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ABSTRACT

Empirical tests of hypotheses developed in a discussion of income and substitution effects support the hypotheses and show that women with more education have their first birth (B1) sooner after leaving school than less educated women; also, an additional year of schooling raises the woman's age at B1 by only about one-half year. The higher the wife's education, the shorter the total interval between B1 and the last birth (Bn), given family size; the effect is even stronger if family size is not held constant. Ceteris paribus, more education for the husband, led to postponement of B1. Higher family income resulted in an earlier B1 and a longer total interval. Women with more education worked during more of the period before B1, were more likely to work after either B1 or Bn, and worked sooner after Bn. If family income was high, she was less likely to work after B1; but if she worked, it was more likely to be between births. If she worked only after Bn, the high income woman's last child was older when she (re-) entered the labor force. (Author)

THE TIMING AND SPACING OF BIRTHS AND WOMEN'S LABOR FORCE PARTICIPATION: AN ECONOMIC ANALYSIS

by

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I wish to thank my sponsor, Professor Jacob Mincer, for introducing me to the study of the economics of labor and human resources and for making useful suggestions throughout my preparation of this dissertation. The National Science Foundation, the National Bureau of Economic Research, and the Manpower Administration of the United States Department of Labor provided financial support during my graduate program; while I was working on my disseratation. the National Bureau made available to me its research facilities, which were especially helpful. My greatest debt of gratitude is due my husband, Gerald, for his encouragement and understanding.

CHAPTER I

INTRODUCTION

A. The Topic

This dissertation analyzes the timing and spacing of childbirths within an economic framework. I have attempted to explain when women in the United States begin child bearing -- i.e., the "timing" (of the first birth) -- and the length of the interval they spend in child bearing -- i.e., the "spacing" of births.

The timing and spacing decisions have both demographic and economic significance. In the first instance, they help determine the size and growth rate of the population; for not only is a postponed birth less likely to occur but, even if it does occur, its postponement results in a lower birth rate and a lower population growth rate. For example, if each couple achieves the same completed fertility as under early timing but experiences these births at a later age, then the length of a generation -- the average age of mothers at the births of all children regardless of birth order -- increases; birth rates drop; and the population grows more slowly.

The levels of birth rates have obvious direct effects on the supply of workers when these babies reach the age of entering the labor force. The age-composition of the labor force at any point in time and the proportion of the population of working age depends on the pattern of birth rates in the past. A more subtle effect of the pattern of birth rates on the supply of labor may work through forces in the marriage market: Since "marriageable age" differs for men and for women, changes in the number of births per year will result later in surpluses of men or of women of marriageable age. This causes a change in the proportion of young persons who are married and alters the average age at marriage; these affect particularly women's labor force participation.

The most important effect of these fertility decisions on labor force participation by women operates directly. In recent years, in the U.S., most women have worked until the birth of their first child was imminent. Many of these women have returned to work after their youngest child was of school age or even sooner; this is especially true of women with high levels of education. But, few women work while they still have small children at home, regardless of their educational attainment.[1] Therefore, women's labor force participation depends importantly on when a woman has her children. This, in turn, depends in part on how many children she has, since there are physiological limits on how close together births can occur. Family size or "completed fertility" is already being studied intensively by economists;[2] my research focuses on the timing and spacing of those births.

B. Survey of the Literature

Most fertility research has focused on completed fertility -- i.e., the number of children born -- rather than on the timing of these births. The published work in child spacing is dominated by sociologists and demographers. In general, the work of the former is descriptive in nature while that of the demographers is directed toward developing mathematical models with little related empirical testing or explaining purely physiological phenomena.

Ronald Freedman and Lolagene Coombs, sociologists who have produced a series of articles based on the Detroit Area Study, describe the relationships observed between the tempo of family growth and income, asset accumulation, age at marriage, religion, employment history, and other socio-economic variables, although no testable hypotheses are presented and no unifying theory or model is suggested to link together the observed phenomena.

In an article on the effect of current, expected, and relative income on fertility behavior, they reported that current income was not related to the expected or preferred number of children, but was strongly related to the timing of events -- to the age at marriage, to the incidence of premarital pregnancies (PMP), and to the length of the interval

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[1]See Appendix A for supporting evidence for these statements based on data from the 1960 U.S. Census of Population.

[2]See, for example, Journal of Political Economy: "New Economic Approaches to Fertility," T. W. Schultz, ed., vol 81, no 2 part II (March/April 1973); Mark R. Rosenzweig, "The Economic Determinants of Fertility in the Agricultural Sector of the United States," (unpublished Ph.D. dissertation, Columbia University, 1973.)

from marriage to a birth of a given order.[1] Women who expected large increases in family income expected to have more additional children than other women. At all income levels over $3,000/year, wives who viewed their family's income as adequate expected more children and planned to have them sooner. However, those who felt that their incomes were higher than the incomes of other families they knew expected or preferred more children than other women only if the women already had four or more children.

A high aspiration to provide material things for ones children was not a function of income but was associated with **expecting fewer** additional children; it was not related to birth intervals. However, those mothers who expected their children to attend college and who were saving for it had fewer children and had wider intervals between births. Freedman and Coombs also found that women in the labor force expected to have fewer children. Long labor force participation was correlated with an expectation of fewer additional children and with longer intervals from marriage to the parity birth. There was no information about labor force participation and the intervals between successive births; the observed relationship may result primarily from work experience before child bearing was begun.

In another article published in the same year as that described above, the authors reported that a family's economic position was better the longer the interval from marriage to first (or later) birth but ascribed this at least in part to marriage duration and to the husband's education.[2] They noted that the sooner after marriage births occur the less asset accumulation and the greater economic pressures the couple faces at the time of the birth. In particular, women with PMP have subsequent children sooner and have the strongest relationship between childspacing and economic position.

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[1] Freedman and Coombs, "Economic Considerations in Family Growth Decisions," Population Studies (hereinafter, Pop. Stud.) XX (November 1966), 197-222.

[2] Freedman and Coombs, "Child Spacing and Family Economic Position," American Sociological Review, XXXI (October 1966), 631-648.

In a more recent article Coombs and Freedman described the effect of the first interval (from marriage to first birth) on the family's later economic status.[1] They compared economic characteristics of couples with PMP, with short first intervals that were not PMP, and with long first intervals and asserted that the fertility and economic patterns of the PMP were markedly different from other couples with short first intervals. Over time the income disadvantage of a PMP couple decreases, but the relative gain in assets is not so good; this was ascribed mostly to their lower education and lower age at marriage. Those few PMP couples who had few children or a long second or third interval were able to improve their economic situation.

Comparing (non-PMP) short spacers with those couples who had a longer first interval, they found that the income and asset disadvantage did disappear with time. Couples with a short first interval had not been married as long at the birth of the i-th child, so their disadvantage was due to the husband's lower age and the shorter marriage duration. The authors expect that the two groups would have similar incomes and assets at the same <u>age</u>. The short spacers had similar education but a somewhat higher occupation status than long spacers, and they wanted more children and wanted them sooner than the others. By contrast, most PMP couples were dissatisfied with their fertility situation.

In his doctoral dissertation,[2] Donald W. Hastings studied black/white differentials in child spacing. This study also was only descriptive. There are a number of conceptual and computational errors in the data analysis; moreover, data from the U.S. Census are ill-suited for studies

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[1] Coombs and Freedman, "Premarital Pregnancy, Child Spacing, and Later Economic Achievement," Pop. Stud. XXIV (November, 1970), 389-412.

[2] "Parity Time Interval Patterns and Selected Characteristics for Once Married Couples According to 1/1000 Sample of United States Population in 1960," (unpublished Ph.D. dissertation, University of Massachusetts, 1970.) Also, D. W. Hastings, "Child-spacing Differentials for White and Non-white Couples According to Educational Level of Attainment for the 1/1000 Sample of the United States Population in 1960," Pop. Stud. XXIV (March 1971), 105-16.

of timing and spacing of births. The quarter and year of birth can be determined only for those children still residing with the mother, but most women who have passed the normal age of child bearing already have had one or more children leave the household.[1] Furthermore, in the Hastings study, observations were eliminated unless all birth intervals were 0 to 18 months long or all were 18 to 48 months long or all were longer than 48 months. Since most first birth intervals -- from marriage to first birth -- are short (0 to 18 months) and most intervals between successive births are longer than 18 months, this selection criterion eliminates most families with two or more children. For example, among white couples who had at least a high school education 100 percent of one-child families were included; for two child families the inclusion rate was 37.5 percent for mothers under thirty, 28.2 percent for mothers aged 30 to 44, and 28.7 percent for women over 44. In three-child families the percent included in Hastings' sample was 18.0 for the youngest women, 9.8 for those aged 30-44, and 2.5 percent for those 45 and over. In families with four or more children, the inclusion rates were 10.5 percent, 3.4 percent, and 0, respectively. No non-white couples with four or more children were included in the sample studied, and only four percent of the three-child families were included.[2] Hastings claims only to have replicated the findings of previous research, namely: that the interval between marriage and first birth and between successive births increases until the third birth and thereafter decreases; that the intervals between successive events decrease as the number of children increases; that the i-th interval is longer if the i-th birth is terminal than if it

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[1] In the 1960 U.S. Census, 11.3 percent of the white women aged 30-34 had "missing" children and 20.7 percent of those aged 35-39 had one or more children not present in the homes; for blacks the respective percents are 30.2 and 43.8; these certainly are higher for women in their forties. U.S. Department of Commerce, Census Bureau, 1960 Census of Population Subject Report PC (2)-3B "Childspacing," p. XI.

[2] Hastings, Pop. Stud., 109.

is not; that the more recent the marriage the shorter the interval from marriage to first birth;[1] and that the more education a couple has the longer the interval from marriage to first birth.[2] The selectivity bias of the sample severely reduces the importance of the support from this study; but the five findings stand on their own and can all be observed in Table 25 of the U.S. Census Subject Report on "Childspacing."[3]

Hastings also found that non-whites have shorter intervals between events than whites -- as evidenced by the higher proportion of those accepted into the sample who had all intervals of 0 to 18 months -- except among couples who have both completed high school or more education; in this highest education category no differential was observed.

The Princeton University's Office of Population Research has published several volumes based on their National Fertility Studies.[4] The focus was not on birth intervals, and the only quantitative material on spacing consists of a few tables of simple correlations between the length of birth intervals and selected variables.[5] However, these data contain

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[1]The more recent the marriage, the larger the proportion of couples not yet having children; thus longer first birth intervals have not yet been completed and cannot be included in computations.

[2]Hastings, Pop. Stud., 107 and 112.

[3]Childspacing, p. 73.

[4]For example, Larry L. Bumpass and Charles F. Westoff, The Later Years of Childbearing, (Princeton, N.J.: Princeton University Press, 1970); Norman B. Ryder and Westoff, Reproduction in the United States: 1965, (PUP, 1971); and Westoff, Robert G. Potter, Jr., and Philip C. Sagi, The Third Child, (PUP, 1963). Also, Bumpass, "Age at Marriage as a Variable in Socio-Economic Differentials in Fertility," Demography, VI (February 1969), 45-54; Ryder and Westoff, "Family Planning Status: United States, 1965," Demography, VI (November 1969), 435-44; Bumpass and Westoff, "The Prediction of Completed Fertility," Demography, VI (November 1969), 445-54; Bumpass and Westoff, "The 'Perfect Contraceptive' Population," Science, CLXIX (September 1970); Pascal K. Whelpton, Arthur A. Campbell, John F. Patterson, Fertility and Family Planning in the United States, (PUP, 1966).

[5]The Later Years of Child Bearing, pp. 34-38.

much usable information on the timing of births; much of the research reported in this dissertation was based on data from the 1965 National Fertility Study.

Their data show that the lengths of birth intervals of each order are correlated negatively with the number of children desired and with the number achieved. For the entire sample education, age at marriage, and religion (Catholic-non-Catholic) are not correlated with the length of birth intervals, but comparisons within parities yield some weak correlations. The negative relation between age at marriage and the span of fertility is stronger for women with more children, although this is not biologically necessary; Bumpass and Westoff point out that "late" marriages are at young enough ages for most women to have as many as five children at longer than average intervals.

Noting the negative relation between a woman's education and the fertility span, they suggest that this may result in part from more educated women marrying later. But since, for women with only two children, education is negatively related to the inter-birth interval and age at marriage is not, they theorize "a desire to minimize the span of fertility in order to be freed for education-related female roles."[1]

They also suggest "that spacing preferences are oriented more towards the desired duration of child care than towards specific lenghts for given intervals."[2] There is evidence that women who have a short birth interval because of accidental pregnancy have a subsequent interval of at least average length. However, women with a longer than average i interval (successful planners) do not have a shorter than average i+1 interval.

Frank L. Mott, using retrospective data on child births and work histories for a sample of Rhode Island women,[3] found much conflicting

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[1] Ibid, p. 36.

[2] Ibid.

[3] "Fertility, Life Cycle Stage and Female Labor Force Participation in Rhode Island: A Retrospective Overview," Demography, IX (February 1972), 173-85.

evidence about the relationships among labor force participation, birth intervals, and education, concluding only that once a woman left the labor force in any interval she was very unlikely to re-enter it in a later interval. However, he did very little analysis of the open interval (from most recent birth to the date of the interview). His other findings are "... that there has been a recent convergence of labor force rates between better and less educated women, in some instances reversing thetraditional pattern of higher labor force rates for less educated women." He also noted "... a greater tendency for more recent cohorts of women to re-enter the labor force after childbearing..."[1]

It appears that much more could be done with these data than Mott's simple cross-classifications and calculations of contigent probabilities of labor force participation, which might yield some conclusive results. However, the residents of that state are not representative of the U.S., being less well-educated, having lower incomes, having higher labor force participation for women, and consisting of a very large percentage of Roman Catholics.

The demographic works may be divided into mathematical models of population growth, birth rates, and the like with little or no empirical testing or application and studies of the purely physiological aspects of fertility. Examples of the former include models of the time required for conception: Sheps derived a model of the expected distribution of intervals to conception assuming that conception is a random event, that the fecundability of each couple in the population is stable over time, and that fecundability varies across couples.[2] Other examples are an examination of the theoretical effect of truncation on the length of birth intervals[3] and a discussion of the effect on birth rates of contraceptive techniques with various levels of efficiency.[4]

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[1] Ibid., p. 173.

[2] Mindel C. Sheps, "On the Time Required for Conception," Pop. Stud., XVIII (July 1964), 85-97.

[3] Sheps, "Truncation Effect in Closed and Open Birth Interval Data," Journal of the American Statistical Association, LXV (June 1970), 678-93.

[4] Nathan Keyfitz, "How Birth Control Affects Births," Social Biology, XVIII (June 1971), 109-21.

There have been empirical studies of the physiological factors affecting the length of time required for conception, such as the length of the period of post-partum sterility. In a biological study Potter and Parker used a waiting-time model to estimate the expected time to conception.[1] They found that as the period of infertility lengthened the likelihood of sterility increased rapidly, and that if the couple is not sterile the number of expected additional months to conception increases at about one-half month for each additional month of previous conception delay. The authors also attempted to relate the time to conceive the second child to the time to conceive the first, and they report that past abortions have little effect on the time to conception.

Potter analyzed the components of the birth interval into gestation, post-partum amenorrhoea, anovulatory cycles, time to conceive after resumption of ovulation, and pregnancy wastage.[2] Among his findings was that the average birth interval increases somewhat with age probably because of fetal loss and secondarily due to a decline in fecundability. In societies with little contraception, according to Potter, the mean birth interval varies from two to somewhat less than three years, due to differences in the duration of post-partum amenorrhoea. Finally, he concludes that the average length of ovulatory exposure (from resumption of ovulation to conception) probably varies between four and seven months for women in their 20's.

Using data for Chilean women, Perez found that the timing of the first post-partum ovulation and menstruation depends closely on the lengths of full and partial breast-feeding.[3] The average interval to ovulation for

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[1]Robert G. Potter, Jr., and M. P. Parker, "Predicting Time Required to Conceive," Pop. Stud., XVIII (July 1964), 99-116.

[2]R. G. Potter, Jr., "Birth Intervals: Structure and Change," Pop. Stud., XVII (November 1963), 155-66.

[3]Alfredo Perez, et. al., "Timing and Sequence of Resuming Ovulation and Menstruation after Childbirth," Pop. Stud., XXV (November 1971), 491-503; Perez, et. al., "First Ovulation after Childbirth: The Effect of Breast Feeding," American Journal of Obstetrics and Gynecology, CXIV (15 December 1972), 1041-47.

women whose breast feeding was artificially suspended was only 49 days; for those who stopped spontaneously within fifteen days after childbirth, 60 days; and for all others, 117 days. Among women who breast fed exclusively only 36 percent had ovulated within 18 weeks. Thirty-four percent ovulated within nine weeks of beginning supplemental feedings for their infants. Fifty percent ovulated within three and one-half weeks of ceasing breast-feeding. The authors also found that most women ovulated before the first post-partum menstruation: 51 percent of those whose cycle was 30 to 59 days in length and 83 percent of those over 60 days.

Of more relevance to my research were such studies as those of the French demographer, Louis Henry, who estimated fertility rates, age-specific fertility rates, and age-specific sterility rates for such diverse non-contracepting populations as the Hutterites, eighteenth-century Canadians, and the seventeenth-century bourgeoisie of Geneva.[1] The Hutterite data were studied more intensively by Sheps and by Eaton and Mayer.[2] The former calculated the proportion of Hutterite women not having a birth of any given order at stated intervals after the preceding event; Eaton and Mayer estimated the birth probabilities for women by age in this non-contracepting population. In both studies, it appears that average fecundability changes little for women between the ages of 18 and 29 and therafter declines gradually; however, this decline may be due in part to the high parity of Hutterite women in their thirties. I decided, based on these studies, that in my empirical work

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[1]"Some Data on Natural Fertility," Eugenics Quarterly, VIII (June 1961), 81-91.

[2]Mindel C. Sheps, "An Analysis of Reproductive Patterns in an American Isolate," Pop. Stud., XIX (July 1965), 65-80; Joseph W. Eaton and Albert J. Mayer, Man's Capacity to Reproduce: The Demography of a Unique Population, (Glencoe, Illinois: The Free Press, 1954), reprinted from Human Biology, XXV (no. 3, 1953), 206-64.

I could safely assume that the length of time required for conception to occur is not related to a woman's age.[1]

In a demographic study that is atypical of that field, Namboodiri used data from the 1955 Growth of American Families study to show that, not surprisingly, the longer a woman has been married when she gives birth to a child of a given order (up to the third) the more years she has worked between marriage and that birth.[2] From the data as presented in the article it is impossible to examine relationships among the lengths of successive intervals, the length of the total interval from first to last birth, the work experience after the first child was born, the work experience since the birth of the last child, and other relevant variables such as the wife's education or the husband's income.

A third type of study, that of the effect of the length of birth intervals on the physical health and intellectual development of the child, is particularly relevant to the discussion of income effects and child quality in Chapter II, Section C. In a survey of the effects of family size and child spacing on the child and on the mother, Wray wrote that numerous studies have linked fetal loss, and neonatal and infant mortality to short birth intervals.[3] For all age groups -- early

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[1] This, of course, assumes that other things are equal. One important exception to this assumption may be that the frequency of coition within marriage declines with age. (Kinsey, A.C., W. B. Pomeroy & C. E. Martin, Sexual Behavior in the Human Male, (Philadelphia: W.B. Saunders Co., 1948) p. 252 and Kinsey, Pomeroy, Martin & P.H. Gebhard Sexual Behavior in the Human Female, (Saunders, 1953), 348-54). This is largely a function of family size and duration of marriage and there is no evidence that the relationship holds for couples who are trying to conceive. See J. Barrett, "Fecundability and Coital Frequency," Pop. Stud., XXV (July 1971), 309-13.

[2] N.K. Namboodiri, "The Wife's Work Experience and Child Spacing," Milbank Memorial Fund Quarterly, XLII (July 1964), 65-77.

