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Intensive Parenting: Fertility and Breastfeeding Duration in the United States

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Abstract Using 30 years of longitudinal data from a nationally representative cohort of women, we study the association between breastfeeding duration and completed fertility, fertility expectations, and birth spacing. We find that women who breastfeed their first child for five months or longer are a distinct group. They have more children overall and higher odds of having three or more children rather than two, compared with women who breastfeed for shorter durations or not at all. Expected fertility is associated with initiating breastfeeding but not with how long mothers breastfeed. Thus, women who breastfeed longer do not differ significantly from other breastfeeding women in their early fertility expectations. Rather, across the life course, these women achieve and even exceed their earlier fertility expectations. Women who breastfeed for shorter durations (1–21 weeks) are more likely to fall short of their expected fertility than to achieve or exceed their expectations, and they are significantly less likely than women who breastfeed for longer durations (≥22 weeks) to exceed their expected fertility. In contrast, women who breastfeed longer are as likely to exceed as to achieve their earlier expectations, and the difference between their probability of falling short versus exceeding their fertility expectations is relatively small and at the boundary of statistical significance ($p = .096$). These differences in fertility are not explained by differences in personal and family resources, including family income or labor market attachment. Our findings suggest that breastfeeding duration may serve as a proxy for identifying a distinct approach to parenting. Women who breastfeed longer have reproductive patterns quite different than their socioeconomic position would predict. They both have more children and invest more time in those children.

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Introduction

Demography has a long tradition of studying breastfeeding as part of the reproduction process. Breastfeeding is a proximate determinant of fertility (Bongaarts and Potter 1979; Davis and Blake 1956), a correlate of infant mortality in developing regions (Mosley and Chen 1984), and a culturally informed practice that sustains distinct and localized patterns of birth timing (Bledsoe et al. 1994). Despite a rich international literature, however, little demographic work has explored the relationship between breastfeeding and fertility in the United States.

This gap in the literature is striking given that research by qualitative scholars identifies breastfeeding as a key practice embedded in the larger discourse of "intensive" or "total" mothering (Hays 1998; Wolf 2010). This literature describes breastfeeding in the United States as a time-intensive and emotionally charged practice—a project that middle-class women take on that epitomizes the complex intersection of gender, culture, power, and agency in the construction of contemporary motherhood (Avishai 2007; Huber 2007; Wolf 2010). In this way, breastfeeding is a culturally informed part of childbearing in the United States much like in many other nations, and we might expect that it is related to fertility patterns in this context as well. We know of no existing study, however, that examines how fertility relates to breastfeeding in the United States. Our study fills this gap in the literature.

Understanding the relationship between breastfeeding and fertility outcomes advances both the theoretical and empirical literature on fertility in the United States. Although childbearing decisions are often explained using economic theories (Becker 1991; Becker and Tomes 1976), childbearing and child investment include many other dimensions as well (Blake 1974; Morgan and King 2001; Schoen et al. 1997). As a time-intensive, embodied task that only mothers can perform, breastfeeding fits well within the quality/quantity framework: women who expect to invest considerable time and resources in their children might choose to have fewer children overall. But demographers have long argued that social scripts matter as well, and given the contentious space that breastfeeding occupies in the United States, studying the relationship between breastfeeding and fertility can help to advance more culturally grounded theories of fertility outcomes (Bachrach and Morgan 2013; Johnson-Hanks 2015). Breastfeeding is particularly interesting because it touches on multiple determinants simultaneously: it is a biological determinant of fertility that can lengthen intervals between births (Bongaarts and Potter 1979; Davis and Blake 1956); it is positively associated with resources such as women's education, family income, and age at first birth (Li et al. 2005); and it is a culturally informed practice that differs across groups and has changed considerably over time (Avishai 2007; Hendershot 1984; Hirschman and Butler 1981).

Using 30 years of longitudinal data from a nationally representative birth cohort of American women with completed fertility, we study the association between breastfeeding duration and women's completed fertility levels, fertility expectations, and birth spacing. We extend the existing literature by using a life course perspective to study how fertility expectations early in life and fertility outcomes across adulthood

relate to how long women breastfeed their first child. Our analyses make no causal claims between breastfeeding duration and fertility choices. Indeed, our study reveals the opposite: the interconnectedness of family preferences and child investment across the life course. By taking a life course view, we observe both the association between fertility expectations before the start of childbearing and future breastfeeding duration, and the association between breastfeeding duration and completed fertility. We also measure how early fertility expectations and final fertility outcomes differ for women who breastfeed for longer and shorter durations. Our results suggest that breastfeeding duration may serve as a powerful proxy that captures numerous observed and unobserved preferences about family and child investment.

Breastfeeding in the United States

Prior to the twentieth century, breastfeeding was the primary source of food for infants (Apple 1987: chapter 8), and breastfeeding rates were quite high. During the 1900s, however, advances in formula technology, changes in mothers' political and labor market participation, and a consensus emerging from the medical community that formula was best for children caused formula to replace breastfeeding as the primary way that American mothers fed their newborns (Apple 1987; Wolf 2001). Nationally, roughly two-thirds of mothers born in 1911 to 1915 reported ever breastfeeding, compared with only one-quarter of mothers born in 1946 to 1950 (Hirschman and Butler 1981). By the early 1970s, breastfeeding rates reached their lowest point, with only 5 % of mothers reporting that they were breastfeeding at all six months after birth (Ryan et al. 2002:1104).

Yet, as medical authorities increasingly turned against breastfeeding in the mid-1900s, psychologists began to emphasize that the mother-child bond promoted healthy development, and this rekindled a resurgence of breastfeeding (Martucci 2015). By the early 1980s, an increase in research and public policy initiatives extolling the benefits of breastfeeding led breastfeeding rates to rise nationally (Hendershot 1984; Wright and Schanler 2001). By 2008, three-quarters of all mothers initiated breastfeeding, and 44 % maintained some breastfeeding six months after birth (Allen et al. 2013).

Compared with women in other wealthy nations, women in the United States have lower rates of breastfeeding initiation, lower average breastfeeding duration, and much less access to formal parental leave support (Callen and Pinelli 2004; Waldfogel 2001). Compared with women in lower- and middle-income countries, however, women in higher-income nations breastfeed for shorter durations (Victora et al. 2016). Like women in Europe, Canada, and Australia, U.S. mothers who breastfeed for longer durations, on average, are better educated, older, and married, and have higher family incomes (Callen and Pinelli 2004; Thulier and Mercer 2009). But these socioeconomic gradients in breastfeeding are not universal. In poorer and middle-income nations, it is women with fewer resources who breastfeed longer (Victora et al. 2016).

Breastfeeding patterns differ by race and ethnicity as well as by socioeconomic status (SES) in the United States. African American women report lower rates of breastfeeding initiation and short durations than Hispanic and white women (Li et al. 2005). Hispanic women report the highest rate of breastfeeding initiation across all racial/ethnic groups, and Hispanic and white women have similar average breastfeeding

durations (Ryan et al. 2002). As this summary makes clear, breastfeeding is strongly informed by both context and resources. These dimensions shape women's breastfeeding practices in different ways across time, place, and social group.

