The Thesis Committee for Amanda Jean Stevenson
Certifies that this is the approved version of the following thesis:

The effect of first interbirth interval on women's poverty at midlife

APPROVED BY
SUPERVISING COMMITTEE:

Supervisor:

Joseph E. Potter

Daniel A. Powers

The effect of first interbirth interval on women's poverty at midlife

by

Amanda Jean Stevenson, B.S.

Thesis

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Arts

The University of Texas at Austin

May 2012

Acknowledgements

I am grateful to Joseph E. Potter and Daniel A. Powers for their generous guidance in developing this work. Celia Hubert also provided important insights.

April 30th, 2012

Abstract

The effect of first interbirth interval on women's poverty at midlife

Amanda Jean Stevenson, M.A.
The University of Texas at Austin, 2012

Supervisor: Joseph E. Potter

Understanding the relationship between childbearing and socioeconomic status could help explain one mechanism by which the United States' gender disparity in poverty comes to exist. However, measuring the relationship between childbearing and socioeconomic status is complicated by the very high prevalence of childbearing among women and multiple sources of endogeneity in the characteristics of childbearing that do vary. Focusing on the timing of childbearing, I use miscarriage to construct an instrument for delivery and build a counterfactual condition for having a short temporal space between births. Using this approach with data from the National Longitudinal Survey of Youth 1979, I estimate the effect on midlife poverty of having first and second births within 24 months of each other. My results indicate that these short interbirth intervals are causally related to increased midlife poverty. The results are robust to a variety of alternate specifications of counterfactual conditions and estimation methods.

Table of Contents

List of Tables

Introduction

The relationship between the timing of childbearing and socioeconomic outcomes has received considerable attention in recent years (for example Brand and Davis 2011 and Hotz, McElroy et al. 2005). I focus on one aspect of fertility timing, the temporal space between first and second births, and assess its causal effect on an important outcome, women's poverty at midlife. At midlife, poverty among women is higher than poverty among men and it increases risk for adverse outcomes as age advances (Sandoval et al 2009, Vartanian 2002). But why and how women arrive at midlife poverty is not well understood. Because childbearing and mothering are experienced differently by women than men and have been demonstrated to be connected to socioeconomic outcomes, particularly in the teenage years and early adulthood, (Geronimus 1992, 2004, Miller 2011, Heckman 1992), examining the role of childbearing in women's socioeconomic trajectories can illuminate how poverty and gender are connected.

This study addresses one possible explanation of how childbearing may affect socioeconomic status by using an instrumental variables approach to measure the causal effect of a short time interval between first and second births in early adulthood on midlife poverty among women. Because of substantial problems of endogeneity and omitted variable bias in observational studies of the effects of fertility events (Geronimus and Korenman 1992), I use pregnancy as an instrument for birth and specify a counterfactual framework through which I estimate the causal effect of having a short interval between first and second births in early adulthood on poverty at midlife.

Childbearing and Socioeconomic Status

The relationship between socioeconomic status and childbearing receives substantial attention from social scientists (for example Stange 2011, Geronimus and Korenman 1992, Geronimus 2004, Miller 2011, Musick and England 2009, Brand 2011, Heckman and Walker 1990). In particular, the effects of teenage childbearing on socioeconomic status are very well studied. While early findings indicated negative repercussions of teenage childbearing, more recent work has demonstrated that accounting for selection bias obviates the group level effects (Hotz and McElroy 2005, Geronimus and Korenman 1992). Hotz and McElroy (2005) find that using miscarriage as an instrument removes the observed negative effects of teenage childbearing on a host of socioeconomic outcomes, while Geronimus and Korenman use sister fixed effects to demonstrate similar results. This literature points to the importance of using methods of analysis with the capacity to account for selection bias when examining the effects of fertility on later life outcomes.

In a recent examination of fertility timing beyond adolescence, Stange (2011) finds that women who eventually become mothers have different educational behaviors substantially before they enter motherhood, indicating that selection into education and birth are correlated and that that correlation varies with time. Miller (2011) finds that earnings increase by 9% for each year of delayed childbearing, pointing to but not demonstrating a causal connection. Musick and England (2009) find that women with lower levels of education have higher levels of unintended pregnancy and childbearing and that wages did not account for the educational difference. This finding points to the importance of unplanned events leading to motherhood, particularly among the already disadvantaged.