[3] Joe D. Wray, "Population Pressure on Families: Family Size and Child Spacing," in Rapid Population Growth: Consequences and Policy Implications, published for the National Academy of Sciences (Baltimore: The Johns Hopkins Press, 1971), pp. 403-61, especially 434-45.

fetal, late fetal, neonatal, infant, and childhood (through four years of age) -- death rates are highest in the shortest intervals. Fetal and neonatal deaths, which are due primarily to biological factors, are at their lowest rate when the interval from the preceding birth to the current conception is around two years (child spacing of about two years and nine months). The mortality rate rises sharply as shorter intervals are considered; it rises, but to much lower levels, as the interval increases from the optimum. Postneonatal (one month to one year) and early childhood mortality, affected primarily by environmental factors, declines monotonically with the length of the interval between births. The longer a child is born after his immediately preceding sib, the higher are the chances of his surviving to age five.[1]

One study, using British data, reported higher mortality for all maternal ages and social classes if the first birth occurred within one year of marriage. It was suggested that this was probably because many of these births were either premature or premaritally con ived. In the latter instance the mother may have received less pre-nata. medical care.

Wray found little evidence from developed countries on the relationship, if any, between the lengths of birth intervals and child morbidity. In poorer countries, a short birth interval i detrimental to the health of the earlier child. In these countries physical development during childhood was related to birth intervals in a manner similar to morbidity.[2]

The lowest incidence of prematurity was observed when the interval between conceptions was from three to six years in length. Women with longer intervals may have had physical disabilities associated with subfecundity which also increased the risk of a premature birth.[3]

The effect of child spacing on the mother's health is not at all clear. Wray notes that, although many writers assume that there is a

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[1]Ibid., pp. 435-40.

[2]Ibid., pp. 440-41, 443.

[3]Ibid., pp. 441-43.

"maternal depletion syndrome" associated with close spacing, there is little evidence supporting or refuting this assumption. A Johns Hopkins study did find the lowest rates of anemia in pregnancy with birth intervals of forty-eight months or longer. However, the incidence of hemorrhage, infection, and maternal mortality were not affected by the interval's length; and hypertensive toxemia was more common in pregnancies as the birth interval was longer. This may have resulted, at least in part, because the mother was older on average the longer the interval since her preceding pregnancy.[1]

In another review of the medical literature on the effects on children of child spacing,[2] Day reported that the interval most favorable to early fetal survival was one year, as measured from the end of the preceding pregnancy to the beginning of the pregnancy under consideration. A pregnancy interval (from preceding birth to current conception) of three or more years was most favorable for survival through childhood. Late fetal and neonatal deaths were described as being in an intermediate position between early fetal and postneonatal deaths, with biological factors influencing early pregnancy and environmental pressures playing an increasing role as time passes.[3]

Day reported a study that found prematurity less frequent if pregnancies were spaced two or more years apart but suggested that women who were careless about family planning (his description) might be careless also about all aspects of health. Another study found an association between low birth weight and intervals of less than two years and, to a lesser extent, of more than six years.[4]

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[1] Ibid., pp. 444-5.

[2] Richard L. Day, M.D., "Factors Influencing Offspring: Number of Children, Interval Between Pregnancies, and Age of Parents," American Journal of the Diseases of Children, CXIII (February 1967), 179-185.

[3] Ibid., pp. 179-80.

[4] Ibid., p. 183.

He concluded: "An interval of approximately two years between the end of one pregnancy and the beginning of another is associated with the lowest incidence of late fetal and neonatal mortality and prematurity. Survival through childhood is more likely if pregnancy intervals are three years or more."[1] (Such a pregnancy interval implies a birth interval of forty-five months or more.)

Links also have been found between child spacing and various aspects of the child's intelligence. A study of middle-class British families found that, within each family size, vocabulary test scores of children were relatively high when births were widely spaced and relatively low when births were close together. A study of general attainment by children in two-child families, standardized by sex, birth order, and sex of sib, found the highest scores at each age occurred with intervals of medium length (two to four years) as compared to intervals of less than two and of more than four years. (Only these three categories of intervals were used.) It was concluded that contact with adults was correlated with intelligence scores; the effect of the interval on scores increased as the children grew older.[2]

Twins represent the ultimate in close spacing of births. It is generally agreed that twins score about five points lower on IQ tests than singletons, a difference not accounted for by differences in experiences before and during birth but rather due to post-natal environment.[3] Twins who are raised alone, generally because of the co-twin's death, have IQ or verbal reasoning scores much higher than twins raised together; their scores are almost equal to those of singletons despite the fact that such twins have a lower birth weight than twins where both survive. The twin-

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[1] Ibid., p. 184.

[2] Wray, op. cit., pp. 443-44, 453.

[3] R. G. Record, Thomas McKeown, and J. H. Edwards, "An Investigation of the Difference in Measured Intelligence Between Twins and Single Births," Annals of Human Genetics, XXXIV (July 1970), 11-20.

singleton differences were not explained by differences in maternal age, birth order, birth weight, length of the gestation period or monozygosity ("identical" twins). The authors view their findings as supporting the theory that twin-co-twin contact reduces verbal communications with older sibs and with adults, concluding that the "handicapping of twins, reflected in their low verbal reasoning scores, is due to postnatal rather than prenatal influences."[1]

Vandenberg also noted that single-born children are consistently faster than twins in language development, IQ's, and reading scores.[2] However, he found that when twins were carefully matched with single born children who had one sibling near to them in age, the differences were smaller: twins still performed somewhat more poorly on verbal and quantitative parts of the tests, but they did about the same as singletons on spatial tests and scored better on perceptual tests.[3] It appears that children who are not born after a short birth interval are both healthier and more intelligent, as measured by standard tests.

Although knowledge about contraception has been widespread enough to make fertility decisions possible for many decades, economists have entered this field of research only recently. In 1960 Becker reported that a positive relation exists between family income and number of children when contraceptive knowledge is held constant.[4] Mincer docu-

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[1]*Ibid.*, p. 20.

[2]Steven G. Vandenberg, "The Nature and Nurture of Intelligence," in *Genetics*, David C. Glass, ed., (New York: Rockefeller University Press, 1968), pp. 3-58.

[3]*Ibid.*, pp. 28-31.

[4]Gary S. Becker, "An Economic Analysis of Fertility," in Universities-National Bureau Committee for Economic Research, Conference Series 11, *Demographic and Economic Change in Developed Countries*, (New York: Columbia University Press, 1960), 209-30.

mented income and substitution effects in completed fertility among working women and, using area averages, for all women.[1]

Deborah Freedman reported that women with an extensive work history (occurring primarily pre-maternally) tend to have almost as many children as those with little or no labor force experience but have the births later. This relationship may not hold true today when many more women work also after having children. She suggests that in this society family size is converging toward a commonly held norm and that the important fertility differential is the timing of that common number of births.[2] "This suggests that differential child spacing may replace differential fertility as a central interest in fertility research."[3]

Silver found that birth rates were sensitive to cyclical economic conditions;[4] this apparently is one of the earliest studies albeit an indirect one, of economic forces affecting the timing of births. Most of the work of the past five years has consisted of refinements and extensions of the approach introduced by Becker and Mincer. Although in some cases extremely complex models have been devised to explain fertility behavior,[5] none of these has explicitly confronted the question of whether economic factors affect the timing and spacing of births.

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[1]Jacob Mincer, "Market Prices, Opportunity Costs, and Income Effects," in Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld, Carl Christ, ed., (Stanford: Stanford University Press, 1963).

[2]Deborah Freedman, "The Relation of Economic Status to Fertility," Communication in American Economic Review, LIII (June 1963), 414-26.

[3]Ibid., p. 421.

[4]Morris Silver, "Births, Marriages and Business Cycles in the United States," Journal of Political Economy, LXXIII (June 1965), 237-55.

[5]See especially Robert J. Willis in Shultz, ed., op. cit.

Ben-Porath and Welch used the interval of time between births as a dependent variable in their analysis of East Pakistani fertility.[1] They were not, however, studying the timing and spacing of births *per se* but rather suggested "that the interval of time between births be taken as an indication of the weakness of the desire to have more children." This may be an acceptable approach for such a population that does little family planning. They found that the average birth interval for young women of 30.1 months, if the family had an equal number of boys and girls, was reduced by 0.6 months per each boy in excess of the number of girls and by 1.0 months per each "excess" girl.[2]

In a study of 717 households in the Western Area of Sierre Leone, Snyder regressed the average spacing between children and other variables on the logarithm of the number of surviving children.[3] He found that the regression coefficient of "spacing" was positive and highly significant. This runs counter to U.S. experience; for example, in the 1960 U.S. Census, at every education level, women with more children had shorter average intervals.[4]

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[1]Yoram Ben-Porath and Finis Welch, *Chance, Child Traits and Choice of Family Size*, RAND Report, R-1117-NIH/RF, (December 1972), pp.17-18.

[2]*Ibid.*, p. 21.

[3]Donald W. Snyder, "The Economic Theory of Fertility in a West African Context," paper presented at the Annual Meeting of the Western Economic Association, Claremont, California, August 1973.

[4]Average Interval in Months Between Births by Number of Children Ever Born (CEB) and Education of Wife

Education

CEB	0-7 yrs	8 yrs	HS 1-3	HS 4+	Coll 1-3	Coll 4+
2	54.3	55.3	56.0	51.8	47.5	42.5
3	46.6	46.5	47.7	45.0	42.0	38.2
4	39.9	39.7	40.5	38.5	36.2	33.3

Calculated from Table 25 "Average (mean) Number of Months Between Birth Dates of Successive Children -- White Women Ever Married 35 to 39 Years Old by Years of School Completed by Women and Number of Children Ever Born, For the United States: 1960," *Childspacing*, 1960 U.S. Census Subject Report, PC(2)-3B.

For over 20 percent of these observations, one or more birth dates was imputed rather than determined directly from answers to Census questions.

Because incomes are much lower in Sierra Leone than in the U.S., couples may be unable to finance large families in a short period of time. These differences may also be attributable to the fact that probably not more that thirty percent of the households in Snyder's sample practice contraception;[1] also, the data used in most of the studies cited above and those used in the research for this dissertation are for U.S. whites only.

Snyder also finds that the relation between income and number of children is negative for younger households and positive for older ones.[2] He suggests that this may be because higher-income families delay child births while they accumulate human and other capital and then make up for it in later years. This same phenomenon will be discussed later in this dissertation with respect to white families in the U.S.

Using data from the National Longitudinal Survey of Work Experience for women aged 30 to 44 in 1967, Mincer and Polachek note peripherally in their report on human capital investment by females that, as observed wage rates and the marginal price of time increase with education, highly educated mothers respond by spacing their children more closely (and by having fewer children.)[3] Thus total expenditures on children do not rise nearly as fast as the price of time, when education increases.

Until the past year there seems to have been no research at all by other economists in timing and spacing, and still none has attacked the problem explicitly. Therefore, in this dissertation, I have attempted to determine whether and how economic and other forces affect the decisions by white non-farm couples in the United States with respect to when they begin child bearing and how long they spend in the child-caring life-stage.

In Chapter II an economic model is developed which predicts that women with a rising price of time over the lifetime will start having

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[1] Snyder, p. 11.

[2] *Ibid.*, p. 29.

[3] Jacob Mincer and Solomon Polachek, "Family Investment in Human Capital: Earnings of Women," paper presented at Population Conference, II, Chicago, Illinois, June 1973; pp. 39-40.

their children sooner after finishing school. Those with a high price of time throughout their lifetimes will have their children closer together. The model also predicts that families whose income receipts rise sharply, at least in the early years after the husband enters the labor force, will postpone their first birth and that families with a high lifetime income will have their children farther apart.

The data and variables used to test the model's hypotheses are described in Chapter III. Chapters IV and V describe, respectively, the empirical tests of the timing and the spacing hypotheses. The results of an investigation of some relationships between the timing of the various demographic events and labor force participation are reported in Chapter VI. Chapter VII summarizes the theoretical analysis and the empirical results, which generally support the timing and spacing hypotheses.

CHAPTER II

THEORETICAL ANALYSIS

A. General Framework

This model assumes that couples receive utility from household production and consumption activities that may be divided into those that are child-related and all others. These activities require as inputs the time of one or both persons, purchased market goods and services, and -- for child-related activities -- own children.[1] Parents desire children because of the "child services" they can produce, and couples marry in order to have children.[2]

I assume that each couple attempts to maximize the utility it receives from these various activities and that the utility received by each partner to a marriage while he or she is still single is considered none-the-less as part of the life-time utility to be maximized. The only difference is that there can be no utility from child-related activities before marriage. Thus, the couple's total life-time utility is a function of the levels of each member's non-child-related activities before marriage and of both their child-related and their other activities after marriage. This utility maximization is constrained by the amount of time and goods the couple can put into their household activities, and this depends in turn on the amount of non-labor income available

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[1]This approach was derived from Gary S. Becker, "A Theory of the Allocation of Time," Economic Journal, LXXV (September 1965), 493-517; Kelvin J. Lancaster, "A New Approach to Consumer Theory," Journal of Political Economy, LXXIV (April 1966), 132-57; and Jacob Mincer, "Labor Force Participation of Married Women: A Study of Labor Supply," in National Bureau of Economic Research Special Conference Series, Vol. 14, Aspects of Labor Economics, (Princeton, N.J.: Princeton University Press, 1962), 63-105.

[2]Gary S. Becker, "A Theory of Marriage: Part I," Journal of Political Economy, LXXXI (July/August 1973), 813-46, suggests that the primary explanation for the existence of marriages is for the production and raising of children: p. 818.

to the couple and on their market wage rates and their productivity in household activities.[1]

The amount of time that is available to a husband and a wife in each time period is fixed; the length of the life-time is taken to be exogenous. The wife allocates her time between household activities and labor market activities;[2] the husband's time is used only in market activities. (See footnote 4, page 24). Time spent in the market either yields an immediate pay-off in terms of current money income which enables the household to purchase market goods to be combined with the home time of the wife in child-related and other activities or it may be used to invest in the worker's own stock of human capital.[3] Acquisition of human capital leads to higher money wage rates in the future.

The model also assumes that money, like time, cannot be shifted to an earlier period. That is, a couple's cumulative consumption cannot exceed cumulative income at any given point in time, for they cannot borrow against future earnings to finance the goods inputs for current household activities. Apparently private individuals usually are able to borrow only to finance the purchase of durable goods,[4] (in which case the

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[1]Many of the assumptions made here were used by Willis in a more mathematical model of completed fertility. See Robert J. Willis, "The Economic Determinants of Fertility Behavior," (unpublished Ph.D. dissertation, University of Washington, 1971). I found that expressing this model in mathematical notation added little to the analysis.

[2]She may allocate all of her time to household activities, but not all to market activities.

[3]An adult who is still in school may be considered as devoting all of his or her market time to investment.

[4]F. Thomas Juster of the University of Michigan Survey Research Center, formerly with the National Bureau of Economic Research, advised me in a private interview at NBER, May 1973, that, based on his Consumer Expenditure Surveys and other studies, it is his impression that the ability of young people to borrow to finance consumption in excess of current income is very unusual; he noted the only exceptions as occurring occasionally among young doctors.

good, rather than potential earnings, serves as collateral.) But, the acquisition of a durable raises the household's consumption level not by the value of the durable but rather by the value of the flow of services in that period from the asset. I am assuming that the value of the flow of services from durables in each period approximately equals the marginal costs of the asset in that period. Thus, consumption in any period -- especially in the early adult years when little savings probably would have been accumulated -- is limited to the income received in that period. (Some young couples do receive financial help from their parents, usually without an explicit repayment obligation; this is equivalent to non-labor income received in the period of the transfer.)

Fertility control costs and inefficiencies are not included formally in the model; this is probably the modification that should be introduced next as I pursue this topic in the future. Since there is probably a negative correlation between education and the cost of contraception -- at least of that part of costs attributable to the search for information -- this may alter slightly the interpretation of the empirical effect of differences in education. The importance of this possible shortcoming in the model should not be over-estimated: in recent decades in the U.S. probably nearly all married women knew of the existence of methods of contraception; observed differences in the effectiveness of contraceptive use by education of the wife may reflect in large part differing levels of motivation -- e.g., women with low levels of education may view "accidental" children as less costly than do more educated women.[1]

Within this household production/consumption framework, I have analyzed the price or substitution effects of variations in the relative price of child-related activities and the income effects on the timing and spacing of child births. The substitution effects may be sub-divided

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[1]Work by economists in the theory of fertility control is still in its very early stages. For examples of attempts to broach the problem, see Robert T. Michael and Robert J. Willis, "The 'Imperfect Contraceptive' Population: An Economic Analysis," paper presented at the Annual Meeting of the Population Association of American, New Orleans, April 1973; and Robert T. Michael, "Education and the Derived Demand for Children," in T. W. Schultz, ed., <u>op. cit</u>.

into the effects of the average level and of the pattern over time of the price of inputs; the income effects consist of the effect of the lifetime level of income or the permanent income effect and the effect of the timing of income receipts -- i.e., the pattern of (annual) income over the life cycle. Discussion of and predictions about the substitution effects are presented in Section B; the income effects are discussed in Section C of this chapter. Although I have presented the general framework in terms of the usual utility maximization approach, the reader may well bear in mind while reading the rest of this chapter that this approach has a dual: cost minimization. Often it will be more convenient to think of the timing and spacing decisions as responses to the problem of achieving a chosen level of activities at a minimum cost or of trading off some part of child-related activities through revising the timing and spacing of births from what they would be in a costless, unconstrained world.

B. Substitution Effects

The price or substitution effect refers to the influence on the timing and spacing decisions of differences across couples and, for a couple, across time in the relative prices or costs of child-related and of other activities. These differences arise because the two types of activities utilize different input mixes of time and of purchased goods and services and because the price of time varies across individuals and may vary for an individual over the lifetime.

My analysis of the substitution effect on the timing and spacing of births follows as much as possible the approaches used in economic analyses of completed fertility (i.e., number of children born).[1] We assume that child-related activities are more time-intensive than other activities. That is, for any household at any point in time, the ratio of the value of time inputs to the value of goods inputs is

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[1]For a most complete exposition of the current state of the economic model of fertility and its underlying assumptions, see Willis' dissertation, 1971.

higher in child-related activities than in other activities.[1] Therefore, the opportunity cost of child-related activities in terms of other activities foregone (or the ratio of the shadow prices of child-related to other activities) is an increasing function of P_t.[2]

We also assume that only the price of time varies across households or over time and that the prices of the purchased market goods and services used in all types of household production/consumption activities are the same to all households. Comparisons of completed fertility for different cohorts apparently also have assumed implicitly that these prices do not change over time.[3] In an analysis, such as this, of fertility over a span of time it seems worthwhile to acknowledge this assumption explicitly.

The price of time of household members that enters household activities, does vary across households and, within households, over time. In this model (following Willis, 1971) I make the simplifying assumption that all of the time inputs in household activities are provided by the wife.[4] Then variations in the price of the wife's time (P_t) result in

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[1]The time-goods mix for each type of activity will vary with the price of time; as P_t rises, more goods-intensive methods of household production/consumption will be used. The assumption here is that, at each level of P_t, child-related activities will be more time-intensive than other activities.

[2]See Becker, Allocation of Time.

[3]This problem might be avoided if income data from different years were adjusted for current prices levels.

[4]Leibowitz' data show that fathers provided less thatn ten persent of the time devoted to physical care of children and less than twenty persent of the time inputs to all types of child care activities; their time contributions amount to about one-eighth of the total time spent in child care, meal preparation, and laundry work. (Calculated from Arleen Leibowitz, "Women's Allocated Time to Market and Non-Market Activities: Differences by Education," (unpublished Ph.D. dissertation, Columbia University, New York, 1972), p. 116. Although husbands obviously must spend some time at household activities to receive utility from them, this assumption is not too unrealistic. Equivalently, one might assume that three-way division of women's time and two-way division of men's time utilized by Mincer in Aspects. Then, if husbands spend the same amount of time in "leisure" activities at each stage of their lives regardless of the timing of births -- a reasonable assumption given their generally fulltime labor force participation and the fact that most males work an approximately standard work week -- then this leads to the same

differences in the relative costs of child-related and other activities across households and, perhaps, over time.