In many societies, breastfeeding is understood as both taxing on a woman's body and a critical form of child investment (Bledsoe et al. 1994, 1998; Huber 2007). In the United States, contemporary analyses of breastfeeding have routinely noted its interconnection with culturally idealized visions of high-investment motherhood and childrearing (Hays 1998; Huber 2007; Wolf 2010). In this view, breastfeeding is valued because of the health advantages it is believed to have for both children and mothers (Wolf 2010). This high investment ideal is consistent with broader socioeconomically differentiated patterns of how much time and money parents spend on children (Bianchi 2000; Kornrich and Furstenberg 2013). Families with more socioeconomic resources increasingly structure their family life to maximize investments in their children (Lareau 2003). In this vein, middle-class mothers describe breastfeeding as a time-intensive project that they take on for the benefit of their children (Avishai 2007; Kukla 2006). Breastfeeding is thus a central part of the culture of contemporary motherhood in the United States.

Breastfeeding and Fertility

Fertility is a well-theorized topic in demography, and fertility choices are often explained using a multidimensional framework that incorporates economic, cultural, and social processes. In the economic framework, individuals or couples weigh the costs and benefits of children and try to balance how many children they will have with how much they expect to invest in those children (Becker 1991). As child-rearing becomes more intensive and expensive, parents may choose to have fewer children but invest more in the few children they have. Childbearing, however, involves processes that reach far beyond economic calculations (Blake 1974; Morgan and King 2001). By incorporating the work of social, cultural, and historical theorists (Bourdieu and Wacquant 1992; Giddens 1984; Sewell 2005) and drawing attention to the role of social scripts in reproduction decisions, demographers have developed more socially contingent and dynamic models that underscore the interplay of culture and material constraints across the life course in informing fertility outcomes (Bachrach 2014; Bachrach and Morgan 2013; Johnson-Hanks 2015). Finally, fertility decisions are also embedded in broader social systems. Children are a social resource that reinforces interpersonal relationships, community integration, and social networks (Astone et al. 1999; Morgan and King 2001; Schoen et al. 1997), and these factors inform fertility choices as well. Breastfeeding touches on many of these dimensions: it is time-intensive and thus "expensive" in terms of a woman's resources; it is a culturally informed practice tied to narratives of mothering and childrearing; and it is a behavior that is highly differentiated by socioeconomic characteristics. For all these reasons, understanding the relationship between breastfeeding and fertility in the United States fills an important gap in the existing literature.

Based on the existing literature, however, one could hypothesize that breastfeeding duration and fertility might be either negatively or positively correlated. Women who breastfeed their children are positively selected with regard to many socioeconomic

characteristics, including education and age at first birth (Li et al. 2005; Thulier and Mercer 2009), which would predict a negative association between breastfeeding duration and total fertility. For example, education is associated with lower overall completed fertility in the United States (Hagewen and Morgan 2005) and stronger labor force attachment post-birth (Boushey 2008). Older age at first birth may predict lower overall fertility both because women lower their fertility expectations as they age (Hayford 2009) and because delaying childbearing may limit the number of years available to conceive children (Bongaarts 2001). Similarly, in the quality-quantity framework of fertility, breastfeeding is a time-intensive activity that only mothers can perform, so women who want to breastfeed longer might choose to have fewer children.

Other characteristics of women who breastfeed, however, could lead us to hypothesize a positive association between breastfeeding duration and total fertility. Women who do not intend to return to work breastfeed longer (Arlotti et al. 1998), and women who breastfeed their firstborn for longer durations are more likely to be out of the labor force (Rippeyoung and Noonan 2012). Both of these patterns are consistent with lower opportunity costs of future fertility, which would predict a positive correlation between breastfeeding duration and total fertility. Breastfeeding duration might also serve as a proxy for a preference for family life over career investment (Hays 1998), in part because of the emergence of cultural scripts that link breastfeeding with a particular vision of child "quality" (Law 2000; Wolf 2010). Breastfeeding duration might proxy for preferences about time with children, the work-family balance that women prefer, or the type of child investment that women or couples feel is important to provide and thus predict having more children overall.[1] In the analyses that follow, we examine which of these hypotheses the empirical results support.

Data and Approach

Our analyses use 30 years of longitudinal data from the 1979 to 2012 waves of the National Longitudinal Survey of Youth 1979 (NLSY79), a nationally representative sample of respondents aged 14–22 when first surveyed in 1979. We omit the military and poor white oversamples because these were not followed for all survey years, and we use the 1979 probability weights to adjust for the survey's complex design.[2] The women in this cohort sample were aged 47–55 in the 2012 data wave and have completed their fertility. These data offer a unique opportunity to study differences in family formation by breastfeeding duration for a recent cohort of women with completed fertility. Most NLSY79 mothers gave birth between 1975 and 1995, at the start of the resurgence of breastfeeding in the latter part of the century.

The NLSY79 sample includes 3,854 mothers, 96 % of whom (3,691) have complete information on breastfeeding status at first birth. Using these data, we can describe the cohort's breastfeeding distribution, completed fertility, and fertility timing by breastfeeding duration for nearly the complete sample of mothers. This is important

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[1] Breastfeeding can also elicit hormonal changes that increase mother-infant bonding (Uvnäs-Moberg and Eriksson 1996), which might increase future fertility.

[2] We also used the NLSY sample-specific weights and obtained the same results.

because breastfeeding is an extremely selective practice that is correlated with both observable characteristics (such as age, marital status, and socioeconomic resources) and unobservable characteristics (such as preferences for time with children and child investment). We use this sample of 3,691 women to summarize the distributions of breastfeeding duration and fertility outcomes as well as their bivariate associations so that we can generalize these descriptive patterns to the mothers the NLSY79 represents: U.S. women not living in institutions who were born between 1957 and 1964 and have children.[3]

The selectivity of breastfeeding, however, makes it equally important to examine how much of the observed association between breastfeeding and fertility outcomes is due to compositional differences among women who breastfeed for different durations. We use two strategies for studying and addressing these compositional differences. First, guided by the literature on the determinants of breastfeeding, fertility, and child investment, we use the extensive set of covariates available in the NLSY79 to measure as many relevant observed characteristics as possible in our analyses. Second, we use women's expected fertility, measured early in life and at least one year before *conceiving* their first child, as a measure of early preferences for family and child investment.[4] This early measure of expected fertility comes both before the initiation of breastfeeding (and the conception of the child that is breastfed) and completed fertility. This measure allows us to examine whether expected fertility early in life is correlated with how long women breastfeed later in life as well as how the difference between expected and total fertility differs by breastfeeding duration. We assume that expectations measured at ages 14–22 are proxies for family schemas early in life, but this measure is likely noisier when measured in adolescence than early adulthood. To address this potential issue, our multivariate analyses control for the respondent's age in single years in 1979, when these early fertility expectations were measured.

