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Measuring the Effects of Childbearing on Labor Market Outcomes

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Abstract: Decisions about childbearing and market work are significantly interrelated. Although there are many estimates of the effects of fertility on labor supply, few of them have adequately addressed the problems of simultaneity inherent in these choices. In our research we use exogenous variations in fertility due to twin births to measure the impact of an unplanned child on labor supply and earnings. We contrast these results to those for closely-spaced births (one year or less). We consider effects for married and unmarried mothers separately, and for married fathers. We discuss the implications of these measurements for estimating the magnitude of the rise in female labor supply and earnings as birthrates decline.

JEL Codes: J13, J22, J30

Keywords: fertility; labor supply; earnings

1. Introduction

The untangling of fundamentally interlinked actions is one of the central problems for social scientists. While a randomized experiment is considered to be the gold standard for untangling linkages, this option is available only rarely when linkages are multi-year in nature and involve fundamental human choices like childbirth. Hence the difficulty in resolving fundamental questions such as the effect of children on labor supply and earnings. If women have more children, this may be because their labor market attachment is a priori weaker, and/or because their market production possibilities are relatively low relative to their nonmarket production possibilities. Hence the relationship between children and labor market attachment and earnings will appear stronger than it really is.

While a standard approach is to attempt to control for simultaneity and endogeneity using fairly sophisticated statistical techniques on standard datasets, another method is to look for "natural experiments." These are events whereby factors that are normally interlinked are separated by some exogenous force that occurs randomly. In this particular situation, we need a situation in which a person has an exogenous shock to their lifetime fertility. Then we can observe how they respond to this unplanned increase in lifetime number of children.

In this paper we utilize information regarding whether or not a woman has twins in her first birth. While recent developments in infertility treatment appear to have raised significantly the rate of twinning (and higher-order multiple births), our data are from before the period when such treatments were widely available. Therefore we argue that the occurrence of twinning (once age at first birth, which is positively related to the incidence of twinning, is controlled for) is truly exogenous in our samples. In earlier papers by ourselves (JPR 1999) and Bronars and

Grogger (1994), we and they explored the use of multiple birth events to estimate effects on labor supply, earnings, occupational choice, and other outcome variables.[1] This paper extends this methodology, both by utilizing additional data to check the robustness of our earlier findings, and by contrasting the results to those found using an alternative instrument, closely spaced birth events.

One obvious limitation of the twin-birth methodology is that it only tells us what happens to a mother who has already had one child, rather than allowing us to measure the effect of the change from no children to one child. Nevertheless, given that most women do have at least one child, measuring the marginal effect of an additional child is still very useful. As fertility has declined over time, most women (and men) continue to have at least one child; it is the "marginal" children that are not being added to families. Thus this experiment allows us to construct a measure of the importance of the marginal child both in affecting labor supply and earnings.

Another limitation is that the particular experiment of considering twin births does not allow for spacing to be varied exogenously as well. Twins always appear simultaneously, and the raising of twins may involve different household production technologies than the raising of singlets separated in time. In addition, it is not clear that separation is in general preferable to simultaneity, or vice versa, even in such a matter as whether two children are cheaper to raise if they are the same age or different ages. While one can conceive of reasons why twins might be

[1] Our results are not precisely comparable because the earlier papers used the occurrence of multiple births, which could include triplets and even higher-order births, as the instrument. This distinction is not particularly problematic because the incidence of these events is even rarer than twinnning: triplets occur naturally about one time in ten thousand births, and higher-order multiples are much rarer. In our largest sample, the 1980 Census sample, we identify 143 occurrences of triplets, two cases of quadruplets, and one case of quintuplets. Occurrence of a multiple birth is a reasonable instrument. Nevertheless, these results, in which we delete the higher-order birth cases, constitute a more consistent approach towards estimating the marginal effect of the multiple birth on total fertility.

cheaper than singlets, arguments can also be made in the other direction. This is the essence of the recent critique by Rosenzweig and Wolpin (2000) of this experimental structure.

Another problem with natural experiments in general is that they do not occur as often as we might like, and their data requirements are in general stringent. In the case of twin studies, large data sets are needed of births in order to generate sufficient twin birth occurrences, and sufficient information on fertility history has to be collected to identify accurately the occurences of twins. Hence it would be convenient to resolve the exogeneity question so that one could forego this methodology. Mroz (1987), after extensive testing of different specifications on several datasets, concluded that the exogeneity of fertility for married women on their hours of work cannot be rejected. If this conclusion is robust across time and dataset, it would allow researchers to avoid having to create elaborate statistical or experimental structures in order to measure the effects of fertility on labor supply.

We attempt to move forward in both of these latter two directions from our earlier work (JPR 1999) and the work by Bronars and Groggers (1994), both of which considered only multiple birth cases, by considering the labor supply and earnings outcomes for parents who have closely spaced births (defined as occurring with no more than one year of separation). We compare these outcomes to those for both parents of twins and parents of singlets (with wider spacing, or only children) in order to shed more light on the parent heterogeneity and spacing issues.

Note that two things could cause the results for parents of closely spaced births to deviate from the results for parents of twins. On the one hand, if parents of closely spaced births are comparable to parents in general, contrasting the results for twin births to the results for closely spaced births allows us to gauge the effect of marginally increasing spacing. In other words, this

would be a natural experiment in which having children closely spaced is viewed as an "accident" where parents would generally prefer to have them farther apart (or only to have one child).