If the wife works the value of her time in household activities (P_t) must equal her market wage rate (plus the value of on-the-job investments.)[1] If a working woman's wage rate is not known, it is assumed that wage rates are a positive function of education.[2]

If the wife does not work, P_t -- the price of her time in household production/consumption activities -- must exceed her potential market wage rate. P_t depends on the quantity of goods she has as inputs to these activities and on her efficiency in household production.[3] The former effect means that the price of her time will be an increasing function of her husband's (and non-labor) income. The latter effect probably implies a rising P_t with education.[4] The expectation of a positive relation between P_t and education for non-working wives is

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conclusions as the assumption that wives supply all of the time inputs. It is the wife who adjusts her hours of work when children are born, probably leaving the labor force entirely, at least for five or ten years. James P. Smith, "The Life Cycle Allocation of Time in a Family Context," (unpublished Ph.D. dissertation, University of Chicago, 1972), found that increasing the number of young children in the household increased the husband's hours of work and greatly reduced the wife's; the effect of the presence of older children on time allocation was less clear.

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[1]According to economic theory, if a person is allocating his time optimally -- i.e., in a manner that will maximize his utility, the marginal value of his time in all activities -- including labor market activities -- must be the same. If a person is in the labor force, the return to his time spent in labor market activities, his wage rate plus the present value of the increase in future earnings resulting from any human capital investment being undertaken, must equal the value of the marginal unit of time spent in each kind of household activity (P_t).

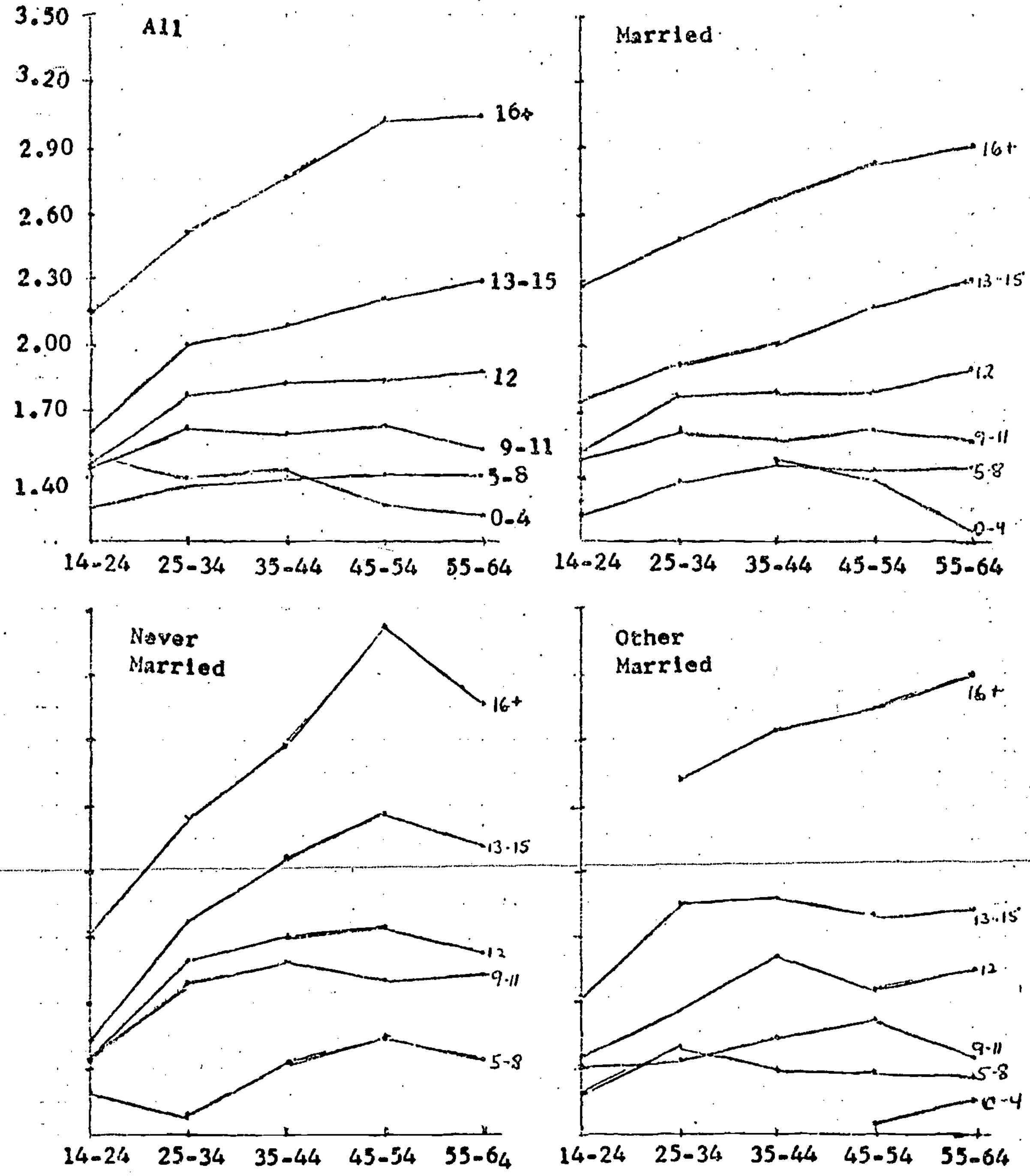
[2]This is known to be true for average values of aggregated data; see J. Mincer and S. Polachek, op. cit. They found the differences by education to be even greater for the "capacity wage." See also Figure 1.

[3]And, on the endogenous variable, the activity mix in the household.

[4]Robert T. Michael, The Effect of Education on Efficiency in Consumption, (New York: National Bureau of Economic Research Occasional Paper 116, 1972), finds some support for this.

Figure 1

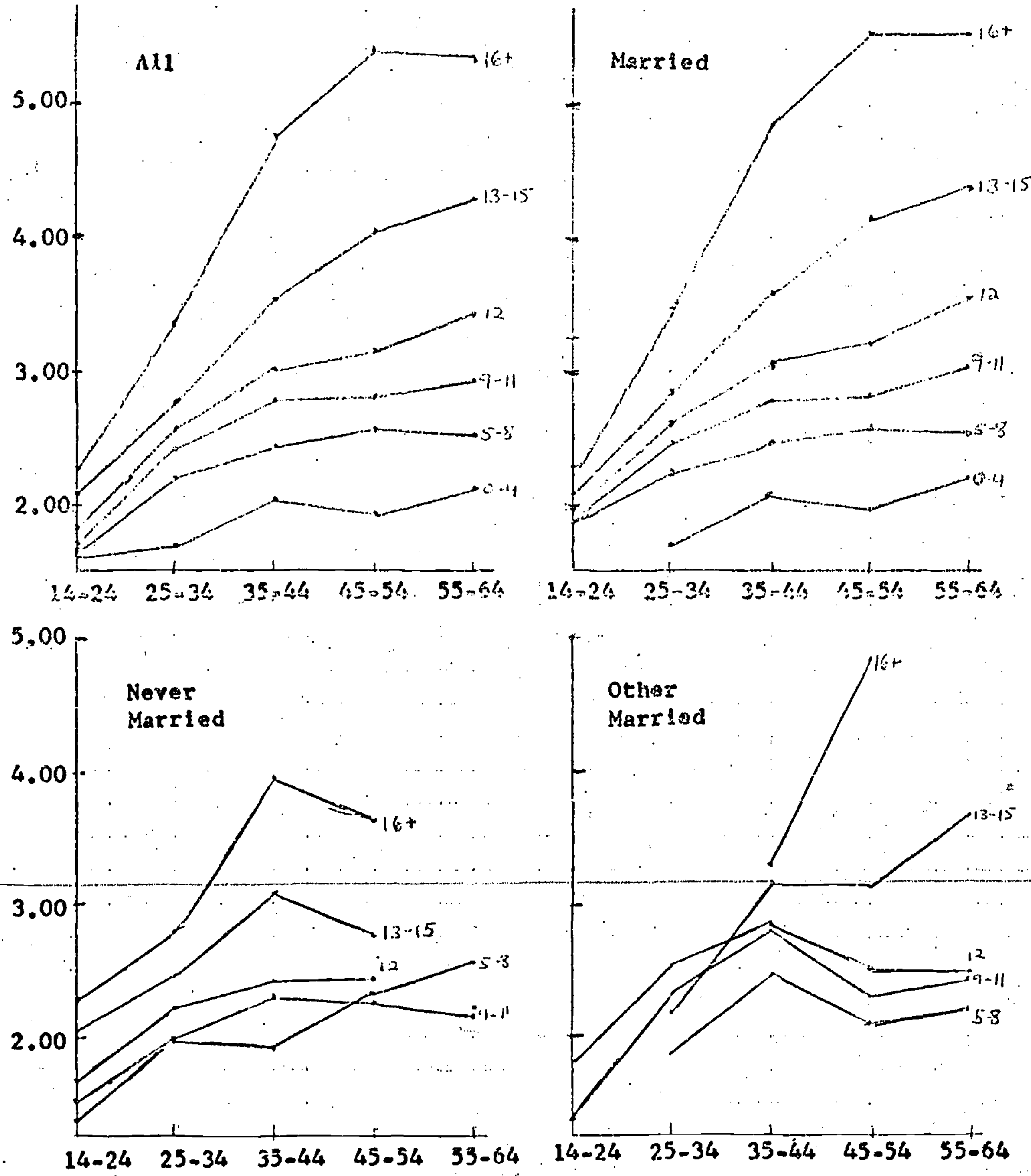
Average hourly earnings in 1959 for all non-farm, white employed females, by age, education, and marital status



Drawn from data provided by Victor Fuchs, calculated from 1960 1:1000 U.S. Census sample; data points eliminated if ten or fewer observations.

Figure 2

Average hourly earnings in 1959 for all non-farm, white employed males, by age, education and marital status



Data source: See Figure 1; data points eliminated if fewer than twenty observations.

reinforced by the fact that, on average, women with more education have a higher potential wage (W_e) than women with less education (W_n). Because they are not in the labor force the educated women's $P_t > W_e > W_n$; for the non-labor force woman who is not educated, $P_t > W_n$, but in many instances $P_t < W_e$. We may conclude that child-related activities, being time-intensive, are more costly to more educated women and, to the extent that non-working women's P_t is affected by their husband's earnings, are somewhat more costly to women with a high family income.

Not only is the general level of wage rates, earnings, and income positively correlated with educational attainment, but also the slope of the age- or experience-earnings profile is greater for more educated persons,[1] suggesting that they do more post-school investing. Human capital theory also predicts that a person will invest more the more years of labor force participation remaining before him.[2] Given the greater labor force participation of women with more education,[3] one expects to find more investment by these women and a steeper earnings path (rising P_t) than for the less educated women. Over her life time, a woman with a relatively high level of education will have a high and rising P_t; this is likely to be true even if she is not in the labor force, for highly educated women marry highly educated men, and P_t for women not in the labor force is related positively to her husband's income.

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[1]See charts 2a and 2b in J. Mincer, Schooling, Experience and Earnings, (NBER, in press, 1973), for males; for females, see Victor Fuchs, Differentials in Hourly Earnings by Region and City Size, 1959, (New York: NBER Occasional Paper 101, 1967). See also Figures 1 and 2, this paper. Leibowitz regressed time since school (=Age-Education-6) and other variables on log wages for females and found larger coefficients moving from education 1-8 to 9-12 to 13-18 years. This would result in even greater slope differences if wages rather than the log of wages were considered. Leibowitz' dissertation, Chapter III.

[2]Gary S. Becker, Human Capital (New York: NBER, 1964); and Becker, Human Capital and the Personal Distribution of Income, Woytinsky Lecture, University of Michigan, 1967.

[3]The fact of their higher level of education may in itself indicate greater labor force commitment.

The pattern of investments in human capital by women is probably not as straightforward as the monotonically declining path of investments usually posited for males. Women may invest in on-the-job training before and/or after the childbearing and rearing period.[1] However, given Mincer and Polachek's findings that human capital depreciates during the child caring period and that depreciation rates are greater the larger the stock of capital,[2] there are strong economic incentives to postpone some human capital formation from the pre-maternal period to the period after the last birth.[3] Moreover, human capital theory predicts that an employer will bear a greater share of the costs of capital acquisition the greater the probability that the employee will remain with his firm and the greater the proportion of the capital that is firm-specific. Since greater job continuity can be expected after the period of child caring than before, the employer should be more willing to help finance human capital investment then; this should reinforce the tendency for women who will invest substantially in themselves to do so after the period of child caring. Also, the highly educated woman is more likely than the less-educated woman to postpone investment until after she has her children in order to shift more of the cost of the investment to the employer, if persons with more skills in total also have more specific skills (as suggested by Becker, 1964, op. cit.). Since depreciation is greater the longer the skills are not used and greater the higher a woman's skill level, this reinforces the assertion above that woman with more education face higher costs for time-intensive activities, not only because of earnings or opportunities foregone but because they have a greater amount of market skills which depreciate with nonuse.

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[1]Mincer and Polachek, op. cit., found that labor force participation was intermittent at best until the youngest child was several years old. Labor force participation was more continuous after the last birth. Probably little investment occurs during the child caring period.

[2]Ibid., pp. 19-20.

[3]Ibid., p. 18 presents evidence tending to support this hypothesis.

From this exposition of the various forms the price or substitution effect can take, it should be clear that for each couple the various timing and spacing patterns have different costs of child-related activities associated with them. Spacing a given number of births closer together will reduce the cost of children (as would reducing the number of births); the reduction in costs of closer spacing would be greater the higher is P_t. Having children early in the life cycle, when P_t is usually lower, would reduce the cost of child-related activities; the reduction would be more pronounced the steeper the rise in P_t over time. Therefore, this model hypothesizes a substitution effect that produces a stronger incentive to have children close together if P_t is high and to have children earlier after completing school[1] if P_t is rising. The higher a woman's educational level and, to a lesser extent, the higher her husband's income if she is not a labor force participant, the sooner and closer together she is expected to have children. Also, if labor force participation is positively correlated with investment in human capital, women with greater participation will have a rising P_t and should have their first children sooner after school.[2]

These hypotheses are reinforced by considerations of depreciation: Women with more education are more likely to plan to re-enter the labor force after having children so that considerations of depreciations are of more concern to them. These women are also subject to the highest rates of depreciation. If the highly educated woman postpones investment in her market skills until after the period of child caring, she suffers less depreciation during that period and is more likely to get her employer, post-children, to bear some of the investment costs. This postponement of investment is also economically rational because women do not know with certainty whether they will eventually re-enter the labor force. The more of her post-school investment a woman postpones until

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[1]The level of schooling completed is assumed to be exogenous to this model. Having children while still in school would be very undesirable, according to this model, if one assumes that schooling, like child-related activities, is time-intensive.

[2]This is confounded by the fact that, at least among women still of childbearing age, a large number of years in the labor force may indicate lengthy work experience pre-maternally and a postponed first birth, for many of these women have not begun working post-maternally or have begun only recently.

after the child caring stage, the less time she is likely to work pre-maternally; for her earnings in that early period, relative to later, will be much lower than for women who do little post-school investing throughout their working years. Thus the predicted substitution effect, that women with more education (higher P_t) will space births closer together, is strengthened by the desire to reduce depreciation, which occurs at a higher rate as education is greater. And the substitution effect providing an incentive for more educated (steeper P_t) women to have children sooner after leaving school is strengthened by their presumed greater career commitment and concomitant greater acquisition of market skills; for it is rational not to acquire these skills until the skills will be used (to avoid depreciation and to induce employer-investment). This should result in less work experience before having children; a more continuous labor force participation over the life-time can occur if the woman postpones her career until after having and raising her children.

C. Income Effects

Almost certainly the income elasticity for child-related activities and for children is positive; couples with higher incomes will demand more child-related activities than those with lower incomes. They also will demand greater child-inputs to these activities, but child-inputs are not synonymous with number of children. The amount of child-inputs available to a couple depends both on the number of children, or quantity, and on the quality of the children.[1] Although probably no one definition of child quality would satisfy everyone, perhaps the two most important aspects of quality are the child's health, including at the extreme whether or not he survives at all, and his intelligence or attainments and accomplishments. The literature reviewed in Chapter I

[1]Nearly all recent studies of fertility by economists acknowledge the two dimensions of the quantity of children produced and consumed. In T.W. Schultz, ed., op. cit., Willis defines $C=NQ$, p. S21; DeTray states that $C=C(N,Q)$, p. S72; Michael defines $C=\alpha(N)$ with $Q=\emptyset(\alpha)$, p. S130; Ben-Porath equates C with $\bar{Q}N$, p. S207; and Becker and Lewis specify a utility function $U=U(n,q,y)$ whose arguments are number of children, their quality, and the rate of consumption of all other commodities, p. S280.

indicates that the timing of the first birth has little or no effect on child quality, (except perhaps that a very late first birth might preclude wide enough intervals between later births.) It was also quite clear, however, that longer intervals between births, at least up to a maximum of about six years, enhance child survival, health, intelligence, and verbal ability.[1] Thus child quality would be maximized by having moderately long intervals between births, with the timing of the first birth of only minor consequence.[2]

The quantity (N) of children obviously can be increased by having more children, but quantity also has a time dimension: During how much of their lifetime does a couple have children? It is not clear what spacing of a given number of births maximizes the quantity of child-inputs. Two obvious and extreme solutions would be to have all children as soon as possible, maximizing the child-years experienced during the parents' lifetimes, or to have the first child as early as possible and then space widely, to minimize the number of years without children in the home -- i.e., to minimize the "empty nest" period. Whether one of these schemes or some intermediate course were chosen, it appears that maximizing N requires an early first birth but that the ideal subsequent spacing is not clear. Considering

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[1] Supra, pp. 11-15.

[2] This is not inconsistent with Becker's definition of quality as being the time and goods devoted to a child: Gary S. Becker, "An Economic Analysis of Fertility," in Demographic and Economic Change in Developed Countries, Universities-National Bureau Conference Series 11, (New York: Columbia University Press, 1960), pp. 209-30. Of course, closer spacing does not necessarily imply that less time is devoted to each child, for the mother may spend a larger proportion of her time in child rearing to offset the close spacing. This time may, however, be of a lower quality. For a discussion of the amount of time devoted to child care by women of various education levels, see Arleen Leibowitz, "Women's Allocated Time to Market and Non-Market Activities: Differences by Education," (unpublished Ph.D. dissertation, Columbia University, New York, 1972); for a discussion of the effects of time spent with children, see Leibowitz, "Home Investments in Children," paper presented at NBER-Population Council Conference on "Marriage, Family Human Capital, and Fertility," Chicago, June 1973.

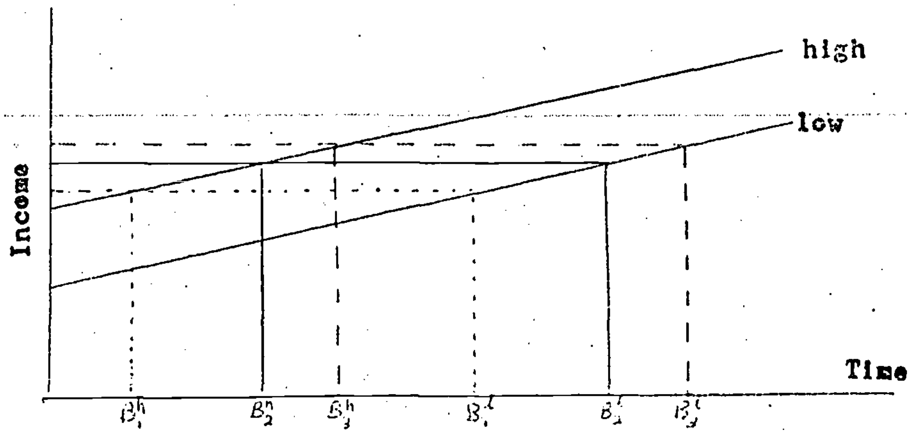
both the quantity and the quality aspects of children, I assume that child-inputs and child-related activities are maximized by having the first birth soon after leaving school and having subsequent births at moderately wide intervals, thus maximizing the utility received from a given number of children.[1]

As was emphasized in the discussion of the substitution effects, in Section B, couples may differ not only with respect to the average level of income during the lifetime (permanent income) but also with respect to the timing of those income receipts. The level and pattern of income receipts determine the earliest point in time that a couple can afford to have a birth of a given order -- when their current money income is adequate to purchase the market goods and services necessary to support that child, preceding children, and a minimal standard of living.