In analyses using expected fertility and controlling for covariates, we restrict our analyses to women who had their first birth in 1981 or later to ensure that fertility expectations and other covariates are measured before women were pregnant with their first birth. This sample restriction systematically censors women who had their first birth at early ages because these variables are only available as of the first survey wave in 1979, when respondents were ages 14–22. We also omit the handful of women who breastfed longer than two years ($N = 11$) and restrict the earliest age of first birth to age 15, for a total multivariate sample of 2,339 mothers. We conduct many additional analyses to check the robustness of our results to these sample restrictions, which we report in the Sensitivity Analyses section. Overall, our results are extremely consistent across all the analyses and samples we tested.

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[3] Cumulative retention rates in the NLSY79 exceeded 90 % in 1993, when respondents were aged 28–36, and exceeded 80 % in 2000, when respondents were aged 35–43. With the military and poor white oversamples excluded, the sample includes 874 women who had no children. For 81 % of these women, the NLSY79 includes fairly complete information on their fertility. The remaining 19 % ($n = 169$) left the survey before year 2000. These 169 women were observed to a median age of 27, which represents approximately the 80th percentile of the age at first birth distribution for the sample. Only 9 % ($n = 80$) of the 874 women we categorize as not bearing children left the survey before age 27.

[4] Although the minimum gap between this measure of early expected fertility and first birth is 2 years, the median gap is 7 years, and the interquartile range is 4–11 years.

We group women into one of four breastfeeding categories. The first category comprises women who do not initiate breastfeeding at first birth. The other three groups represent tertiles of the observed distribution of breastfeeding duration for those who breastfed their first child. The bottom tertile breastfed for 1 to 6 weeks; the second tertile breastfed for 7 to 21 weeks; and the third tertile breastfed for 22 weeks (five months) or longer. These breastfeeding categories capture any breastfeeding, rather than breastfeeding exclusively, and only as it relates to the woman's first child. We tested other specifications of these categories and found consistent results across the different specifications.[5]

Outcomes and Statistical Models

In order to examine how much respondents' early expectations differ from their achieved fertility, we analyze three aspects of fertility with respect to how long a woman breastfeeds her first child: total fertility, birth spacing, and the difference between total and expected fertility. Because our sample is restricted to women who have at least one child, we analyze fertility using negative binomial and Poisson models for both truncated and nontruncated data (Greene 2000). The negative binomial models produce the same results at the Poisson models, and the variance inflation parameter is essentially zero. The truncated and standard Poisson models also produce similar substantive results. For analyses of total fertility, we report results using a truncated Poisson model as well as a multinomial version that categorizes women's fertility into having one, two, or three or more children. We use ordinary least squares (OLS) for modeling the number of months between births and the difference between achieved and expected fertility. We also use a multinomial model that categorizes the difference between total and expected fertility into having fewer children than expected, the same number as expected, or having more children than expected.

Independent Variables

The literature on the social determinants of breastfeeding guides the variables we include as controls in our multivariate analyses. Women who breastfeed have higher SES on numerous dimensions. Our multivariate analyses include controls for education, work status, marital status at first birth, age at first birth (specified as a piecewise linear spline with knots at 20, 25, 30, and 35), and race/ethnicity. We confirmed that the association between each fertility outcome and age at first birth does not differ meaningfully by breastfeeding status. The interaction between race/ethnicity and breastfeeding duration is also not statistically significant once we control for compositional differences between the groups.

Because women who breastfeed differ in cognitive skills and personality traits (Der et al. 2006; Wagner et al. 2006), we include measures for cognitive skills, locus of control, and self-esteem. The Armed Forces Qualifying Test (AFQT) serves as a validated measure of cognitive skills. The Rotter locus of control scale describes the

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[5] Our alternative approaches included using the distribution quartiles rather than tertiles and dividing the categories into two alternative different intervals: 0, 1–8, 9–26, 27–52, 53–208 weeks and 0, 1–13, 14–26, 27–52, 53–208 weeks.

extent to which respondents feel that they have control over their lives through motivation or determination (internal control) versus having things happen to them by fate or luck (external control). Among these, only cognitive skills are significantly associated with fertility outcomes once other characteristics are controlled. In the results we report, we omit the measures of self-esteem and locus of control from our multivariate models.

Although we do not analyze breastfeeding and paid work in this study, these choices are clearly related (Roe et al. 1999), and decisions about work intervene between breastfeeding one's first child and completed fertility. We address potentially unobserved differences in labor market aspirations by breastfeeding duration using measures from before first conception so that these are not affected by breastfeeding itself. Our multivariate analyses include an early measure of future work commitment (measured when the respondent was aged 14–22) derived from whether the respondent answered yes or no to the following question: "If, by some chance, you (and your (husband/ wife)) were to get enough money to live comfortably without working, do you think you would work anyway?" We also tested a measure of whether the respondent's mother worked when the respondent was 14 years old, which did not change our results and is thus omitted from the results we report. Our analyses also include a measure of weekly hours worked prior to first birth.

In our sensitivity analyses, we include two additional measures of women's labor market experiences before and after first birth. First, we control for women's wages in the year before first birth using a measure of average log hourly wage, adjusted to year 2000 constant dollars. Second, we control for whether the woman left the labor force after first birth for three, five, or seven consecutive years. Including these work measures does not change our substantive findings with respect to breastfeeding and fertility.

To address the role of family income as a potentially unobserved but important characteristic that informs both breastfeeding and fertility, our sensitivity analyses control for long-run average family income using information from the year before first birth up to nine years after first birth. Using all the measures of family income available in these years, we compute the log of the average of family income in this 11-year window, adjusted to year 2000 constant dollars, for women with at least three observations of family income in these years (94 % of the sample). Sample women have, on average, seven observations of family income in this window, regardless of breastfeeding status. The results are unchanged if we use cases with any observation of family income in this window or if we restrict the measure to observations of family income only in the years following first birth. Our results are also unchanged if we exclude women's earnings from the measure of family income.

Results

Figure 1 shows the distribution of breastfeeding duration for women's first children. The histogram shows the full distribution in four-week intervals, and the inset box plot shows the distribution for those who breastfeed at all. Nearly half the mothers in this cohort (47 %) did not breastfeed their first child. Among those who breastfed at all (inset box plot), most did so fewer than six months, and few women—about

8 %—breastfed longer than one year.[6] Those who breastfed their first child did so for a median duration of 13 weeks, with an interquartile range of 6–30 weeks. For the vast majority of new mothers, breastfeeding was an activity that was short-lived. Eight out of 10 women in this cohort breastfed their first child no more than four months, if at all.

Figure 2 shows the nonparametric association between breastfeeding duration and total fertility using a local polynomial smoother.[7] The graph shows that women who did not initiate breastfeeding (0 weeks) had similar fertility to those who breastfed for only 1 or 2 weeks. Average fertility, however, increases steadily as breastfeeding duration increases up to about 40 weeks—a range that captures about 85 % of the distribution among those who initiate any breastfeeding. The association between fertility and breastfeeding duration is relatively flat between 40 and 55 weeks. The confidence interval at the extreme tail of the breastfeeding distribution (55 to 104 weeks) grows wide because there are so few observations in this range.

Table 1 shows bivariate differences in women's personal and family characteristics by breastfeeding duration. Consistent with the existing literature, women who breastfeed for longer durations have, on average, more education overall, are more likely to hold a four-year college degree, have higher cognitive skills, and are more likely to be married when they start their families. They are also more likely to be in the labor force and earn substantially higher hourly wages. They have, on average, significantly better self-esteem and a stronger sense of self-control. Compared with women who do not initiate breastfeeding, women who breastfeed are more likely to work full-time in the year before their first birth.