On the other hand, parents who experience closely spaced births may be fundamentally different from other parents. For one thing, they may be more "accident" prone, and this tendency may be correlated with other outcomes, in particular with labor market outcomes. Alternatively, they may be more interested in having children, and having them as quickly as possible, and this interest may be correlated with labor market outcomes. Heterogeneity in parent type, when correlated with having closely spaced births, would lead to different results than for the other two groups of parents.

Hence, if these two possible effects are hypothesized to operate in the same direction (e.g.., both tend to reduce rather than increase labor force participation) if operable, and if no differences are found in parents of closely spaced births relative to parents of twins, then neither heterogeneity nor spacing can be said to affect outcomes across parents. Unfortunately, if there are measurable effects between parent types, we cannot say which source is the cause, although reference can be made to other out-of-sample forces, or to patterns across the samples, in order to hypothesize which cause is more important.

Our results indicate some differences in outcomes between these three types of parents, but not so much that fertility can be viewed as fully endogenous in any of the three cases. However, there is increasing evidence of heterogeneity (or spacing increasingly mattering) over time as we compare results for 1960, 1970, and 1980. On the other hand, these differences are relatively small even in 1980. Hence we argue that fertility effects on labor market outcomes are relatively insignificant, both as an explanation for why women's labor force participation has

risen so substantially over the twentieth century, and as an explanation for why women's labor force participation might rise in the future in developing countries as birthrates drop further around the world.

2. Methodology

We use a straightforward regression model. Given a set of observations on individuals, we define:

k_i = number of children born to person i, i = 1, . . . , N.

Z_i = outcome variable (e.g., hours worked)

A_i = age at first birth

T_i = 1 if first birth is twins, 0 otherwise

Then we can estimate the following two equations:

(1) $k_i = ß_1 + ß_2 T_i + ß_3 A_i + u_{ki}$

(2) $Z_i = Ω_1 + Ω_2 T_i + Ω_3 A_i + u_{zi}$

Note that given the exogeneity of twinning with respect to everything except age of the mother, that other variables are not needed as controls in these regressions in order to get unbiased estimates of $ß_2$ and $Ω_2$.

Alternatively, one might estimate:

(2*) $Z_i = \Delta_1 + \Delta_2 k_i + \Delta_3 A_i + e_{zi}$

But if e_{zi} and k_i are correlated, the OLS estimate of Δ_2 is biased (likely upwards). However, T_i is correlated with k_i and uncorrelated with e_{zi}, so T_i can be used as an instrumental variable to estimate Δ_2 consistently. Rearrange (1) so that T_i is expressed in terms of k_i and substitute this expression into (2). Then if the expectation operator is exercised on the modified version of (2):

$$E(Z) = (\Omega_1 - \frac{\Omega_2 \beta_1}{\beta_2}) + (\frac{\Omega_2}{\beta_2}) E(k) + (\Omega_3 - \frac{\Omega_2 \beta_3}{\beta_2}) E(A)$$

in other words, $\Delta_2 = \frac{\Omega_2}{\beta_2}$

Expanding this idea to incorporate close spacing, note that another possible instrument, correlated with k_i and (potentially) uncorrelated with e_{zi}, is:

C_i = 1 if first two (singlet) births separated by 1 year or less, 0 otherwise

C_i may also be affected by age at first birth, so the continued use of the control of the mother's age is reasonable.[2] Given that C_i and Ti are orthogonal, we can run:

[2] Although this appears as a reasonable assumption if overall fertility declines with age such that the probability of conception in any given month is a declining function of age, in actuality, this does not appear to be the case. The coefficients on terms involving A_i are not affected when we add the additional variable C_i to equations (1) and (2).

(1') $k_i = ß_1 + ß_2 T_i + ß_3 A_i + ß_4 C_i + u_{ki}$

(2') $Z_i = \Omega_1 + \Omega_2 T_i + \Omega_3 A_i + \Omega_4 C_i + u_{zi}$

Then an alternate estimate for Δ_2 is $\frac{\Omega_4}{\beta_4}$.

If the two different estimators for Δ_2 yield different results, then they must have at least one difference in their relative relationships to k_i and e_{zi}. In particular, if one instrument is known to be a "perfect instrument" (perfectly correlated with k_i and perfectly uncorrelated with e_{zi}), then the other instrument must have a lower level of correlation with k_i and/or a higher degree of correlation with e_{zi}. If both instruments are perfectly correlated with k_i, then the second instrument must have a higher degree of correlation with e_{zi}, i.e., display endogeneity. As discussed above, this endogeneity could occur in this case either because spacing of births has a separate effect on labor market outcomes than the event of having a birth in and of itself (i.e., a simultaneous birth), or because the probability of having closely spaced births is not independent of the probability of particular labor market outcomes (e.g., labor market participation).

