3.294***		-3.095***		-3.104***		-3.074***
Parents' Age Difference (First Stage)		-0.007		-0.003		0.006		-0.001
P-Value Wald test for Exogeneity		0.06		0.09		0.08		0.01
Observations	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141
Ln Sigma		0.778***		0.770***		0.730***		0.730***

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table 2—3: Probit and IV-Probit Estimates for Engaging in Risky Behaviors for the Second-borns and Higher Birth Order (Excluding First-borns)

	Underage-Smoking		Unprotected Underage Intercourse		Stealing Other's Belongs		Attacking Someone with Intent to Injure or Kill	
	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage
Birth Spacing	-0.010	-0.278***	0.013	-0.183**	0.014	-0.153*	-0.005	-0.216***
Being First								
Being Second	-0.104	-0.382	0.045	-0.242	0.147	-0.106	0.107	-0.203
Being Third	0.023	-0.158	-0.018	-0.189	0.004	-0.151	0.073	-0.124
Being Fourth	0.163	-0.002	0.267	0.135	0.189	0.085	0.148	0.008
Same Sex Female	-0.083	-0.031	-0.047	0.002	0.133	0.186	0.208	0.261
Same Sex Male	0.358	0.368*	0.082	0.150	0.052	0.093	0.142	0.187
Older Sibling in a Pair	0.025	3.261***	-0.476	-0.510	0.651	0.544	1.166**	0.939
Number of Sibling	0.058	0.179***	0.012	0.099*	0.018	0.079*	0.025	0.099*
Education	-0.094**	-0.090**	-0.131***	-0.110***	-0.019	-0.023	-0.023	-0.028
AFQT Score	0.002	0.003	0.002	0.002	-0.005*	-0.005**	-0.006*	-0.004
Age	-0.092***	-0.074**	-0.218***	-0.193***	-0.010	-0.008	0.036	0.034
Family Income	0.016	0.028	0.127*	0.125*	0.067	0.069	0.056	0.061
Parents	-0.031	-0.106	0.220*	0.136	-0.209*	-0.233**	-0.107	-0.141
Mother's Age at First Birth	-0.005	-0.011	0.040***	0.026*	0.020*	0.008	-0.003	-0.015
Mother's Education	0.032	0.016	-0.027	-0.028	0.003	-0.000	0.025	0.018
Urban	-0.074	-0.068	-0.232**	-0.245**	0.252**	0.200	0.011	-0.035
Female	-0.354**	-0.225*	-0.163	-0.134	-0.650***	-0.569***	-0.473***	-0.365**
Black	0.076	0.154	0.349***	0.367***	-0.201	-0.172	-0.084	-0.050
Constant	6.452***	7.280***	3.576**	4.921***	-1.937	-0.228	-2.936*	-0.598
Twin (First Stage)		-3.273***		-2.900***		-3.013***		-2.941***
Parents' Age Difference (First Stage)		-0.030**		-0.024**		-0.008		-0.015
P-Value Wald test for Exogeneity		0.05		0.02		0.09		0.02
Observations	822	822	822	822	822	822	822	822
Ln Sigma		0.819***		0.823***		0.798***		0.798***

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1*

Table 2—40—2: Probit and IV-Probit Estimates for Engaging in Risky Behaviors for the Whole Sample

	Underage-Smoking		Unprotected Underage Intercourse		Stealing Other's Belongs		Attacking Someone with Intent to Injure or Kill	
	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage
Birth Spacing	-0.010	-0.278***	0.013	-0.183**	0.014	-0.153*	-0.005	-0.216***
Being First								
Being Second	-0.104	-0.382	0.045	-0.242	0.147	-0.106	0.107	-0.203
Being Third	0.023	-0.158	-0.018	-0.189	0.004	-0.151	0.073	-0.124
Being Fourth	0.163	-0.002	0.267	0.135	0.189	0.085	0.148	0.008
Same Sex Female	-0.083	-0.031	-0.047	0.002	0.133	0.186	0.208	0.261
Same Sex Male	0.358	0.368*	0.082	0.150	0.052	0.093	0.142	0.187
Older Sibling in a Pair	0.025	3.261***	-0.476	-0.510	0.651	0.544	1.166**	0.939
Number of Sibling	0.058	0.179***	0.012	0.099*	0.018	0.079*	0.025	0.099*
Education	-0.094**	-0.090**	-0.131***	-0.110***	-0.019	-0.023	-0.023	-0.028
AFQT Score	0.002	0.003	0.002	0.002	-0.005*	-0.005**	-0.006*	-0.004
Age	-0.092***	-0.074**	-0.218***	-0.193***	-0.010	-0.008	0.036	0.034
Family Income	0.016	0.028	0.127*	0.125*	0.067	0.069	0.056	0.061
Parents	-0.031	-0.106	0.220*	0.136	-0.209*	-0.233**	-0.107	-0.141
Mother's Age at First Birth	-0.005	-0.011	0.040***	0.026*	0.020*	0.008	-0.003	-0.015
Mother's Education	0.032	0.016	-0.027	-0.028	0.003	-0.000	0.025	0.018
Urban	-0.074	-0.068	-0.232**	-0.245**	0.252**	0.200	0.011	-0.035
Female	-0.354**	-0.225*	-0.163	-0.134	-0.650***	-0.569***	-0.473***	-0.365**
Black	0.076	0.154	0.349***	0.367***	-0.201	-0.172	-0.084	-0.050
Constant	6.452***	7.280***	3.576**	4.921***	-1.937	-0.228	-2.936*	-0.598
Twin (First Stage)		-3.273***		-2.900***		-3.013***		-2.941***
Parents' Age Difference (First Stage)		-0.030**		-0.024**		-0.008		-0.015
P-Value Wald test for Exogeneity		0.05		0.02		0.09		0.02
Observations	822	822	822	822	822	822	822	822
Ln Sigma		0.819***		0.823***		0.798***		0.798***