Taken together, these findings indicate that childbearing, education, and socioeconomic disadvantage exhibit highly endogenous interrelationships whose causal chains are neither obvious nor understood. The present study clarifies part of this complex problem by isolating the causal effect of one aspect of fertility timing, namely the role of having closely space first and second births, on an important measure of socioeconomic wellbeing, poverty in midlife.

Short Interbirth Intervals

Interbirth intervals (IBIs) measure the length of time between two deliveries to the same woman. Short interbirth intervals and interpregnancy intervals have been associated with adverse perinatal and maternal health outcomes (Conde-Agudelo 2006, Conde-Agudelo, Rosas-Bermudez et al. 2007, Zhu 1999). In this literature interbirth intervals have been identified to be problematically short if they are less than 24 months. While no previous studies have assessed the effect of short interbirth intervals on midlife socioeconomic status, Furstenburg (2007) does find short term negative socioeconomic impacts of rapid repeat childbearing among teenagers.

Little is known sociologically about this aspect of fertility timing but it has received substantial biomedical attention. Given the biomedical findings of negative outcomes associated with short interbirth intervals, and given the links between fertility, education, and socioeconomic status, understanding the influence of this aspect of fertility timing on socioeconomic status could help link the sociological study of fertility timing with the biomedical study of fertility. For example, while contraception makes fertility planning possible, because of socioeconomic gradients in unintended pregnancy and birth (Musick and England 2009, Finer and Kost 2006), short interbirth intervals may be a pathway by which socioeconomic disadvantage is perpetuated among women.

I further focus on short interbirth intervals in early adulthood (before age 30) because delayed childbearing and subsequent rapid intervals may confound the effect of the interval length with the causes of the delay. For example, if more advantaged women delay childbearing and thus have short interbirth intervals, their outcomes would have arisen from a different pathway than women who had short interbirth intervals in early adulthood. Furthermore, focusing on short interbirth intervals in early adulthood removes the additional confounding factor of highly variable lengths of follow up, since the accumulation of effects might mean that short interbirth intervals later in adulthood may have led to the accrual of different levels of effect by midlife than short interbirth intervals occurring early in adulthood.

Counterfactual model

I use the counterfactual model of inference, which supports causal reasoning by comparing the observed outcome to the outcome that would have occurred had the hypothesized cause taken a different value (Morgan 2007). While probit regression cannot account for unmeasured correlations between the hypothesized cause and its hypothesized effect, the counterfactual model guides researchers to build plausible hypothetical comparisons in order to argue that the effect of interest varies as a result of variance in the cause of interest. In this study the hypothesized cause is having a short space between the first and second birth in early adulthood and the counterfactual condition is not having a short space between the first and second birth.

Childbearing timing is a continuous right censored variable and therefore counterfactual conditions for characteristics of childbearing timing are sets of conditions. For example, if a woman has a child at 22.0 years of age and a child at 23.0 years of age, estimating the causal effect of her short interbirth interval requires comparing her observed outcome with the set of possible alternate outcomes in which she did not have a short interbirth interval. Taking as given her first birth, the set of counterfactual conditions would include all birth dates for her second birth that are beyond 24 months from the first. Because of right censoring there are two broad categories within this counterfactual. These two categories are (1) having a non-short first interbirth interval and (2) not having a second birth by the end of the data. Because women who have only one child may differ substantially from women who have two or more children, I focus on a narrower counterfactual. I compare women who had a short first interbirth interval in early adulthood with women who had a longer and closed first interbirth interval. This narrower counterfactual ensures that variation in completed family size does not contaminate the estimate of the effect of the interbirth interval.

The statistical methods I use to estimate these counterfactual conditions are discussed in the next section.

Analytic Approach

Instrumental Variables

An instrumental variables (IV) approach may be used to estimate the causal effect of an event when it is not possible to randomize that event. The IV approach isolates the covariance of the hypothesized cause from the hypothesized effect through the use of an instrument that is correlated with the hypothesized cause but whose occurrence is otherwise independent of the hypothesized effect. In this study I use identified pregnancies (including both those ending in birth and those ending in miscarriage) as an instrument for birth. By including pregnancies ending in miscarriage, the instrument allows for the isolation of variation in the outcome due to the plausibly exogenous shock of random miscarriage. I choose to exclude pregnancies ending in induced terminations because women who elect to terminate pregnancies differ from women who do not in ways that may vary systematically by propensity to be in poverty later in life. For example, women who elect to terminate their pregnancies may be more motivated to limit their family size or space their births intentionally.