To determine the effect of the level of income, apart from the timing of income receipts, consider two families with different levels of life-time (or average annual) incomes but similar patterns of income receipts (Figure 3).[2] B_i^h and B_i^1 refer to the i-th birth to the high and

Figure 3

Predicted timing and spacing of births for couple with different levels of income



[1]Wide spacing means that each stage of childhood is experienced separately with each child, so that parents can enjoy each type of child-related activity over a longer period of time as each successive child passes through infancy, early childhood, etc.

[2]The income profiles are drawn as straight lines for simplicity; the conclusions apply equally to concave profiles. It is irrelevant whether the vertical scale is arithmetic or geometric (log income). If the couples enter the labor force at the same age, the profiles may be either age- or experience-income profiles. If they do not, then these are experience profiles if one is predicting the length of time from completing school to various events and age profiles if one is predicting age at various events (i.e., births).

to the low income families respectively. The high income family will be able to afford the first birth sooner, but no differences in spacing are predicted.[1]

Lower income couples, on average, demand less of other activities, but it takes them longer to reach any given level of consumption of other activities. It is not clear whether these two offsetting forces would result in B_1 occurring sooner for low than high income familes; this probably depends on the relative income elasticities of the two types of activities.[2] But in a discussion only of the basic level of other activities that is required by families of all income levels before they can afford children, the prediction is that families with higher income can (and will) have their first children sooner.

The diagram suggests that the level of income does not affect the spacing of births subsequent to B_1. It does not, however, take account of the possibility that higher income couples may be able to save more or have easier access to capital markets than lower income couples; if, for example, higher income facilitates saving for college expenses during a child's early years, high income couples can have children closer together than can low income couples. On the other hand, low income couples may see no need to save for college expenses. Thus, in terms of paying for market goods and services, it would appear that couples with higher levels of income can afford to have their first child sooner and may be better able to finance short birth intervals.

The discussion based on Figure 3 does not, however, take account of the total cost of children. In fact, short birth intervals probably

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[1] I assume that couples do not save, at least in the early years of marriage.

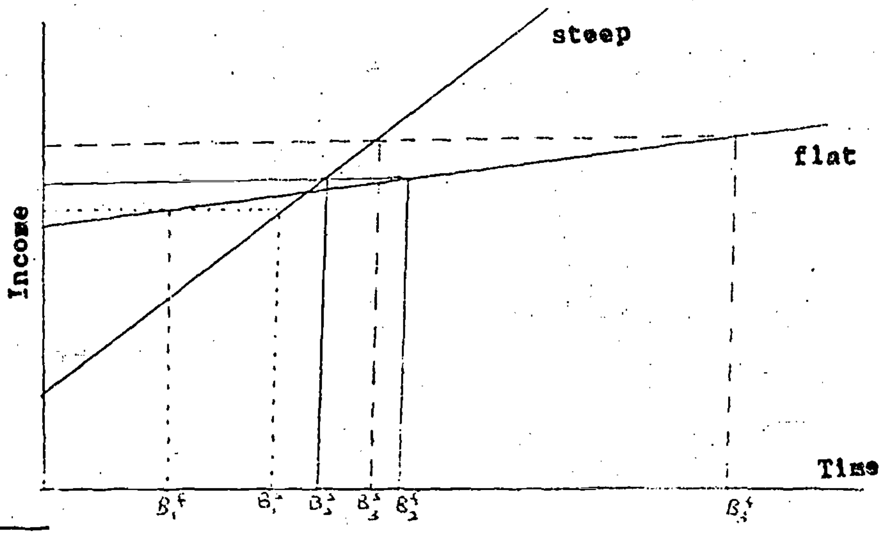
[2] Little is known about the relative income elasticities, but very preliminary estimates of the money expenditures on children have been undertaken by Thomas J. Espenshade, "Estimating the Cost of Children and Some Results from Urban United States," mimeo, International Population and Urban Research, University of California, Berkeley, 1972. If the work is successful, the results could be combined with estimates of the opportunity costs of children at different income levels to gain evidence as to whether the income elasticity of child-related activities, narrowly defined, is greater or less than one.

reduce the total cost of a given number of children, aside from concerns for the adequacy of current income. Having births closer together will, most importantly, reduce the cost of the total time inputs to child care. But, it will also lower the costs of purchased goods and services, as one baby-sitter can care for several children, nursery schools often charge less for a second child from the same family, it is easier to make use of hand-me-downs, the mother can chauffeur two children to the same activity as easily as she can one, and so on. The income effect probably works to enable wives in high income families to space births as far apart as desired, with no concern for the higher costs, while low income families employ closer spacing of births in order to reduce direct costs of children and to enable the wife to return to work sooner to supplement family income. More women in families with otherwise low incomes work than in families with high husband's and other income.[1]

To determine the effect of income slope, or the timing of income receipts, on the timing and spacing of births that is financially feasible, separately from the effect of the level of the lifetime income, consider Figure 4:

Figure 4

Predicted timing and spacing of births for couples with different timing of income receipts

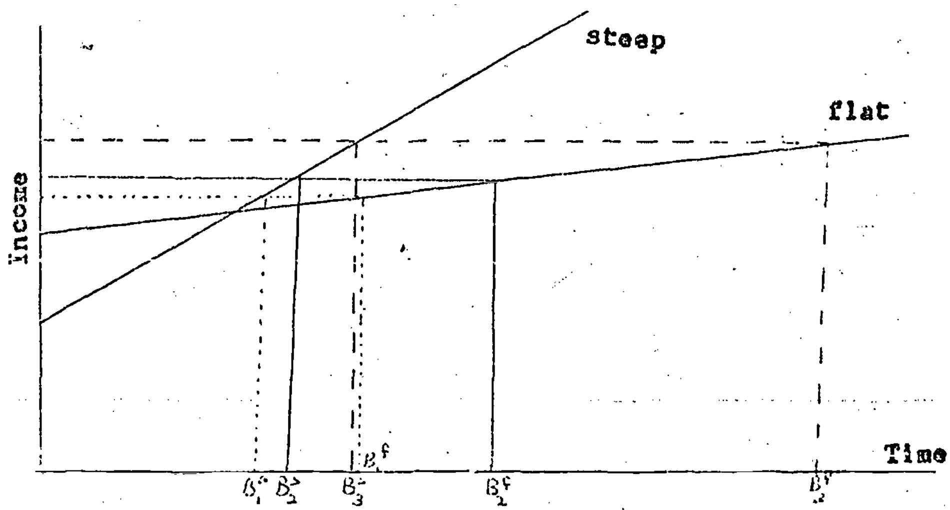


[1]J. Mincer, "Labor Force Participation of Married Women," in Aspects of Labor Economics, Universities-National Bureau Conference Series 14 (Princeton, N.J.: Princeton University Press, 1962), pp. 63-97.

The two income paths are intended to represent the same level of lifetime income. The couple with the flatter income path can afford the first birth (B_1^f) sooner but they must space subsequent births farther apart, as it takes them longer to reach the required higher level of income to be able to afford the next child. The total interval can be shorter for the couple with a steeply rising income path, no matter what the requisite income level for B_1 or for subsequent births. However, if the couples cannot afford B_1 until after the "point of over-taking," when the two current incomes are equal (Figure 4a), although the total

Figure 4a

Predicted timing and spacing with different timing of income receipts when the point of overtaking precedes B_1



interval from the first (B_1) to last (B_n) birth still can be shorter for couples with steeply-rising income paths, in this case the first birth can be afforded sooner by the couple with a steep income profile. Since the point of over-taking is about seven to nine years after entering the labor force[1] and since most first births occur before that time (but just barely),[2] the timing effect of the slope of income probably

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[1]J. Mincer, Schooling, Experience, ane Earnings, op. cit., Table 1.

[2]The average age at B_1 of White Protestant fathers of two or more children (1965 National Fertility Study, see below) was 26.56 years; the average education level, 11.57 years. Then, following Mincer, ibid (and G. Hanoch), the average age at labor force entry would be 19.57, indicating that B_1 occurs on the average seven years after a man enters the labor force.

will be to enable earlier first births the flatter the slope and definitely to permit closer spacing the steeper the slope.

The fact that couples with rising incomes, given permanent income, can finance closer spacing of births does not mean that they will choose to do so. The diagram and exposition have considered only when a couple can afford to have each birth. As stated earlier, the total cost of a given number of children is higher the longer the interval between the first and last births but wider intervals probably increase child-quality and the utility parents receive from child-related activities. Since I am considering here couples with identical levels of permanent income, they are expected to demand identical levels of child-related activities. Therefore, although the restriction on how soon they can begin having children is a real constraint, the constraint on how close together the births can be spaced will be irrelevant if couples do not indeed want closely spaced births. Thus couples with the same permanent incomes might even all choose the same total interval irrespective of the steepness of each couple's income profile; or, only those couples with the flattest profiles might be forced to have a total birth interval that was longer than the ideal. However, couples with steeply rising incomes might have somewhat shorter birth intervals than they would choose if income level and slope placed no constraints on their behavior because they have had to postpone B_1 and may wish to "catch up." The constraint of the slope of the income profile acts to delay the first birth if the profile rises steeply over time and perhaps to produce a shorter total interval.

Although in the case of similar slope but different level of income the results of contemplating the effects of the cumulative life-time income up to any point in time are ambiguous because of the different levels of other activities desired, in the case of equal income but different slopes it may seem reasonable to modify conclusions drawn from the simple Figures 4 and 4a. Specifically, one might argue that in the case (Figure 4a) where it appears that B_1 occurs earlier for families with a steep profile than for flat profile families, the delay by the families with flat profiles may be less than that diagrammed if cumulative consumption to B_1 is relevant or if saving can occur. Since the flat profile is above the steep profile throughout most of the pre-B_1 period, by the time B_1^s occurs the couple with the flat profile may easily have a higher cumulative income and savings and may not need to wait until the time when their current income equals that of the other couple at the time of B_1^s. Thus even if B_1 occurs after the point of over-taking, the couple with the flat profile may still be able to have B_1 sooner, or very little later; while if B_1 occurs before the point of over-taking the flat-profile family definitely can have B_1 sooner.

Incidentally, this observation that the income effect of a steep profile of income is to postpone the first birth may help explain why highly educated women, who are expected to invest heavily in post-school acquisition of market skills and who should do this investing after the period of child caring to minimize depreciation, do work before having their first children. Ignoring the effects of a positive discount rate on postponing earnings (and expenditures), women can maximize their earnings if they have their children immediately post-school and then concentrate their entire labor force experience into one continuous, post-maternal period. This minimizes depreciation and produces the time-intensive activities when P_t is lowest. Women, especially highly educated women, invest less pre-maternally than post-maternally, suggesting that they have accurately analyzed the situation. Presumably, the reason that they do work before B_1 is that most women with high education are married to men with high levels of education, who are likely to have the steepest profiles, due to their extensive post-school investments in human capital. Since the effect of the slope of the income path leads to postponement of the first birth, the wife may as well work. Her working also has the desirable effect of smoothing the flow of family income receipts (in the period up until she re-enters the labor force post-maternally).

In summary, if the income level is high the couple can afford to have B_1 sooner and to have the moderately long subsequent birth intervals that are probably viewed by most couples as maximizing child-quality and the consumption of child-related activities. This produces a longer total interval from B_1 to B_n given the number of children. If the slope of the income path is steep, given the level of premanent income, B_1 will have to be postponed relative to families with a flatter income path over time; once childbearing begins, the couple with a steeply rising income can have subsequent children closer together but will not want to unless either (a) most couples, with all but the steepest profiles, are foreclosed from choosing the birth interval lengths which maximize child-quality or (b) the postponement of B_1 produces in them a desire to compress birth intervals lest B_n occur when the mother is "too old." That is, couples with steeply rising incomes probably do have somewhat shorter birth intervals to the extent that the income slope constraint actually does impinge on the spacing desires of couples with the same level of income but a flatter slope and to the extent that they have a target age for ending childbearing which might not be met because they had B_1 later than the couples whose incomes change little as they grow older.

CHAPTER III

DATA AND VARIABLES

A. 1965 National Fertility Study

Two sources of data were used to test empirically the hypotheses about the timing and spacing of births. The 1965 National Fertility Study conducted by the Office of Population Research at Princeton University, which is described below, has the most complete fertility information of a national survey that I could find, but the economic data are not extensive and are of questionable accuracy. The 1967 National Longitudinal Survey of Work Experience of Women 30-44 under the direction of Professor Herbert Parnes of Ohio State University, which is described in Section B of this chapter, does not include as much information on the timing, spacing, and number of births, but its information on income and labor force activity is more detailed and appears to be more accurate.

The National Fertility Study (NFS) was a national probability sample of 5617 women who were currently married and living with their husbands at the time of the interview late in 1965; the women were aged eighteen to fifty-four, living in the United States, and able to participate in an English-language interview.[1] Women over forty-four were half-sampled; Negroes were doubled-sampled but are excluded from my empirical analyses. I focused on white, non-Catholic[2] mothers from this sample who

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[1] This data set is described in detail in Norman Ryder and Charles Westoff, Reproduction in the United States: 1965, (Princeton, N.J.: Princeton University Press, 1971).

[2] The religion distinction was made because I found statistically significant differences between Catholics and non-Catholics in the way certain independent variables -- in particular, education -- affected timing and spacing and because I assume basic differences between the two groups with respect to their taste for child-related activities and the (psychic) cost of contraception. Relevant to the former point, Ryder and Westoff found that unlike Protestants, Catholic women in this sample who had attended college had fertility behavior more like that of Catholics with low education than like those with moderate amounts of education. (See table below). They attribute this to a very high level of religiosity among the college level Catholic women, most of whom attended

had been married only once, whose husbands had been married only once, who did not live on a farm at the time of the interview, and who were old enough to have almost certainly completed childbearing -- namely those aged forty to fifty-four.[1] Occasionally comparisons were made between this primary subset of the NFS and other subsets, such as Catholics, mothers of two or more children, women who had been married one or more times, or the like; but unless otherwise specified all results from the NFS refer to the 585 observations in the primary subset.

The following timing and spacing variables were measured in months: wife's and husband's ages at the first birth (W Age B_1 and H Age B_1, respectively), their ages at the last birth (W Age B_n and H Age B_n), their ages when they married (W Age Mar and H Age Mar), the difference in their ages (Age Diff), and the lengths of the various birth intervals -- the total interval from B_1 to B_n (Total Int), the interval from marriage to B_1 (1st Int), and the average interval between successive births if there were two or more births (Ave Int). Age Diff

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colleges with a religious affiliation.

Number of Children Expected - Wives Aged 30-39
(number of observations in parentheses)

Education	Protestant	Catholic	Excess Catholic over Protestant
0-8	4.0 (102)	4.9 (53)	.96
9-11	3.4 (186)	3.8 (83)	.42
12	2.9 (455)	3.9 (215)	1.04
13-15	2.8 (110)	3.6 (49)	.80
16	2.7 (88)	5.0 (24)	2.32
All	3.1 (941)	4.0 (424)	.98

From Ryder and Westoff, Reproduction in the United States: 1965, (Princeton, N.J.: Princeton University Press, 1971), pp. 74-76.

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[1]I also eliminated observations if the woman had a multiple birth, if the first birth was pre-marital, if the family received welfare, and the one observation not reporting the husband's education. The income of families receiving welfare could not be determined; the amount of welfare received was not reported, and one cannot tell whether the reported income figure includes or excludes that amount. Its inclusion, or exclusion, may not even be consistent between records.

is positive if the husband is older than the wife and negative if she is the older of the two. Total Int and Ave Int are set equal to zero for one-child families.

W Ed and H Ed represent the highest year of school completed by the wife and by the husband, respectively; if the educational attainment exceeded sixteen years, this variable was set equal to eighteen. The number of live births to each woman was represented by #C; $\#C^2$ is the square of that number, included in regressions on dependent variables which are related non-linearly to the number of children born.

There were three different types of income measure: the first, Y1965, was the income, expressed in thousands of dollars, of the husband from all sources in 1965. The income data in the NFS consisted of only two pieces of information, the income brackets of the husband and of the wife for 1965.[1] The information is of doubtful reliability, because most of the interviews occurred in October of that year and because income was not defined. Respondents were not reminded to consider non-labor sources of income; the form of the question made it difficult to report joint income; there was no instruction on whether to include transfer payments; and apparently, there was no probing by interviewers to determine if the couple had received (or expected to receive) non-wage and salary income. It is not possible to determine wage rates either, for the necessary questions about weeks and hours of work were not asked.

A second type of income measure was an estimate of the annual income that the couple might have predicted, in the early years of their marriage, that the husband would earn at given points in their life cycle, based on his occupation, education, and geographic location. Y40 is the predicted earnings, in thousands of dollars, of the husband

[1]In the empirical work, the midpoints of the income classes were used to represent the income level except in the case of the lowest and highest income categories. The \$0 - \$2,000 bracket was represented by \$1500; the open ended class, \$15,000 and over, was assigned a value of \$20,000. (Assuming a Pareto distribution for these data yields a mean income for the class of \$21,553; the median is certainly lower.)

at age forty. The value of Y40 was determined by first running an earnings function on all husbands of white non-farm mothers aged twenty-five to fifty-four. (See Appendix B.) The resulting equation was used to predict annual income at age forty for each husband in the smaller sample (of women forty to fifty-four) on the basis of his own individual characteristics. This predicted-income measure was expected possibly to be more relevant than the, perhaps poorly measured, 1965 income in early fertility decision. Additionally, Y40 has the advantage of representing income at a given point on the life cycle income profile, providing a more comparable measure of income than Y1965 for men whose current ages differed over two or three decades. Y EXP 20 is the predicted income for the husband twenty years after entering the labor force: Y W Ed + 20 is his predicted income twenty years after the wife leaves school, assuming her age at leaving school equals six plus the number of years of school completed.

Three cohort measures were used to supplement or substitute for the income variables, in recognition of the fact that general economic conditions changed greatly during the child bearing years of these women. The oldest women in the sub-sample reached their twentieth birthdays in July 1930; the youngest, in June 1945. The measures used were (the last two digits of) the year of the wife's birth (W Yr B), the husband's year of birth (H Yr B), and the year the couple married (Yr Mar).

B. 1965 National Longitudinal Survey

Although the data of the National Fertility Study have numerous advantages over all other data sets I have tried to use -- especially, identification of the woman's religious preference and the only complete information on the dates of birth of all children ever born to the woman -- the economic content is deficient. The National Longitudinal Survey, on the other hand, has little information on fertility,[1] but has more

[1]It does report the month and year that the first child was acquired by any means -- childbirth, adoption, marriage to a man who has children -- so that, by excluding women who acquired any children by means other than childbirth, I was able to determine the date of B_1 for my subsample of the NLS. Ages of all children present in the household at the time of the Survey are reported in years; but one cannot determine whether all of these children actually were born to the respondent or whether some children born to her are not included in the report. The data do not include direct information on the number of children ever born, but a reasonably accurate estimate can be constructed from the answers to several questions.

detailed, and probably more reliable, information on labor force participation, the earnings of the various family members, and non-labor income.

The NLS is a national probability sample of American women aged thirty to forty-four.[1] The subsample used in this research consisted of 706 mothers who were aged forty to forty-four, white, married once-spouse present, and not living on a farm. As explained in footnote 1 on page 43, women who had acquired children other than by giving birth to them were excluded.[2] There is a high incidence of missing information for the observations in this survey; therefore several different subsets of observations were used, depending on which variables were needed.