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table 2—5: Probit and IV-Probit Estimates for Engaging in Risky Behaviors for the Second-borns and Higher Birth Order while Excluding Education and AFQT Score

	Underage-Smoking		Unprotected Underage Intercourse		Stealing Other's Belongs		Attacking Someone with Intent to Injure or Kill	
	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage	Probit	Second Stage
Birth Spacing	-0.008	-0.271***	0.012	-0.197**	0.016	-0.153*	-0.010	-0.213***
Being First		-0.371						
Being Second	-0.099		0.065	-0.245	0.154	-0.105	0.108	-0.193
Being Third	0.061	-0.117	-0.027	-0.206	0.015	-0.143	0.081	-0.109
Being Fourth	0.218	0.056	0.220	0.086	0.198	0.095	0.146	0.015
Same Sex Female	-0.117	-0.059	0.000	0.046	0.143	0.196	0.194	0.248
Same Sex Male	0.356	0.372**	0.071	0.146	0.057	0.098	0.131	0.177
Older Sibling in a Pair	0.011	3.137***	-0.307	-0.356	0.684	0.576	1.108*	0.906
Number of Sibling	0.051	0.170***	0.001	0.116**	0.019	0.080*	0.025	0.096*
Education								
AFQT Score								
Age	-0.093***	-0.073**	-0.201***	-0.174***	0.000	0.004	0.021	0.022
Family Income	-0.010	0.009	0.191**	0.181**	0.089	0.090	0.016	0.027
Parents	-0.056	-0.127	0.260**	0.163	-0.207*	-0.232**	-0.113	-0.146
Mother's Age at First Birth	-0.012	-0.017	0.049***	0.033**	0.023**	0.011	-0.008	-0.019
Mother's Education	0.016	0.002	0.010	0.004	0.013	0.008	0.001	-0.003
Urban	-0.114	-0.104	-0.179	-0.200*	0.255**	0.201	0.001	-0.043
Female	-0.382**	-0.281*	-0.184	-0.159	-0.651***	-0.569***	-0.470***	-0.369**
Black	0.093	0.163	0.338**	0.356***	-0.315	-0.291	0.047	0.047
Constant	6.023***	6.754***	3.212**	4.558***	-2.827**	-1.119	-1.983	0.015
Twin (First Stage)		-3.289***		-2.848***		-3.012***		-2.947***
Parents' Age Difference (First Stage)		-0.030**		-0.026**		-0.008		-0.014
P-Value Wald test for Exogeneity		0.06		0.02		0.08		0.03
Observations	822	822	822	822	822	822	822	822
Ln Sigma		0.820***		0.823***		0.798***		0.798***

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Table 2—6: Robustness Checks – Second Stage Only

Row Number	Samples	Underage Smoking	Unprotected Underage Sex	Stealing	Attacking
1	Whole Sample	0.379***	-0.157*	-0.143*	-0.235***
2	First-borns	-0.097*	-0.332*	-0.104*	-0.03*
3	Second-borns and higher	0.278***	-0.183**	-0.153*	-0.216***
4	Removing anyone who is a twin	-0.069	-0.317*	-0.317*	-0.467*

*Significantly different regression coefficients from Zero: *** p<0.01, ** p<0.05, * p<0.1**

Chapter 3: Heterogeneities in the Long-Term Impact of Early Sexual Activity

3.1. Introduction

The conventional wisdom is sexual activity among adolescents has the potential to cause irreparable damage to teenagers. The Affordable Care Act of 2010 appropriated funding to the U.S. Department of Health and Human Services for the Abstinence Education Program (AEP). The AEP grants funding to states that provide appropriate services and mentoring to promote abstinence among teenagers. One of the requirement of AEP funding is that the state must "Have as its exclusive purpose, teaching the social, psychological, and health gains to be realized by abstaining from sexual activity."[1]

It is undeniable that sexual activity of young people is costly to society in terms of sexually transmitted diseases, which cost $16 billion annually in direct medical care costs alone (CDC 2013). Young people (under 25) make up half of STD cases, and make up the vast majority affected by Chlamydia and the human papillomavirus. Teen pregnancy, an obvious potential consequence of adolescent sex, may have negative consequences on human capital production. The HHS essentially states as fact that teen childbearing leads to fewer years of schooling and lifelong poverty.[2] However, the causal link from teen childbearing to persistent poverty has not been established (Kearney and Levine 2012).

In this paper, we aim to provide more information to the discussion of the consequences of teen sexual activity. We do not aim to dispute that there are some negative short-term effects on teens engaging in sex, including disruptions of education plans if they become pregnant, STDs,

[1] See the HHS-AEP fact sheet at http://www.acf.hhs.gov/fysb/resource/aegp-fact-sheet
[2] See http://www.hhs.gov/ash/oah/adolescent-health-topics/reproductive-health/teen-pregnancy/.

and potential psychological effects. We do aim to understand how damaging this is to long-term economic success.

Our main results, which use the National Longitudinal Survey of Youth form 1979, show that there is no evidence that engaging in sex in a female sample, particularly among those ages 15-17, has a negative long-term economic effect. This group of young people were ages 14-21 during 1979. We follow their labor market outcomes into their late thirties to early forties. Even before controlling for teen pregnancy, education, and marital stability later in life, there is simply no negative correlation between adolescent sex and future earned income. Once we control for education and family composition, the long-term economic prospects of the sexually active are positive and substantial. The upshot is that if one engages in adolescent sex such that education and early pregnancy is avoided, there is appears to be positive outcomes in the future. We also confirm the validity of these results from the NLSY in another data set, the National Longitudinal Study of Adolescent to Adult Health (Add Health), which is a longitudinal study of a nationally representative sample of adolescents in grades 7-12 in the United States during the 1994-95 school year. We show that by the time this group of approximately 12-18 year olds are in their late twenties and early thirties, there is also no negative correlation between sex and their earnings as reported on tax forms. Again, controlling for education, child bearing and marital status actually shows a positive correlation between sexual activity and wages.