3. Data

In order to estimate these models, we need sufficient occurrences of both twin births and closely spaced births. In the case of twin births in particular, this is a relatively rare event, occurring in about 7 births out of every thousand. Closely-spaced births are somewhat more frequent. In addition, we need a data set in which birth types can be identified with minimal

error. These requirements of significant dataset size and sufficient detail on fertility history led us to using the Public Use Microdata Samples from the 1960, 1970, and 1980 Censuses.[3] We combine data from all available samples[4] in order to maximize the number of twin birth cases that can be identified with reasonable certainty.[5] Hence for the 1980 Census in particular, sample sizes are large enough to generate thousands of twin birth instances, as well as a huge number of control cases (over one million in the 1980 sample).

It may be useful at this point to illustrate what the patterns of birth spacings look like. In Figure 1 we show patterns of birth spacings between consecutive children (for families with at least two children) for a subset of 1980 Census data (a 1-in-1000 sample). The number of multiple births is represented by the column at 0. Births with less than or equal to four quarters of separation are represented by the columns at 1 through 4. Figure 1 shows that the great majority of births have a spacing of more than four quarters, with both mean and median in the two to three year range between births. The number of births occurring with one to three quarters of separation is quite small;[6] we add the fourth quarter births in to increase sample size

[3] Many other data sets contain detailed fertility histories, but are generally of insufficient size to generate many twin birth occurrences. As we will discuss below, the 1990 Census is larger, but would only allow for measurement of twin status with error.

[4] For 1960 there is a single 1-in-100 sample available, for 1 percent of the U.S. population. For 1970 we combined data from the 6 available 1-in-100 samples, three of them drawn from the 5 percent questionnaire respondents and three of them drawn from the 15 percent questionnaire respondents, yielding a sample of 6 percent of the U.S. population. For 1980 we combined data from the 5-in-100 sample and the two 1-in-100 samples, yielding a sample of 7 percent of the U.S. population.

[5] "Reasonable certainty" required first identifying all potential parents and children, and then matching them using relationship and subfamily status codes. We then eliminated all cases where the mother reported an implausibly high (greater than 55) or low (less than 12) age at first birth.

[6] It may seem to violate biological limits to have two births with only one quarter of measured separation; however recall that this can include births with almost six months of separation. For example, a birth on January 1 followed by a birth on June 30 would be coded as having only one quarter of separation. Nonetheless, we examined these cases to see if they had a higher rate of imputed birthdates than the sample has as a whole. There was no evidence of a higher imputation rate in these cases. We have no other way of checking for coding errors in the data; these are cases in which the number of children in the household who are related to the householder equals the number the mother reports ever having had.

as preliminary results showed little difference in coefficient estimates but an improvement in efficiency.

We had to impose a couple of additional data restrictions in order to reduce coding errors. To be considered a parent with twins in the first birth, the mother had to: (1) be living with the same number of her own children as she had reported ever having borne; (2) have no children older than 18 years of age; and (3) have a second child with the same age and calendar quarter of birth as her first child. To be considered a parent with closely spaced first and second births, the mother had to satisfy the same first two conditions, along with (3) having a second child with no more than three calendar quarters of separation from the first child.[7] We excluded mothers living apart from some or all of their children or whose oldest child was over 18 because it was not possible to determine full age histories of the children unless all children were still present in the household.

One problem with our earlier work was that the sample size was limited if we required that the marital status of the mother needed to be known at the time of the birth. This is a reasonable requirement if marital status is influenced by birth. Upon testing for this linkage (using the half-sample for 70 and the full sample for 80), we find (with the results for twins reported in JPR 2001) that this is not a problem in general. Neither the probability of subsequent marriage for women who are single at the time of first birth, nor the probability of subsequent dissolution of marriage for women who are married at the time of first birth, is influenced by twins in the first birth or closely spaced births. Hence we classify mothers by their marital status at the time of the survey date rather than by their earlier reported status. This is useful for three

[7] Note that we cannot identify the precise number of months of separation between the two births. For example, a child born anytime from January through March of a calendar year would be reported as a first quarter birth. Then we would consider any birth happening in in the next three quarters of the year or the first quarter of the following

reasons. First, it allows us to utilize Census data for 1960, wherein information regarding marital status at the time of the survey was collected, but not information that would allow us to determine marital status at time of first birth. Second, it allows us to double the sample size for 1970, wherein half the sample had marital status at time of first birth, but the other did not.[8] Third, it allows us to study labor supply behavior of fathers as well as mothers. We can identify (with some error) fathers in the case of married women, by utilizing information on the current husband.[9] For identifying fathers we impose the simple restriction of utilizing information on the husband in the house at the time of sample for the set of included mothers. While this is not fully satisfactory as it may include stepfathers in some cases, given the paucity of results on childbearing/childraising effects on fathers, this is still potentially a useful exercise.

Note that because of data limitations, namely the lack of full fertility histories for fathers, we cannot estimate equation (1') for fathers. However, we can still estimate equation (2'). As it turns out, the effect on total fertility of having a twin or closely spaced birth ($ß_2$ and $ß_4$) is very close to one additional child for women, so transforming the coefficients from (2') to calculate the instrumental variable estimates of Δ_2 yields estimates very close to those coefficients $\Omega_2$and Ω_4 on T_i and C_i as observed directly from the estimation of (2'). If the effect on men is also approximately one additional child, then the coefficients from these estimations provide a useful measure of the effect of an additional child on their labor market outcomes (and at any rate

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year as being a closely spaced birth. This would be a maximum of fourteen months' spacing, but the expected value would be closer to twelve months for births reported with four quarters of separation.