The timing variable ($Sch-B_1$) is an estimate of the number of months from the time the woman left school[3] until she had her first birth. Unfortunately, the design of the interview questionnaire was such that women who had never entered the labor force were not to be asked the year they left school (Grad). Of the 706 women, ninety-eight reported no labor force participation; however, all but forty-one of them do report the year of leaving school. In addition to those forty-one, five of the women who did work outside the home lack information on Grad.

The spacing variable, Total Int, is conceptually identical to that used with the NFS data. With the NLS data, however, the date of the last birth is not given. In constructing Total Int I have assumed that the youngest child in the household at the time of the interview was the last child born to the mother. His age as of April 1, 1967 is reported; by using October as the "average" month of birth I estimated the month and year of B_n and, from that, Total Int. This will, of course, result in a

[1]For a more detailed description of the NLS Surveys of Work Experience see J. R. Shea, R. S. Spitz, and F. A. Zellner, Dual Careers, Center for Human Resource Research, Ohio State University, Columbus, May 1970.

[2]Also excluded were observations with coding errors on variables relevant to this study; those with inconsistent responses to questions needed to reconstruct the (estimated) number of children born, such as whether any children born to the woman are not living with her and how many; and (sometimes) those with missing information in important income categories.

[3]Only the year of leaving school was known; I used June of that year as the month of leaving school.

a significant underestimation of Total Int if the youngest child has already left his parents' household.[1] Ave Int equals the estimated Total Int divided by one less than the computed number of children.

Some of the other variables also differ from those described in Section A of this chapter: W Ed and H Ed here are reported by year through seventeen years; anything in excess of seventeen years was coded as nineteen years.[2] The income measure, Y1966, is actual 1966 annual income, in thousands of dollars, of the husband and non-labor income. The wife's income was not included in Y1966 (or in Y1965 from the NLS) because her decision as to whether to work outside the home is complementary to the timing and spacing decisions; because women's earnings generally are a small part of total family income (for husband-wife families); because this results in overstated income differences between families with working and non-working wives by not taking account of the added expenses incurred by the former or the greater household productivity of the latter; and because most women do not work anyway during the child caring years.

The year the woman left school (Grad) and her age in years as of April 1, 1967, (Age) were sometimes used as cohort variables. Since the NLS women reached age twenty between April 1942 and March 1947, their ages are not correlated with economic conditions in the way that the cohort variables in the NFS data are; the cohort variable may actually reflect in part the effects of World War II on fertility decisions.

The variables #C and $\#C^2$ have the same definition as in Section A, but, as noted on page 43, their values are estimated.

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[1] Most of the intervals look reasonable although there is no way to be sure that the total interval is approximately correct if there are three or more children; because of the existence of such observations as the mother of four children whose first birth was in September 1942 and whose youngest child was twenty-four as of April 1967, it is obvious that Total Int is measured with error.

[2] The NLS reported "Highest Grade Attended" and "Whether Completed;" when the latter information was missing (a large minority of the observations) I assumed the grade had been completed.

Several variables relating to labor force participation were used with observations from the NLS, both in the examination of fertility behavior and in the study of the timing of labor force activities reported in Chapter VI. The number of years during which a woman worked at least six months (Yrs LF) consists of three components: years worked before marriage (LF S-M), years worked between marriage and the first birth (LF M-B), and the number of years worked after the first birth. The first two of these combine to give the number of years of labor force activity between leaving school and having the first birth (LF S-B_1). The lengths, in months, of the intervals from school to marriage (Sch - M), from marriage to first birth (M - B_1), and from school to first birth (Sch - B_1) are used as independent variables in some regressions on years worked. LFPR designates the ratio of the total number of years worked to the total number of years since leaving school. The number of months after the first or after the last birth until the woman entered or re-entered the labor force, if indeed she did, B_1 - LF and B_n - LF, respectively, are still other measures of the extent of labor force attachment.

Two dummy variables were used and are identified in the appropriate tables of regression results. One dummy is assigned the value "one" if the woman worked at any time after having had one or more children and "zero" if she was never in the labor force after she began childbearing. The second variable applies only to those women who did work after having children; it takes the value "one" if she worked after B_1 and before B_n -- i.e., between births -- and the value "zero" if she worked after having her last child but not between births. When the first of these two dummies is used as a measure of commitment to market activities the age in years of the youngest child (Age YC) is sometimes introduced to standardize for the fact that the labor force participation of the mother of a preschool child and of a mother whose youngest child is, say, twelve years old do not represent the same degree of labor force commitment. The value of Age YC is set equal to eighteen if the youngest child is over eighteeen or if no children were living in the household at the time of the interview.

Before examining the empirical results it may be helpful to explain why these particular variables were used -- how they are assumed to relate

Table 1

Definition of variable names

Name	Definition	Sample
Age	Age in years of the wife at interview date	NLS
Age Diff	Excess of husband's over wife's age, in months	NFS
Age YC	Age in years of youngest child present in household	NLS
Ave Int	Average interval in months between successive births	both
B_1 - LF	Number of months from first birth to labor force entry	NLS
B_n - LF	Number of months from last birth to labor force entry	NLS
1st Int	Number of months from marriage to first birth	NFS
Grad	Year the woman left school	NLS
H Age B_1	Husband's age in months at first birth	NFS
H Age B_n	Husband's age in months at last birth	NFS
H Age Mar	Husband's age in months at marriage	NFS
H Ed	Highest year of school completed by husband	both
H Yr B	Husband's year of birth	NFS
LF S-M	Number of years in labor force from leaving school to marriage	NLS
LF M-B_1	Number of years in labor force from marriage to first birth	NLS
LF S-B_1	Number of years in labor force from leaving school to first birth	NLS
LFPR	Ratio of total years worked to years from leaving school to interview	NLS
M-B_1	Same as 1st Int	NLS
#C	Number of children born	both
$\#C^2$	Square of number of children both	both
Sch - B_1	Number of months from leaving school to first birth	NLS
Sch - M	Number of months from leaving school to marriage	NLS
Total Int	Number of months from first to last birth	both
W Age B_1	Wife's age in months at first birth	NFS
W Age B_n	Wife's age in months at last birth	NFS
W Age Mar	Wife's age in months at marriage	NFS
W Ed	Highest grade of school completed by wife	both
W Yr B	Wife's year of birth	NFS

Table 1

(cont'd)

Name	Definition	Sample
Y1965	Husband's (expected) income in 1965, in thousands of dollars	NFS
Y1966	Husband's and other 1966 income, in $1,000's	NLS
Y40	Predicted income of husband at age forty, in $1,000's	NFS
Y EXP 20	Predicted income of husband twenty years after his leaving school, in $1,000's	NFS
Y W Ed + 20	Predicted income of husband twenty years after the wife is estimated to have left school, in $1,000's	NFS
Yr Mar	Year of marriage	NFS
Yrs LF	Total number of years worked by the wife	NLS

In addition, there are two dummy variables; for the one, 1 = worked after B_1; 0 = did not. For the other, 1 = first worked after B_1 before B_n; 0 = worked after B_n but not between B_1 and B_n.

to the theoretically relevant variables. Considering first the independent variables, ideally the study would use information on the path of the wife's price of time, on the path of the family's full income, and on their expectations for these values throughout the remainder of their lifetimes (e.g., in order to determine the "permanent income.") This information is not available, so I have used the wife's education as a proxy for the level and slope of P_t. Figure 1 depicts positive relationships between the slope of the wage profile and education and between the level of wages and education, for married women. Moreover, even if a woman is not in the labor force a high level of education may be associated with greater efficiency in household production (high P_t) and with more learning and improvement in household productivity through time (rising P_t).

The level of the husband's income and non-labor income[1] may not affect P_t for purposes of the timing decision, because most women work until the first birth is near; but it may be relevant for spacing decisions, as some wives never re-enter the labor force after bearing children. Variables relating to labor force participation were included in some regressions in the hope that they might reflect some of the effects of differences in the slope of the lifetime path of P_t, under an assumption that women with greater labor force experience are investing more in human capital and therefore having more sharply rising P_t profiles.

Because the predicted income effects of income level and income slope on the timing of B_i differ, tests of the model require variables that measure each of these effects separately. The relevant known data are the current (1965 or 1966) reported annual income and the level of the husband's education. Figure 2 suggests that H Ed is correlated, on average, with both the level and the slope of the income path; of course, there is variation of individuals around the average. I have assumed that the annual income figure reflects the average level of family income, given education. When both H Ed and one of the income variables are

[1]The variable reported in the NFS data probably represents the sum of these two elements; I was able to construct the appropriate measure in the NLS, which presented more detailed income information.

included in a regression equation, I assume that the coefficient of H Ed -- the effect of the husband's education, given his level of income -- represents the income slope effect and that the coefficient of Y1965, Y1966, or whatever income variable has been used, reflects the effect of income level, given slope. Since the income of one year may not accurately represent a couple's general economic situation, the size of positive or negative transitory components being unknown, and since the income variable in the NFS is not measured well, I have used cohort variables as proxies for the level of income. Especially for the National Fertility Study, a positive and monotonic relation exists between the value of cohort variable and the general economic condition prevailing when the couple was in its prime childbearing years. This variable may even have an added advantage over the more direct income measures, Y1965 and Y1966, being ex-ante rather than ex-post. That is, the cohort variable is related to the economic situation existing when the couple had to make their fertility decisions; current income is relevant only to the extent that the couple correctly foresaw what their income would be in middle-age and to the extent that it contains small or no transitory components.

The variable #C, number of children born, is introduced into most of the equations in order to standardize for the fact that timing and spacing decisions cannot, for physiological reasons, be made independently of the decision as to family size. I will return briefly to the subject of completed fertility in Chapter V.

The dependent variables used in studying the spacing decision, the lengths of the total interval from first to last births and of the average interval between births, are straightforward and the reasons for their use are self-evident.[1] Most previous studies of timing have used, as the dependent variable, the length of the interval from marriage to B_1. The inconclusive results are often attributed to inaccuracies in the data,

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[1]Ideally, if one admits the possibility of contraception failure to the model, the dependent variables would be the desired lengths of these various intervals. This information is not available, so I will not present here the many problems, especially definitional, of even this "ideal" measure.

as couples with pre-marital conceptions report their wedding dates falsely.[1] My model suggests a second explanation: that the most relevant measure of timing is not the "First Interval" but rather the couple's age at B_1 or the length of time between leaving school, and entering the labor force, and B_1. I do not suggest that the independent variables have no effect on the length of the first interval but that, because the wedding is an action taken by pairs of adults in part because they desire to have children, the first interval is a weak, partial measure of timing variations. The model suggests that the important considerations for timing are the price of time and income levels and paths, which are related to the levels of education and labor force experience. Hence, the more appropriate measure of variations in timing decisions is the age at B_1 (given education) or, in the NLS data where it can be determined, the length of time from leaving school to B_1.

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[1]See Harold T. Christensen, "Child Spacing Analysis via Record Linkage," Marriage and Family Living, XXV (August 1963), 272-80; Christensen and Olive P. Bowden, "Studies in Child-Spacing: II - The Time Interval Between Marriage of Parents and Birth of their First Child," Social Forces, XXXI (May 1953), 346-51; and Elizabeth Murphy Whelan, "The Temporal Relationship of Marriage, Conception, and Birth in Massachusetts," Demography, IX (August 1972), 394-414.

CHAPTER IV

EMPIRICAL FINDINGS: TIMING

A. Primary Samples

The tables in this chapter present the results of regression analyses designed to test the hypothesized effects of economic variables on the timing of the first birth -- i.e., the beginning of the child-caring stage of the life cycle.[1] Various combinations of the wife's education, the husband's education, several income variables, and the number of children born were regressed on W Age B_1 for observations from the National Fertility Study. The results are shown in Table 2. In all regressions containing either the husband's education or a measure of his income, the regression coefficient of W Ed is between 4.5 and 6.5; it is significantly different from zero (positive) but, of more relevance, it is significantly less than twelve (months). That is, each additional year of education for the wife raises her age at B_1 by somewhat less than one-half year. As hypothesized in the discussion of the substitution effect above, women with more education have B_1 sooner after leaving school -- a little over a half year sooner per each year of education. Although the coefficient is larger when H Ed and income measures are not included, as W Ed picks up some of the effect of those correlated variables, it is still significantly less than twelve (months).

The regressions in Table 3 test directly the effects of education and income on the interval from school to first birth; the sample differs from that used in Table 2 in that it includes Catholics and it excludes nearly half of the women who have never worked. The coefficients of W Ed in the regressions which exclude Grad range from -6.10 to -6.82 if the

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[1]All regression results presented in this chapter are ordinary least squares estimates. If #C is included in such OLS regressions, this implies implicitly that the decision on family size precedes and is independent of the timing and spacing. I believe this to be fairly realistic. However, in an attempt to allow for the possibility of simultaneity I performed also two-stage least-squares regressions, first with #C as the dependent variable. Then, in the second step, I substituted the estimated for the actual number of children as an independent variable in regressions on the timing and spacing variables. The results, presented in Appendix C did not seem to justify pursuing further the 2SLS approach.

Table 2

Regressions on wife's age, in months, at first birth; 1965 National Fertility Study: non-Roman Catholic mothers aged 40-34, white, non-farm, married once-spouse present; N=385.
Regression coefficients with t-values in parentheses.

W Ed	H Ed	Y 1965			#C	$\#C^2$	W Yr B	R^2
8.39							-2.08	
(9.96)							(4.02)	.16
5.52	3.29						-2.15	
(4.83)	(3.68)						(4.22)	.18
7.09					-9.41		-1.83	
(8.59)					(1.28)		(3.70)	.23
4.50	2.99				-9.20		-1.91	
(4.08)	(3.49)				(7.23)		(3.89)	.25
6.49		.84			-9.43		-1.86	
(7.22)		(1.68)			(7.36)		(3.76)	.24
4.48	2.87	.17			-9.21		-1.91	
(4.05)	(3.06)	(.32)			(7.23)		(3.89)	.25
7.33					-17.02	.89	-1.70	
(8.84)					(4.67)	(2.23)	(3.42)	.24
4.68	3.09				-17.41	.96	-1.77	
(4.24)	(3.62)				(4.82)	(2.43)	(3.59)	.26
7.81		.81					-2.10	
(8.48)		(1.56)					(4.07)	.17
6.42			3.43	Y40			-2.07	
(6.09)			(3.06)				(4.05)	.18
6.32			3.31	Y EXP 20			-2.08	
(5.95)			(3.15)				(4.05)	.18
6.34			4.10	Y W Ed+20			-2.05	
(6.58)			(4.19)				(4.03)	.19
6.49		.84			-9.43		-1.86	
(7.22)		(1.68)			(7.36)		(3.75)	.24
5.33			3.10	Y40	-9.25		-1.83	
(5.22)			(2.89)		(7.25)		(3.73)	.24
5.21			3.05		-9.27		-1.83	
(5.06)			(3.03)	Y EXP 20	(7.27)		(3.73)	.25
5.24			3.77		-9.16		-1.82	
(5.60)			(4.01)	Y W Ed+20	(7.22)		(3.71)	.25

Table 2

(cont'd)

W Ed	H Ed	Y 1965	Y40	Y EXP 20	Y W Ed+20	#C	W Yr B	R^2
5.51	3.24	.06					-2.16	
(4.81)	(3.32)	(.11)					(4.21)	.18
5.46	2.75		.91				-2.14	
(4.76)	(2.09)		(.56)				(4.18)	.18
5.46	2.69			.93			-2.14	
(4.76)	(1.96)			(.58)			(4.18)	.18
5.82	1.12				3.18		-2.08	
(5.07)	(.83)				(2.15)		(4.08)	.19
4.48	2.87	.17				-9.21	-1.91	
(4.05)	(3.06)	(.32)				(7.23)	(3.89)	.25
4.46	2.53		.78			-9.19	-1.90	
(4.02)	(2.01)		(.50)			(7.22)	(3.86)	.25
4.45	2.39			.94		-9.20	-1.89	
(4.01)	(1.82)			(.61)		(7.23)	(3.85)	.25
4.79	.97				2.97	-9.15	-1.84	
(4.32)	(.75)				(2.10)	(7.21)	(3.76)	.26

Table 3

Regressions on the number of months from leaving school to first birth; 1967 National Longitudinal Survey; non-farm mothers aged 40-44, white, married once-spouse present, no "acquired" children, Grad known; N = 660.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	Age	Age YC	LFPR	R^2
-6.10	2.27	-.65	-13.02	.65		-18.46					
(6.71)	(3.42)	(1.83)	(5.33)	(2.86)		(5.05)					.16
-2.18	2.46	-.61	-13.02	.62	-5.67	-19.49					
(2.08)	(3.83)	(1.78)	(5.51)	(2.84)	(6.82)	(5.51)					.22
-6.19	2.33	-.67	-13.06	.63		-19.09		4.50			
(6.87)	(3.54)	(1.91)	(5.39)	(2.80)		(5.26)		(3.55)			.18
-6.82	1.40	-.56	-29.22	1.38		-3.67			-6.44		
(9.05)	(2.54)	(1.92)	(13.10)	(7.14)		(1.17)			(17.33)		.42
-1.48	1.57	-.50	-30.84	1.41	-7.82	-3.61			-7.09		
(1.82)	(3.15)	(1.88)	(15.24)	(8.08)	(11.99)	(1.27)			(20.79)		.53
-6.50	2.80	-.48	-12.72	.68							
(7.04)	(4.20)	(1.33)	(5.11)	(2.92)							.13
-2.73	3.01	-.43	-12.70	.65	-5.47						
(2.56)	(4.65)	(1.23)	(5.26)	(2.90)	(6.45)						.18
-6.40	2.91	-.37	-11.38	.64			1.23				
(7.02)	(4.43)	(1.05)	(4.60)	(2.79)			(4.40)				.15
-2.90	3.09	-.34	-11.57	.62	-5.10		1.03				
(2.74)	(4.82)	(1.00)	(4.80)	(2.78)	(6.03)		(3.78)				.20
-6.62	2.89	-.37	-11.54	.64						26.82	
(7.24)	(4.37)	(1.05)	(4.64)	(2.78)						(3.82)	.15
-2.91	3.09	-.33	-11.57	.62	-5.38					25.61	
(2.74)	(4.82)	(.96)	(4.80)	(2.76)	(6.41)					(3.76)	.20
-6.59	2.87	-.49	-12.75	.66				4.18			
(7.19)	(4.34)	(1.39)	(5.16)	(2.86)				(3.23)			.14
-6.72	2.96	-.39	-11.55	.62				4.26		27.22	
(7.40)	(4.51)	(1.10)	(4.69)	(2.72)				(3.33)		(3.90)	.16

Table 3

(cont'd)

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	Age	Age YC	LFPR	R^2
-5.95 (6.28)	2.84 (4.12)	-.63 (1.70)									.07
-5.56 (5.91)	2.38 (3.46)	-.78 (2.14)				-15.94 (4.23)					.09
-5.94 (6.41)	2.97 (4.41)	-.47 (1.29)					1.57 (5.63)				.11
-6.22 (6.67)	2.94 (4.34)	-.46 (1.27)								35.53 (5.06)	.10
-5.55 (6.15)	2.08 (3.14)	-.83 (2.35)				-7.87 (2.09)			-2.84 (7.71)		.17
-2.27 (2.05)	3.05 (4.54)	-.58 (1.62)			-5.31 (6.04)						.11
-1.76 (1.60)	2.58 (3.85)	-.75 (2.10)			-5.46 (6.31)	-16.83 (4.59)					.14
-2.59 (2.38)	3.14 (4.77)	-.44 (1.25)			-4.84 (5.57)		1.40 (5.12)				.15
-1.17 (1.13)	2.26 (3.57)	-.79 (2.35)			-6.28 (7.62)	-8.02 (2.22)			-3.15 (8.84)		.23

Similar regressions on other sub-sets of the 1967 NLS observations are presented in Appendix D.

number of children is held constant (and from -5.55 to -6.22 if #C is not included among the independent variables.) This agrees extraordinarily well with the results from the NFS: Each additional year of education reduces the interval to B_1 by just over one-half year. If Grad is included in the regression, the coefficients, while still significantly negative, are much smaller. It is likely that the cohort variable, Grad, in this instance, where the women range in age only from forty to forty-four, is measuring education more than cohort. The simple correlation between W Ed and Grad for this sample is .65. (As the age range is reduced to, say, one year, the correlation of W Ed and Yr Grad would approach 1.) This seems a plausible explanation also because the other regression coefficients are not affected by the inclusion of the year the wife left school.