We will speculate on the reasons for why this positive effect holds across two generations of teenagers in the next section, but we suspect there are unobserved characteristics to the researcher of those engaging in adolescent sex that have positive effects in the labor market. These characteristics might include physical attractiveness and social skills.

Regardless of the source of the positive relationship, the policy implication is clear. One of the key tenets of those who promote abstinence, which is that long-term economic harm is done by engaging in sex while a teenager, is not supported by the evidence. Combined with ample evidence that abstinence programs have been found to be ineffective at preventing sex or pregnancy (Trenholm et al. 2007; Bruener and Mattson 2016)), Federal funding of such programs and state implementation of such programs are misguided at best and damaging at worst. The latter would be the case if sexual activity while young actually causes one to develop social skills or confidence that has returns in the labor market. Although unlikely, this is a possibility that our estimates cannot rule out. We can rule out that sexual activity has any negative long-term labor market effects among the representative samples of women born in the 1950-60s and 1970-80s in our data.

We also show that the positive, significant association between sexual activity and earnings are largely concentrated among those of higher socioeconomic status. For poorer families, there is a positive but non-significant difference in long-term earnings among those who have sex at ages 15-17 vs. those who wait. Exploring reasons for these heterogeneities by family incomes, we find differences in educational attainment and teen pregnancy, which are more strongly correlated with sex among the poor. We also find that while other evidence suggests sex while young generally lowers short-term self-esteem, we find no correlation with sex on long-term self-esteem for either group. We are left to surmise that it is likely differences in returns to social networks, physical attractiveness, or some other unobservable that explains the differences across groups. We also allow for the less likely possibility that sex itself might have a positive impact that has direct returns in the labor market but cannot show this definitively.

The paper proceeds as follows. Section 2 describes the existing research on teen sexual activity and economic outcomes. We also discuss how differences by socioeconomic background might arise. Section 3 describes the data and provides basic descriptive evidence of the consequences of sexual activity. Section 4 provides more detailed evidence of the gap in the experiences of those who are sexually active in different subgroups and endeavors to explain the reason for these differences. Section 5 concludes.

3.2. Background

Chesson et al. (2006) presents a model of teen sexual activity that reflects the state of the current policy mindset on sexual activity. It assumes young people assess the short-term benefit vs. the short and long-term costs of sexual activity when deciding whether to have sex. Discount rates should matter in such a setting, where the costs are concentrated later. They verify the important of discount rates in a sample of clinical patients in both a medical and STD clinic, as well as survey respondents on a university campus. Those who answered questions revealing their discount rates were high were more likely to be sexually active.

This assumption that the future economic impacts of sex is negative, which is also one held by policymakers that promote abstinence education, is questionable at best. The most obvious consequence of sexual activity, teen parenthood, has been studied extensively and the conclusion that it leads to persistent poverty has been part of public discourse for decades. The evidence is hardly conclusive. The simplest of OLS estimates does reveal large negative impacts on education and earnings, as reviewed by Hoffman et al., (1993). Disentangling the causal influence teen childbearing from underlying socioeconomic status has led to more mixed results, with some recent, credible evidence suggesting a negative but modest impact (Fletcher and Wolfe, 2009; Ashcraft et al., 2013). Kearney and Levine (2012) show that the negative effect of childbearing appears to fall on those with more disadvantageous backgrounds. They also show that those who

choose to have a child from these backgrounds were on lower economic trajectories to begin with. This is consistent with the finding of Wolfe et al. (2007) that income expectations affect teen childbearing decisions.

What about sexual activity itself, apart from pregnancy? Are there negative long-term effects? The evidence is sparse and limited to immediate outcomes. These immediate negative effects could plausibly have lasting effects. For example, teen sexual activity has been linked to depression (Halfors et al. 2004) and psychological well-being (Sabia and Rees 2008). It also is associated with lower educational attainment (Sabia and Rees 2009), which is consistent with the findings of Chesson et al. (2006) that those with higher discount rates are sexually active. Each of these factors have the potential to result in poor labor market outcomes. Moreover, some of these papers suggest through the use of instrumental variables that sex "causes" these adverse outcomes and is not merely reflective of unobservable characteristics.

We look at longer-term effects in this paper, and have no a priori expectation of what the impact of sexual activity long-term will be. Especially after controlling for education, teen childbearing and long-term marital stability, we may even expect a positive effect. This is because public discourse tends to overlook other attributes associated with those engaging in sex as an adolescent, some of which are rewarded in the labor market. For example, perceived attractiveness as a sexual partner is an obvious reason one might choose a sexual partner (Cawley et al. 2006). There is also a substantial literature documenting the positive economic returns to physical attractiveness in general in the labor market (Scholz and Sicinski, 2015).

Sexual activity among adolescents also is also reflective of one's peer influences and reputation (Cawley et al. 2006). Therefore, one's development of a peer network likely influences their decision to have sex. The skills that lead to one developing a peer group also might be related

to skills that have a labor market return later in life. For example, the labor market rewards extraversion (Fletcher 2013), which is also likely to be correlated with dating and sexual activity.

Finally, it is possible that engaging in healthy sexual intercourse has some long lasting effects that are positive. This is part of a sex-positive framework to researching sexual activity of adolescents (Harden 2014), which departs from the normative stance that adolescent sex is risky activity to be avoided. This opens up the theoretical possibility that adolescent sex can have positive impact on a person. For example, this would be the case if one learns about herself and relationships through sexual activity, as she would learn from other experiences had while navigating adolescence (Tolman and McClelland 2011).

