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THE EFFECTS OF CHILD-BEARING ON MARRIED WOMEN'S LABOR SUPPLY AND EARNINGS: USING TWIN BIRTHS AS A NATURAL EXPERIMENT

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ABSTRACT

Married women's decisions about child-bearing and market work are importantly interrelated. Although there are many estimates of the effects of fertility on female labor supply few of them have adequately addressed the problems of simultaneity inherent in these choices. In this paper, we use exogenous variations in fertility due to twin births to measure the impact of an unanticipated child on married women's labor supply and earnings. We find that the short-run effects of an unanticipated birth on labor supply are appreciable and have increased in magnitude as more mothers enter the labor market. It also appears that the impact of unanticipated births on earnings and wages has changed from 1980 to 1990. In 1980 reduced labor supply caused a temporary drop in earnings, but in 1990 earnings and wages remained depressed well after the labor supply effects of a twin birth had disappeared.

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The Effects of Child-Bearing on Married Women's Labor Supply on Earnings: Using Twin Births as a Natural Experiment

1. Introduction

Despite the dramatic increase in married women's labor force participation rates in recent decades, in most families women continue to be responsible for providing the majority of childcare and other nonmarket services.[1] Fuchs (1989) has argued that conflicting demands on women's time have been an important factor inhibiting the reduction of gender gaps in earnings and occupations. To meet familial obligations, he argues, many women drop out of the labor force entirely, while others look for part-time or less demanding types

[1] According to Juster and Stafford (1991, p. 474) in 1981 American women spent over two times as many hours doing housework (30.5) as American men (13.5). For married women with children under 5 at home, Robinson (1988) reports that hours of housework fell to 22.5 per week in 1985 from 32 per week in 1965. On the other hand, in 1985 married men with children under 5 at home averaged just 9 hours of housework, up from 3.9 hours in 1965. Jacobsen (1994, p. 61) calculates that although the fraction of time spent by both men and women in child care is relatively small, women spend 4 times as much time engaged in this activity as men.

of work. Increased labor supply drives down wages in female dominated occupations, while lower levels of investment in human capital formation reduces the future growth of earnings. Thus, he concludes, it is mainly women's stronger preference for children (rather than discrimination) that explains persistent gender inequality.

Unfortunately it is difficult to measure the impact of childbearing on women's labor supply behavior and earnings. Many early studies of female labor supply treated fertility and family structure as exogenous determinants of female labor supply behavior (e.g., Mincer 1962, Cain 1966, Heckman 1974). However, decisions about when and how much to work, on the one hand, and about the number of children to have and the timing of their births, on the other, are most plausibly viewed as jointly endogenous consequences of the household's utility maximization problem. Consequently the population correlation between fertility and either labor supply or earnings may be misleading for several reasons. First, to the extent that fertility is affected by measured exogenous variables--such as a woman's wage, her education or her husband's income--failure to account for the endogeneity of fertility may bias estimates of the effect of both fertility and these exogenous variables on labor supply behavior. Second, to the extent that there are left out or unmeasured variables--such as individual heterogeneity in tastes--that affect both labor supply behavior and fertility decisions, observed fertility will serve as a proxy for the effects of these variables (Shultz 1978; Rosenzweig and Wolpin 1980; Nakamura and Nakamura 1992). One solution to these problems is to estimate the determinants of fertility and labor supply within a simultaneous

equations framework.[2] But implementing this approach is complicated by the difficulty of finding plausible identifying restrictions so that the underlying structural parameters can be recovered. Another approach, suggested by Nakamura and Nakamura (1992) and Lehrer (1992), is to include the lagged dependent variable as a regressor to control for unobserved differences in tastes that are likely to affect both labor supply and fertility. While this approach sidesteps the problem of finding plausible identifying restrictions it does not address the endogeneity problem caused by the dependence of both fertility and labor supply on a common set of explanatory variables.

Ideally we would like to be able to observe how female labor supply and earnings would respond to an exogenous variation in the number of children within a family. We cannot, of course, literally perform such an experiment. However, as Rosenzweig and Wolpin (1980) note, the occurrence of twins in the first birth provides a close approximation.[3] The occurrence of twins in the first birth is an exogenous and unanticipated event. Moreover, because the occurrence of twins is random with respect to other characteristics that may be related to labor force participation and earnings, we can measure the effects of exogenous fertility variations using simple statistical techniques.[4] The major

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[2] This has been the approach adopted in most recent studies of female labor supply. See for example, Shultz (1978), Dooley (1982), Moffit (1984), Hotz and Miller (1988). Although most of these studies find substantially different parameters when fertility is treated as endogenous, Mroz (1987) concludes on the basis of extensive specification tests that the exogeneity of actual fertility cannot be rejected.