Women who breastfeed are between 2.5 and 4.5 years older at the time of first birth than those who do not breastfeed. Age at first birth also differs significantly across the breastfeeding groups. The top panel of Fig. 3 shows the full distribution of age at first birth for the breastfeeding groups. About one-quarter of women who do not breastfeed have their first child at ages 18 or earlier, and more than half have their first child by age 21. In contrast, fewer than half of the women in the longest breastfeeding group have had their first birth by age 25. Women who breastfeed at least five months have a median age at first birth of 26 and a 75th percentile first-birth age of 31. The upper whisker of the age distribution reaches 35 for women who do not breastfeed, compared with 43 for those who breastfeed five months or longer.

The bottom panel of Fig. 3 shows the full distribution of the time between first and second births by breastfeeding group (among those with at least two births). The interval between births has a much larger spread for women who do not breastfeed at all than for those who do. Women who do not breastfeed have their second child about four years after their first birth. Women who breastfeed their first child 1–21 weeks have first and second births that are about 3.5 years apart, on average, whereas women who breastfeed at least 22 weeks have first and second births that are about 3.3 years apart. Among those who go on to have

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[6] In this sample of almost 3,700 mothers, only 19 women breastfed for two years, and 11 breastfed beyond two years.

[7] We omit from Fig. 2 the 11 women who breastfed beyond two years. Because not initiating (breastfeeding 0 weeks) is such a distinct and large group, we plot this mean directly from the data and use the polynomial smoother only for the remainder of the breastfeeding distribution shown (1 to 104 weeks).
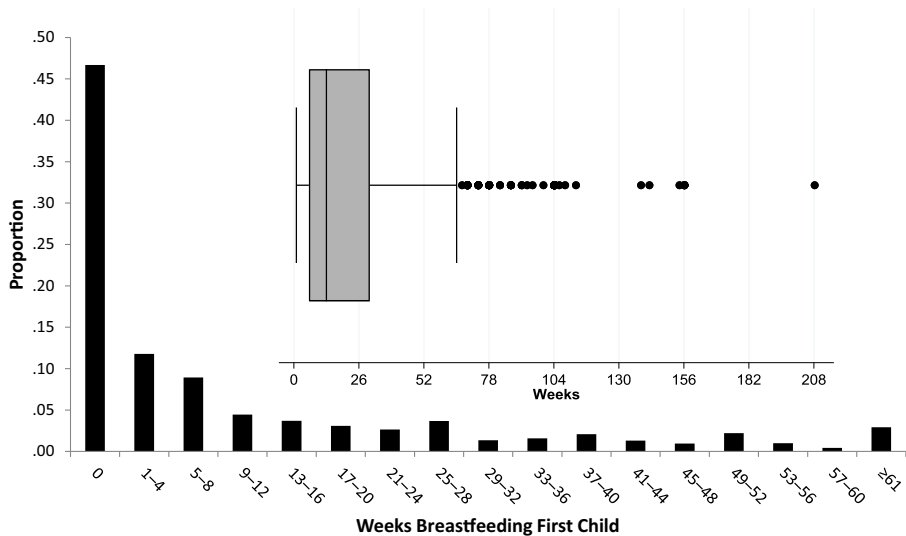
Fig. 1 Number of weeks breastfeeding the first child, NSLY79 ($N = 3,691$). Estimates are weighted with sample probability weights. The histogram shows the full distribution. The inner box plot shows the distribution for those who breastfed at least one week. Breastfeeding is defined as any breastfeeding, rather than breastfeeding exclusively

third births, the interval between the second and third births does not differ significantly among the groups.

The results in Table 1 show that among those who initiate breastfeeding, women who breastfeed the longest have significantly higher completed fertility than women who breastfeed for shorter durations. Women who breastfeed 22 weeks or longer
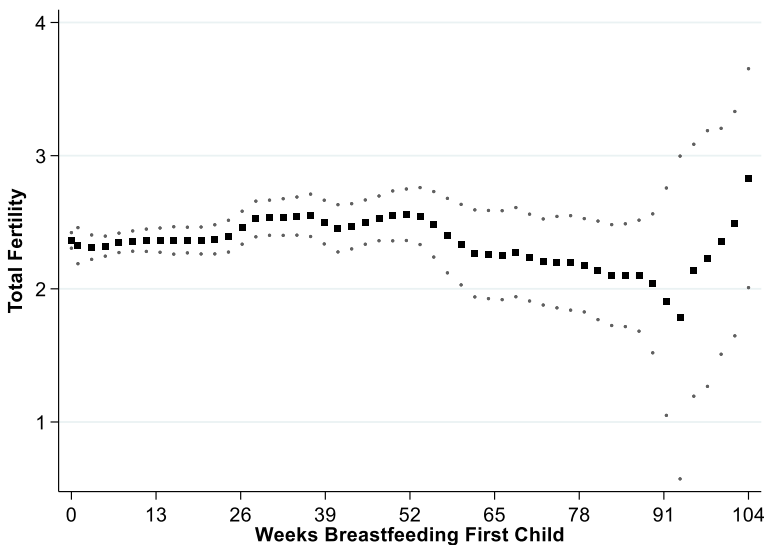
Fig. 2 Bivariate association between total fertility and weeks breastfeeding the first child using a locally weighted polynomial smoother with a 95 % confidence interval, NLSY79 ($N = 3,691$). The figure shows observed average fertility for those who breastfeed 0 weeks

**Table 1** Bivariate differences in personal and family characteristics, by breastfeeding duration: NLSY79

	Breastfeeding Duration				
	0 Weeks	1–6 Weeks	7–21 Weeks	≥22 Weeks	N
Personal Characteristics					
Highest grade completed at first birth	11.95	12.76	13.21	14.18	3,467
% college completed	0.07	0.17	0.22[b]	0.39	3,628
Hourly wage year prior first birth, if working (adjusted to year 2000 dollars)	9.76	11.66	12.80[b]	14.22[c]	2,378
Hours worked in year prior first birth					3,179
0 hours	0.22	0.14	0.10	0.11	
≤20 hours per week	0.28	0.21	0.23	0.25	
21–34 hours per week	0.19	0.20	0.25	0.25	
≥35 hours per week	0.31	0.45	0.42	0.39	
Average family income post first birth (adjusted to year 2000 dollars)	41,371	61,478	68,381[b]	80,141	3,473
AFQT (cognitive test score)	33.97	47.93	52.96	63.02	3,513
Rotter (lower = more internal control)	9.04	8.50	8.29[b]	8.08[c]	3,656
Self-esteem (higher = more self-esteem)	21.72	22.42	22.73[b]	23.16[c]	3,523
Work if could live comfortably without working (% yes)	0.76	0.79[a]	0.80[b]	0.78[a,b,c]	3,679
Respondent's mother worked (at respondent's age 14)	0.52	0.55[a]	0.59[b]	0.52[a,b]	3,612
Age at first birth	22.08	24.59	25.52	26.56	3,691
Married at first birth	0.63	0.82	0.90	0.89[c]	3,676
Family Characteristics					
Number of children, full cohort	2.36	2.25	2.31[a,b]	2.46[a]	3,691
Expected fertility, full cohort	2.35	2.55	2.60[b]	2.62[b,c]	3,648
Family size distribution					3,691
1 Child	0.22	0.22	0.19	0.16	
2 Children	0.41	0.47	0.46	0.43	
≥ 3 Children	0.37	0.31	0.35	0.41	
Number of months between first and second birth	51.54	44.44	41.75[b]	39.06[c]	2,934
Number of months between second and third birth	50.30	48.41[a]	45.53[a,b]	44.60[a,b,c]	1,460
N	2,029	551	569	542	3,691

Notes: Estimates are weighted with sample probability weights and are statistically significant from the other feeding categories at the .05 level unless otherwise noted. Pearson chi-squared test used for hours worked and family size distributions.