Ultimately, our goal is threefold. The first is to establish whether there exists a difference between the labor market earnings of those who engage in sexual activity during adolescence, particularly between the ages of 15 and 17. We also test for effects of sex at even younger ages and find largely mixed and unreliable estimates. The second is to establish whether there is any difference between this relationship across socioeconomic strata. Intergenerational transmission of poverty in the United States is well established and economic mobility has decreased in recent decades (Aaronson and Mazumder 2008). So too is the fact that the poor have far less access to health care services than those in higher economic strata (Butler et. Al. 2013). It is also the case that the poor choose teen pregnancy at greater rates than wealthier children, investing less in their human capital. Again, the additional penalty in terms of economics outcomes among these poorer teenagers who have children has not been established (Kearney and Levine, 2012).

Our final goal is to determine why those who have sex during adolescence, particularly those from more advantaged backgrounds, do better in labor market outcomes. Here we look for links working through education, pregnancies, or psychological impacts. Our finding of a positive

effect for wealthier families, even after controlling for education and teen pregnancy, suggests there may be some other factor at play.

3.3. Data and descriptive evidence

Our first aim is largely descriptive in nature. We wish to establish whether there are long-term labor market differences between those who are sexually active when young. The best data source for this purpose currently is the NLSY79, as it provides us with data on teen sexual activity but also allows for measurement of mid-life earnings for women. This survey was begun in 1979 on a cohort of 14-21 year olds and has continued through present day. We are interested in a mid-career read on the progress of these individuals in the labor market, and we focus on the 2002, 2004, and 2006 waves of the NLSY, during which the respondents ranged from approximately 36-48 years of age. These are years with relatively stable unemployment rates and economic growth. Moreover, there were no fundamental changes to labor or employment law during this time period that might confound the interpretation of our results.

The main outcomes of interest for our purposes are average labor market earnings over the three waves that we measure income. We add $0.01 to all negative respondent earnings to preserve the small number of observations with zero incomes for all three periods in the log transformation. All income figures are converted to 1979 dollars.

The other variable that is important for our analysis is sexual activity. The NLSY asked individuals about the age at which they first had sex in the 1983, 1984, and 1985 surveys. By 1985, the age of the sample respondents were approximately 20-27, so we can definitively determine who reported sex before the age of 20. We do not know if or when those who had not reported having sex by 1985 eventually had sex. Our goal, however, is to learn more about the relative characteristics and outcomes of those who had sex at earlier ages. So, we define a series

of dummy variables that indicate the age at which someone first had sex among the 2,450 women for whom we have data on all of the variables in our analysis.

We combine all people who had sex at age 14 or younger, which amounts to just over 5% of the sample. Over 40% of the sample had sex by the age of 17. We do not have a large sample size so we combine these into bins, with ages 15-17 being combined to form our target group for the analysis. Since much of the abstinence education is targeted to high school students, this is also a policy-relevant group. We also combine the 18-20 group and those who were yet to have sex by 21 into separate groups. We suspect those having sex before 15 are engaging in the activity unusually early and should be treated differently, a point we return to below. Those ages 18-20 are the age of majority in most states.

Table 3.1 provides some additional descriptive statistics of what will be our main variables of interest. We look at how our labor market outcomes differ based on various characteristics of the women in our sample, particularly with regard to age of first sexual experience and family background. We estimate family income as of 1979. There is one concern with this measure. For some in the sample, particularly those over 18 in 1979, they might not be part of the household in which they grew up. Therefore, their sex and fertility decisions were made in an environment that is perhaps different than that we are hoping to capture with the 1979 income variable. We test for the importance of this by excluding those 18 or older as of 1979, and this does not change the main findings of the paper.

What emerges from Table 3.1 are a few patterns that will guide our estimations. First, the number of those who had sex while 14 or under is so low (only 151 respondents) and their labor force participation so different, that we view their inclusion in most of our analysis misleading. Therefore, the breakdown by family earnings excludes this group. For the overall sample, it

appears that average earned income later in life is slightly lower if one engages in sex as an adolescent. The earnings conditional on working are also less. These estimates do not account for cohort difference, race, or any other basic characteristic that might affect both sexual decisions and future earnings.

We next observe whether these raw means differ by family background. In the middle panel, we look at the top 20% of the income distribution. Unlike with the whole sample, those engaging in sex while young show virtually no difference in earned income. In fact, the earnings of those who had sex between ages 15 and 17 have higher incomes than those who had sex between 18 and 20. This is likely because of their lower eventual labor force non-participation, as measured in the middle column. When we look at the bottom panel, there is a stark contrast, as those in the bottom quintile of the distribution appear penalized for engaging in early sex. We will look at these relationships in a more controlled fashion later in the paper, but there appear to be clear heterogeneities across income groups that should be explored.

We will corroborate the basic NLSY results using another data source that includes information on sexual activity and earnings. The Add Health data set began as an in-school questionnaire administered to 7^{th}-12^{th} graders in 1994. This sample in the baseline survey ranged from ages of 11-19, with a few difficult to explain outliers. There were follow-ups conducted with these students as they entered adulthood. In particular, there were in-home follow-ups conducted in 1995, 1996, 2001-02, and 2008. Each wave asks about sexual activity, and the later waves include some basic earnings information. We can therefore determine date of first sexual experience, as with the NLSY. The initial wave also measures baseline family earnings so we can confirm whether we find differences by socio-economic status, as with the NLSY. The data on earnings have some limitations, however, as we only measure earnings as of one year only, namely

the 2008 survey in which the sample respondents ranged mostly from 26-34. This is a fairly young age range to measure mid-career earnings. Most of this group had some non-zero earnings, but a non-trivial number refused to answer the earnings question. So we limit our attention to positive female earners in this sample. The data also had only a subset of the variables we used as controls in the NLSY. For example, we control only for age, race, school GPA (as a replacement for ASVAB score) and birth order. We can control for years of education, teen motherhood, and marital status as well. Given these limitations, the Add Health data are more suggestive that our NLSY results are not spurious.