From a latent variables perspective, women who have closely spaced miscarriages and who deliver closely spaced second births share a set of latent traits characterized by conceiving and then not terminating a second pregnancy ending in a short interbirth interval. Women who conceive and then terminate pregnancies form a third latent class. Including them in my analysis would potentially conflate terminations with random events. This might lead to an over-estimate of the effect of a short interbirth interval on midlife poverty, since women who terminate a closely spaced second pregnancy might have a higher opportunity cost associated with carrying their closely spaced second pregnancy to term.

The aim of this study is to understand how changes in the length of first interbirth intervals might change chances of midlife poverty. Therefore, this study requires an estimate of the local area treatment effect of having a short interbirth interval in early adulthood. The IV approach is ideally suited to provide this estimate since the IV estimation directly estimates the treatment effect on the treated (Heckman, 1992). Thus, B1 is a causal estimate of the effect of having a short first interbirth interval in early adulthood among women who were at risk of having such an event (Morgan 2007).

An important benefit of the IV approach is its robustness to selection bias, even when that bias varies with time (Heckman 1992). This is crucial in the case of this study because it may be the case that women who have short first interbirth intervals in early adulthood have different socioeconomic trajectories than women who do not have short first interbirth intervals in early adulthood. If this difference in socioeconomic trajectories is true then probit regression estimates of the effect of short interbirth intervals are subject to bias due to both initial selection conditions and time varying differences in selection, making the IV specification even more necessary to substantiate causal claims of the effect of short first interbirth intervals in early adulthood on midlife poverty.

From a counterfactual perspective, the IV approach yields estimates of causal effect when three assumptions are met (Heckman 1992; Morgan 2007). First, the exclusion restriction requires that the instrument not be correlated with any predictors of the outcome other than treatment assignment. Second, the nonzero effect of the instrument assumption requires that the relationship between the instrument and the hypothesized cause must vary in the sample. And third, the monotonicity assumption requires that the relationship between the instrument and they hypothesized cause must not include both positive and negative values in the sample. Meeting these assumptions, an IV estimate isolates the variance of the hypothesized effect due to the hypothesized cause. The adequacy of random miscarriage as an instrument is described in the next section.

In this study I use random miscarriage that would have resulted in a closely spaced second birth to construct non-terminated closely spaced pregnancy as an instrument for delivery. Using miscarriage in this way yields a strong instrument for the assessment of the causal effect of a birth because the absence of a miscarriage is a reduced barrier to the birth. This is true because any live birth must have been the result of a pregnancy and any pregnancy is at risk of random miscarriage. Miscarriage also meets the three conditions necessary for an IV to substantiate a causal estimate, the exclusion restriction, the nonzero effect of the instrument assumption, and the monotonicity assumption (Morgan 2007). The random nature of miscarriage meets the exclusion restriction assumption of the IV approach, since miscarriage precludes a live birth delivery of the miscarried pregnancy. The constructed non-terminated pregnancy instrument has a nonzero effect on birth because a woman cannot have a birth due to a second pregnancy at the same time as her miscarried pregnancy would have been delivered. This fact is true because waiting time to conception is nonzero and because pregnancies ending in live birth must be a large fraction of nine months in length (Bongaarts and Potter 1983). Thus, if a woman experiences a miscarriage that would have resulted in a closely spaced second birth, any subsequent pregnancies and births must be at least the waiting time to conception plus the additional length of gestation later than the miscarried pregnancy’s delivery would have been. Finally, miscarriage does not increase the probability of having a birth since by definition it can only occur during an already existing pregnancy and therefore the monotonicity assumption is also met.

Data and Models

Sample

I use the female sample of the National Longitudinal Survey of Youth (NLSY79) to estimate the causal effect on midlife poverty of short interbirth intervals in early adulthood. The NLSY79 follows a nationally representative sample of 12,686 people who were between the ages of 14 and 22 in 1979. Respondents were interviewed annually through 1994 and biannually through 2008. Early interviews included detailed fertility questions, allowing for the identification of specific outcomes for all reported pregnancies (live birth, stillbirth, abortion, or miscarriage) for female respondents between 1979 and 1990. Because my outcome is poverty status measured at midlife, I include only the 2,344 women who were followed through 2008 and had had at least two children by 2008 (2009).