[8] Two different questionnaires were used to collect data for 1970, one of which did not collect age at first marriage and quarter of first marriage. Hence we were not able to identify marital status at time of first birth for one of the two 1-in-100 samples available from 1970.

[9] In the 1980 Census, the category of "married, spouse not in household" was introduced, leading to cases where no information was available on the spouse. In earlier Censuses, all persons identifed as married had to have records for both spouses, and cases with missing spouses were coded as "separated." Hence in the 1980 Census sample, there are fewer records for married fathers than for married mothers, while in the other two samples, the number of records is the same.

provide a measure of the effect of twins and closely spaced births on their labor market outcomes).

We utilize four measures of labor market outcomes in this paper: the probability of labor force participation at any point in the year preceding the Census survey date (Censuses are always taken in April and questions asked regarding labor market participation and earnings in the previous year); the number of weeks worked during the preceding year, the number of hours worked during the week preceding the Census survey date, and the total earnings (wage, self-employed, and farm) from the preceding year.[10] Labor force participation rates are estimated using probits and results expressed in terms of the percentage change in going from 0 to 1 in the variable of interest (twin/nontwin or close births/nonclose births). The other three equations are estimated using tobits to correct for the nonparticipants in the labor market.

Below we present and discuss the results found for all persons, overall and separately by age ranges for the oldest child at time of survey. Ranges are given for three-year intervals (except for nine-year olds) to allow for synthetic cohort comparisons. A fuller set of tables is available from the first author's website, containing results separately for white and black persons (with nonwhite nonblack excluded). We mention a few results from these subset comparisons below when it is relevant for addressing heterogeneity issues. Results are presented separately by marital status for mothers, and also for married fathers.

4. Results

Table 1 gives means for our subsamples, separately for the two "treatment" groups—the twin parents and the closely spaced-birth parents—and for the control group. The number of

children born per mother is indeed higher for both the twin and closely spaced samples, with the highest numbers for the closely spaced samples. Mothers and fathers of twin births are older than the control group while parents of closely spaced children are younger. From a cursory examination of the means of the labor market outcome variables, it appears that the control group has higher participation rates for both married and unmarried mothers, but does not evidence substantially higher levels of weeks and hours worked, nor substantially higher earnings levels. Fathers evince little difference between the control and treatment groups in any of the outcome variables, although earnings are somewhat lower for the closely spaced samples.

Table 2 considers the impact of twins and closely spaced births on total fertility.[11] Here the numbers are quite consistent in showing an effect. Having either a twin in the first birth or closely spaced first and second births raises total fertility by about one child. In other words, either of these events is associated with a permanent increase in fertility equal to the additional child born as a result of either event. Neither event simply affects spacing. The patterns by age of first child are relatively consistent both within sample and across synthetic cohorts.

Table 3 measures the direct impact of either twins or closely spaced first and second births on the probability of working. Here the effects are small for married persons but substantial for unmarried mothers. Married mothers evince no effect of either event in 1960, but have a two to three percent lowered probability overall of working in 1970 and 1980. The effect is concentrated in the years when the child is preschool age, but continues across time.

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[10] For labor force participation, weeks worked, and earnings, we calculate the age of the child as of the end of the year preceding the Census year. For hours worked in the previous week, we calculate the age of the child as of the end of the first quarter of the Census year.

[11] All of these numbers are statistically significant at the 1% or higher level except for those for the smaller nine-year old group in the 1960 Census. Given the very large sample sizes involved in most of the calculations, in general I downplay statistical significance in these tables in favor of trying to emphasize size of effect; hence statistical significance is reported at the relatively low 10% level in the following tables even though many numbers are much more statistically significant. The full set of standard errors for all the reported means and coefficients in

Unmarried mothers show a significant response in all years and subsamples except the twin mothers in 1960, with a relative drop in the probability across all ages of the child of working of about 8 percent. They also have the largest drops when the child is preschool age, but the effect drops off by less over time than for the married mothers. There is little difference except in 1960 between the two treatment groups, although the pattern is less consistent over child age groups for the twin samples. Married fathers evince no effect from either event, except for fathers of closely spaced children in the 1980 sample, who have about a one percent lower participation rate over the full lifespan of the child. The within sample patterns are generally consistent with the synthetic cohort patterns.

Table 4 shows relatively small, but statistically significant negative effects of either treatment on weeks worked in the previous year for both married and unmarried mothers. The effect on unmarried mothers is two to three times as large as for married mothers in 1970 and 1980, with the largest average effect occurring for unmarried mothers in 1960. Effects are again largest during the preschool ages but are significant as the child ages for the closely spaced groups in particular. The overall effects for the twin's mothers appear to be driven by the large effects when the children are young.

For married fathers, there is a small but statistically significant negative effect in Table 4 in 1960 and 1980 for the closely spaced groups. The largest effects occur for young children in the 1980 sample, with a two week decline in weeks worked for these fathers. This pattern, along with the slight but statistically significant reduction in fathers' participation in 1980 as shown in Table 3, is potential evidence of either increased heterogeneity in this sample, or an increased effect of birth spacing on male labor supply. When results are considered separately for whites

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Tables 1 through 6, as well as notations indicating significance at the 1%, 5%, and 10% level, are available in the full set of results on the first author's webpage.

and blacks, it becomes clear that this effect is not driven by the increased preponderance of minority fathers in the sample. While black fathers in 1980 have a slightly higher rate than white fathers of reduced labor force participation and weeks worked, both groups show a significant increase relative to the 1970 (and 1960) numbers.

