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CHILD SPACING AND CHILDREN'S LABOR MARKET OUTCOMES

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ABSTRACT

This study 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. (JEL I12, J12, J13)

Keywords: birth spacing, children's labor market earnings, twins, parents' age difference.

INTRODUCTION

How many children to have and when to have them are two 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 & Corcoran, 2001; Black, Devereux, & Salvanes, 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, Devereus, & Salvanes, 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 & Essed, 2001; Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006; Van Eijsden, Smits, van der Wal, & Bonsel, 2008), there is no general agreement on the effects of spacing on education (Broman, Nichols, & Kennedy, 1975; Zajonc, 1976; Galbraith, 1982; Powell & 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 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 findings 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 older twin siblings in the family. 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 only Nguyen's (2013) study has linked spacing and income. 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.

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 19^{th} 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

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divided attention and one child (Zajonc & 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 decreases 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 with 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 & 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 thinking 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.

Health Outcomes

Zhu, Rolfs, Nangle, and Horan (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 et al. (2006) extended this interval to 18 months to 59 months. More recently, Angrist and Pischke (2008) showed that an interpregnancy interval longer than eleven months is an achievable and low-cost means to reduce multiple adverse perinatal outcomes.

Van Eijsden et al. (2008) used birth weight to show that depletion of nutrition creates inverse effects of spacing on birth outcomes. Cheslack-Postava, Liu, and Bearman (2011) showed that those children born after shorter intervals between pregnancies are at an increased risk of developing autism. They showed pregnancies 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 timing intervals are well beyond a year.

Educational Outcomes

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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 by the time interval 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 et al. (2010) showed that earlier born children have higher IQs.

In relation to the impact of time intervals, Broman 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 birth spacing see increased test scores for first-borns.

Labor Market Outcomes

There are some papers considering women's labor market participation and its effect on time intervals between their children (Heckman & Walker, 1990; Angrist & 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. I want investigate the effect of time interval between siblings on their labor market income.

This belies the well-established trend that indicates family background has a strong effect on children's outcomes (Zajonc 1976; Smits & Essed, 2001; Black 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 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

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spacing. Therefore, I consider different subgroups for studying the effect of birth spacing and labor market income.

DATA

I use data from the National Longitudinal Survey of Youth, 1979 (NLSY79), as it provides me with data on family characteristics like siblings ages , parents ages and education but also allows for measurement of mid-life earnings for respondents. This survey was begun in 1979 on a cohort of 14-21 year olds and has continued through present day. I consider birth spacing as the shortest age difference between the index child and his or her older sibling. I restrict my sample to children who have at least one other sibling, which gives me 1,682 observations.

Descriptive statistics are shown in Table 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 respondents in my sample 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. The spacing of children might affect parents' relationships with their children or with each other (Christensen 1968); 75% of respondents in my sample live with both parents in 1979.

Table 1: Descriptive Statistics for the Whole Sample

		All	
Variable	Description	Mean	Std. Dev.
Log Income	Natural 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	Natural 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

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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 are older twin siblings 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	

My sample consists of 53% females, while the mother and father's average years of education are 11 years. The *Number of Siblings* is the total number of children in each family. Because I limit the sample to observations which have at least one sibling, 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 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 (IVs) in the model. Also, I consider four dummy variables for indicating birth order in the family. Since there is 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 & 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.

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:

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

The index *i* denotes observations at the individual level. The dependent variable, *Log Income,* is natural log of the average real income during 2001, 2003 and 2005. *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. These include age,

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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), 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 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 older twin siblings.

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

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

and the second stage is as follows:

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

It is crucial to have good instrumental variables to address the endogeneity problem even if good ones are very hard to find. The first step is to find instrumental variables that are correlated with the variable of interest and 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. In addition, 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.

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In addition, I compare the mean of birth spacing for the individuals whose parents' age difference is less than the mean in the sample vs the ones with larger parent\s' age difference. It shows that parents with a larger age difference would have the children with the closer birth spacing. I did the same comparison for birth spacing in the families with and without twins. It shows that families with twins will experience a longer birth spacing for their next children compare to families with no twins. It is reasonable to suppose that parents with twins need more time to rebuild their resources.

For these reasons, I am comfortable that these instrumental variables can be used to identify exogenous changes in birth spacing.

There is sizable body of literature on the different causal effects of education on child outcomes for different family background groups (Chiswick, 1988, Barrow & Rouse, 2005; Belley & 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's outcomes. These bring us to the fact that time intervals may have different effects on labor market outcomes for people who are born in high income families vs low income families. So, I divide the sample based on family income.

Since the median of the annual family income in 1979 is 20,000 dollars, I considered families with a higher annual income than 20,000 dollars in 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 & Munnich, 2012).

RESULTS

The effects of birth spacing on labor market outcomes are reported in Table 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.

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

Row Number	Samples	Birth Spacing OLS	Birth Spacing Second Stage	F Statistics (Weak IV)	P-Value Over Identification Test	Observations
1	Whole Sample	-0.006	-0.047	122.52	0.62	1,682
2	High-Income Family	0.007	-0.200***	26.79	0.64	662
3	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*

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 third and fourth columns present results of the 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 these effects of time intervals on labor market income depends on the strength of them. 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. For children from the *High Income Family* group, the positive effect of shorter birth spacing rules out the negative effect of depleting parents' resources. So, children from these families will benefit of having siblings with small age differences.

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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 3 (Blake, 1981; Price, 2010; Buckles & Munnich, 2012).

Table 3 represents the 2SLS results for the whole sample of second-borns and higher birth order children. There are statistically insignificant effects of birth spacing on labor market income for the whole sample and the *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.

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

Row Number	Samples	Birth Spacing OLS	Birth Spacing Second Stage	F Statistics (Weak IV)	P-Value Over Identification Test	Observations
1	Whole Sample	-0.009	-0.022	90.58	0.61	1,314
2	High-Income Family	0.010	-0.197***	22.22	0.60	513
3	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*

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 & 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 with and without *Education*, and *AFQT* score. Table 4 shows the results of excluding both *Education* and *AFQT score* to assess whether that effect is working through human capital accumulation or something else. Results while excluding these variables show the same effects of *Birth spacing* on labor market income, which indicates these effects are working through birth spacing and not human capital. The models show that more years of schooling over all subsamples increases labor market income, which is consistent with the literature.

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

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

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

Furthermore, in Table 5 I follow the same scenario for the whole sample of second-borns and higher birth order children. It shows the same pattern as presented in Table 3.

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.

CONCLUSION

In this paper, I investigate the link of time intervals between children and their future labor market outcomes. I use 2SLS regression, and my sample is based on data from NLSY79. 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 effects for all subsamples. Instrumental variables estimation, however, shows heterogeneity over the sample. Birth spacing has positive and statistically insignificant effects on labor market income for the children from *the Low-Income Family*. Effects are negative and statistically significant for those 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.

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Appendix

Table A1: 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	

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Table A2: 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)

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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 A3: OLS and 2SLS Estimates of Effect 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)

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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 A4: 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

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	(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 A5: 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

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	(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*