All descriptive statistics and estimates are weighted using 2008 cross sectional sampling weights for the NLSY79 and account for sample design.

Measures

Poverty at midlife. I measure poverty as living in a household in 2008 which falls below the federal poverty level, adjusted for family size. In 2008 the federal poverty level was $21,200 for a family of four (HHS, 2008).

Interbirth intervals. The NLSY79 public use data files include calculated dates of each birth. Comparing these dates for the first and second birth to each woman yielded an interbirth interval (IBI), measured in months. I call this the first interbirth interval because it may be the first of several intervals between births for women who are multiparous. Following the biomedical literature, I coded interbirth intervals as short if they were less than 24 months. Dichotomizing this variable facilitates modeling, enhances the power of the estimate, and is consistent with previous research on the effects of interbirth intervals.

Closely Spaced Pregnancies using Births and Miscarriages in the NLSY79. Using responses to the fertility sections of the 1982, 1983, 1984, 1986, 1988, and 1990 interviews I recreate the respondents' pregnancy histories with detailed outcomes by pregnancy for 1979 through 1990. I use these histories to identify 119 women who experienced miscarriages of pregnancies that would have led to short first interbirth intervals had the miscarriage not occurred. I combined these women with the women who had closely spaced second births to form a group of women who had closely spaced second pregnancies. This variable was my instrument.

Identified pregnancies not ending in terminations are an appropriate instrument for birth to the extent that miscarriage is distributed randomly across all the identified non-terminated pregnancies in the sample. While not all pregnancies are identified before they are miscarried, and while miscarriage reporting is unlikely to be truly complete, the number of miscarriages reported in the NLSY79 for the period under study is about 80% of the expected value, indicating that a substantial portion of random miscarriages are included (Bongaarts and Potter, 1983). Women who had identified miscarriages experienced all the prerequisites of birth except carrying the pregnancy to term, thus making them an ideal comparison group.

Control variables. I include Hispanic ethnicity, Black race, respondents' mother's education in years, a dummy indicator of respondent living in poverty in 1979, a dummy indicator of respondent living with both parents in 1979, respondents' Armed Forces Qualifying Test score in 1979, respondents' age at first birth in years, and a categorical measure of respondents' educational attainment as of 2008 (less than high school, high school, or more than high school). These covariates were chosen because of their reliable prediction of poverty at midlife.

Between group differences

In order to illustrate the possibility of selection bias in estimating the effect of a short first interbirth interval in early adulthood on midlife poverty, I compare the group characteristics of women with and without short first interbirth intervals in Table 1.

Probit regression models

In order to illustrate the relationships between midlife poverty and short first interbirth intervals in early adulthood, I estimate a series of probit models shown in Table 2. These models are estimated using the probit and svy commands in Stata 12 and are displayed in Table 2 (StataCorp 2011).

Instrumental variables models

In order to estimate the causal effect of short first interbirth intervals in early adulthood on midlife poverty, I also estimate a set of models using maximum likelihood estimation of simultaneous equations for short first interbirth interval in early adulthood and poverty at midlife.

The aim of these models is to identify the difference in midlife poverty associated with having a closely spaced second birth instead of having a second birth 24 months or more after the first birth. This effect can be characterized as β, the expected difference between having and not having a closely spaced second birth in early adulthood, given that a woman is of the latent type that she may have a closely spaced second birth and not terminate the pregnancy, which may be labeled latent type A.

$$\beta = E\left(Y_{shortIBI} - Y_{longIBI} \middle| A\right)$$

Morgan (2007) refers to this estimate of effect as local average treatment effect.

In order to estimate β using an instrumental variables approach, the following estimate is constructed (Morgan 2007).

$$\widehat{\beta_{IV}} = \frac{E_N[y_i|shortIBI_i = 1] - E_N[y_i|shortIBI_i = 0]}{E_N[d_i|shortIBI_i = 1] - E_N[d_i|shortIBI_i = 0]}$$

Where y_i is poverty at midlife and d_i is the instrument, closely spaced pregnancy.

Like the probit models, and following the counterfactual conditions, the IV models are estimated for the group of women with at least two children born as of 2008.