[a] Contrast to 0 weeks not significant at $p < .05$.

[b] Contrast to 1–6 weeks not significant at $p < .05$.

[c] Contrast to 7–21 weeks not significant at $p < .05$
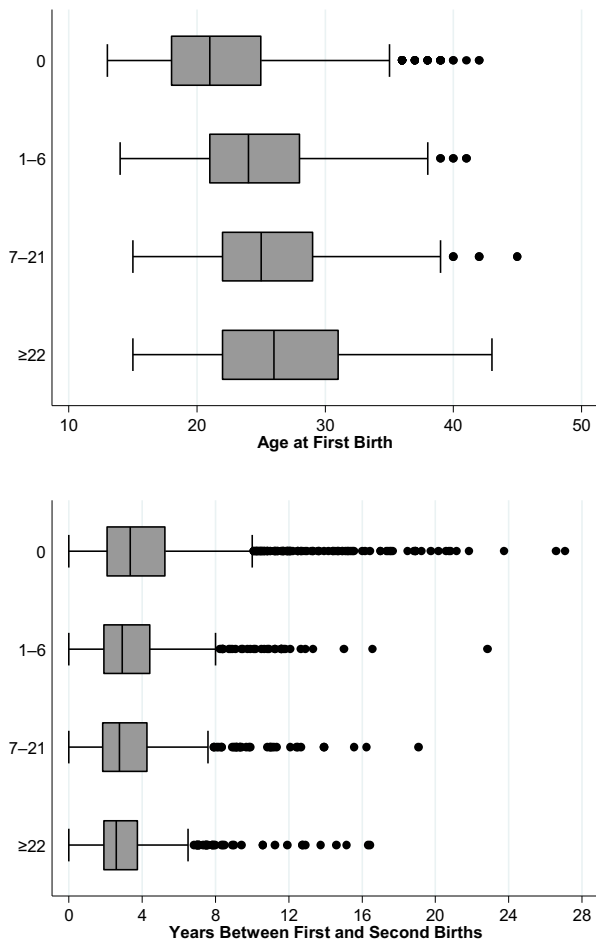
Fig. 3 Distribution of age at first birth (N = 3,691) and years elapsed between first and second births by breastfeeding group (N = 2,934), NLSY79

also have higher average fertility than women who do not breastfeed (2.46 vs. 2.36 children), but this difference is not statistically significant (p = .10) in the bivariate comparison.[8] Looking at family configurations across feeding groups, women who breastfeed for longer durations are both less likely to have only one child and more likely to have three or more children than women in the other breastfeeding groups. Finally, women who do not initiate breastfeeding expect fewer children (when asked at ages 14–22) compared with women who breastfeed their first child for any duration. Among women who initiate breastfeeding, expected fertility does not differ by breastfeeding duration. This pattern suggests that women who expect more children early in life are also more likely to initiate breastfeeding. We examine these bivariate differences in more detail in the multivariate analyses that follow.

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[8] Simply adjusting for race/ethnicity, and nothing else, makes this contrast significant as well.

Multivariate Differences in Achieved and Expected Fertility by Breastfeeding Duration

We next investigate whether the observed differences in achieved and expected fertility and the time elapsed between births are explained by compositional differences between the breastfeeding groups. These analyses use a subsample of 2,339 respondents with valid information on the covariates and with first births in 1981 or later, so that women's expected fertility is measured before the start of the pregnancy with their firstborn child. We summarize the characteristics of this subsample in the online appendix, Table S1. This subsample is positively selected on most dimensions, especially for women who do not breastfeed. Restricting the sample to those with a first birth after 1980 results in lower average fertility and a lower share of women with three or more children in the nonbreastfeeding group. Expected fertility, however, is quite similar across the two samples. In the section that follows, we confirm that the results that we discuss in this section are generalizable across many alternative sample definitions and robust to additional control variables.

Table 2 shows the multivariate results for total fertility, both measured as a total count and categorized by whether the woman have one, two, or three or more children. For average fertility (column 1), holding other characteristics constant, women who breastfeed 22 weeks or longer have more children overall than women in each of the other feeding groups. Compared with the other groups, women who do not breastfeed have significantly fewer children than women who breastfeed 1–6 weeks ($p < .08$) and 7–21 weeks. Holding other characteristics constant, women who breastfeed 1–6 weeks and those who breastfeed 7–21 weeks do not differ significantly in their completed fertility.

The second and third columns in Table 2 disaggregate these average results into differences between having only one child (vs. two children) or three or more children (vs. two children). Compared with women who breastfeed 22 weeks or longer, women who do not breastfeed are more likely to have only one child rather than two and are less likely to have three or more births. Thus, they are both more likely to stop at one child and less likely to go on to have more than two children. Women who breastfeed 1–6 weeks are more likely to have only one versus two births ($p < .08$), and they are less likely to go on to have three or more births versus two births. Women who breastfeed 7–21 weeks do not differ significantly in their odds of having one versus two births, but they are significantly less likely to have three or more births rather than two.[9]

The multivariate results for total fertility show that women who breastfeed their first child for longer durations have larger families than women in the other feeding groups, even after we account for differences in their observed personal and family characteristics. But what about differences in unobserved characteristics? Perhaps women who breastfeed longer had expected to have more children in the first place—that is, they both wanted more children and wanted to invest more time in those children. In order to

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[9] In this subsample, women who breastfeed 22 weeks or longer have significantly higher average fertility than all other groups even without controls for any other characteristics. The categorical contrasts to women who do not initiate breastfeeding are also significant without controls, as are the contrasts for having three or more children (regressions not shown).