[3] See also Bronars and Grogger (1994), who use twin births to explore the impact of unwed motherhood.

[4] It is necessary to control for parity because the probability of twin births is obviously an increasing function of the number of pregnancies, and the number of pregnancies is likely to be correlated with unobserved preferences concerning family size. Since every woman

challenge in using the twins first approach arises from the need to identify a large enough sample of twin mothers. Rosenzweig and Wolpin's (1980) estimates, for example, are based on a sample of just 87 twin mothers--with the result that most of their coefficient estimates are not very precise.

Here we use the Public Use Micro Samples (PUMS) from the 1980 and 1990 censuses to identify large samples of twins-first mothers in each year. We compare this "treatment" group to a randomly selected control group of mothers who experienced single first births. We find that in both years, exogenous variations in fertility cause a significant, but temporary reduction in married women's labor supply. As the overall rate of labor force participation has increased for married women over the decade of the 1980s, we find that the size of the labor supply effects has also increased. Although the labor supply effects of exogenous fertility variations appear to be relatively transitory in both 1980 and 1990, we find that they have a more persistent impact on wages and earning. Moreover the magnitude of the impact on earnings appears to have increased substantially between 1980 and 1990.

2. Methods and Data

If the occurrence of twins in the first birth were uncorrelated with any other individual characteristics then we could proceed to estimate the effect of exogenous variations in fertility as the difference in the average level of the outcome variables of interest between

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who wishes to have a non-zero number of children must experience a first pregnancy, we can avoid this selectivity bias by using the occurrence of twins in the first birth. See Rosenzweig and Wolpin (1980, p. 336). Comparison at higher levels of parity are also possible, but sample sizes will be smaller.

the treatment and control groups. Because the probability of twins rises with age, however, and age may be an important determinant of labor supply decisions and earnings, the situation is slightly more complicated (Rosenzweig and Wolpin 1980, pp. 336-37; Bronars and Grogger 1994, pp. 1142-43). To isolate the pure effect of fertility variations it is thus necessary to control for variations in age at first birth.

The basic regression framework that we use to estimate the treatment effects controlling for age at first birth is as follows:

$$Y_{ji} = a_{j0} + a_{j1}AGEFB_i + a_{j2}AGEFB_i^2 + a_{j3}TWINS1_i + u_i, \qquad (1)$$

where i indexes individual observations, Y_j is the jth outcome variable, AGEFB is age at first birth, TWINS1 is an indicator variable equal to one if the woman had twins in the first birth and zero otherwise, and u is a disturbance term. Because of the independence between the TWINS1 indicator variable and all other factors influencing the outcome variables Y, we can subsume the influence of these other variables into the disturbance term. The impact of twins first on the jth outcome variables is estimated by the coefficient a_{j3}.[5]

To compile a sample of twins-first mothers we used data from the 1980 and 1990 Census PUMS (Bureau of the Census 1983, 1993). For 1980 we drew a 1-in-5 random sample from the 5% (A) sample, and for 1990 we used the 1% (B) sample of the census. The PUMS data contain a single record for each individual in each household, which includes information on his or her demographic and economic characteristics. The record

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[5] Note that this approach provides an estimate of the effect of the discrete event "twins in the first birth." Alternatively, it is possible to obtain an estimate of the relationship between the number of children in a household and the outcome variables of interest using the occurrence of twins as an instrumental variable which affects the number of children but is uncorrelated with the error term. See Bronars and Grogger (1994, p. 1143).

also contains information about the individual's relationship to the head of household and to other persons in the household.

Following the procedure used by Bronars and Grogger (1994), we first identified families within households, and then determined whether the first birth of the mother in the family had been twins. To be included in the twins-first sample a woman had to: (1) be living with the same number of children as she reported ever having born; (2) have no children older than 18, and (3) have a second child with the same age as her oldest child. Mothers of children over the age of 18, and mothers living apart from their children were excluded from the sample to ensure that it consisted of women whose oldest children were twins and not women whose oldest children remaining in the home were twins. To construct the control group we randomly sampled women who met criteria (1) and (2), but had singleton first births.

A total of 1,924 twins-first mothers were located in the 1990 PUMS, and 6,428 non-twin mothers were sampled as controls. For 1980 we located 1,987 twins-first mothers, and drew a sample of 8,085 non-twin mothers as controls. Because of the potential differences in labor supply response to fertility variations across married and unmarried mothers we further restricted our sample to include only currently married (not separated) women. Finally, to focus on the civilian labor market, we excluded the very small number of mothers who reported that they were employed in the armed forces.