Table 5 considers effects on hours worked in the previous week. Here the average effects for mothers are again driven by relatively large hours reductions in the preschool years, followed by smaller but still significant reductions while the children are school age. In 1960, there is again little effect of having twins, while there are larger effects of having closely spaced children (in line with the results for the later two samples). In 1970 and 1980, there appears to be little difference between the treatment groups. However, the effect is consistently larger for unmarried mothers than for married mothers.

Married fathers show some small amount of hours reduction (only one hour) for the closely spaced groups, with the largest effects again occurring across the child age groups in 1980. Again, the apparent increased effect in 1980 is not mainly due to the increased number of minority fathers; as with participation and weeks worked, the effect is also found among white fathers, although it is larger among black fathers (and shows secular increase for them relative to 1960 and 1970).

Table 6 considers the effect on annual earnings of the two treatment types. Here the net result of reduced labor force time plus any potential effect on wages is, for most of the treatment groups, a reduction in earnings. Unmarried mothers experience the largest results, particularly in 1980; however, the two types of treatments do not yield much difference except in 1960, where the effect of twins is not statistically significant. Among married mothers, the negative impact on earnings of either treatment is much smaller, and is insignificant in the 1980 twins sample.

Losses for the other group are all less than $275. Among fathers, there are fairly substantial treatment effects, perhaps more than one might have expected given the relatively low labor supply effects. This indicates a lower hourly wage rate for these fathers, or substantial loss of earnings related to the marginal change in work hours. In 1980 the effects are particularly large for fathers of closely spaced births. Here the composition effect of black v. white fathers is more substantial, with black fathers experiencing a substantially bigger change in their negative earnings from 1970 to 1980 than do white fathers. However, even in 1970 the effect was driven in large part by the large earnings reduction among black fathers. In 1960, on the other hand, the reduction experienced among fathers of closely spaced births was driven by earnings reductions among white fathers.

Interestingly, while in the majority of comparison cases white and black mothers (within marital status case) did not appear significantly different in their treatment responses, in 1980 the income reduction among black married mothers with closely spaced births was about twice as large as among white married mothers (no such distinction was found among unmarried mothers). This parallel effect with the black fathers indicates a significant drop in earned income for these families and again appears to relate more to lower earnings rates (at least on the margin) than to the reduction in labor supply.

Finally, Table 7 shows the instrumental variables estimates of the effects of fertility on the labor supply and earnings variables for mothers for all child ages. The transformation into per-child terms tends to amplify the twin effects slightly (as they tended to yield slightly less than one additional child to total fertility) and reduce the close-spaced effects slightly (as they tended to yield slightly more than one additional child). The net results in terms of lowered

participation, weeks worked, hours worked, and earnings are relatively small for married mothers but more notable for unmarried mothers in 1970 and 1980.

To sum up the overall patterns, it does not appear that the two types of treatment yield very different results for mothers. Having an additional child, with or without an additional year of spacing, leads to measurable, though relatively small, effects on labor supply and earnings for married mothers, and more substantial effects for unmarried mothers. These effects have increased in particular for unmarried mothers in the 1980 sample. The findings for married mothers in 1970 and 1980 are in line with those reported in our earlier study (JPR 1999), although they are slightly smaller.

Therefore falling fertility can account for very little of the substantial increase in female labor force participation, weeks worked, hours worked and earnings that has occurred since 1960. While labor market participation as measured in both cross-sectional and panel data sets is generally observed to drop substantially when women have children, this effect is apparently related primarily to the effect of having the first child. As fertility rates have declined primarily because women are not having higher-numbered births rather than from some women's not having any births, our measurements are relevant to this discussion. This implies that further expected falls in fertility in countries currently undergoing demographic transition will not be the primary cause of any observed increase in female labor market participation in those countries. It also implies that small increases in marginal fertility, such as any possible widespread increase from two to three children families (as pronatalist policies in countries like France have attempted to stimulate) will not have large effects on female labor market participation.

For fathers, there is some evidence that either increased heterogeneity or increased spacing effects have led to slightly reduced labor supply and earnings by 1980 for the closely

spaced birth sample in particular. Otherwise our findings are consistent with other studies that have found little effect of fertility on male labor market outcomes. Therefore changes in fertility for men is also likely to have (and to have had) little effect on their labor market participation levels over time, and does not contribute to explaining reduced male participation since the 1960s.

These results also imply that additional children are not very costly in terms of foregone labor income. Assuming that parents correctly ascertain this weak relationship, decisions about whether or not to have additional children would not appear to be likely to be driven by this financial consideration for most parents, although unmarried mothers might be more wary of the effects on their earned income.

5. Conclusion

We have argued in this paper that marginal changes in fertility, either in total number of births or in birth spacing, do not have large effects on labor market outcomes. This is contrary to popular perception, both of how mothers in particular change their labor market behavior in response to having more children, and of what forces explain changes in female labor market behavior overall in both developed and developing countries.