The labor force participation variables, Yrs LF and LFPR, have positive coefficients, indicating that women with the most extensive labor force experience delayed their first births the longest. The experience variables had been posited as proxies for the steepness of the P_t path over time; the more a woman works, the more her P_t rises. The steeper a woman's P_t profile the earlier she will have B_1, according to the model's hypotheses. However, for the women in this sample most of the work experience occurred before B_1; 84 percent of them worked before B_1, less than 45 percent worked after B_1, and, being still relatively young, many of them have not yet worked very long after having children.[1] In an attempt to work around the problem of the correlation between Yrs LF and labor force experience pre-B_1 and therefore with Sch-B_1, I used a dummy variable whose value is one if the woman has worked after having children and zero if she has not, as a measure of labor force attachment.

[1]A variable measuring the total labor force experience over the entire lifetime might yield the hypothesized results. To clarify the problem, consider two women who behave as the model predicts; one, with W Ed=12, works from age eighteen to age twenty-five and never works again; the other, with W Ed=16 has her children before working and then enters the labor force, permanently, at age 35. Over their lifetimes the latter woman will work more, but as of the average interview age, forty-two, the women will have the same labor force experience.

The very significantly negative coefficient that was found was expected both according to my theory and because women who are working after having children are likely to be women whose children are older because they had the children at an early age. Standardizing for the age of the youngest child greatly reduces the significance of the dummy variables, although they are still negative. On balance, the results from including work experience variables are inconclusive. Moreover, their inclusion has very little effect on the coefficients of W Ed, which was itself intended to reflect in part different rates of increase in the value of time of different women.

Additional education for the husband raises the wife's age at B_1 (Table 2) and the interval from her leaving school to the first birth (Table 3), <u>ceteris paribus</u>. Since families in which the husband has a high level of education generally have steeper lifetime income profiles, the income effect predicted this postponement of the childbearing period as H Ed is larger.

In Table 2, the income variables, other than the cohort measures, are insignificant except with H Ed is excluded from the equation and except for Y W Ed + 20. In the former case the Y variables almost certainly are reflecting the H Ed effect. In the latter instance, inclusion of this variable reduces H Ed to insignificance; this is partly because men with more education usually marry women with more education, and the more education the wife has, the later in the life cycle are incomes estimated, and in this age range incomes are rising with age.[1] The various subscripted-Y variables are included mainly to show that this

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[1]Although the earnings function based on the questionable income information from the NFS looks fairly reasonable, it does predict that the peak income will be received 24.42 years after entering the labor force:

$$\text{Income} = \ldots + .24605 \text{ Experience} - .0050416 \text{ Experience}^2 + \ldots$$

$$\text{Income Maximum: } .24605 - .0100832 \text{ Exp} = 0; \text{ Exp} = 24.42 \text{ years}$$

This is well after "W Ed + 20" or twenty years after the wife left school; but it seems much too early in the lifetime. By comparison, Mincer's second equation, Table 10, in <u>Schooling Experience and Earnings</u>, yields an earnings maximum at 33.75 years. The reader must bear in mind that the income information in the NFS is very limited and was not defined either to the respondents or to researchers using these data.

data set's income variable is not very useful. The NLS data, with their more adequate income information, reported in Table 3, have the negative coefficient on Y that the model predicted. The sign of the coefficient is statistically significant except when measures of the wife's labor force experience are included.

In Table 2 the cohort variable, the year of the wife's birth, was included as a proxy for income level. It was significantly negative in all specifications of the regression equations, supporting the hypothesis that the income effect will tend to produce earlier first births the higher the family's expected lifetime income. With the NLS data, the wife's age, the complement of the year of birth, was significantly positive. Since nearly all mothers have their first births before age forty, these correlations are not simply statistical tautologies.[1]

The coefficients of #C and $\#C^2$ suggest that couples planning larger families have B_1 sooner but that the shortening of the interval is less than proportional to family size. If one assumes that contraceptive failures occur, the interpretation might also be that couples having B_1 sooner may have larger families unintentionally because they are at risk of a contraceptive failure, after having all their desired children, for a longer period of time.

Table 4 presents a comparison of some of the same regressions run on the husband's and the wife's age at B_1; in the former instances the cohort variable used was the husband's year of birth. The results are fairly similar, as expected, except that the cohort measure is much more significant and (ignoring sign) larger when H Age B_1 is the dependent variable. I have no explanation for this.

The comparisons presented in Table 5 indicate that the economic forces are robust enough to remain statistically significant in explaining the wife's age at B_1 even if the husband's age at B_1 or at marriage is held constant. Similarly, inclusion of a variable (Age Diff) measuring

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[1]The average W Age B_1 for women under twenty would be lower than for women twenty to thirty simply because the first group could not include any members of that cohort who will have B_1 after reaching age twenty.

Table 4

Comparison of regressions on wife's and husband's age at first birth; National Fertility Study. N = 585

W Age B_1

W Ed	H Ed	Y40	#C	$\#C^2$	W Yr B	R^2
5.52	3.29				-2.15	
(4.83)	(3.68)				(4.22)	.18
6.42		3.43			-2.07	
(6.09)		(3.06)			(4.05)	.18
5.46	2.75	.91			-2.14	
(4.76)	(2.09)	(.56)			(4.18)	.18
4.50	2.99		-9.20		-1.91	
(4.08)	(3.49)		(7.23)		(3.59)	.25
5.34		3.10	-9.25		-1.83	
(5.22)		(2.88)	(7.25)		(3.73)	.25
4.46	2.54	.78	-9.19		-1.90	
(4.02)	(2.01)	(.49)	(7.22)		(3.86)	.25
4.68	3.09		-17.41	.96	-1.77	
(4.24)	(3.62)		(4.82)	(2.43)	(3.59)	.26
		Y1965				
4.48	2.87	.17	-9.21		-1.91	
(4.05)	(3.06)	(.32)	(7.23)		(3.89)	.25

H Age B_1

W Ed	H Ed	Y40	#C	$\#C^2$	H Yr B	R^2
5.33	2.01				-4.69	
(4.77)	(2.14)				(10.95)	.22
5.63		2.52			-4.62	
(5.12)		(2.16)			(10.86)	.22
5.24	1.13	1.49			-4.67	
(4.37)	(.82)	(.87)			(10.87)	.22
4.49	1.78		-7.61		-4.68	
(3.83)	(1.94)		(5.64)		(11.21)	.26
4.74		2.25	-7.61		-4.62	
(4.38)		(1.97)	(5.65)		(11.14)	.26
4.41	.98	1.35	-7.59		-4.66	
(3.74)	(.73)	(.81)	(5.63)		(11.13)	.26
4.57	1.83		-11.66	.48	-4.65	
(3.89)	(1.99)		(3.05)	(1.13)	(11.12)	.27
		Y1965				
4.51	1.92	-.20	-7.59		-4.67	
(3.84)	(1.92)	(.35)	(5.63)		(11.16)	.26

Table 5

Comparison of regressions on W Age B_1,
with and without husband's age held constant

W Ed	H Ed	#C	$\#C^2$	W Yr B	H Age Mar	H Age B_1	R^2
5.52 (4.83)	3.29 (3.68)			-2.15 (4.22)			.18
4.50 (4.08)	2.99 (3.49)	-9.20 (7.23)		-1.91 (3.89)			.25
4.68 (4.24)	3.09 (3.62)	-17.41 (4.82)	.96 (2.43)	-1.77 (3.59)			.26
3.38 (3.26)	3.33 (4.17)			-1.70 (3.70)	.46 (12.10)		.35
2.84 (2.63)	3.08 (3.99)	-7.79 (6.77)		-1.52 (3.42)	.44 (11.79)		.40
2.82 (2.82)	3.19 (4.16)	-16.73 (5.17)	1.05 (2.95)	-1.36 (3.07)	.44 (11.92)		.40
2.08 (2.63)	2.80 (4.58)			-1.21 (3.45)		.64 (25.69)	.62
1.71 (2.20)	2.68 (4.46)	-4.63 (5.09)		-1.13 (3.27)		.61 (24.64)	.63
1.83 (2.34)	2.74 (4.57)	-9.55 (3.75)	.57 (2.07)	-1.05 (3.03)		.61 (24.56)	.64

W Ed	H Ed	#C	$\#C^2$	Y 1965	Age Diff	R^2
4.70 (4.21)	2.88 (3.05)	-19.15 (5.30)	1.13 (2.84)	.14 (.26)		.24
4.71 (4.31)	2.39 (2.57)	-17.89 (5.03)	1.03 (2.65)	-.02 (.04)	-.24 (4.96)	.27

the excess of the husband's over the wife's age (in months) did not change the coefficients of the other variables very much. Nor did any of the other demographic variables entered in the regressions on the other timing and spacing variables produce any changes in the coefficients of economic variables worth noting.'

Most of the other studies of timing have concentrated on trying to explain the length of the first interval (from marriage to first birth). Although the model leads me to expect this interval to be explained less well by economic variables than the timing measures already discussed, I did regress some of the same variables on 1st Int (Table 6). I expected that the results would be less significant than those in Tables 2-5, because the decision to marry rests in part on a desire to start having children, but that they would not necessarily be insignificant, because the desire to have children is not the only reason for choosing to marry at a particular time.

The education variables are much less significant in these regressions on first interval than they are in equivalent regressions on W Age B_1. The cohort variable also is less significant although the reduction is not so extreme as with the education variables. The large reduction in explanatory power (R^2 changes from .26 to .08 for equations with education, number of children, and cohort and from .18 to .03 for equations with education and cohort only) supports the contention that an important reason for marrying is to have children. However, the more traditional economic variables are still of some importance.

The small positive sign on W Ed might suggest that women with more education are a little less likely to marry primarily in order to begin to have children or that they simply are more proficient contraceptors (and therefore may choose a wedding date without regard to how long they wish to postpone B_1.) The latter possibility receives a small bit of support from a comparison of equations 2 and 16 in Table 6. In equation 6.16, which was run on a subsample of women whose first birth was a "timing success"[1] the coefficient of W Ed is even smaller and less

[1] Such a success occurs because the woman either did not contracept in the interval solely because she wanted a birth as soon as possible or purposely interrupted contraception in an effort to conceive.

Table 6

Regressions on interval, in months, from marriage to first birth; 1965 National Fertility Study. N=585

Eq. No.	W Ed	H Ed	Y40	Y1965	#C	$\#C^2$	Yr Mar	R^2
6.1	1.00 (1.28)	.45 (.51)	1.01 (.91)				-.83 (2.88)	.03
6.2	.67 (.87)	.46 (.54)	.94 (.87)		-11.25 (4.59)	.79 (2.94)	-.89 (3.16)	.09
6.3	.82 (1.16)		1.36 (1.85)		-11.23 (4.58)	.79 (2.93)	-.87 (3.12)	.09
6.4		.75 (.93)	1.02 (.96)		-11.23 (4.58)	.78 (2.90)	-.86 (3.07)	.08
6.5			1.84 (3.04)		-11.18 (4.56)	.77 (2.86)	-.81 (2.96)	.08
6.6	1.04 (1.34)	.90 (1.36)		.20 (.52)			-.84 (2.91)	.03
6.7	.70 (.91)	.84 (1.30)		.25 (.68)	-11.26 (4.58)	.79 (2.93)	-.90 (3.19)	.09
6.8	1.26 (2.00)			.44 (1.30)	-11.18 (4.55)	.78 (2.87)	-.86 (3.07)	.08
6.9		1.17 (2.21)		.27 (.73)	-11.24 (4.58)	.78 (2.88)	-.87 (3.11)	.08
6.10				.70 (2.20)	-11.04 (4.48)	.72 (2.69)	-.73 (2.68)	.08
6.11	1.06 (1.37)	1.04 (1.71)					-.84 (2.91)	.03
6.12	.73 (.95)	1.01 (1.72)			-11.25 (4.58)	.79 (2.93)	-.90 (3.19)	.08
6.13	1.57 (2.68)				-11.12 (4.52)	.77 (2.85)	-.84 (3.00)	.08
6.14		1.37 (3.04)			-11.22 (4.57)	.78 (2.88)	-.86 (3.10)	.08
6.15					-10.87 (4.40)	.69 (2.56)	-.64 (2.37)	.07

Table 6

(cont'd)

Eq. No.	W Ed	H Ed	Y40	#C	$\#C^2$	Yr Mar	R^2
6.16*	.46 (.52)	-1.02 (1.02)	1.98 (1.55)	-14.20 (4.36)	1.00 (2.62)	-.55 (1.56)	.11

*Sub-sample: B_1 was a "timing success,"; N=387.

Eq. No.	W Ed	H Ed	Y40	#C	$\#C^2$	Yr Mar	W Age Mar	R^2
6.11a	1.19 (1.51)	1.08 (1.78)				-.63 (1.81)	-.04 (1.02)	.03
6.15a				-11.38 (4.57)	.72 (2.65)	-.33 (.95)	-.06 (1.50)	.07
6.13a	1.88 (3.13)			-11.94 (4.82)	.82 (3.05)	-.40 (1.18)	-.09 (2.21)	.09
6.12a	.93 (1.28)	1.11 (1.88)		-12.13 (4.90)	.85 (3.14)	-.44 (1.29)	-.09 (2.33)	.09
6.3a	1.09 (1.52)		1.97 (2.01)	-12.11 (4.90)	.85 (3.14)	-.41 (1.21)	-.10 (2.34)	.09

significant, suggesting that part of the education effect observed in equation 6.2 is due to differences in contraceptive efficiency. The difference in the coefficients is small and the definition of "timing success" may lump together the most and least knowledgeable contraceptors, so too much should not be made of this observation.

The last five equations in Table 6 include the wife's age at marriage as an indepdent variable. The education variables are only slightly less insignificant, even though the first interval, given W Age Mar, is related to W Age B_1. Apparently, the proper test of the timing hypotheses is that suggested by the model: to explain the wife's age at B_1 or the length of the interval after schooling to B_1.

B. Other samples

The same set of regressions was run on other subsets of these older, white, non-Catholic women in the 1965 National Fertility Study (Table 7). When the subsets were the 387 women whose first birth was a "timing success," the 496 women with two or more children (because one-child mothers might be sub-fecund), the 322 mothers of two or more children whose first birth was a timing success, and the 530 couples with no unwanted children,[1] the slope coefficients and t-values were very similar to those reported above.

The fact that the regression results were not very different when women with only one birth were removed from the sample (Table 7 - equations A and B) fits with a general observation that many couples in the 1930's chose to remain childless, apparently for economic

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[1]A couple has an unwanted child if the wife answered affirmatively to the question, "Would you rather have had fewer children?" Eighty-seven of the 530 couples with no unwanted children reported that they would like to have had more children; it is not clear whether they were limited by physiological, economic, or other factors.

Table 7

Comparison of regression results using different sub-sets of the primary sample from the 1965 National Fertility Survey

Sample	Dependent Variable	W Ed	H Ed	#C	W Yr B	R^2
	W Age B_1	5.52	3.29		-2.15	
A		(4.83)	(3.68)		(4.22)	.18
		5.76	3.23		-2.24	
B		(5.33)	(3.84)		(4.43)	.23
		5.39	3.19		-3.39	
C		(3.75)	(2.80)		(5.02)	.19
		5.88	3.20		-3.16	
D		(4.25)	(2.95)		(4.60)	.22
	W Age B_1	4.50	2.99	-9.20	-1.91	
A		(4.08)	(3.49)	(7.23)	(3.89)	.25
		4.76	3.09	-6.76	-2.19	
B		(4.44)	(3.77)	(5.12)	(4.45)	.27
		4.32	2.69	-10.88	-2.96	
C		(2.14)	(2.47)	(6.42)	(4.58)	.27
		4.85	2.82	-8.44	-2.92	
D		(3.57)	(2.67)	(4.67)	(4.39)	.27
	W Age B_1	4.50	2.99	-9.20	-1.91	
A		(4.08)	(3.49)	(7.23)	(3.89)	.25
		4.76	3.09	-6.76	-2.19	
B		(4.44)	(3.77)	(5.12)	(4.45)	.27
		4.32	2.69	-10.88	-2.96	
C		(3.14)	(2.47)	(6.42)	(4.58)	.27
		4.85	2.82	-8.44	-2.92	
D		(3.57)	(2.67)	(4.67)	(4.39)	.27

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A All white non-Catholic mothers of one or more children; N=585

B Mothers of two or more children; N=496

C B_1 a timing success -- one or more children; N=387

D B_1 a timing success -- two or more children; N=322

E All mothers with no unwanted children (see text for definition) N=530

Table 7

(cont'd)

Sample	Dependent Variable	W Ed	H Ed	#C	W Yr B	R^2
A	W Age B_1	5.52 (4.83)	3.29 (3.68)		-2.15 (4.22)	.18
B		5.76 (5.33)	3.23 (3.84)		-2.24 (4.43)	.23
C		5.39 (3.75)	3.19 (2.80)		-3.39 (5.02)	.19
D		5.88 (4.25)	3.20 (2.95)		-3.16 (4.60)	.22

Sample	Dependent Variable	W Ed	H Ed	#C	W Yr B	R^2
A	W Age B_1	5.52 (4.83)	3.29 (3.68)		-2.15 (4.22)	.18
E		5.22 (4.13)	3.17 (3.29)		-1.96 (3.62)	.16
A	W Age B_1	4.50 (4.08)	2.99 (3.49)	-9.20 (7.23)	-1.91 (3.89)	.25
E		4.82 (3.97)	2.75 (2.97)	-9.82 (6.62)	-1.73 (3.30)	.23

Sample	Dependent Variable	W Ed	H Ed	#C	H Yr B	R^2
A	H Age B_1	4.49 (3.83)	1.78 (1.94)	-7.61 (5.64)	-4.68 (11.21)	.26
B		4.88 (4.22)	1.71 (1.91)	-6.34 (4.45)	-5.06 (11.92)	.30
C		4.67 (3.34)	.84 (.75)	-8.93 (5.22)	-4.82 (8.84)	.26
D		5.28 (3.75)	.97 (.87)	-7.63 (4.08)	-5.28 (9.45)	.30

Table 7

(cont'd)

Sample	Dependent Variable	W Ed	H Ed	Y1965	#C	$\#C^2$	H Yr B	R^2
	H Age B_1	5.33	2.01				-4.69	
A		(4.47)	(2.14)				(10.95)	.22
		5.81	1.83				-5.07	
B		(5.01)	(2.01)				(11.72)	.27
		5.55	1.25				-4.88	
C		(3.87)	(1.08)				(8.64)	.21
		6.20	1.34				-5.38	
D		(4.36)	(1.18)				(9.40)	.26

Sample	Dependent Variable	W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2
	Total Int	-1.64	1.09	-.60	54.12	-2.76	-1.26	
A		(1.82)	(1.43)	(1.36)	(18.60)	(8.61)	(3.79)	.65
		-1.98	1.41	-.59	46.20	-2.11	-1.70	
B		(1.87)	(1.60)	(1.16)	(10.99)	(5.05)	(4.02)	.52
		-.98	1.30	-1.01	53.11	-2.54	-1.45	
C		(.92)	(1.43)	(1.82)	(13.68)	(5.60)	(3.44)	.66
		-1.08	1.44	-1.02	44.82	-1.79	-1.76	
D		(.86)	(1.37)	(1.56)	(7.50)	(2.86)	(3.39)	.54

reasons.[1] It is likely that many others chose to have only one child rather than that those women were sub-fecund. Eighty-nine of 585 women had only one child; it is unlikely that fifteen percent of the females who had children were unable to have more than one. Moreover, comparison of the mean values of various economic variables for one-child families and families with two or more children suggests that the two groups did not come from the same (economic) population, as might be expected if the reason for small family size were physiological.[2] (Table 14, Chapter V).