Table 1 reports the means and standard deviations of a variety of variables for twin and non-twin mothers in 1980 and 1990. Blacks make up 9-12 percent of our samples in 1980 and about 8 percent of our samples in 1990. As would be expected the average number

of children is higher for twins-first mothers than for the control group. The twins-first mothers are between a quarter and half a year older than the comparison group, and their age at first birth is also slightly higher, consistent with the positive relationship between age and the probability of twinning. The remaining rows of the table compare a variety of measures of labor supply and earnings experience. In the next section we examine differences in these variables across the treatment and control groups controlling for the effects of age at first birth.

3. The Effects of Unplanned Births on Number of Children Ever Born

Before exploring the labor supply and earnings effects of twins-first it is helpful to consider more carefully the nature of the fertility variation that this experiment represents. Initially, the occurrence of twins in the first pregnancy is like adding an unplanned child to the household. In the long-run, however, families are likely to adjust their fertility to compensate for this shock. Over a woman's lifetime, then, the occurrence of twins-first is perhaps most appropriately viewed as an exogenous variation in the timing of births rather than in completed family size. Because some families desire only one child, because fertility control is imperfect, and because desired family size may be partly path dependent, it is unlikely that all families will be fully adjust subsequent childbearing in response to the occurrence of twins in the first birth. Nonetheless, we would expect that the impact of a twins-first birth on the total number of children would tend to diminish with time.

Table 2 examines the effects of twins-first births on the total number of children in the household as a function of the number of years since the first birth for both the 1980 and

1990 samples. As the table shows, within the first two years after birth, the effects of twins is very close to that of adding an additional child. Thereafter the effect diminishes. In the most extreme case, that of White mothers in 1990, by 12 to 18 years after the occurrence of twins, there are on average just 0.4 more children in twins-first households than in the control group. In both 1980 and 1990 the effects of twins on the total number of children ever born are more persistent among Blacks than Whites.

The cross-sectional evidence in Table 2 does not reflect true life-cycle experiences for any individual. Rather, as one reads down the columns one is examining women whose child-bearing experiences occurred at different points in time. In 1980 women whose first child was born 12 to 18 years ago had their children in the early to mid 1960s when abortion was illegal and other contraceptive technologies were less readily available. The relatively high fertility effects of twins for these women may be attributable to the greater difficulty of adjusting completed fertility to an unplanned birth. The subsequent decline the effect of unplanned births on fertility for women in this group in 1990 suggests that changes in the legal environment and improved contraceptive technology has allowed families to adjust more completely to the exogenous shock of a twin birth.

4. The Effect of Unplanned Births on Labor Supply

The addition of a child increases the quantity childcare services required by a family and raises the marginal value of time at home. In most cases it appears that women are responsible for supplying the additional non-market services that are required. In response to the increased value of time at home some mothers may withdraw entirely from the labor

force, others may seek to reduce the intensity of their work effort by shifting to part time work schedules or finding less demanding occupations. Using the twins-first methodology it is possible to explore the impact of an exogenous variation in fertility experience on the amount of time that mothers devote to market work. Again it makes sense to look at how these responses vary with time since the first birth. As children age, the amount of time that is required for their care declines. Moreover, as we have just seen, in the long-run adjustments in subsequent behavior enable families to move back toward their desired level of completed fertility.

The census contains information on a variety of dimensions of labor supply behavior, and it is helpful to consider each of them separately. Here we consider three: (1) labor force participation, (2) the number of hours worked in the week preceding the census, and (3) the number of weeks worked during the calendar year preceding the census. Most of the adjustment in labor supply occurs through adjustments in labor force participation and in weeks worked, rather than in weekly hours. The effects on both participation and weeks worked are appreciable, but transitory, being concentrated in the years immediately following the birth. Between 2 and 6 years after an unplanned birth, the labor supply behavior of women who experience an unplanned birth is indistinguishable from that of women in the control group.

Table 3 examines changes in labor force participation due to the occurrence of twins in the first birth. Consistent with the fact that the greatest conflicts between work and home time arise when children are young, and the declining fertility effects of a twin birth with the passage of time, differences between the treatment and control groups are most pronounced

within two years of the first birth. In 1980, when about 50 percent of White mothers, and about 70 percent of Black mothers were in the labor force, an unplanned birth reduced participation rates by roughly 8 to 9 percentage points for women in the first two years after their first birth. Beyond the two year time horizon, an unplanned birth had little consistent effect on labor force participation. The large positive effect of twin-births for Black mothers 12 to 18 years after their first birth may indicate some intertemporal substitution in labor supply and/or the income effects caused by additional children in the family.

Between 1980 and 1990 labor force participation rates increased within the control group (see Tables 1a and 1b), rising to 63 percent among Whites, and 78 percent among Blacks. At the same time, the magnitude the effect of twin-births increased substantially as well. In 1990, the participation rate of Black mothers was reduced by nearly 29 percentage points in the first two years after an unplanned birth. Moreover, the negative effects of a twin birth persisted longer, reducing participation by 21 percentage points 2 to 6 years after the first birth. Among Whites, the negative effects of a twin birth on labor force participation rates increased as well. Within the first two years of an unplanned birth, participation rates of White mothers in 1990 were 13.5 percentage points lower than for the control group. Thereafter the effect was slightly--though statistically insignificantly--positive.