Estimation is performed with the ivprobit and svy commands in Stata 12 (StataCorp 2011). These models are displayed in Table 3.

Results

Between group differences

Two or more children sample. Table 1 compares the group characteristics of women with short first interbirth intervals in early adulthood with all women who had two live births as of 2008 but who did not have short first interbirth intervals. The panel illustrates that women with short first interbirth intervals have significantly greater levels of poverty at midlife (16.8% versus 12.1%, p<0.05). Among women with short interbirth intervals, a higher proportion had less than high school education (12.4% versus 11.3%, p<0.05). While other between group differences are not statistically significant, they are on the whole consistent with the group with short first interbirth intervals being generally less advantaged than the comparison group, with higher proportions in poverty in 1979, lower AFQT scores, and lower levels of education.

Probit regression estimates

Model 1 illustrates that the zero order estimate of the effect on midlife poverty of having a short interbirth interval in early adulthood versus delaying the second birth 24 months or more is statistically significant (t=2.07). Models 2 and 3 illustrate that this estimate of effect is strengthened by accounting separately for ethnicity and race and educational attainment. However, accounting for all covariates simultaneously makes the effect of short first interbirth interval only approach statistical significance (t=1.82). In Model 4, however, while the direction of the effect of having a short first interbirth interval is still positive, statistical significance is lost when ethnicity, race, mother's education, poverty in 1979, and educational attainment as of 2008 are accounted for simultaneously.

IV estimates

Models 5 and 6 instrument short first interbirth interval in early adulthood using pregnancy for women with two or more children as of 2008. Model 5, which does not include educational attainment in 2008, the IV estimate of the causal effect of having a short first interbirth interval in early adulthood is statistically significant. When educational attainment in 2008 is included in the model the IV estimate of the causal effect of having a short first interbirth interval in early adulthood remains statistically significant after accounting for education at 2008 (t=2.28). This is an estimate of the causal effect of having a short first interbirth interval in early adulthood rather than having moderate or long first interbirth interval or delaying childbearing into the late 20s and beyond.

Discussion

Table 1 clearly demonstrates a strong zero order correlation between poverty at midlife and short first interbirth intervals in early adulthood. It also illustrates the potentially spuriousness of this correlation, since women with short interbirth intervals have characteristics associated with lower levels of advantage than women with longer interbirth intervals. Because of highly correlated covariates, the probit models with covariate controls diminish both the point estimate of the coefficient on short first interbirth interval in early adulthood and its statistical significance. Importantly, the probit models point to an effect through education, since including educational attainment at the time poverty is measured (around age 42) in the model creates the strongest changes in the coefficient on short first interbirth interval in early adulthood. Given that covariates from adolescence have weaker effects than this contemporaneous measure, these probit models provide evidence that short first interbirth intervals may be working through an effect on education to impact midlife poverty or that eventual educational attainment and having a short first interbirth interval in early adulthood share a common cause.

By accounting for selection into short first interbirth intervals in early adulthood, the IV models in Table 3 make a much more convincing case for a causal effect of short first interbirth interval in early adulthood on midlife poverty. In Models 5 and 6 the estimated effect size is almost 50% greater than in the probit models and the statistical significance is higher (t=2.32 and 2.28 versus t=1.99).

These findings demonstrate that after accounting for selection into having a short first interbirth interval in early adulthood, having a short first interbirth interval increases the chances of poverty at midlife by approximately 4%. Because this finding is consistent with the probit models and remains when alternate estimation methods are used for the IV models, this provides evidence that having a second birth within 24 months of the first in early adulthood is causally associated with increased risk of poverty at midlife among women.

Limitations

The IV estimates presented here are unbiased causal estimates of the effect of having a short first interbirth interval in early adulthood to the extent that births taken together with the miscarriages identified in the NLSY79 are representative of the women becoming pregnant who would not terminate their pregnancies. Because random miscarriage is only captured if the woman knows and reports to the interviewer that she was pregnant and miscarried, differential knowledge of pregnancy and differential reporting could bias the estimate by limiting the completeness of the pregnancy instrumental variable. However, if women with less access to health services are less likely to know they are pregnant and thus report a lower proportion of miscarriages this would bias the estimate of the effect of short interbirth interval in the direction of zero, meaning that the estimates presented here are conservative. A more complete reporting of pregnancies would yield a stronger instrument and might lead to greater estimated effects.