Ninety-five (of 585) couples reported that their parents gave them important financial help when they were first married. For this small subset the coefficients of H Ed in various regressions on W Age B_1 were smaller than for the entire sample, and even negative, with an absolute t-value of less than one (Table 8). (The 490 who received no financial help had larger H Ed coefficients than the entire sample.) This was the expected result, for such parental help is equivalent to additional income from non-labor sources; those who receive it can better afford children in the early, relative to the later, years of marriage than those who do not. This "income" in the early years tends to reduce the steep slope of the earnings profile that is associated with high H Ed.

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[1]See 1960 Census of Population Subject Report PC(2)-3A, "Women by Number of Children Ever Born." The rates of childlessness for U.S. white women who were married-spouse present were 16.6 percent for those aged forty-five to forty-nine and 19.4 percent for those between fifty and fifty-four (Table 27, p. 181). These high rates were not due to inadequate medical treatment of infertility, for the rates ranged widely by the husband's occupation, for example; 27.7 percent of the wives of social scientists were childless. The other highest and lowest rates, by husband's occupation, were architects, 27.7 percent; authors, editors, and reporters, 26.5; medical and dental technicians, 25.7; farm laborers and foremen, 11.2; and coal miners, 9.1 percent. (Table 33, pp. 167-68).

[2]Subfecundity, if it is not correlated with poor general health, may facilitate economic success, high levels of education, etc. But the differences are larger than I would expect from that reason alone.

Table 8

Comparison of regressions on W Age B_1 for couples who did and did not receive financial help; 1965 National Fertility Study

Sample	N	W Ed	H Ed	#C	W Yr B	R^2
All	585	5.52 (4.83)	3.29 (3.68)		-2.15 (4.22)	.18
Did	95	6.45 (2.36)	1.82 (.97)		-1.53 (1.26)	.18
Did Not	490	5.25 (4.17)	3.55 (3.52)		-2.18 (3.87)	.18
All		4.50 (4.08)	2.99 (3.49)	-9.20 (7.23)	-1.91 (3.89)	.25
Did		6.12 (2.25)	1.75 (.95)	-4.88 (1.57)	-1.29 (1.05)	.20
Did Not		4.12 (3.41)	3.19 (3.31)	-9.82 (7.04)	-1.96 (3.65)	.26

The coefficient of the wife's year of birth was less negative in the sample of couples receiving parental help. Since W Yr B was a proxy for general income levels, the reduction in its impact also was expected. All other coefficients were similar to those reported for the entire sample.

When women who had been married more than once were added to the primary sample, raising the total number of observations to 748, most of the coefficients changed very little (Table 9). However, the slope and t for W Ed were larger, probably because the values of H Ed and income were for the current husband. In the case of women who were married more than once, those are not necessarily the relevant values, although they may be reasonable proxies for information on the previous husbands. In those cases W Ed picked up more of the variation in the relevant husband variables.

To summarize, the empirical evidence supports the hypotheses that if the wife's P_t is rising, represented by W Ed, she will have B_1 sooner after finishing school; that a couple will postpone B_1 more if they anticipate a rising family income profile -- H Ed is the proxy; and that they will have B_1 sooner the higher the anticipated level of average income, represented by the cohort variables and, in NLS data, by Y1966, the total income of the family other than from earnings of the wife.

Table 9

Comparison of regressions for women married only once and women married more than once; 1965 National Fertility Study, mothers of one or more children

Dependent Variable: W Age B_1

Married one or more times N=748

W Ed	H Ed	#C	$\#C^2$	W Yr B	R^2
6.76	2.17			-1.59	
(6.58)	(2.68)			(3.31)	.15
6.09	1.70	-9.65		-1.34	
(6.16)	(2.18)	(8.08)		(2.90)	.22
6.24	1.85	-18.96	1.12	-1.22	
(6.33)	(2.38)	(5.51)	(2.88)	(2.63)	.23

Married once only N=585

W Ed	H Ed	#C	$\#C^2$	W Yr B	R^2
5.52	3.29			-2.15	
(4.83)	(3.68)			(4.22)	.18
4.50	2.99	-9.20		-1.91	
(4.08)	(3.49)	(7.23)		(3.89)	.25
4.68	3.09	-17.41	.96	-1.77	
(4.24)	(3.62)	(4.82)	(2.43)	(3.59)	.26

Table 9
(cont'd)

Dependent Variable: H Age B_1

Married one or more times N=748

W Ed	H Ed	#C	$\#C^2$	H Yr B	R^2
5.88	2.06			-6.04	
(5.16)	(2.28)			(15.42)	.28
5.30	1.68	-8.21		-6.00	
(4.74)	(1.89)	(6.10)		(15.69)	.31
5.38	1.76	-13.20	.60	-5.98	
(4.81)	(1.98)	(3.40)	(1.37)	(15.63)	.32

Married once only N=585

W Ed	H Ed	#C	$\#C^2$	H Yr B	R^2
5.33	2.01			-4.69	
(4.77)	(2.14)			(10.95)	.22
4.49	1.78	-7.61		-4.68	
(3.83)	(1.94)	(5.64)		(11.21)	.26
4.57	1.83	-11.66	.48	-4.65	
(3.89)	(1.99)	(3.05)	(1.13)	(11.12)	.27

CHAPTER V

EMPIRICAL FINDINGS: SPACING

A. Total Interval

The hypothesized substitution effect on the spacing of births (subsequent to B_1) is that a high price of time for the wife -- i.e., high W Ed if she does not leave the labor force permanently at B_1, high W Ed or husband's income if she does -- will induce the couple to plan on closer spacing between births or, given #C, a shorter total interval between the first (B_1) and last (B_n) births. The income effect probably is to enable higher income families to space widely, which apparently facilitates the production of child quality. This positive effect will be offset to the extent that the husband's income affects P_t for non-labor force wives, producing a negative substitution effect. If the slope of the income profile has any effect on the spacing of births, it may cause closer spacing intended to offset the later start of child-bearing occasioned by the steep income profile.

The various specifications of the regression equation in Table 10 yielded the predicted negative coefficient on W Ed. From the coefficients it can be seen that three additional years of education for a woman reduce the total birth interval for a given family size by five or six months (Equations 10.3 or 10.6). If family size is not held constant the reduction is between thirteen and fifteen months (Equations 10.1 or 10.4). Thus, as education and P_t rise, women have their children in a shorter span of time and/or they have fewer children.[1] As will be noted in Chapter VI, they may also spend less time at home after the last birth.[2]

The results for data from the National Longitudinal Survey (Table 11) are similar but the coefficients and t-values are smaller; much of the difference in results probably resulted from the errors in the measurement of Total Int for the NLS data. The t-values on W Ed are

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[1]Table 14 shows that childless women have significantly more education; the difference in mean education is almost one year.

[2]See also Mincer and Polachek, op. cit.

Table 10

Regressions on the total number of months from B_1 to B_n*;
1965 National Fertility Study, white, non-farm, non-Roman Catholic
mothers aged 40-54, married once-spouse present; N = 585.

Regression coefficients with t-values in parentheses

Eq. No.	W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2
10.1	-5.06 (3.46)	-.09 (.08)	-.24 (.33)				.04
10.2	-1.58 (1.66)	1.10 (1.37)	-.62 (1.32)	30.96 (28.19)			.60
10.3	-2.06 (2.27)	.78 (1.02)	-.61 (1.38)	53.68 (18.25)	-2.67 (8.26)		.64
10.4	-4.35 (2.98)	.40 (.33)	-.22 (.31)			-1.88 (3.50)	.06
10.5	-1.22 (1.28)	1.37 (1.70)	-.61 (1.31)	30.68 (28.02)		-1.05 (2.98)	.60
10.6	-1.64 (1.82)	1.09 (1.43)	-.60 (1.36)	54.12 (18.60)	-2.76 (8.61)	-1.26 (3.79)	.65
10.7	-1.69 (1.86)	.89 (.87)	-.37 (.29) Y40	54.09 (18.56)	-2.76 (8.61)	-1.27 (3.81)	.65
10.8	-1.68 (1.86)	.97 (.91)	-.45 (.36) Y EXP=20	54.09 (18.56)	-2.76 (8.61)	-1.27 (3.81)	.65
10.9	-1.75 (1.92)	.93 (.89)	-.38 (.33) Y W Ed+20	54.07 (18.55)	-2.76 (8.60)	-1.27 (3.80)	.65

*If #C =1, Total Int = 0.

Table 11

Regressions on estimated total interval; 1967 National Longitudinal Survey, white, non-farm mothers of two or more children; aged 40-44; observations eliminated if Total Int = 0. N = 597.

W Ed	H Ed	Y1966	#C	$\#C^2$	1=LF After B_1	Age YC	Age	R^2
-.88	-.91	.59	39.55	-1.69				
(1.04)	(1.44)	(1.71)	(13.48)	(6.84)				.48
-.46	-1.24	.50	39.16	-1.68	-10.96			
(.54)	(1.96)	(1.45)	(13.42)	(6.88)	(3.06)			.49
-1.40	-1.91	.56	25.07	-1.05	2.21	-5.81		
(1.97)	(3.58)	(1.97)	(9.67)	(5.06)	(.71)	(16.00)		.64
-.46	-1.25	.50	39.05	-1.68	-11.30		1.42	
(.54)	(1.97)	(1.47)	(13.38)	(6.88)	(3.15)		(1.14)	.49
						Yrs LF		
-.63	-1.05	.52	38.39	-1.64		-1.00		
(.76)	(1.67)	(1.52)	(13.15)	(6.74)	LFPR	(3.70)		.49
-.47	-1.03	.50	38.35	-1.64	-26.89			
(.56)	(1.65)	(1.47)	(13.15)	(6.73)	(3.85)			.49
-.89	-.90	.59	39.48	-1.69			1.09	
(1.06)	(1.43)	(1.73)	(13.45)	(6.84)			(.87)	.48
-.48	-1.03	.51	38.28	-1.61	-26.29		1.10	
(.57)	(1.65)	(1.49)	(13.11)	(6.73)	(3.85)		(.89)	.49
-3.96	-.93	1.24						
(3.54)	(1.10)	(2.69)			1=LF			.05
-3.11	-1.54	1.06			-19.80			
(2.77)	(1.81)	(2.32)			(4.16)			.07
-.322	-1.22	1.05				-2.11		
(2.94)	(1.48)	(2.34)			LFPR	(6.01)		.10
-2.91	-1.18	1.02			-53.60			
(2.64)	(1.43)	(2.27)			(6.03)			.10

Similar regressions on other sub-sets of the 1967 NLS observations are presented in Appendix E.

between 0 and -1 when variables measuring labor force activity are included (except when #C and $\#C^2$ are excluded); the only exception to this occurs when the dummy variable for labor force participation is used while standardizing for the age of the youngest child. As explained in Chapter IV, because of the complementarity of birth intervals and the amount of labor force activity this may be the best specification of the equation. (The simple correlations between Total Int and respectively Yrs LF, LFPR, and the dummy variable, are -.252, -.264, and -.178.)

The model predicted that in families with steep earnings profiles (high H Ed) children might be spaced more closely together. In regressions on the NFS data the coefficient is positive but of low significance. Since the income measure for the NFS data is not good, H Ed may be picking up some of the income level effect. In regressions on the NLS data, which has more adequate income information, the coefficient of H Ed is negative.

A large value for the income variable was expected to cause shorter intervals, through a price effect, for those women who are not in the labor force; an offsetting positive influence results from the income effect, as couples with higher incomes demand more child-related activities and child quality and can afford longer birth intervals. This is based on an assumption that prospective parents believe that longer birth intervals produce more quality per child, as suggested by the authors of the articles cited in Chapter I. In regressions on NFS data the coefficients of the several income measures are negative and insignificant (Table 10). The coefficients of Y1966, for the NLS data in Table 11, are positive; the t-values average about 1.6 if the number of children is held constant and about 2.4 if #C and $\#C^2$ are omitted from the regression equation. Although the results are inconclusive, since the income data are apparently more reliable in the National Longitudinal Survey than in the National Fertility Study, I would conclude that the positive income effect is stronger than that part of the substitution effect that works through the husband's income for women not in the labor force. Still another possible explanation for the difference in signs between the two data sets is that, since they represent two substantially different cohorts -- women born between 1922 and 1927 for the NLS and between 1910 and 1925 for the NFS -- the income effect may have changed. Finally, in addition to its other shortcomings, Y1965 measures incomes for husbands of many different ages, not a desirable characteristic for a "permanent income" proxy.

In some regressions on the NFS data, Yr Mar was introduced to reflect changing economic conditions over time. But, its strongly negative coefficient probably was inevitable, however economic conditions varied across time; for more recently married couples cannot have birth intervals that are as long as those who were married earlier can. Similarly, the coefficient of the Age variable in Table 11 reflects the fact that some women do have children after the age of forty, greatly lengthening Total Int for them.

These regressions were run on other subsets of the National Fertility Study observations; the results are listed in Table 12 with those from the primary sample for purposes of comparison. There are no surprising changes in coefficients -- the only observed sign reversals occur in instances where the t-value is less than .4.

The negative coefficient of W Ed becomes insignificant only in regressions on women who claimed that the first birth was a timing success, when the number of children was included as an independent variable. This is more likely attributable to the small sample size than to possible effects of education on contraceptive knowledge; for, in the sample of parents with no unwanted children the W Ed coefficients, given #C, are virtually identical with those for the primary sample. This sample is probably more representative of successful contraceptors than the samples of couples reporting B_1 as a timing success. Most timing successes were births that occurred because contraception was never used at any time in the relevant interval. Many of the couples who did not contracept in the first interval did not contracept in subsequent intervals until the desired family size was achieved.[1] For such couples, the level of W Ed is likely to have little effect on the

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[1] Ryder and Westoff, Reproduction in the United States: 1965.

Table 12

Regressions on Total Int for other sub-sets of the 1965 National Fertility Study

Sample: Primary Sample: Married once, one or more children; N = 585

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-5.06	-.09	-.24				
(3.46)	(.08)	(.33)				.04
-2.06	.78	-.61	53.68	-2.67		
(2.27)	(1.02)	(1.38)	(18.25)	(8.26)		.64
-4.35	.40	-.22			-1.88	
(2.98)	(.33)	(.31)			(3.50)	.06
-1.64	1.09	-.60	54.12	-2.76	-1.26	
(1.82)	(1.43)	(1.36)	(18.60)	(8.61)	(3.79)	.65

Sample: Married once, two or more children; N = 496

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-6.66	.46	-.16				
(4.66)	(.38)	(.22)				.07
-2.71	1.00	-.66	45.90	-2.02		
(2.56)	(1.13)	(1.27)	(10.76)	(4.77)		.51
-5.48	1.10	-.08			-2.47	
(3.83)	(.92)	(.11)			(4.30)	.10
-1.98	1.41	-.59	46.20	-2.11	-1.70	
(1.87)	(1.60)	(1.16)	(10.99)	(5.05)	(4.02)	.52

Sample: Mothers married any number of times; N = 748

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-4.19	-.76	-.20				
(3.29)	(.70)	(.30)				.03
-2.24	.61	-.33	56.93	-2.98		
(2.88)	(.92)	(.80)	(21.16)	(9.81)		.65
-3.39	-.31	.22			-1.85	
(2.65)	(.29)	(.33)			(4.21)	.05
-1.78	.86	-.31	56.92	-3.02	-1.12	
(2.29)	(1.30)	(.77)	(21.39)	(10.05)	(4.20)	.65

Table 12

(cont'd)

Sample: Married once, no unwanted children; N = 530

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-3.17 (2.10)	-.48 (.38)	-.19 (.26)				.02
-2.11 (2.23)	.78 (.99)	-.82 (1.85)	54.83 (18.31)	-2.78 (8.41)		.62
-2.62 (1.74)	.04 (.04)	-.18 (.25)			-1.81 (3.40)	.04
-1.76 (1.87)	1.11 (1.41)	-.81 (1.84)	55.13 (18.62)	-2.85 (8.73)	-1.24 (3.70)	.63

Sample: Married once, one or more C., B_1 a timing success; N = 387

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-4.54 (2.61)	-1.10 (.73)	.30 (.33)				.04
-1.45 (1.36)	.85 (.93)	-.97 (1.73)	52.01 (13.25)	-2.37 (5.19)		.65
-3.88 (2.22)	-.48 (.32)	.25 (.27)			-1.83 (2.63)	.06
-.98 (.92)	1.30 (1.43)	-1.01 (1.82)	53.11 (13.68)	-2.54 (5.60)	-1.45 (3.44)	.66

Sample: Married once, two or more C., B_1 a timing success; N = 322

W Ed	H Ed	Y 1965	#C	$\#C^2$	Yr Mar	R^2
-5.45 (3.15)	-.98 (.67)	.29 (.32)				.07
-1.85 (1.48)	.92 (.87)	-1.03 (1.55)	43.27 (7.15)	-1.58 (2.50)		.52
-4.38 (2.52)	-.26 (.18)	.29 (.32)			-2.26 (3.13)	.10
-1.08 (.86)	1.44 (1.37)	-1.02 (1.56)	44.82 (7.50)	-1.79 (2.86)	-1.76 (3.39)	.54

length of birth intervals, at least in its role as a proxy for contraceptive knowledge. If nearly all of the women who wanted some or all of their births as soon as possible are included in this subsample, while approximately two hundred (or 260) of the other observations are excluded, the smaller coefficient on W Ed does not counter our hypothesis about the effect of wife's education on spacing.

W Ed and H Ed are more significant in regression on families with two or more children than in those for the sample including also one-child families. The lower level of significance in the sample that includes one-child families may have resulted because, for want of a better alternative, I had assigned the value zero for the length of the interval from B_1 to B_n to one-child families (B_1 to B_1); therefore, the data are not homoskedastic. Also, the relationship between the number of children and the total interval may not be able to fit the specified "$b_1 . \#C + b_2 . \#C^2$." Finally, it is possible that another regression technique than OLS should have been used when the sample included one-child families, and the dependent variable was distributed with a concentration of observations at zero.[1] Of the regression results in Table 12, those in the second panel, "Married once, two or more children," are probably econometrically most reliable.

In regressions on the various sub-sets of the 1965 NFS (Tables 10 and 12), when the number of children is not held constant the coefficient of Y1965 is much less negative or is even positive although, in all cases, its t-value is very small. In regressions on the 1967 NLS (Table 11) not standardizing for family size more than doubles the size of the (positive) coefficients of Y1966 and raises their t-values. This suggests that higher income couples have had more children. Although this is not a study of completed fertility, we may note that the income effect apparently not only makes possible wider spacing of births but also results in more births. Note also that allowing family size to vary strengthens the substitution effect represented by W Ed: women with

[1]This looks like a candidate for PROBIT analysis, but I have not found a working computer program to perform this form of regression analysis.

high P_t have the same number of children in a shorter length of time, and the shortening of the total interval, with higher education, is even more pronounced with #C is not held constant. In Table 10 the coefficients of W Ed are about two and one-half times as large when family size varies; for the NLS sample the coefficients increase by a factor of about five. These women apprently have births closer together <u>and</u> have fewer births.

B. Average Interval; Number of Births

Since decisions about the total length of the childbearing period can be implemented both through the length of the average interval between successive births and through the number of births, I briefly examined each of these phenomena separately. The results of regressions on Ave Int for the 496 women in the National Fertility Study who had had two or more births are presented in Table 13. Ave Int (average interval) is the total number of months between B_1 and B_n divided by the total number of birth intervals, that is, by one less than the number of births.[1]

The results are similar to those in Table 12 (second panel) except that, as expected, the coefficients are smaller in the regressions on Ave Int, because the dependent variable is smaller. Comparisons of Equations 13.1 and 13.2 with comparable regressions on Total Int -- 10.6 or the last equation in Table 12's second panel -- show little change in the t-values for W Ed, H Ed, and Yr Mar and about a twenty percent reduction in the t-value of Y1965 in the regressions on Ave Int. These results tend to support the spacing hypotheses but they do not produce new insights; they do suggest however, with their much lower levels of R-square, that the number of children is also a spacing decision variable.