Even with the increased impact of twin births between 1980 and 1990, our estimates of the effect of unanticipated variations in fertility on labor supply appear somewhat lower than those found by Rosenzweig and Wolpin (1980) using the twins first methodology to analyze data from surveys conducted in 1965 and 1973. Based on a pooled sample from these two surveys they find that twins-first reduced labor force participation by 37 percentage

points among women in the 15-24 age group and by about 10 percentage points for women in the 25 to 34 age group. Because of the imprecision of their estimates, however, it seems risky to draw any inferences about longer term trends based on this comparison.[6] On the other hand, the magnitude of the participation effects we find is equal to or larger than the effects found by studies using other methodologies. Shultz's (1978) estimates of labor force participation equations using instrumental variables to control for endogeneity based on data from 1967 imply that an additional child reduces the likelihood of participation by about 8 to 10 percentage points in most cases. Lehrer's (1992) paper treats family composition as exogenous, but includes a measure of past labor supply as a proxy for unobserved differences in tastes. Based on survey data gathered in 1982, she finds that increasing the number of children under 6 from 1 to 2 reduces the likelihood of working by 7 percentage points among Whites regardless of education level. Among Black mothers, however, she finds that the probability of working is reduced only among women with more than 12 years of schooling, and then it falls only by 4 percentage points.

Tables 4 and 5 examine the effects of exogenous fertility variation on the intensity of work. For these tables the sample is restricted to only those mothers who reported positive numbers of hours or weeks worked, respectively. The effects of unplanned births on weekly hours shown in Table 4 appear quite modest overall. Most of the effects are small in economic magnitude and not statistically significant. The short-run effects for Blacks in both

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[6] Note also that they do not explicitly control for years since first birth, as we do, although they do report separate effects for the older age groups depending on whether their first birth occurred before or after age 25.

1980 and 1990 reduce average hours worked slightly. For both Blacks and Whites, however, by 12 to 18 years after the first birth, the effects appear weakly positive.

The effects of unplanned births on weeks worked in the previous year appear to be more substantial. Once again, the negative labor supply effects of an unplanned birth are concentrated mainly in the years immediately following that event, and the effect diminishes fairly steadily thereafter. Between 1980 and 1990 the magnitude of the negative effects increased substantially in the first two years. The parallel behavior of labor force participation and weeks worked, along with the more limited effects on hours of work suggests that most of the adjustment in labor supply behavior in response to unplanned births occurs through movement into and out of paid work, rather than through shifts into part time work. This may be due either to fixed costs of work, or to institutional rigidities that make hours adjustments difficult in many workplaces.

The increasing impact of unplanned births on labor force participation and weeks worked between 1980 and 1990 is striking. It is not immediately clear if this is an anomalous event or if it reflects an ongoing trend. It may be, however, that as more and more married women move into paid work, the demands of child care will cause more of them to temporarily reduce their supply of market work.

5. The Effects of Unplanned Births on Earnings and Wages

The temporary reduction in women's labor supply caused by exogenous fertility variations can affect their earnings in a variety of different ways. Interruptions in work will reduce the amount of on-the-job experience that women acquire, thus reducing their quantity

of human capital and hence earnings potential at any later date. Reduced labor force participation and interruptions in paid work may also be associated with a movement into occupations that allow more flexibility about when work is performed. The increased supply of labor to these occupations may drive down wages. These may also be jobs which do not offer much opportunity for human capital accumulation, and consequently subsequent wage growth may be slower for women in these jobs.

Table 6 reports the differences in earned income (wages, salaries, and self-employment income) between the treatment and control groups. The sample is limited here to those women who reported working some positive number of weeks during the year preceding the census. For Blacks unplanned births caused substantial short-run reductions in income in both 1980 and 1990. The figures in Table 6 are nominal, but even after adjusting for the 66 percent inflation in consumer prices from 1979 to 1989, within the first two years following a twin birth, the impact on income was about twice as large in 1990 as it had been in 1980. Adjusted for inflation the impact on income between 2 and 6 years after a twin birth was about the same for Blacks in 1990 and 1980. For Whites, the increase in the impact of unplanned births was even more dramatic. In 1980 there was little difference between treatment and control groups. By 1990 the effects were large and persistent, increasing in magnitude for women as much as 12 years after an unplanned birth.