Because this study excludes women who aborted their closely spaced second pregnancies, it measures the causal effect of having a short first interbirth interval in early adulthood only for women who would not receive induced abortions of a closely spaced second birth. This limits the generalizability of the findings.

By limiting the counterfactual group to women who eventually had at least two children, the effect of having a closely spaced second birth instead of having no more children is not estimated. However, because most women (2344 of 2895 with complete data) went on to have at least one more birth, so the estimated effects presented here are likely to represent the most common counterfactual conditions experienced by women.

All of the women in the NLSY 1979 are of the same cohort and experienced similar conditions during their childbearing years, and thus the estimates presented here could be biased of the effects childbearing timing vary with cohort or period. However, they help to explain how childbearing might affect poverty and are based on a nationally representative sample.

Conclusion

This study provides evidence that bearing first and second children close together in time and in early adulthood causally increases women's chances of poverty at midlife. Because women continue to experience midlife poverty at higher rates than men and because poverty at midlife is an important predictor of negative outcomes later in life, how women arrive at poverty in midlife is an important social science and public welfare question (Sandoval, et al 2009, Vartanian and McNamara 2002). From a social scientific standpoint, understanding the place of childbearing timing in the life course illuminates how two different trajectories (fertility and socioeconomic) interact through time in individual lives.

From a public policy perspective, the desire to alleviate gender inequity in poverty requires an understanding of how that inequity arises. The evidence presented here points to education as a pathway by which reproductive timing may influence poverty. Social scientists and policy makers may attend to supporting mothers' educational pursuits if they wish to break the causal link between short first interbirth intervals and poverty at midlife. As long as women are substantially more involved in parenting than men, the effects of reproductive timing will fall more heavily on women and therefore support for effective fertility planning could help to address this inequity. This may be a particularly effective intervention to prevent midlife poverty among women if it is the case that access and effective use of contraception lead to the educational gradient in unintended pregnancy and childbearing as Musick and England (2008) suggest.

Table 1. Weighted Sample Characteristics

	Followed Women with 2+ Children Ever Born		
	All	Short IBI	Moderate or Long IBI
In poverty in 2008	13.4%	16.8%*	12.1%*
Non-Hispanic White	78.0%	78.5%	77.9%
Hispanic	6.9%	7.2%	6.8%
Black	15.1%	14.3%	15.3%
Mother's education (years)	10.7	10.6	10.7
In poverty in 1979	16.3%	15.6%	16.6%
Living with both parents in 1979	73.5%	74.2%	73.2%
AFQT score 1979 [a]	45.1	44.5	45.2
Age at first birth	23.0	23.5	23.2
Educational attainment in 2008			
Less than High School	11.5%	12.4%*	11.3%*
High School	37.9%	37.9%	38.0%
More than High School	50.5%	49.7%*	50.8%*
N	2344	630	1714
	100%	26.9%	73.1%

Data Source: NLSY79, All Women Sample; weighted estimates
*p<0.05 for χ^2 test of difference in group means
[a]Armed Forces Qualifying Test

Table 2. Probit Models of Midlife Poverty

	Followed Women with 2+ Children Ever Born			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Short First Interbirth Interval	0.21*	0.23*	0.21*	0.21†
	(2.07)	(2.23)	(1.97)	(1.82)
Hispanic		0.86**		0.17
		(5.48)		(0.85)
Black		1.02**		0.48**
		(8.72)		(3.18)
Mother's education (years)				-0.04†
				(-1.68)
In poverty, 1979				0.15
				(1.05)
Living with both parents, 1979				-0.22†
				(-1.82)
AFQT score 1979 [a]				-0.01**
				(-3.36)
Age at first birth				-0.01
				(-1.00)
Educational attainment, 2008				
Less than High School (Reference)				
High School			-0.88**	-0.49*
			(-6.74)	(-3.36)
More than High School			-1.33**	-0.61**
			(-9.79)	(-3.53)
Constant	-1.17	-1.17	-1.14	0.31
Number of Observations		2263		