3.3. Empirical Methodology

3.3.1. Basic estimation

We first establish the relationship between sexual activity at younger ages and labor market earnings among females. In the NLSY, we transform the average income variable from 2002-2006 to log form (maintaining the zero incomes by coding zeroes to .01). We then estimate the following regression by ordinary least squares:

$$(1) \qquad LnY_i = \alpha + Sex\beta_1 + X\beta_2 + Z\beta_3 + \mu$$

The variable labelled *Sex* is an indicator or series of indicators of when one first had sex. Initially, this will be sex at 14 or under, sex at 15-17, or sex at 18-20. The omitted category are those yet to have sex by age 21.

The X matrix contains those variables that could affect average income but are plausibly determined prior to or concurrently with the decision to have sex. That is, these variables themselves are not potentially affected by whether one was sexually active. These are age, indicators of whether one was black or Hispanic, number of siblings, birth order, and whether both

parents were present in the household in 1979. We also controlled for two other factors that might be correlated with engaging in a risky behavior such as adolescent sex. The first is a control for one's cognitive ability, as measured by the Armed Services Vocational Aptitude Battery (ASVAB) test. This is commonly used as a proxy for cognitive ability or cognition and is available for all women in our sample. The second is whether one smoked while under 18. This is a proxy for a myriad of unobservable characteristics, including impulsiveness and risk-taking.

For the Z matrix, we add three variables that are themselves influenced by sexual activity and might also affect long-terms economic outcomes. The first is whether one gave birth to a child prior to age 19. The second is one's highest level of educational attainment. Both of these are obvious and previously verified consequences of sexual activity. Finally, one's marital status and marital stability is likely affected. We control for marital status in each year for 2002 through 2006. We note that each of these variables are endogenous. The aim is to look at whether there is an effect of adolescent sexual activity apart from these consequences.

We will conduct a similar test using the Add Health data assessing the effect of income on those in 2006-2008 who were teenagers in the early to mid 1990s. Again, we attempted to use many of the same control variables that are used in the NLSY, but only a subset are available. One important variable that is missing is the ASVAB scores, but we include GPA at the time of baseline interview (1995). We also include years of education, whether they were a moth by age 19, and whether they are married as of the most recent wave of the survey.

3.3.2. Assessing the role of family background

There are a few variations to equation (1) that will explore. The first breaks the population up into the lowest family income quintile as of 1979 and the highest. This is meant to understand how results vary based on the resources families had at their disposal in 1979. The bottom 20% have incomes of $6,112 is 1979 dollars. The highest 20% had incomes above $25,221. We

observe results for those at the low end and high end of the income distribution. Another variation to equation (1) is to change the dependent variable to other outcomes that themselves are human capital measures. These include the indicators for having period(s) of non-employment, as well as income, conditional of positive income from 2002 through 2006. These alternative dependent variables will be analyzed for both women from low and high income backgrounds.

We also are interested in why those of varying backgrounds show such stark differences in terms of the consequences of sex while a minor. We will analyze teen childbearing, education, and long-term self-esteem in the NLSY to assess whether there appears to be different consequences of adolescent sex that might explain the findings.

3.4. Results

3.4.1. Basic estimations of relationship between teenage sex and earnings

For establishing whether there are long-term labor market earnings between those who are sexually active when they are underage, we start with the basic OLS model in which we use there different dummies for sexually active underage teens. Table 3.2 displays the results of several specifications. All regressions are OLS. Column 1 shows the results from a model of three dummy variables, which shows whether individual has had sex by age of 14, between ages of 15-17, or between ages of 18-20. Teens who had sex by age 14 experience lower earnings as an adult compared with first sex after age 20. For those in the 15-17 and 18-20 category, there is no differential effect.

In column (2), we add some variables for age, race, and some other basic demographic characteristics. Adding those explanatory variables substantially reduce the negative impact of sexual activity at age 14 or under. The most important additional explanatory variable is the Armed Services Vocational Aptitude Battery (ASVAB) test, which shows a high correlation with future earnings. Note that for girls who had had sex between 15-17 now have higher labor market

income than who does not have sex by age 20. We find a positive but non-significant effect on girl's income among those who had sex between ages 18-20.

The third column shows a regression that is run on the full set of variables, including three variables that are themselves influenced by sexual activity and might affect long-terms economic outcomes. We add years of education, series of dummy variables which shows whether individual has been mother by age of 19, and showing her marital status at years 2002, 2004, and 2006. There is a little difference between the results in columns two and three except the effect of being sexually active at ages 15-17 actually are now positively associated with future earnings. By adding education to the regression, the ASVAB test score effect becomes smaller, which might reflect that part of this positive effect on labor income is now working through years of schooling. We also show that girls with more years of schooling earns the higher income in the labor market. Psacharopoulos and Patrinos (2004), among others, have documented the positive relationship between education and cognitive ability in explaining labor market outcome.

So far, despite the popular belief that sexual activity is a dangerous activity for young people, we show that girls who had sex between ages 15 and 17 end up having higher labor market income. For the remainder of the paper, we focus on this group of 15-17 year olds, comparing their experiences to those who have sex as adults (ages 18 or older). We therefore remove from the sample all girls whose first sexual experience was at ages 14 or younger. This group seems both remarkably different in terms of both observable and unobservable characteristics. For example, Fletcher (2007) shows that girls who experience a tragic situation in their lives might be more likely to have sex at these younger ages. So, the remainder of our evidence excludes them. Column (4) of Table 3.2 shows the effects of sexual activity between ages 15 and 17 on the log average earnings when an adult. The effect indicates a positive and significant effect.