A final question to consider is whether this line of research can be continued with other currently available datasets. As discussed above, only the Census datasets contain sufficient numbers of observations to make it possible to collect large samples of twin births. Unfortunately the 1990 and 2000 Censuses both did not ask for quarter of birth, making it impossible to identify twin births with any degree of certainty. However, one could still identify births occurring within the same calendar year, which would include twin births along with any

births occuring with less than twelve months of separation within the same year. But one would exclude births that had less than twelve months of separation, but occurred in separate calendar years. The other problem with both the 1990 and 2000 Census datasets is that the increasing use of infertility treatments (that have a high rate of leading to multiple births) have made the assumption of exogeneity of twinning increasingly questionable.

If these two problems are viewed as insurmountable (which is currently our view), then the window on this natural experiment may have now closed, given the difficulty of collecting retrospective data from the U.S. or other countries for before the period when infertility treatments became widespread and small sample sizes of other samples with sufficient information to identify twin and closely-spaced births. Some data may still be obtainable from areas where infertility treatments are not commonly available, such as many developing countries. But the results we present in this paper also indicate that it may not be worth collecting such data if it is very costly in order to understand the relationship between fertility and labor market outcomes.

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Figure 1

Distribution of Births, 1980 Census data, by Number of Quarters Between Births

for Families with at least two children

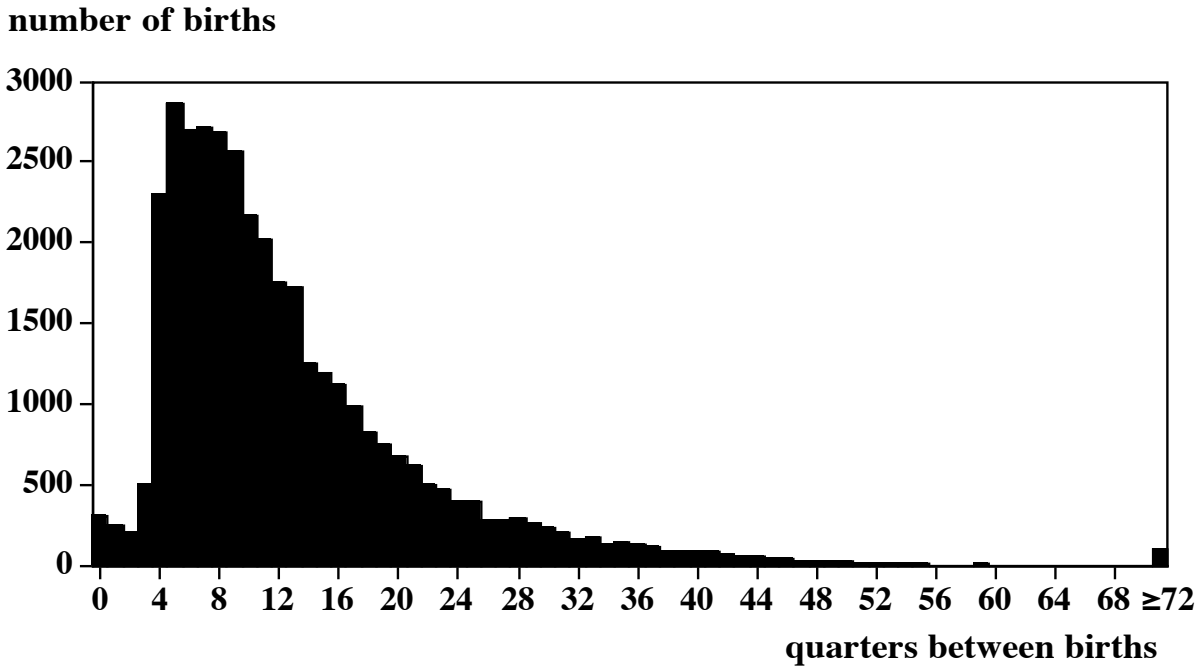

Table 1
Variable Means for Mothers (Married and Unmarried) and Married Fathers

Married Mothers									
	1960			1970			1980		
Variable	Twin	Close space	Control	Twin	Close space	Control	Twin	Close space	Control
No. of children	3.1	3.4	2.4	3.1	3.5	2.3	2.7	3.1	2.0
Mother's age	34	30	33	33	32	32	32	33	32
Age at first birth	25	22	24	24	22	23	24	22	23
Worked for pay	0.33	0.29	0.36	0.45	0.42	0.47	0.58	0.56	0.60
Weeks worked	10	8	11	15	14	16	22	21	22
Hours worked	7	6	8	10	10	11	15	16	16
Earnings	1,330	1,037	1,500	2,566	2,237	2,682	3,911	3,474	3,879
Family income	17,289	15,087	17,030	23,082	21,545	22,665	24,070	22,327	23,366
No. of persons	1,569	11,978	156,290	6,555	79,491	879,860	8,515	60,533	1,115,962
Unmarried Mothers									
	1960			1970			1980		
Variable	Twin	Close space	Control	Twin	Close space	Control	Twin	Close space	Control
No. of children	2.8	3.3	2.1	2.9	3.4	2.1	2.6	3.0	1.7
Mother's age	35	30	34	32	31	31	31	31	30
Age at first birth	25	22	24	23	21	22	22	20	21
Worked for pay	0.63	0.51	0.65	0.61	0.60	0.68	0.64	0.62	0.71
Weeks worked	26	17	25	23	23	27	26	24	28
Hours worked	21	15	20	18	17	20	19	18	22
Earnings	3,870	2,400	3,680	4,413	4,469	5,177	4,985	4,455	5,487
Family income	10,520	7,423	9,060	10,812	9,546	11,381	10,287	9,168	11,133
No. of persons	101	1,075	11,889	931	11,627	113,900	1,909	14,765	242,890
Married Fathers									
	1960			1970			1980		
Variable	Twin	Close space	Control	Twin	Close space	Control	Twin	Close space	Control
Father's age	37	34	36	36	35	35	35	36	34
Age at first birth	28	26	27	27	25	26	27	25	26
Worked for pay	0.99	0.99	0.99	0.99	0.98	0.99	0.97	0.95	0.97
Weeks worked	48	47	48	48	48	48	47	46	47
Hours worked	41	40	41	40	40	40	41	40	41
Earnings	14,979	13,045	14,418	19,040	18,132	18,749	18,707	17,317	18,243
No. of persons	1,569	11,978	156,290	6,555	79,491	879,860	8,420	59,809	1,105,017