In part, the increased impact of unplanned births on women's income may be attributable to the larger impact of fertility variations on labor supply in 1990. Since labor supply effects of unanticipated births are transitory, however, this cannot be the entire story. To explain the persistent and increasing impact on earnings, there must also have been some

effect of fertility variations on wage rates. This is indeed what Table 7 shows. In 1980 the effect of unplanned births on wages were relatively small in magnitude and never statistically significant. In contrast, by 1990 there appear to be large negative effects on wages as much as 12 to 18 years after an unplanned birth. The effects reported in Table 7 imply that for Whites in 1990, wages 2 to 6 years after an unplanned birth were roughly 20 percent below levels for the control group. Six to twelve years after an unplanned birth this gap had fallen only to 14 percent. For Blacks, the short-run effects were even larger (48 percent within the first two years; and 24 percent 2 to 6 years after the unplanned birth), but were not statistically significant.

We cannot offer a conclusive explanation for the increasing cost of exogenous fertility variations, but these results appear consistent with Fuchs' conjecture that married women's responsibility for child care and other non-market activities is an important factor inhibiting reductions in the gender gap. The increased impact on wages and earnings of unplanned births between 1980 and 1990 is also striking. Possibly this reflects the fact that in the past married women generally opted for career paths that offered fewer opportunities for human capital accumulation and earnings growth either by choice or through societal pressures and employer discrimination. Consequently, interruptions in work caused by unanticipated births did not have much lasting effect on earnings or wages. As career opportunities for women have expanded over the past decade and a half, however, it appears that the financial penalties of taking time off from work have increased substantially.

6. Conclusions

For married women decisions about child bearing and the allocation of time between market work and other activities are significantly interrelated. Understanding the linkages between fertility variation and married women's labor supply and earnings is important both for predicting future changes in the size and composition of the labor force, and for analyzing the sources of the gender gap in earnings and occupations. Unfortunately the simultaneity of work and fertility decisions has made it difficult in the past to estimate the true effects of exogenous variations in fertility on married women's labor supply.

In this paper we have sought to resolve this problem by using the exogenous variation in fertility due to twin births as a natural experiment to investigate the impact of unanticipated births on married women's labor supply behavior and earnings. Our estimates indicate that an unanticipated birth has a pronounced but transitory impact on both labor force participation and the number of weeks married women work per year. Moreover, comparisons between 1980 and 1990 indicate that as more married women have entered the labor force, the strength of these effects has increased.

Withdrawal from the labor force or reductions in the intensity of work impose a direct cost in terms of foregone earnings and an indirect cost in terms a reduction in human capital accumulation. In 1980 we find that most of the costs of unanticipated births were transitory, but in 1990 an unanticipated birth had a large and persistent negative effect on married women's wages which lasted well after the labor supply effects had disappeared. It seems possible that this widening wage gap is attributable to the greater opportunities for human

capital accumulation and career advancement that have been opened up for women since the late 1970s.

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Table 1A:
Variable Means (Standard Deviations)
for Married Mothers with Spouse Present in 1980

	Twin Mothers			Non-Twin Mothers		
Variable	Overall	Whites	Blacks	Overall	Whites	Blacks
Sample size	1983	1648	199	8073	6986	619
Number of children	2.79 (1.02)	2.73 (0.97)	3.03 (1.19)	2.05 (1.00)	2.03 (0.97)	2.23 (1.18)
Oldest child's age	8.96 (5.28)	8.89 (5.32)	9.57 (5.05)	8.13 (5.11)	8.12 (5.15)	8.75 (4.84)
Mother's age	32.33 (6.65)	32.45 (6.60)	31.80 (7.14)	31.12 (6.31)	31.19 (6.26)	30.90 (6.77)
Age at first birth	23.37 (4.75)	23.56 (4.58)	22.23 (5.22)	23.00 (4.42)	23.07 (4.32)	22.15 (5.27)
Labor Force Participation Rate	0.52 (0.50)	0.49 (0.50)	0.71 (0.45)	0.51 (0.50)	0.50 (0.50)	0.67 (0.49)
Weeks worked in 1979[a]	37.06 (16.69)	37.15 (16.52)	38.69 (16.33)	36.84 (16.66)	36.37 (16.77)	39.98 (15.45)
Hours worked in Week before survey[b]	33.25 (12.22)	32.55 (12.80)	36.21 (8.56)	33.32 (12.49)	32.54 (12.85)	37.22 (9.23)
Earned income[c]	6108.52 (5257.60)	6042.77 (5253.90)	6471.33 (5246.20)	6313.40 (5672.12)	6042.99 (5460.38)	8084.47 (5994.24)
Family income	22964.99 (13956.90)	23894.78 (14072.33)	18408.19 (11918.15)	23001.30 (13246.75)	23494.281 (3254.78)	19644.85 (12203.48)
Hourly wage rate[d]	5.98 (8.16)	6.03 (8.34)	5.28 (5.77)	5.94 (8.41)	5.87 (7.31)	6.18 (6.38)

[a] Average for mothers reporting positive number of weeks worked during 1979. There are 1137 observations on twin mothers (of whom 911 are White, and 147 are Black); for non-twin mothers there are 4782 observations (of whom 4087 are White, and 442 are Black).