3.4.2. Effects by socioeconomic status

We next divide our NLSY sample using the income of parents as of 1979. This household income includes all earned and unearned income of family members. We set low income households as those in the bottom 20% of the income distribution and high income households as those in the top 20%. The left panel of Table 3.3 shows the effect of engaging in sex while a teenager on earnings later in life. With no controls, there is a fairly large negative but non-significant effect on earnings of the girls from low-income households. Once we add controls in columns (2) and (3), this quickly turns into a non-effect. This shows that while those from low-income households that engage in sex do have lower earnings, these are explained by other demographic characteristics. The sex itself has no unique effect on earnings.

In the right columns, we focus our attention on the earnings of those in the top 20% of the income distribution as measured by family income in 1979. Even without controls, individuals in this group show a strong positive correlation with earnings later in life. This only becomes stronger and more significant as we add controls. There are two likely takeaways. First, any of the adverse effects of teenage sexual activity that affects lower income family is non-existent in higher income families. This may include the ability to obtain contraception or more complete access to female reproductive services through better health care coverage. Second, once there are controls for pregnancy and education added, there is a significant positive correlation with earnings. This suggests that sex while young is positively correlated with some unobserved factors that have a high return in the labor market, such as physical attractiveness or a broader social network.

3.4.3. Effects in an alternative sample

In this section, we test the validity of our findings using an alternative data source, the Add Health Survey. Originally fielded in 1994, by 2008 the age of the sample respondents were approximately 26-34 and we are able to piece together from various waves both their age at first

sex and their family income while in school. So, we can partially replicate the results in Table 3.3. We first estimate the correlation between teen sex and adult earnings without and with controls for the low income households. The correlation in the first column is positive, rather than negative. The standard error is very large, however. The effect becomes larger once the controls are added but again no significance can be determined given the standard errors. What is clear, however, is that the Add Health also shows if anything a small, positive relationship between sex and earnings.

The last two columns show the results for the children from wealthy families. As with the NLSY, the relationship between sex while young and earnings is positive. It falls short of statistical significance, however. Once we add the controls for demographics, along with education, teen childbearing, and marital status, the relationship is positive and significant. Again, this suggests that sex while 15-17 is correlated with some positive effects that likely have labor market returns for these individuals. These are substantial enough to produce significant associations with earnings.

3.4.4. Additional effects of Sex while young

Although the correlation between sex and earnings are clearly non-negative and perhaps even positive in the long run, the effects vary whether one's family has more economic resources vs. less. In this section, we measure whether there are correlations between sex and measureable outcomes for each of these income groups. The three measures are likely related to human capital acquisition and earnings ratios.

Taken together, these results suggest that the more positive associations between sex and earning observed throughout the paper is likely the product of these negative effects being stronger for lower income families, which mitigate the positive effects. It is no surprise that once we add controls for education and teen motherhood in the previous regressions, the effects for women

from lower income families becomes more positive. The results still fall short of statistical significance, however.

3.5. Conclusion

In this study, we stablish that there are long-term labor market differences between who are sexually active when they are young and who wait. Our finding is a contrast to the general belief that sexual activity of young people has negative long-term consequences on labor market outcomes. Our results, after controlling for teen pregnancy, marital status, and education, show having sex between the ages of 15-17 is positively correlated with higher labor market earnings.

We show that engaging participate in sex while young and higher earnings is a statistically significant relationship among those in from families in higher socioeconomic strata. This means that the negative impacts of teen sex are likely more avoided in this group and the positive factors associated with those who engage in sexual activity augmented. Because the effect is strongest when we control for teenage pregnancy, education and marital status, we suspect that these positive effects are arising from some unobserved characteristics, like social skill, higher self-esteem, or physical attraction.

Implications of our findings for policymakers would be to reallocate federal and state funding away from abstinence programs and toward those educational and health objectives that have empirical support.

References

Aaronson, D., & Mazumder, B. (2008). Intergenerational economic mobility in the United States, 1940 to 2000. *Journal of Human Resources*, *43*(1), 139-172.

Aizer, A., & Currie, J. (2014). The intergenerational transmission of inequality: Maternal disadvantage and health at birth. *Science*, *344*(6186), 856-861.

Ashcraft, A., Fernández- Val, I., & Lang, K. (2013). The consequences of teenage childbearing: Consistent estimates when abortion makes miscarriage non- random. *The Economic Journal*, *123*(571), 875-905.

Breuner, C. C., Mattson, G., & COMMITTEE ON PSYCHOSOCIAL ASPECTS OF CHILD AND FAMILY HEALTH. (2016). Sexuality Education for Children and Adolescents. *Pediatrics*, e20161348.

Butler, D. C., Petterson, S., Phillips, R. L., & Bazemore, A. W. (2013). Measures of social deprivation that predict health care access and need within a rational area of primary care service delivery. *Health services research*, *48*(2pt1), 539-559.

M. Caliendo, M. Gehrsitz. (2014) Obesity and the Labor Market: A Fresh Look at the Weight Penalty. IZA Discussion Paper No. 7947 IZA, Bonn, Germany (2014)

Chesson, H. W., Leichliter, J. S., Zimet, G. D., Rosenthal, S. L., Bernstein, D. I., & Fife, K. H. (2006). Discount rates and risky sexual behaviors among teenagers and young adults. *Journal of Risk and uncertainty*, *32*(3), 217-230.