Table 2 Multivariate results for total fertility using truncated Poisson and multinomial logit models (odds ratios shown): NLSY79 (N = 2,339)

	Count	Categorical	
		1 vs. 2 Children	≥3 vs. 2 Children
Breastfeeding Duration (ref. = ≥22)			
0 weeks	0.780*	1.802*	0.493*
1–6 weeks	0.845*	1.509†	0.547*
7–21 weeks	0.883*	1.318	0.653*
Education (ref. = ≥16)			
<12 years	0.763*	2.145*	0.627
12 years	0.796*	1.914*	0.691†
13–15 years	0.844*	1.601*	0.813
Age at First Birth (spline)			
15–20	0.943	1.174	0.890
20–25	0.942*	1.028	0.832*
25–30	0.944*	1.134*	0.891*
30–35	0.928*	1.178*	0.839†
35–45	0.869*	1.286*	0.906
Married at First Birth	1.095†	0.509*	0.867
AFQT	1.001	0.999	1.002
Race/Ethnicity (ref. = white)			
Hispanic	1.112*	0.899	1.212
Black	1.084†	0.951	1.188
Respondent U.S.-born	0.938	1.757†	0.902
Work Commitment, 1979	0.894*	1.204	0.826
Weekly Hours Worked Prior to First Birth (ref. = 0)			
1–20	0.873*	1.085	0.709†
21–35	0.945	0.960	0.906
≥35	0.954	0.904	0.931
Wald Tests, Prob. > F			
0 weeks = 1–6 weeks	0.08	0.34	0.54
0 weeks = 7–21 weeks	0.008	0.09	0.096
1–6 weeks = 7–21 weeks	0.40	0.52	0.36

Note: All models control for respondent's age in 1979 in single years.

†$p < .10$; *$p < .05$

assess whether women who go on to breastfeed their first child differed in their fertility expectations before they began childbearing and thus breastfeeding, we next examine the association between women's expected fertility measured at ages 14–22 and how long they breastfeed their first child later in life. In this set of regressions, we ask whether women's early expectations about how many children they would bear is associated with how long they breastfeed their first child.

Table 3 reports results from a multinomial model that predicts the odds of not breastfeeding, breastfeeding 1–6 weeks, or breastfeeding 7–21 weeks, compared with the baseline of breastfeeding 22 weeks or longer. Our key covariate of interest is women's early fertility expectations, categorized as expecting to bear zero, one, two, three, or four or more children. Holding other characteristics constant, women who expected to have four or more children have significantly lower odds of not breastfeeding at all. This is true both relative to those who breastfeed 22 weeks or longer (odds ratio of 0.607) and relative to the other two breastfeeding groups. In contrast, there is no significant association between expected fertility and breastfeeding duration for women who breastfeed at all. This suggests that women who expect more children are more likely to initiate breastfeeding—expecting to have more children and breastfeeding those children are positively associated—but women who breastfeed for the longer durations had not expected more children than women who breastfeed for shorter durations.

Our results show that all women who go on to breastfeed, regardless of duration, expected similar-sized families but that women's realized fertility differs by breastfeeding duration. If breastfeeding for longer durations reflects preferences and cultural meanings with regard to family size, these are unrelated to expected fertility measured at ages 14–22. Rather, across the life course, women who breastfeed five months or longer have more children. In contrast, women who do not breastfeed at all report expecting fewer children before they begin their families, and they go on to have few children as well. We next examine whether women who breastfeed for longer durations exceed their expected fertility or whether women who breastfeed for shorter durations fall short of their expected fertility.

Table 4 shows multivariate results for the difference between total and expected fertility (total minus expected) by breastfeeding duration. Column 1 shows results for the average difference between total and expected fertility. Holding other characteristics constant, women who breastfeed 1–6 weeks are marginally more likely to have fewer children than expected compared with women who breastfeed at least 22 weeks. The results shown in columns 2 and 3 disaggregate this average difference into the odds of having fewer, the same, or more children than expected. Compared with women who breastfeed 22 weeks or longer, women who breastfeed 1–6 weeks or 7–21 weeks have significantly higher odds of having fewer children than expected or the same number as expected versus having more children than they expected. Women who breastfeed for longer durations and women who do not initiate breastfeeding do not differ in their odds of having fewer children than expected or having the same number of children as expected versus having more children than expected.

Figure 4 shows predicted values from the multinomial regression summarized in Table 4. Among women who breastfeed, those who breastfeed for shorter durations (1–21 weeks) are more likely to have fewer children than they expected than to achieve or exceed their expectations. They are also more likely to achieve their fertility expectations than to exceed them. In contrast, women who breastfeed 22 or more weeks do not differ in their likelihood of achieving or exceeding their fertility expectations. They also have significantly higher probabilities of exceeding their fertility expectations compared with women who breastfeed for 1–6 or 7–21 weeks. Women who breastfeed 1–6 weeks are more than twice as likely to fall short of their expectations as to exceed them (predicted probabilities .45 vs. .21). Women who breastfeed 7–21 weeks are also nearly twice as likely to fall short of their expected fertility as to exceed it (probabilities of .43

Table 3 Multivariate multinomial results for breastfeeding duration, by expected fertility (odds ratios shown): NLSY79 ($N = 2,339$)

	Breastfeeding Duration		
	0 vs. ≥22 Weeks	1–6 vs. ≥22 Weeks	7–21 vs. ≥22 Weeks
Expected Fertility (ref. = 2 children)			
0 children	1.568	1.170	0.830
1 child	1.557	0.874	0.816
3 children	1.029	0.902	0.900
≥4 children	0.607*	0.987	0.833
Education (ref. = ≥16)			
<12 years	2.511*	2.905*	2.508*
12 years	2.531*	2.218*	1.888*
13–15 years	1.402	1.453	1.394
Age at First Birth (spline)			
15–20	0.873	1.402	1.365
20–25	0.951	0.942	1.013
25–30	0.946	0.962	0.981
30–35	0.893	0.906	0.894
35–45	0.897	0.837	1.066
Married at First Birth	0.499*	0.520*	0.816
AFQT	0.968*	0.984*	0.986*
Race/Ethnicity (ref. = white)			
Hispanic	0.790	1.002	1.014
Black	1.662*	0.881	0.561*
Respondent U.S.-born	1.631	0.859	1.368
Work Commitment, 1979	0.688[†]	0.969	1.214
Weekly Hours Worked Prior to First Birth (ref. = 0)			
1–20	0.666	0.784	0.722
21–35	0.976	1.160	0.926
≥35	1.902*	2.404*	1.384
Wald Tests, Prob. > F			
Expect 0 = expect 1	0.99	0.56	0.97
Expect 0 = expect 3	0.21	0.49	0.83
Expect 0 = expect ≥4	0.005	0.66	0.99
Expect 1 = expect 3	0.25	0.94	0.81
Expect 1 = expect ≥4	0.01	0.77	0.96
Expect 3 = expect ≥4	0.02	0.72	0.75

Note: All models control for respondent's age in 1979 in single years.

[†]$p < .10$; *$p < .05$

vs. .23). Women who breastfeed for longer durations, however, have only a .08 difference in the probability of falling short rather than exceeding their expectations (.39 vs. .31, pairwise comparison has a *p* value of .096).