Earnings and family incomes are expessed in 1979 dollars.

Table 2
Impact of Twins in the First Birth or Close spacing on the Number of Children Ever Born

Married Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	1.1	0.9	1.0	0.9	0.9	1.0
3 - 5	0.8	0.9	0.7	0.8	0.7	0.7
6 - 8	0.8	1.0	0.8	0.8	0.8	0.6
9	0.9	1.2	0.7	0.9	0.8	0.6
10 - 12	0.7	1.2	0.7	1.0	0.8	0.6
13 - 15	0.7	1.2	0.7	1.1	0.8	0.6
16 - 18	0.8	1.2	0.7	1.2	0.8	0.7
All Ages	0.8	0.9	0.8	1.1	1.0	0.7
Unmarried Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	1.0	1.0	1.0	1.0	1.0	1.0
3 - 5	0.9	0.8	1.0	0.9	1.0	0.9
6 - 8	1.2	0.8	1.0	0.9	1.0	0.8
9	1.1	NA	1.0	0.7	1.0	0.7
10 - 12	1.2	1.0	1.1	0.9	0.9	0.8
13 - 15	1.1	0.4	1.1	0.7	1.0	0.7
16 - 18	1.7	1.3	1.3	0.7	1.0	0.9
All Ages	1.1	0.9	1.3	0.8	1.2	0.9

Table 3
Impact of Twins in the First Birth or Close spacing on the Probability of Working

Married Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-6%*	-9%*	-13%*	-12%*	-12%*	-16*
3 - 5	-2%	-5%*	-3%*	-5%*	0%	-10*
6 - 8	1%	-2%	-1%	-3%*	1%	-7%*
9	-1%	-1%	1%	-2%*	-3%	-4%*
10 - 12	4%	-1%	1%	-2%*	0%	-4%*
13 - 15	0%	-2%*	0%	-2%*	2%	-2%*
16 - 18	-8%*	-2%	1%	0%	-1%	0%
All Ages	0%	0%	-2%*	-2%*	-2%*	-3%*
Unmarried Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	2%	-11%*	-18%*	-16%*	-20%*	-21%*
3 - 5	-1%	-16%*	-11%*	-13%*	-12%*	-16%*
6 - 8	-13%	-6%*	-5%	-8%*	-5%*	-15%*
9	35%	-6%	-2%	-8%*	-4%	-11%*
10 - 12	-12%	-12%*	-12%*	-7%*	-5%*	-9%*
13 - 15	0%	-1%*	1%	-5%*	-5%*	-7%*
16 - 18	23%	-10%*	-6%	-4%*	-1%	-5%*
All Ages	-2%	-13%*	-8%*	-8%*	-8%*	-8%*
Married Fathers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	0%	0%	0%	0%	0%	-1%*
3 - 5	-1%*	-3%*	-1%	0%	0%	-2%*
6 - 8	-1%*	0%	0%	0%	0%	-1%*
9	1%	0%	0%	0%	0%	-1%*
10 - 12	0%	-1%*	0%	0%	-1%	-1%*
13 - 15	0%	0%	0%	0%	0%	-1%*
16 - 18	0%	0%	0%	-1%*	0%	-1%*
All Ages	0%	0%	0%	0%	0%	-1%*

*Statistically significant at the 10% level

Table 4
Impact of Twins in the First Birth or Close spacing on Weeks Worked per Year

Married Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-8*	-11*	-11*	-12*	-9*	-13*
3 - 5	-4	-7*	-4*	-6*	-1	-9*
6 - 8	0	-3*	-2	-3*	1	-6*
9	0	-1	1	-2*	-1	-4*
10 - 12	4	-1	1	-2*	1	-3*
13 - 15	0	-3*	0	-2*	2*	-1*
16 - 18	-7*	-2	0	-1	0	0
All Ages	-3*	-7*	-2*	-3*	-1*	-2*
Unmarried Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	6	-15*	-12*	-12*	-16*	-17*
3 - 5	-1	-13*	-9*	-11*	-8*	-14*
6 - 8	-11	-8*	-4	-7*	-3*	-12*
9	26	-6	0	-7*	-3	-9*
10 - 12	-7	-10*	-9*	-5*	-3*	-7*
13 - 15	4	-8*	-1	-4*	-4*	-6*
16 - 18	14	-8*	-6*	-3*	0	-4*
All Ages	-1	-12*	-6*	-6*	-5*	-6*
Married Fathers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-1*	-1*	0	0	0	-2*
3 - 5	0	-1*	0	-1*	0	-2*
6 - 8	0	-1*	0	0	0	-2*
9	0	0	0	0	0	-2*
10 - 12	0	-1*	0	0	-1*	-1*
13 - 15	1*	-1*	-1*	0	0	-1*
16 - 18	0	0	0	-1*	0	-1*
		0		0		0
All Ages	0	-1*	0	0	0	-1*