Cawley, J., K. Joyner, *and* J. Sobal. *"Size Matters: The Influence of Adolescents' Weight and Height on Dating and Sex." Rationality and Society, 18, 2006, 67–94.*

Denise D. Hallfors, Martha W. Waller, Carol A. Ford, Carolyn T. Halpern, Paul H. Brodish, and Bonita Iritani, "Adolescent Depression and Suicide Risk: Association with Sex and Drug Behavior," *American Journal of Preventative Medicine*, Vol. 27, No. 3 (October 2004), pp. 224-230

Drydakis, N. (2015). The effect of sexual activity on wages. *International Journal of Manpower*, *36*(2), 192-215.
Kearney, M. S., & Levine, P. B. (2012). Why is the teen birth rate in the United States so high and why does it matter?. *The Journal of Economic Perspectives*, *26*(2), 141-166.

Fletcher, J. M. (2013). The effects of personality traits on adult labor market outcomes: Evidence from siblings. *Journal of Economic Behavior & Organization*, *89*, 122-135.

Harden, K. P. (2014). A sex-positive framework for research on adolescent sexuality. *Perspectives on Psychological Science*, *9*(5), 455-469.

Hoffman, S. D., Foster, E. M., & Furstenberg Jr, F. F. (1993). Reevaluating the costs of teenage childbearing. *Demography*, 1-13.

Psacharopoulos, G., and H. A. Patrinos (2004). 'Returns to Investment in Education: A Further Update'. Education Economics, 12(2): 111–34.

Sabia, J. J., & Rees, D. I. (2008). The effect of adolescent virginity status on psychological well-being. *Journal of Health Economics*, *27*(5), 1368-1381.

Sabia, J. J., & Rees, D. I. (2009). The effect of sexual abstinence on females' educational attainment. *Demography*, *46*(4), 695-715.

Scholz, J. K., & Sicinski, K. (2015). Facial attractiveness and lifetime earnings: Evidence from a cohort study. *Review of Economics and Statistics*, *97*(1), 14-28.

Tolman, D. L., & McClelland, S. I. (2011). Normative sexuality development in adolescence: A decade in review, 2000–2009. Journal of Research on Adolescence, 21, 242–255.

Trenholm C, *et al*., *Impacts of Four Title V, Section 510 Abstinence Education Programs Final Report*. Princeton, NJ: Mathematic Policy Research; submitted to U.S. Dept. Health & Human Services, Assistant Secretary for Planning and Evaluation, 2007.

Wolfe, B., Haveman, R., Pence, K., & Schwabish, J. A. (2007). Do youth nonmarital childbearing choices reflect income and relationship expectations?

Table 3—0—1: Descriptive statistics, NLSY79

	Average income from 2002-2006
Females who has sex by age 14 (n=151)	7,765
Females who first had sex between ages 15 and 17 (n=1060)	9,794
Females who first had sex between ages 18 and 20 (n=785)	10,623
Females yet to have sex by age 21 (n=454)	12,323
Top 20% of family income distribution in 1979	
Females who first had sex between ages 15 and 17 (n=163)	13,548
Females who first had sex between ages 18 and 20 (n=160)	11,892
Females yet to have sex by age 21 (n=129)	13,302
Bottom 20% of family income distribution in 1979	
Females who first had sex between ages 15 and 17 (n=274)	7,670
Females who first had sex between ages 18 and 20 (n=139)	9,882
Females yet to have sex by age 21 (n=54)	16,356

Table 3—0—2: . Age of first sexual activity and log average income 2002-2006

	The Whole Sample			*Dropping those who had sex at 14 or under*
	(1)	(2)	(3)	(4)
sex14	-1.386***	-0.703	-0.399	…
	(0.418)	(0.437)	(0.446)	
Sex 15-17	0.013	0.426*	0.662***	0.711***
	(0.228)	(0.244)	(0.254)	(0.254)
Sex18-20	-0.102	0.042	0.224	0.245
	(0.237)	(0.239)	(0.242)	(0.240)
Age		-0.790	-1.054	-1.260
		(1.700)	(1.696)	(1.733)
Age-squared		0.008	0.011	0.0135
		(0.019)	(0.019)	(0.0190)
Black		0.458	0.160	0.183
		(0.286)	(0.293)	(0.301)
Hispanic		0.586	0.577	0.559
		(0.379)	(0.378)	(0.381)
Smoked before 18		-0.355*	-0.276	-0.290
		(0.186)	(0.186)	(0.190)
ASVAB		0.089***	0.063***	0.0556***
		(0.011)	(0.013)	(0.0129)
Order of birth		-0.017	-0.012	-0.0624
		(0.063)	(0.063)	(0.0663)
Number of siblings		-0.016	0.002	0.0126
		(0.058)	(0.058)	(0.0606)
Whether parents together in 1979		-0.086	-0.189	-0.0305
		(0.192)	(0.195)	(0.199)
Years of Education			0.222***	0.207***
			(0.051)	(0.0516)
Mother by age 19			0.265	0.0712
			(0.307)	(0.327)
Married in 2002			0.109	0.0782
			(0.299)	(0.304)
Married in 2004			-0.298	-0.265
			(0.341)	(0.346)
Married in 2006			0.364	0.368
			(0.266)	(0.270)
Observations	2,529	2,529	2,529	2,378
R-squared	0.005	0.037	0.045	0.036

Note: Each column is from a separate OLS regression using NLSY sampling weights. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3—0—3: Age of first sexual activity and average income by top and bottom quintile of the family income distribution