[b] Average for mothers reporting positive number of hours worked during the week before the survey. There are 911 observations on twin mothers (of whom 719 are White, and 128 are Black); for non-twin mothers there are 3720 observations (of whom 3145 are White, and 719 are Black).

[c] Average for mothers reporting positive number of weeks worked during 1979. Sample sizes are the same as those in note b.

[d] Average for mothers reporting positive number of weeks worked during 1979 and positive number of hours worked during the week before the survey. Wages are imputed by dividing earned income by the product of weekly hours and weeks worked. There are 853 observations for twin mothers, (of whom 674 are white, and 121 are Black); there are are 3519 observations for non-twin mothers (of whom 2973 are white, and 352 are Black).

Table 1B:
Variable Means (Standard Deviations)
for Married Mothers with Spouse Present in 1990

	Twin Mothers			Non-Twin Mothers		
Variable	Overall	Whites	Blacks	Overall	Whites	Blacks
Sample size	1937	1661	116	6475	5291	398
Number of children	2.54 (0.79)	2.52 (0.76)	2.69 (0.96)	1.94 (0.89)	1.93 (0.88)	1.91 (0.94)
Oldest child's age	7.71 (5.09)	7.65 (5.08)	8.5 (5.18)	7.91 (5.07)	7.82 (5.08)	8.41 (5.07)
Mother's age	33.51 (6.40)	33.60 (6.18)	33.29 (7.43)	33.59 (6.25)	33.70 (6.14)	32.84 (6.65)
Age at first birth	25.80 (5.24)	25.94 (5.04)	24.79 (6.44)	25.68 (5.04)	25.88 (4.92)	24.47 (5.35)
Labor Force Participation Rate	0.62 (0.49)	0.62 (0.49)	0.65 (0.48)	0.64 (0.48)	0.63 (0.48)	0.78 (0.41)
Weeks worked in 1979[a]	39.44 (15.93)	39.35 (15.98)	40.69 (14.28)	41.17 (15.08)	40.78 (15.29)	43.19 (13.71)
Hours worked in Week before survey[b]	34.32 (13.28)	33.92 (13.60)	39.07 (9.83)	33.94 (12.62)	32.96 (13.02)	38.49 (7.46)
Earned income[c]	13746.23 (14163.40)	13683.31 (13845.05)	14960.83 (11205.54)	16617.95 (16373.33)	16290.94 (16673.54)	18790.86 (11714.71)
Family income	46351.53 (34436.05)	48238.92 (34721.63)	33357.46 (23735.54)	53332.70 (39510.70)	55365.01 (40123.01)	43753.54 (27035.74)
Hourly Wage[d]	11.88 (18.82)	12.16 (19.90)	10.05 (7.46)	13.67 (18.86)	13.90 (19.06)	12.48 (9.96)

[a] Average for mothers reporting positive number of weeks worked during 1979. There are 1362 observations on twin mothers (of whom 1185 are White, and 81 are Black); for non-twin mothers there are 4536 observations (of whom 3713 are White, and 318 are Black).

[b] Average for mothers reporting positive number of hours worked during the week before the survey. There are 1113 observations on twin mothers (of whom 968 are White, and 71 are Black); for non-twin mothers there are 3801 observations (of whom 3096 are White, and 277 are Black).

[c] Average for mothers reporting positive number of weeks worked during 1979. Sample sizes are the same as those in note b.

[d] Average for mothers reporting positive number of weeks worked during 1979 and positive number of hours worked during the week before the survey. Wages are imputed by dividing earned income by the product of weekly hours and weeks worked. There are 1072 observations for twin mothers, (of whom 936 are white, and 81 are Black); there are are 3660 observations for non-twin mothers (of whom 2990 are white, and 263 are Black).