Table 4 Multivariate results for difference between total and expected fertility using linear and multinomial models (odds ratios shown): NLSY79 (N = 2,339)

	Average (OLS)	Categorical (multinomial)	
		Had Fewer vs. More	Had Same vs. More
Breastfeeding Duration (ref. = ≥22 weeks)			
0 weeks	–0.036	1.209	1.113
1–6 weeks	–0.207[†]	1.737*	1.658*
7–21 weeks	–0.161	1.533*	1.517[†]
Education (ref. = ≥16 years)			
<12 years	0.029	0.977	0.736
12 years	–0.105	1.182	0.870
13–15 years	–0.109	1.174	0.999
Age at First Birth (spline)			
15–20	–0.159	0.950	0.860
20–25	–0.071*	1.175*	1.183*
25–30	–0.055*	1.067	1.001
30–35	–0.078*	1.206*	1.077
35–45	–0.021	1.060	0.897
Married at First Birth	0.099	0.850	0.988
AFQT	0.004[†]	0.997	1.001
Race/Ethnicity (ref. = white)			
Hispanic	0.032	0.844	0.811
Black	0.174	0.757	0.631*
Respondent U.S.-born	–0.207	1.277	0.877
Work Commitment, 1979	–0.089	1.179	1.179
Weekly Hours Worked Prior to First Birth (ref. = 0)			
1–20	–0.253[†]	1.619*	1.125
21–34	–0.177	1.315	0.919
≥35	–0.127	1.219	0.932
Intercept	3.782[†]		
Wald Tests, Prob. > F			
0 weeks = 1–6 weeks	0.099	0.047	0.04
0 weeks = 7–21 weeks	0.22	0.19	0.10
1–6 weeks = 7–21 weeks	0.69	0.55	0.69

Notes: All models control for respondent's age in 1979 in single years. Fertility difference is computed as total minus expected fertility.

[†]$p < .10$; *$p < .05$

Differences in Birth Spacing

Table 5 shows multivariate results for differences in the interval between first and second birth by breastfeeding duration for those with at least two children. Holding other characteristics, including age at first birth, constant, women who do not
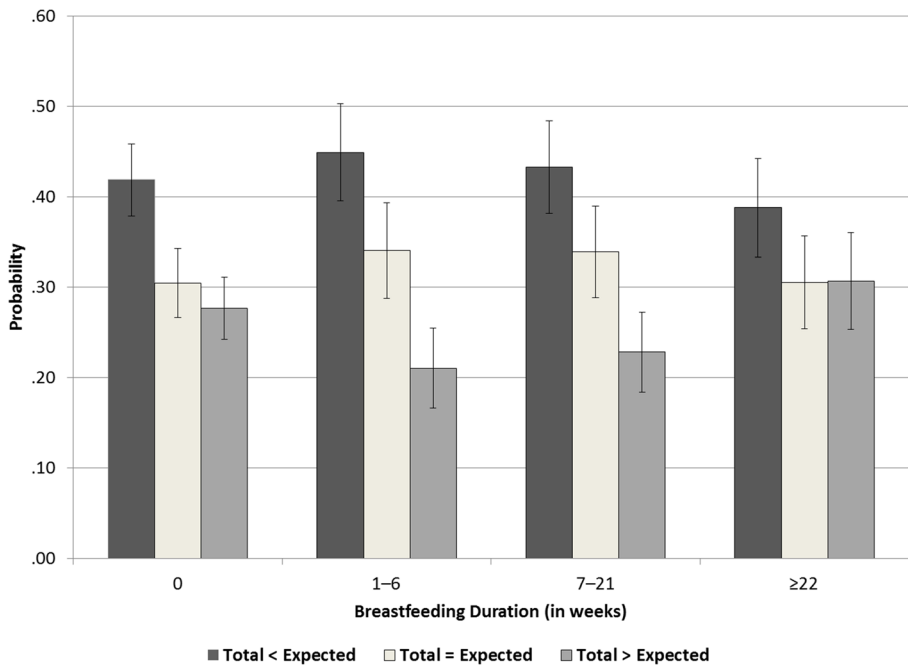
Fig. 4 Predicted difference between total and expected fertility by breastfeeding duration, NLSY79 (*N* = 2,339). Predicted probabilities and 95 % confidence intervals are based on estimates from the categorical model shown in Table 4

breastfeed have an approximately five-month longer interval between their first two births than women who breastfeed at least 22 weeks. The interval between first and second birth does not differ significantly between the other breastfeeding groups. Women who initiate breastfeeding have births that are more closely spaced together, on average, but women who breastfeed for longer durations do not have smaller or longer intervals than women who breastfeed for shorter durations. For those who have at least three children, the interval between second and third birth does not differ significantly by breastfeeding group once age at first birth is controlled (regression results not shown).

Sensitivity Analyses

We conducted sensitivity analyses to confirm that our results are robust to additional controls or alternative sample definitions. First, we estimated our multivariate regressions using samples that include 94 % of all the mothers in the NLSY79 sample (omitting the poor white and military oversamples) while still controlling for key characteristics such as education, age at first birth, race, marital status, nativity, and respondent's age. In these analyses, we included all women rather than only those with first births after 1980. Second, we tested whether differences in family income account for the fertility differences observed by breastfeeding duration (both including and omitting the women's own income from the measure). Third, we controlled for wages before first birth, measuring differences in women's skills as well as potential

Table 5 OLS results for number of months between first and second birth, by breastfeeding duration: NLSY79 ($N = 1,778$)

	Coefficient
Breastfeeding Duration (ref. = ≥22)	
0 weeks	5.406*
1–6 weeks	0.708
7–21 weeks	2.173
Education (ref. = ≥16)	
<12 years	6.670
12 years	0.828
13–15 years	1.912
Age at First Birth (spline)	
15–20	−2.733
20–25	−1.132[†]
25–30	−0.267
30–35	−1.294*
35–45	0.319
Married at First Birth	−6.446*
AFQT	−0.037
Race/Ethnicity (ref. = white)	
Hispanic	3.004
Black	−0.952
Respondent U.S.-born	1.504
Work Commitment, 1979	2.454
Weekly Hours Worked Prior to First Birth (ref. = 0)	
1–20	−4.185
21–35	−0.657
≥35	−0.556
Intercept	106.144
Wald Tests	
0 weeks = 1–6 weeks	0.04
0 weeks = 7–21 weeks	0.19
1–6 weeks = 7–21 weeks	0.54

Note: The model is restricted to mothers with at least two births and controls for age in 1979.

[†]$p < .10$; *$p < .05$

opportunity costs but also limiting the sample to only women in the labor market before first birth. Fourth, we examined potential differences in labor market attachment by controlling for whether women left the labor force for five consecutive years or longer after first birth. The results are the same if we measure leaving work for three or seven consecutive years (these results not shown).

The results of these sensitivity checks, shown in the online appendix in Tables S1–S6, are substantively the same as those reported earlier. These sensitivity checks also

produce the same result in models using only the post-1980 births and our full set of covariates (results not shown). These sensitivity analyses provide support that our results generalize to the full NLSY79 cohort rather than only a subsample of it. They also suggest that family income and labor force attachment do not explain fertility differences by breastfeeding duration.