	Bottom 20%			*Top 20%*		
	(1)	(2)	(3)	(4)	(5)	(6)
Sex 15-17	-0.691	0.009	0.177	0.781*	0.929**	1.045**
	(0.442)	(0.443)	(0.468)	(0.421)	(0.452)	(0.457)
Age		-7.712*	-5.965		-1.060	-0.914
		(4.187)	(4.157)		(4.052)	(4.061)
Age-squared		0.083*	0.063		0.013	0.012
		(0.046)	(0.046)		(0.045)	(0.045)
Black		1.648***	0.934		0.824	0.682
		(0.587)	(0.600)		(1.049)	(1.051)
Hispanic		2.334***	2.188***		1.207	1.130
		(0.770)	(0.762)		(1.259)	(1.260)
Smoked before 18		-0.299	-0.039		-0.072	-0.005
		(0.445)	(0.443)		(0.418)	(0.421)
ASVAB		0.181***	0.124***		0.064**	0.038
		(0.026)	(0.029)		(0.031)	(0.035)
Order of birth		-0.039	0.002		-0.167	-0.104
		(0.134)	(0.133)		(0.179)	(0.182)
Number of siblings		0.094	0.133		0.095	0.100
		(0.108)	(0.107)		(0.166)	(0.167)
Whether parents together in 1979		0.608	0.288		-0.354	-0.496
		(0.439)	(0.447)		(0.596)	(0.625)
Years of Education			0.509***			0.147
			(0.118)			(0.111)
Mother by age 19			0.568			-0.544
			(0.574)			(1.412)
Married in 2002			0.611			-0.776
			(0.695)			(0.734)
Married in 2004			-0.477			0.185
			(0.805)			(0.861)
Married in 2006			-0.098			1.012
			(0.636)			(0.647)
Observations	478	478	478	477	477	477
R-squared	0.005	0.119	0.155	0.007	0.029	0.042

Note: Each column is from a separate OLS regression using NLSY sampling weights. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3—4: Earned Income and sex relationship from the Add Health data; 2008 incomes

	Bottom 20%		*Top 20%*	
	(1)	(2)	(3)	
Sex 15-17	0.059	0.297	0.119	0.243**
	(0.185)	(0.195)	(0.120)	(0.117)
Age		-0.804		-0.273
		(1.687)		(1.202)
Age-squared		0.0130		0.006
		(0.029)		(0.021)
Black		-0.259		-0.008
		(0.188)		(0.169)
GPA		0.061		0.208**
		(0.118)		(0.093)
Order of birth		0.235		0.051
		(0.146)		(0.140)
Years of Education		0.228***		0.115***
		(0.052)		(0.038)
Mother by age 19		0.026		-0.481
		(0.274)		(0.484)
Married		-0.117		-0.006
		(0.180)		(0.119)
Observations		211		266
R-squared		0.14		0.139

Note: Each column is from a separate OLS regression using Add Health data; Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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Mehrnoush Motamedi, *Does Child Spacing Matter? Exploring the Effects of Birth Spacing on Risky Behaviors*

Works in Progress

Scott Adams, Mehrnoush Motamedi, *Heterogeneity in Rates of Return to Education*

Mehrnoush Motamedi, *Does Birth Spacing Affect Obesity?*

Conference Presentations

2016 Midwest Economic Association, 80th annual meeting, April 1-3, Evanston, Illinois

2015 Southern Economic Association, 85th annual meeting, November 21-23, New Orleans, Louisiana

2015 Midwest Economic Association, 79th annual meeting, March 27-29, Minneapolis, Minnesota

2014 Southern Economic Association, 84th annual meeting, November 22-24, Atlanta, Georgia

Teaching Experience

2016-Current **Visiting Assistant Professor**, Department of Economics, University of Wisconsin-Eau Claire
Principles of Microeconomics (ECON 103), Principles of Macroeconomics (ECON 104), Intermediate Microeconomics (ECON 303-503) [One Section]

2011–2015 **Instructor**, Department of Economics, University of Wisconsin-Milwaukee
Principles of Microeconomics (ECON 103) [6 Sections], Introductory Economics (ECON 100) [One Section], Intermediate Microeconomics (ECON 301) [One Section]

2011–2015 **Graduate Assistant**, Department of Economics, University of Wisconsin-Milwaukee
Principles of Macroeconomics (ECON 104), Economic Applications of Game Theory (ECON 404), Intermediate Macroeconomics (ECON 302), Economics Theory Microeconomics (Graduate Course – ECON 701)

2006-2009 **Graduate Assistant,** Department of Economics, Shahid Beheshti University
Economic Statistics, Statistics for Economists, Introduction to Econometrics, Mathematical Economics I and II

2004-2006 **Economics Tutor**, Department of Economics, University of Yazd

Research Experience

2015-2016 **Research Associate,** University of Wisconsin-Milwaukee, Division Academic Affairs

2008-2009 **Research Assistant**, Tehran Municipality, Tehran, Iran

- Created a comprehensive database on outdoor advertising
- Carried out the empirical analysis to optimize the price of outdoor advertising

2003-2006 **Research Assistant**, Yazd University, Yazd, Iran

- Collected survey data on the cooperation sector
- Examined the rapid growth of small sized enterprise

Workshops

2016 (Upcoming) Teaching Economics. Workshop, San Francisco, California

2015 Norton Professional Development Workshop, Minneapolis, Minnesota

2014 Development Teaching Workshop for Principles of Economics Instructors, Naperville, Illinois

Honors and Awards

2016 Recognition for Contributions to Students

2015 Graduate Student Travel Award

2014 Graduate Student Travel Award

2011-2012 Chancellor Graduate Student Award

2011-2014 Graduate Student Teaching Assistantship

Academic Service

2015 (Upcoming) **Discussant**, Southern Economic Association, New Orleans, Louisiana

2015	**Discussant**, Midwest Economic Association, Minneapolis, Minnesota
2014	**Chairman,** Southern Economic Association, Atlanta, Georgia
2014	**Discussant**, Southern Economic Association, Atlanta, Georgia

Software Skills

GAUSS, EVIEWS, STATA, SPSS, Maple, MS-Office, SAS, NVIVO

References

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