Table 2:
Impact of Twins in the First Birth on
Number of Children Ever Born, 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	0.9431 (0.0222)	0.9358 (0.0230)	0.9132 (0.0901)	0.948 (0.0120)	0.9364 (0.0215)	1.0625 (0.0861)
2-6 years	0.6063 (0.0382)	0.5794 (0.0415)	0.8001 (0.1414)	0.6689 (0.0329)	0.6598 (0.0354)	0.9205 (0.1554)
6-12 years	0.6351 (0.0382)	0.6081 (0.0412)	0.5786 (0.1319)	0.5202 (0.0371)	0.4879 (0.0401)	0.6997 (0.1718)
12-18 years	0.6804 (0.0526)	0.6317 (0.0550)	0.7643 (0.1995)	0.4253 (0.0536)	0.3959 (0.0572)	0.6153 (0.1924)
0-18 years	0.7617 (0.0246)	0.7276 (0.0261)	0.8057 (0.0925)	0.6053 (0.0232)	0.5894 (0.0232)	0.7907 (0.0955)

Notes: Impact of twins is derived from Ordinary Least Squares regression estimates of the following equation:

$$Kids = a_0 + a_1 agefb + a_2 agefb^2 + a_3 twins1 + e$$

where Kids is the number of own children ever born, agefb is the woman's age at first birth, twins1 takes the value 1 if the first birth resulted in twins and 0 if the first birth was a singleton, and e is an error term.

Table 3:
Impact of Twins in the First Birth on the
Probability of Labor Force Participation in 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	-0.0744**	-0.0783**	-0.0937	-0.1309*	-0.1348*	-0.2899*
	(0.0311)	(0.0332)	(0.1135)	(0.0289)	(0.0313)	(0.1224)
2-6 years	-0.0196	-0.0247	0.0427	0.0022	0.0245	-0.2077**
	(0.0282)	(0.0306)	(0.0944)	(0.0257)	(0.0276)	(0.1061)
6-12 years	0.0369	0.0226	0.0158	0.0193	0.0343	-0.0469
	(0.0212)	(0.0235)	(0.0611)	(0.0216)	(0.0237)	(0.0753)
12-18 years	-0.0050	-0.0163	0.1456**	0.0124	0.0161	-0.0772
	(0.0229)	(0.0251)	(0.0669)	(0.0250)	(0.0271)	(0.0885)
0-18 years	0.0048	-0.0065	0.0436	-0.0177	-0.0074	-0.1271*
	(0.0125)	(0.0137)	(0.0379)	(0.1250)	(0.0136)	(0.0469)

* Coefficient is significant at 1% level.
** Coefficient is significant at 5% level.
*** Coefficient is significant at 10% level.

Notes: Each entry shows the change in probability of labor force participation of having twins rather than a singleton in the first birth. Estimates of the impact of twins on the probability of labor force participation are derived from probit estimates of the equation

$$LF = a_0 + a_1 agefb + a_2 agefb^2 + a_3 twins1 + e,$$

where the LF takes the value 1 if the woman is in the labor force, agefb is age at first birth, and twins1 takes the value 1 if the individual experienced twins in the first birth and 0 otherwise, and e is an error term. Standard errors are in parentheses.

Table 4:
Impact of Twins in the First Birth on
Weekly Hours of Work for Working Women, 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	-0.6263 (1.3404)	-0.0229 (1.5043)	-2.1131 (3.0630)	0.3379 (1.1211)	0.7916 (1.2348)	-2.6878 (3.3159)
2-6 years	0.0191 (1.1736)	0.9691 (1.3523)	-5.5780** (2.3184)	-0.0708 (0.9379)	0.7371 (1.0338)	-0.1997 (2.1467)
6-12 years	-0.8520 (0.7542)	-0.8386 (0.8871)	-0.7483 (1.4501)	-0.2153 (0.7492)	0.2687 (0.8533)	0.9062 (1.6932)
12-18 years	1.2207 (0.7663)	0.8930 (0.8736)	1.5378 (1.6190)	1.7278** (0.7788)	2.3631* (0.8499)	1.2183 (1.9741)
0-18 years	0.0216 (0.4585)	0.1326 (0.5290)	-0.9560 (0.9283)	0.3892 (0.4347)	0.9769** (0.4837)	0.5868 (1.0679)

*Significant at 1% level.
**Significant at 5% level.
***Significant at 10% level.

Notes: Impact of twins is derived from Ordinary Least Squares regression estimates of the following equation:

$$\text{Hours} = a_0 + a_1\text{agefb} + a_2\text{agefb}^2 + a_3\text{twins1} + e$$

where Hours is the number of hours worked in the week before the census, agefb is the woman's age at first birth, twins1 takes the value 1 if the first birth resulted in twins and 0 if the first birth was a singleton, and e is an error term. The equation was estimated for all women who reported a positive number of hours worked.