Discussion

Our results show four robust associations with regard to breastfeeding and fertility. First, women who breastfeed at least 22 weeks, which represents the top one-third of the distribution of weeks breastfeeding among those who initiate breastfeeding, have more children, on average, than women who breastfeed for shorter durations or not at all. This group has lower odds of having only one child versus two children and higher odds than all the other breastfeeding groups of having three or more children versus only two. Second, among those who initiate any breastfeeding, fertility expectations do not predict how long women breastfeed, suggesting that this pattern of higher fertility is not related to expecting more children before the start of childbearing. Rather, across the life course, women who breastfeed for longer durations are more likely than women who breastfeed for shorter durations to have more children than they expected earlier in life. Third, women who do not breastfeed or who breastfeed for shorter durations (1–21 weeks) are significantly more likely to fall short of their expected fertility than to either achieve or exceed their expectations. Women who breastfeed for shorter durations are also significantly less likely to exceed their expected fertility than to either achieve or fall short of their expectations. In contrast, women who breastfeed for longer durations (≥22 weeks) are as likely to exceed as to achieve their earlier expectations, and the difference between their probability of falling short versus exceeding their fertility expectations is relatively small and at the boundary of statistical significance ($p = .096$). Finally, women who breastfeed have significantly shorter intervals between their first and second births than women who do not breastfeed, but birth spacing does not differ significantly among women who initiate breastfeeding.

These patterns are not consistent with economic theories of trade-offs that predict that parents who want to invest more in children may choose to have fewer children overall (Becker 1991; Becker and Tomes 1976), although perhaps such trade-offs do not bind in a society with relatively low overall fertility or do not apply to investments such as breastfeeding. These associations are also the opposite of what the biological mechanisms between lactation and conception would predict. Moreover, these patterns are in stark contrast with the established finding that those with more education and better job opportunities have, on average, fewer children than they initially intended (Morgan and Rackin 2010:109). Instead, long-duration breastfeeding serves as a proxy for identifying a group of very highly educated women who seem to achieve and exceed their expected fertility across the life course.

The literature on intensive mothering in the United States focuses on the time immediately after birth, suggesting that upon becoming mothers, women find themselves culturally pressured to fulfill the scripts of "doing it all" for their children. Our results extend this literature by suggesting that schemas about mothering and intensive child investment have a much longer life course development. We find that

commitments to larger families for those who initiate any breastfeeding are present from earlier in life and do not differ by breastfeeding duration. Rather, differences in how many children women actually bear develop across the life course in tandem other factors, such as education, relationships, work, and resources.

Our results are consistent with cultural explanations of parenting, which argue that individuals have class-based demographic schema operating from early in the life course that shape the timing and number of their children (Johnson-Hanks et al. 2011). Our findings extend this literature by suggesting that these demographic schema incorporate ideas about child investment as well. Johnson-Hanks et al. (2011) argue that social class differences in expectations about what is needed to be a "good" parent play a central role in explaining observed differences in the timing and ordering of marriage and childbearing. For some social groups, being "ready" means a willingness to do one's best to provide for a child, regardless of economic circumstances; for other groups, being "ready" means delaying childbearing in order to maximize the resources available to invest in children (Johnson-Hanks et al. 2011:106). Quantitative sociologists have also documented socioeconomic differences in the rise of expenditures on children. Not only do parents with more education and income spend more money on children (Kornrich and Furstenberg 2013), but differences in family structure by education and income produce inequalities in parental time as well. Our findings bridge these two literatures by showing that fertility expectations, fertility outcomes, and child investment are linked across the life course. Breastfeeding is an interesting part of this story because it is a time-intensive and embodied practice and is an investment that only mothers can make, making it a behavior that cannot be decoupled from gender and culture.

Our findings also reveal an interesting story about which mothers achieve the fertility they expected to have, measured before childbearing begins. The influence of fertility intentions on achieved fertility has been one way through which scholars have shown the links between social structure, culture, and demography (Bachrach and Morgan 2013; Morgan and Rackin 2010). Recent work in this vein shows how larger structures of inequality may shape the gap between fertility intentions and achieved fertility, and uses life course models to interrogate how women update their fertility intentions over time (Hayford 2009; Iacovou and Tavares 2011). Our results extend this literature by showing a novel pattern. Longer breastfeeding duration appears to identify a group of high-SES women who systematically realize or even exceed the number of children they had expected to have before starting their families.

One interesting question our study cannot answer is whether women in the shorter duration breastfeeding groups fall short of not only their expected fertility but also their breastfeeding intentions. The vast majority of pregnant women intend to breastfeed exclusively for at least three months; however, most women do not achieve this goal (Perrine et al. 2012). Although our data do not allow us to measure breastfeeding intentions, if women in the shorter duration breastfeeding groups indeed fell short of their breastfeeding intentions, then our results suggest that fertility and child investment patterns can move in tandem. This association can come about because falling short of child investment intentions may lead women to update their fertility plans or because of factors that may jointly determine both the ability to achieve time-intensive child investment goals and to have more children. Women who breastfeed may have had similar demographic schema earlier in life, but these earlier intentions and preferences

interact with material, structural, and family circumstances to result in different child investment and fertility outcomes across the life course.

How do the long-duration breastfeeding mothers do it? How do they both have larger families and invest more time in children? Our analyses suggest that these differences are not explained by standard measures of social class (such as education or long-term family income) or women's attachment to the labor market (measured either by their pre-birth wages or their likelihood of leaving paid work after starting their families). We also find that measures of personal resources, such as cognitive skills, education, self-esteem, and locus of control, do not explain the observed patterns. Women in the long-duration breastfeeding group stand out as a distinct group with respect to their family and child investment outcomes. This selectivity is a potentially important part of understanding any association between breastfeeding duration and maternal or child outcomes.

One potential explanation that we cannot examine in our study might include spousal support of women's breastfeeding or fertility preferences, which may be an important unobserved component of the differences we observe by breastfeeding group. Other potentially fruitful lines of future research include more detailed analyses of the occupational characteristics and work flexibility of women and their partners, or support through their social networks. Our study also lacks information on delivery experiences and infant health, which may be salient to the decision to breastfeed and future fertility, as well as breastfeeding intentions.

With these caveats in mind, our results suggest that breastfeeding duration in the United States may serve as a proxy that helps to shed light on a set of otherwise unobservable characteristics encompassed by a subset of higher-SES families and how they engage in parenting and child investment. The patterns we document reflect the unique cultural and historical period in the United States in which higher-SES parents pursue more intensive childrearing and contemporary constructions of motherhood portray breastfeeding as a key investment in children. These patterns do not reflect a causal association between breastfeeding and fertility. Rather, breastfeeding duration, because of the unique cultural meaning that it engenders and its dramatic differentiation by socioeconomic resources, serves as a powerful proxy for identifying a set of usually unobserved characteristics in certain families. These associations do not necessarily generalize to other settings or historical periods because the motivations and meanings of fertility and breastfeeding choices and outcomes differ considerably by time and place.

Our results show that in the contemporary United States, demographic and child investment schema are linked across the life course. Ironically, this quintessentially gendered emblem of intensive mothering may well be a proxy for a broader approach to intensive *parenting*. Breastfeeding duration is likely but one component of the numerous financial and time commitments these families provide their children. What is perhaps the most interesting is that breastfeeding duration helps shed light on how a particular approach to family and child investment emerges across the life course. Women who breastfeed for longer durations have reproductive patterns that are quite different than their socioeconomic position would predict. Unlike other highly educated women, they do not fall short of their fertility expectations. Rather, they have more children and invest more time in those children.

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