*Statistically significant at the 10% level

Table 5
Impact of Twins in the First Birth or Close spacing on Hours Worked per Week

Married Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-2	-11*	-13*	-12*	-8*	-13*
3 - 5	-3	-9*	-2	-6*	-2*	-7*
6 - 8	-4	-4*	0	-3*	1	-5*
9	4	3	4	-3*	-1	-4*
10 - 12	3	-2	0	-2*	1	-3*
13 - 15	-5	-4	2	-2*	2*	-1*
16 - 18	-5	-2	0	-1	0	0
All Ages	-3*	-7*	-1	-2*	-1*	-5*
Unmarried Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-2	-15*	-13*	-10*	-14*	-18*
3 - 5	-1	-18*	-12*	-13*	-10*	-15*
6 - 8	-7	-8*	-5	-9*	-5*	-13*
9	-4	-9*	7	-6*	-3	-9*
10 - 12	-9	-9*	-9*	-7*	-4*	-7*
13 - 15	-4	-5*	-1	-4*	-5*	-6*
16 - 18	14*	-9*	-4	-2*	-1	-4*
All Ages	-1	-11*	-6*	-6*	-6*	-5*
Married Fathers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	2	-1	0	1*	0	-1*
3 - 5	2	-1*	-1	-1*	0	-2*
6 - 8	0	-1*	0	-1*	0	-3*
9	1	0	0	0	-1	-2*
10 - 12	-1	-1*	0	-1*	0	-2*
13 - 15	1	-1*	0	0	-1*	-2*
16 - 18	2*	0	1	-1*	-1	-1*
All Ages	1	-1*	0	0	0	-1*

*Statistically significant at the 10% level

Table 6
Impact of Twins in the First Birth or Close spacing on Yearly Earnings (in 1979$)

Married Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-194*	-193*	-356*	-441*	-858*	-1097*
3 - 5	-75	-126*	-183*	-256*	-84	-830*
6 - 8	-99	-59*	-94	-166*	-38	-766*
9	-39	-50	-7	-107*	-335	-528*
10 - 12	132*	-38	-51	-150*	100	-515*
13 - 15	-49	-89*	3	-116*	563*	-256*
16 - 18	-184	-94	-29	-60*	-71	-140*
All Ages	-79*	-146*	-99*	-174*	-75	-258*
Unmarried Mothers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	-109	-405*	-633*	-384*	-1644*	-1449*
3 - 5	1344*	-356*	-739*	-631*	-1121*	-1687*
6 - 8	-374	-356*	-536*	-546*	-423	-1809*
9	1061	-232	-320	-529*	-806	-1930*
10 - 12	-757*	-483*	-617*	-388*	-866*	-1441*
13 - 15	-66	-4	149	-318*	-759*	-1496*
16 - 18	202	-641*	-688*	-110	-822	-1043*
All Ages	-62	-431*	-479*	-349*	-869*	-918*
Married Fathers						
Age of	1960		1970		1980	
First Child	Twins	Close Space	Twins	Close Space	Twins	Close Space
0 - 2	28	-131*	-240	-228*	10	-1037*
3 - 5	-347*	-52	-146	-424*	471*	-1410*
6 - 8	-27	-316*	-15	-415*	-127	-1720*
9	928*	-8	-528	-328*	264	-1859*
10 - 12	316	-490*	-54	-202*	-961*	-1498*
13 - 15	34	-497*	-283	-355*	-319	-1499*
16 - 18	152	-403*	-263	-317*	206	-878*
All Ages	28	-411*	-156*	-198*	-71	-529*

*Statistically significant at the 10% level

Table 7
Instrumental Variable Estimates of the Effect of Fertility on Labor Supply and Earnings

Married Mothers						
Effect on	1960		1970		1980	
Variable:	Twins	Close Space	Twins	Close Space	Twins	Close Space
Worked last year	0%	0%	-2%*	-2%*	-2%*	-3%*
Weeks worked	-3*	-8*	-2*	-3*	-1*	-2*
Hours worked	-4*	-8*	-1	-2*	-1*	-5*
Annual earnings	-100*	-157*	-129*	-156*	-106*	-258*
Unmarried Mothers						
Effect on	1960		1970		1980	
Variable:	Twins	Close Space	Twins	Close Space	Twins	Close Space
Worked last year	0%	-11%	-9%*	-6%*	-8%*	-6%*
Weeks worked	0	-11*	-7*	-5*	-6*	-5*
Hours worked	-2	-10*	-7*	-4*	-6*	-4*
Annual earnings	-70	-392*	-532*	-273*	-965*	-753*

*Statistically significant at the 10% level