Table 5:
Impact of Twins in the First Birth on
Weeks Worked for Working Mothers, 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	-2.4022*** (1.3820)	-2.6923*** (1.4886)	-3.7649 (4.7621)	-4.3884* (1.1065)	-4.3777* (1.2014)	-9.3840*** (4.8370)
2-6 years	-1.0229 (1.3449)	0.4585 (1.5028)	-6.9253** (3.6394)	-1.9762** (1.0010)	-1.5329 (1.0917)	-6.1572*** (3.4526)
6-12 years	0.9090 (0.9251)	1.6473 (1.0566)	0.2982 (2.3553)	-1.3349*** (0.8114)	-0.6614 (0.8936)	-2.1575 (2.7372)
12-18 years	-0.3981 (0.9133)	-0.0632 (1.0075)	0.0875 (2.4501)	-0.0361 (0.8728)	-0.2974 (0.9478)	2.7477 (2.8819)
0-18 years	0.1797 (0.5496)	0.7068 (0.6128)	-1.2628 (1.4931)	-1.7218* (0.4712)	-1.4217* (0.5148)	-2.2975 (1.7178)

*Significant at 1% level.
**Significant at 5% level.
***Significant at 10% level.

Notes: Impact of twins is derived from Ordinary Least Squares regression estimates of the following equation:

$$\text{Weeks} = a_0 + a_1\text{agefb} + a_2\text{agefb}^2 + a_3\text{twins1} + e$$

where Weeks is the number of weeks worked during the year before the censuss, agefb is the woman's age at first birth, twins1 takes the value 1 if the first birth resulted in twins and 0 if the first birth was a singleton, and e is an error term. The equation was estimated for all women who reported a positive number of weeks worked in the previous year.

Table 6:
Impact of Twins in the First Birth on
Earned Income of Working Mothers, 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	-797.3***	-588.0	-3058.6**	-3516.3**	-2917.0**	-10728.0*
	(425.5)	(422.4)	(1318.9)	(1484.6)	(1659.3)	(3802.7)
2-6 years	-250.6	170.3	-2220.3***	-2921.7**	-3460.0*	-3487.2
	(415.7)	(454.9)	(1165.9)	(1226.5)	(1308.1)	(3093.2)
6-12 years	-642.0**	-491.8	-1589.7	-3639.1*	-3517.8*	-591.8
	(322.0)	(354.9)	(964.3)	(952.5)	(1054.6)	(2700.6)
12-18 years	61.9	122.2	-688.2	-1289.0	-734.5	-5211.3**
	(323.2)	(353.1)	(896.8)	(891.9)	(968.1)	(2158.5)
0-18 years	-278.4	-112.8	-1565.2*	-2725.0*	-2574.9*	-3351.8**
	(182.1)	(196.2)	(540.5)	(550.5)	(602.9)	(1461.5)

*Significant at 1% level.
**Significant at 5% level.
***Significant at 10% level.

Notes: Impact of twins is derived from Ordinary Least Squares regression estimates of the following equation:

$$\text{Income} = a_0 + a_1\text{agefb} + a_2\text{agefb}^2 + a_3\text{twins1} + e$$

where Income is the sum of wage, salary, and self-employment income reported for the year preceeding the census, agefb is the woman's age at first birth, twins1 takes the value 1 if the first birth resulted in twins and 0 if the first birth was a singleton, and e is an error term. The equation was estimated for all women who reported a positive number of weeks workded during the previous year.

Table 7:
Impact of Twins in the First Birth on
Hourly Wages of Working Mothers, 1980 and 1990

Time Since First Birth	1980 Census			1990 Census		
	Overall	White	Black	Overall	White	Black
0-2 years	-0.839	-0.894	-1.600	-0.803	-0.443	-5.967
	(1.160)	(1.337)	(1.647)	(1.982)	(2.283)	(3.917)
2-6 years	0.311	0.673	-1.349	-3.190**	-3.707**	-2.984
	(0.596)	(0.716)	(0.930)	(1.357)	(1.547)	(2.020)
6-12 years	-0.073	-0.291	-0.949	-1.820***	-2.009***	0.303
	(0.382)	(0.426)	(0.952)	(1.043)	(1.211)	(2.633)
12-18 years	-0.080	0.262	-0.950	-1.407	-0.621	-3.796**
	(0.679)	(0.527)	(1.546)	(1.120)	(0.965)	(1.648)
0-18 years	-0.087	-0.020	-0.903	-1.807*	-1.768**	-2.314***
	(0.316)	(0.317)	(0.652)	(0.645)	(0.711)	(1.303)

*Significant at 1% level.
**Significant at 5% level.
***Significant at 10% level.

Notes: Impact of twins is derived from Ordinary Least Squares regression estimates of the following equation:

$$\text{Wage} = a_0 + a_1\text{agefb} + a_2\text{agefb}^2 + a_3\text{twins1} + e$$

where Wage is the hourly wage imputed by dividing income reported for the previous year by an estimate of annual hours worked obtained by multiplying weeks worked in the previous year by the number of hours reported worked in the week before the census, agefb is the woman's age at first birth, twins1 takes the value 1 if the first birth resulted in twins and 0 if the first birth was a singleton, and e is an error term. The equation was estimated for all women who reported a positive number of hours and weeks worked.