Data Source: NLSY79, All Women Sample; weighted estimates

†p<0.10, *p<0.05, **p<0.001

Robust t-statistics are reported in parentheses

[a]Armed Forces Qualifying Test

Table 3. IV Probit Models of Midlife Poverty

	Followed Women with 2+ Children Ever Born	
	Model 5	Model 6
Instrumented Short First Interbirth Interval	0.29*	0.30*
	(2.32)	(2.28)
Hispanic	0.17	0.17
	(0.88)	(0.86)
Black	0.36*	0.48*
	(2.54)	(3.26)
Mother's education (years)	-0.05**	-0.34†
	(-2.08)	(-1.71)
In poverty, 1979	0.17	0.14
	(1.27)	(1.04)
Living with both parents, 1979	-0.27*	-0.22†
	(-2.37)	(-1.83)
AFQT score 1979 [a]	-0.01**	-0.01*
	(-4.69)	(-3.36)
Age at first birth	-0.03*	-0.01
	(-2.08)	(-1.00)
Educational attainment, 2008		
Less than High School (Reference)		
High School		-0.48*
		(-3.32)
More than High School		-0.61**
		(-3.51)
Constant		0.28
Number of Observations	2263	

Data Source: NLSY79, All Women Sample; weighted estimates

† p<0.10, *p<0.05, **p<0.001

Robust t-statistics are reported in parentheses

[a]Armed Forces Qualifying Test

References

______, (2009). National Longitudinal Survey of Youth 1979 Cohort, 1979-2008 (rounds 1-23). U. S. D. o. L. Bureau of Labor Statistics.

Bongaarts, J. and R. G. Potter (1983). Fertility, biology, and behavior: an analysis of the proximate determinants, Academic Press.

Brand, J. E. and D. Davis (2011). "The Impact of College Education on Fertility: Evidence for Heterogeneous Effects." Demography 48(3): 863-887.

Conde-Agudelo, A., A. Rosas-Bermudez, et al. (2007). "Effects of birth spacing on maternal health: a systematic review." American Journal of Obstetrics and Gynecology 196(4): 297-308.

Finer, L. B. and S. K. Henshaw (2006). "Disparities in rates of unintended pregnancy in the United States, 1994 and 2001." Perspectives on Sexual and Reproductive Health 38(2): 90-96.

Finer, L. B. and K. Kost (2011). "Unintended Pregnancy Rates at the State Level." Perspectives on Sexual and Reproductive Health 43(2): 78-87.

Furstenberg, F. (2007). Destinies of the disadvantaged: The politics of teenage childbearing. Russell Sage Foundation.

Geronimus, A. T. (2004). "Teenage childbearing as cultural prism." British Medical Bulletin 69: 155-166.

Geronimus, A. T. and S. Korenman (1992). "The socioeconomic consequences of teen childbearing reconsidered." Quarterly Journal of Economics 107(4): 1187-1214.

Heckman, J. (1992). Randomization and social policy evaluation. Evaluating Welfare. C. Manski, Garfinkel. Cambridge, Mass, Harvard University Press.

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 58(6): 1411-1441.

Hotz, V. J., S. W. McElroy, et al. (2005). "Teenage childbearing and its life cycle consequences - Exploiting a natural experiment." Journal of Human Resources 40(3): 683-715.

Miller, A. R. (2011). "The effects of motherhood timing on career path." Journal of Population Economics 24(3): 1071-1100.

Morgan, S., Winship, C (2007). Counterfacutals and Causal Inference. Cambridge, Cambridge.

Musick, K., P. England, et al. (2009). "Education Differences in Intended and Unintended Fertility." Social Forces 88(2): 543-572.

Sandoval, D. A., Rank, M. R., Hirschl, T. A. (2009) The increasing risk of poverty across the American life course. Demography. 46:4.

Stange, K. (2011). "A Longitudinal Analysis of the Relationship Between Fertility Timing and Schooling." Demography 48(3): 931-956.

StataCorp (2011). Stata Statistical Software: Release 12. . College Station, TX, StataCorp LP.

Vartanian, TP , McNamara, JM (2002). "Older women in poverty: The impact of midlife factors." Journal of Marriage and Family, 62:2. 532-548

Walsemann, K. M., A. T. Geronimus, et al. (2008). "Accumulating disadvantage over the life course - Evidence from a longitudinal study investigating the relationship between educational advantage in youth and health in middle age." Research on Aging 30(2): 169-199.

Zhu, Rolfs, Nangle, Horan. (1999). Effect of the interval between pregnancies on perinatal outcomes. New England Journal of Medicine. 340:589-594