Since couples may choose childlessness or an only child in order to achieve "short spacing intervals," I compared the mean values of numerous variables for the primary sample of white, non-Catholic non-farm women in the 1965 NFS who were forty to fifty-four years old and were married once-spouse present. The means and the t-values for the

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[1]Women with multiple births were excluded from all analyses of the 1965 NFS data.

Table 13

Regression on average interval between successive births;
1965 National Fertility Study, white non-Catholics
with two or more births; N = 496

	W Ed	H Ed	Y1965*	#C	$\#C^2$	Yr Mar	R^2
13.1	-1.20	.41	-.34	-5.87		-.86	
	(1.75)	(.73)	(1.02)	(7.02)		(3.17)	.11
13.2	-1.21	.47	-.33	-9.69	.40	-.84	
	(1.77)	(.82)	(1.00)	(3.56)	(1.48)	(3.09)	.11

*When predicted-income variables were used instead of Y1965 their coefficients were even less significant.

differences between sample means (if larger than ± 1.0) are presented in Table 14. The observations are also distributed by other variables of interest.

The percentage of childless women whose husbands were not in the labor force (or Armed Forces), thirteen percent, was significantly higher than the percentage for women with one or with one or more children. Given our social norms and the high level of labor force participation among married white males, it is reasonable to assume that the causality runs from the husband's non-participation to the childlessness, rather than vice versa -- that is, one response to a husband's inability to work or to work regularly is to have no children (truly a "zero" total interval spent in child caring), so that the wife can work and because family income is low. Moreover, significantly more childless women were working because they liked to (forty-two percent) than among women with children (almost fourteen percent). The proportion of mothers of one child who were working because they preferred to also is somewhat greater than the proportion for mothers of two or more children. Thus, at least part of the response by couples when the woman has a preference for labor market participation -- for whom child-related activities are particularly costly -- is to shorten or eliminate the child caring life stage by having only one or no children.

The childless couples also had much more education than the other couples. This and the high labor force participation of the non-mothers suggest that the cost of children, that is, of the time input to child-related activities, would have been higher on the average for those women who did not have children.[1] The significantly higher average age at marriage for childless women (almost twenty-seven years) also fits the assumption of a greater commitment to careers by these women.

That the childless and one-child mothers are older than the mothers of two or more children probably reflects an income effect, as the older cohorts were in their twenties during the years of the Depression; economic conditions were much more favorable for the more recent cohorts.

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[1]This is not to suggest that labor force participation is the only alternative to raising children, but rather recognizes that market activities are less complementary to the production of child-related activities than are other activities.

Table 14

Mean values of several variables by #C, with t-values for testing significance of difference between means

Variable	#C = 0	#C = 1	#C = 2+	t - 0:1	t - 0:2+	t - 1:2+
No. Obs.	46	89	496			
H Ed	12.98	11.73	11.57	2.06	2.69	--
W Ed	12.48	11.53	11.62	1.89	2.09	--
Y40	9.559	8.917	8.760	1.44	2.12	--
Y1965	8.446	8.781	8.583	--	--	--
Year Mar	44.20	40.89	41.00	2.64	3.89	--
W Yr Born	17.37	18.30	19.86	-1.10	-3.92	-3.24
H Yr Born	14.78	16.44	16.85	-1.56	-2.53	--
Age Diff	30.76	23.62	36.33	--	--	-2.62
W Age Mar	322.7	270.9	253.9	4.39	9.04	3.18
H Age Mar	353.5	294.5	290.3	4.36	7.34	--
W Age B_1		322.7	282.4			6.30
H Age B_1		346.3	318.7			3.94
W Age B_n		322.7	381.4			--
H Age B_n		346.3	417.7			--
First Int		51.85	28.46			5.89
% H not working	13%	1%	4%	3.01	1.93	1.42 (t 0:1+, 2.9

Labor Force Participation since marriage:

	None	Not Now	Working Now - Reason			
			Need	Extras	Prefer.	Unk.
#C = 0	17%	28%	9%	4%	41%	0%
#C = 1	19	40	8	16	17	0
#C = 2+	21	36	14	14	13	2

Chi-square (10 d.f., 1%) = 23.2; observed χ^2 = 31.1

Combining '1' & '2+': χ^2 (5 d.f., 1%) = 15.1; observed χ^2 = 26.2

Thus, in addition to the income and substitution effects on spacing noted earlier in this chapter, there also were responses to economic forces in terms of the number of children born.

C. Age at Last Birth

The total result of the timing and of the spacing (and of the number) decisions can be seen in the regression results in Table 15; the dependent variable is the wife's age in months at the birth of the last child (W Age B_n). The first two equations show that an additional year of education leads to an insignificant increase in a woman's age at B_n. This results partly from having fewer children, but most of the year is "recovered" by having children sooner and/or closer together (equations 15.3 to 15.5). Even if the woman with more education has the same number of children as a woman with less education, each year of education adds only 2.6 months to her age at B_n.

High H Ed raises a woman's age at B_n primarily by causing her to start childbearing later. The income variable is difficult to analyze because of inadequacies in the variable as a measure of expected income at young ages or even as an accurate measure of current income. Women in the most recent cohorts completed childbearing at a younger age than older women in the sample; this may be due in part to the more recent cohorts' being able to begin childbearing sooner because of better economic conditions, but it could result simply because the most recent cohorts have not had a chance to have a last birth at a late age. As in the case of the total interval, the slightly less negative effect when family size is not held constant probably reflects a larger family size for higher income couples.

The reader may wonder whether the negative effect of W Ed on the Total Int isn't merely the result of women with more education being older when they marry and having to compress birth intervals so that they can complete their childbearing at about the same age as other women. The regressions on Total Int in Table 16 were run both with and without the wife's age at marriage being held constant. Not unexpectedly, the coefficient of W Ed was lower when W Age Mar was included in the regressions -- by about twenty-five to thirty percent when family size is held constant and by thirty-seven percent when family size varies.

Table 15

Regressions on the wife's age in months at B_n;
1965 National Fertility Study, Primary Sample; N = 585

Eq. No.	W Ed	H Ed	Y 1965*	#C	$\#C^2$	W Yr B	R^2
15.1	.51	3.01	-.21				
	(.34)	(2.35)	(.28)				.02
15.2	.47	3.16	-.18			-1.49	
	(.31)	(2.43)	(.25)			(2.22)	.03
15.3	2.90	3.99	-.44	21.77		-2.07	
	(2.23)	(3.63)	(.70)	(14.59)		(3.59)	.29
15.4	2.58	3.79	-.43	36.80	-1.76	-2.32	
	(2.01)	(3.49)	(.69)	(8.76)	(3.82)	(4.06)	.31
15.5	2.64	3.66	-.47	34.53	-1.54		
	(2.03)	(3.32)	(.73)	(8.19)	(3.33)		.29

*Results using Y40 were even less significant.

Table 16

Comparison of regressions on Total Int, with and without W Age Mar held constant; sub-samples from the 1965 National Fertility Study

Sample: Married once, one or more children; N = 585

W Ed	H Ed	Y 1965	#C	#C^2	W Age Mar	R^2
-5.06 (3.46)	-.09 (.08)	-.24 (.33)				.04
-3.18 (2.20)	.84 (.70)	-.30 (.43)			-.39 (6.24)	.10
-2.06 (2.27)	.78 (1.02)	-.61 (1.38)	53.68 (18.25)	-2.67 (8.26)		.64
-1.42 (1.56)	1.12 (1.46)	-.63 (1.42)	52.55 (17.97)	-2.62 (8.22)	-.15 (3.75)	.65

Sample: All married, one or more children; N = 748

W Ed	H Ed	Y1965	#C	#C^2	W Age Mar	R^2
-2.24 (2.88)	.61 (.92)	-.33 (.80)	56.93 (21.16)	-2.98 (9.81)		.65
-1.68 (2.13)	.75 (1.13)	-.33 (.82)	55.94 (20.82)	-2.93 (9.71)	-.10 (3.48)	.65

Sample: All married, two or more children; N = 619

W Ed	H Ed	Y1965	#C	#C^2	W Age Mar	R^2
-3.01 (3.20)	.79 (.99)	-.33 (.66)	49.18 (12.04)	-2.32 (5.63)		.50
-2.05 (2.12)	.97 (1.22)	-.32 (.65)	48.16 (11.89)	-2.29 (5.60)	-.15 (3.79)	.51

The coefficients are, however, still significantly negative. The coefficient of H Ed is somewhat more positive while those of Y1965, #C, and $\#C^2$ are virtually unchanged.

Including the wife's age at B_1 reduces the coefficient of W Ed by about one-third if #C is included or by about one-half if it is not.[1] The effect of W Ed is still to reduce the total interval but the effect is weaker; part of it apparently is a response to an older age at B_1. Of course, W Age B_1 is assumed to be endogenous in this model; therefore one cannot rule out the possibility that more educated women plan a shorter total interval irrespective of when they begin childbearing and that then, because they plan a short Total Int, they can afford to have B_1 later.

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[1]See Appendix I.

CHAPTER VI

LABOR FORCE PARTICIPATION AND THE TIMING AND SPACING OF BIRTHS

A. Introduction

The hypotheses generated by the timing and spacing model and generally supported by the data do not require an assumption that women who are not in the child caring life stage will participate in the labor force. There are other uses of a woman's time, called here "other activities;" even if a given woman does not plan on a career she would be expected to take account of the relative costs of child-related and other activities, which are assumed to depend on her education and her husband's income, in planning when to have her children. Nevertheless, labor force participation is an important alternative to child care activities and many people believe it plays a significant role in the timing of the life cycle stages.

I have investigated, using the 1967 National Longitudinal Survey of Work Experience (women aged 30-44), the effects of education and income variables on the relationship between the extent (length) of labor force participation and the timing of the first birth and the spacing of subsequent births. The basic sample from this data set consists of white, non-farm mothers aged 40-44 who were married once-spouse present. Certain types of analyses required further restrictions. For example, to study work experience between child births I had to eliminate one-child mothers; similarly, work experience in other intervals such as between leaving school and marriage required that the interval be positive.[1] The date of birth of the first child was known because the data included the date of acquisition of first child and I eliminated all mothers who acquired a child by other means than childbirth. For analyses requiring the date of birth of the last child, I calculated it from the age of the youngest child present in the household. If no children were still at home, I eliminated the observation unless it was the mother of an only child; in those instances, I used the birth date of the "first" (only) child.

The education variables are measured in years. The income variable is the 1966 income of the family, exclusive of the wife's wages,

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[1]The year of leaving school was not recorded for forty-six women, forty-one of whom had never worked; those observations were eliminated whenever the interval since school was involved in the analysis.

salary, and self-employment income, in thousands of dollars. The number of children is not reported directly in this data set but was reconstructed from answers to several questions on missing children and acquired children and from a count of household members listed as children of the respondent; thus, it is subject to more measurement error than the #C variable in most data sets. The average interval equals the total interval in months from B_1 to B_n divided by one less than the number of children; it is undefined if n=1. The lengths of the intervals relating the dates of school leaving, marriage, and B_1 were expressed in months; the amount of labor force experience in those intervals was measured in years, using in both instances, the units of measurement used in the original data set. Dummy variables are described as they are introduced.

There are 706 women who were white, non-farm, married once-spouse present, aged forty to forty-four, with one or more children. Since labor force experience is recorded for the three intervals from school to marriage, marriage to first birth, and first birth to the interview, there are eight possible combinations of labor force participation or non-participation for each woman. Table 17 presents the participation rates for each of the three intervals and the probability of participation or non-participation in an interval given the labor force status in an earlier interval. The mean values of several variables of interest, by labor force participation in the three intervals, is presented in Table 18.

As Table 17 indicates, the participation rates are highest for these women in the interval before marriage and lowest in the interval between marriage and first birth, when the participation rate is less than half the pre-marital rate. By far the most usual pattern of labor force participation was to work before marriage only (thirty percent of the women). (This suggests that results from this study should be extrapolated to more recent cohorts with caution, for labor force participation by married women has been increasing; indeed, more of these women may have entered the labor force since the 1967 interview.) Not surprisingly, of the 195 women who did not work in the Sch-Mar interval only twenty-five percent did work between marriage and first birth. Ninety-seven of them, or fifty percent, did work at some time after marrying. However, fully sixty percent of the women who were working before marriage dropped out

Table 17

Labor force participation rates and transition probabilities; 1967 National Longitudinal Survey; N = 706

Sch-Mar		$Mar-B_1$		After B_1
195 (28%) non LF	.75	147 (21%) non LF	.67	98 non LF (14%)
			.33	49 LF (7%)
	.25	48 (7%) LF	.38	18 non LF (3%)
			.62	30 LF (4%)
511 (72%) LF	.60	306 (43%) non LF	.70	214 non LF (30%)
			.30	92 LF (13%)
	.40	205 (29%) LF	.38	77 non LF (11%)
			.62	128 LF (18%)
195 (28%) non LF		453 (64%) non LF		407 (58%) non LF
511 (72%) LF		253 (36%) LF		299 (42%) LF

Table 17

(cont'd)

Sch-B_1		After B_1
147 (21%) non LF	.67 →	98 non LF (14%)
	.33 →	49 LF (7%)
559 (79%) LF	.55 →	309 non LF (44%)
	.45 →	250 LF (35%)

Sch-Mar		After Mar
195 (28%) non LF	.50 →	98 non LF (14%)
	.50 →	97 LF (14%)
511 (72%) LF	.42 →	214 non LF (30%)
	.58 →	297 LF (42%)

Includes all observations, even if married while still in school, B_1 pre-marital, etc.

Table 18

Mean values of several variables by wife's labor force participation; 1967 National Longitudinal Survey; N = 706

LFP	Sample # obs	W Ed	H Ed	Y1966	#C	$Sch\text{-}B_1$*	Total Int**	Grad*	Yrs LF	Age	LFPR*	Age YC*
000	98	10.14	10.86	6,442	3.786	45.2	106.5	42.42	0.00	42.14	0.00	11.19
100	214	11.28	12.02	7,878	3.379	91.2	95.3	41.91	4.56	42.00	.18	8.79
010	18	11.78	13.17	10,133	3.056	87.9	82.3	43.41	3.78	41.72	.16	9.00
001	49	10.37	9.84	4,595	3.265	39.8	91.4	41.22	9.02	42.26	.35	13.74
011	30	12.10	11.70	8,105	3.067	37.3	89.5	42.86	13.37	41.97	.54	12.34
101	92	10.85	10.66	6,533	2.978	70.5	77.0	41.36	11.28	42.06	.44	12.31
110	77	11.77	12.10	7,963	3.039	83.2	88.3	42.43	6.12	41.69	.25	9.54
111	128	11.90	11.59	7,233	2.773	77.8	67.6	42.31	14.57	42.02	.49	11.74
"All"	706	11.21	11.48	7,235	3.207	74.6	87.8	42.04	7.45	42.01	.32	10.67

*Forty-six observations lacking Grad were eliminated; forty-one of these were in the first LFP category, 000; N = 660.

**This is reasonably accurate for families with more than one child only if the youngest child is still at home.

Explanation of LFP:

000 Never in LF

100 In LF only during Sch-Mar

010 In LF only during $Mar\text{-}B_1$

001 In LF only after B_1

011 In LF during $Mar\text{-}B_1$ and after B_1

101 In LF during Sch-Mar and after B_1

110 In LF during Sch-Mar and $Mar\text{-}B_1$

111 In LF all three intervals

of the labor force at (or before) marriage. A minority of these women eventually returned to the labor force after having had children, but 214, or forty-two percent of those women who had worked before marriage never worked after marriage.

Labor force participation between marriage and first birth is more predictive of later labor force activity. Sixty-two percent of the married women who worked before B_1 also worked after B_1; 312 of the 453 women who did not work during Mar-B_1, or sixty-nine percent, did not enter the labor force after B_1 either. Only twenty-one percent of the women did not work in the labor force at some time prior to their first births; of these, exactly two-thirds also did not work after B_1.

From Table 18 one can determine what patterns of labor force participation are associated with high or low values of each variable, but, of course, one cannot simultaneously hold constant the values of the other variables; because some of these variables are correlated significantly with others one should not attach too much significance to observed relationships.

As should be expected, the lowest level of wife's education -- more than one year below the mean for the entire sample -- is that of women who have never entered the labor force. Those women who worked only after B_1 also had a low value for W Ed -- an average education level of 10.37 years; probably many of the women in these two groups were pregnant when they left school. The model in Chapter II predicted somewhat similar behavior for women with high education levels -- namely, working for only a short time after school, before B_1; if such a pattern was in fact followed, its existence may have been obscured in my analyses by the labor force activity pattern of those low education women who did not work before B_1 because of unplanned early pregnancies. Of the women who ever worked at all, those who worked after having children were the women with the lowest education (10.68 years) and the women with the highest education (11.94). Those low education women also were in the families with the lowest husband's income; so that the motivations for working may have been quite different.

All four groups of women who worked after marriage, before having children, were the four groups with the highest average W Ed. There is a tendency for the same phenomenon to appear with respect to both H Ed and

Y1966; that is, four of the five highest values for husband's education and for his 1966 income are associated with women who worked during the Mar-B_1 interval. A similar pattern emerges with respect to the wife's age when she was interviewed: the four groups who worked after marriage and before B_1 were among the five youngest groups of women. The average age of women who had worked then was 41.90; for those who had not, 42.07 years. (Since all women in this sample are aged forty to forty-four there is not much room for variations in the average ages of different sub-groups.) This may represent a change over time in attitudes towards labor force participation by married women, to changing economic conditions over time -- availability of jobs, need for the wife's income, wage rates of women, etc. -- or the like.

If women who worked in all three intervals are omitted, the average age of the remaining women who worked during the Mar-B_1 interval falls below 41.8 years. The women who worked in all intervals are the only ones whose family income is below the average of the entire sample; the remaining women have the highest average Y1966. This suggests that the younger women may have worked even though their earnings were not needed, or that their working enabled their husbands to earn more in 1966, perhaps by financing human capital investment -- behavior apparently not so common among earlier cohorts. Perhaps reflecting some of the same forces, all three groups of women whose year of leaving school was earlier than the average for the entire sample did not work between marriage and B_1.

The two groups of women who never worked in the labor force after their marriage have the largest families. There is a tendency for women who worked either before marriage or between marriage and first birth to have fewer children than the average. Not surprisingly, the three groups with an average interval from school to first birth of forty-five or fewer months all were non-participants between school and marriage; this birth interval exceeded seventy months for all other groups. None of the three labor force groups with the longest Sch-B_1 interval has worked since beginning to bear children. As expected, women who worked in all three intervals have the shortest Total Int, as well as the fewest children (and the greatest number of years of labor force experience); while those who have never worked have the longest Total Int and largest #C.

B. LFP Before B_1

I examined the components of the interval from leaving school to the date of the first birth separately as well as *in toto*. Table 19 presents regression coefficients for the effects of several variables on the amount of labor force experience between school and marriage, given the length of that interval. Table 20 presents regressions for the interval from marriage to B_1; Table 21, the total interval from school to B_1. In each table observations with a negative interval were excluded from the analysis, as were observations for which Grad, the year of leaving school, was unknown. In each table results are presented for all women whether or not they worked in that interval and then for only those women who were in the labor force during the interval.

From regression equations 19.1 through 19.12, it is obvious that the wife's education level is a very important determinant of how much of the interval from school to marriage she spends in the labor force. The higher her education the more she will work between school and marriage, given the length of that interval. The larger coefficients and t-values for W Ed in the first six equations, compared to 19.7 through 19.12, indicate that the level of education also affects whether or not a woman will work at all after leaving school. The average W Ed for the 508 women who worked in this interval was 11.45 years; for all 612 women, 11.33 (Table 22); therefore the average education of the non-workers was approximately 10.74 years.[1]

The variables for the husband's attributes, H Ed and Y1966, were not expected to affect the wife's labor force decisions premaritally. The positive but insignificant signs may be indicative of women who are more firmly attached to the labor force meeting and marrying men with higher education and/or income, but this is only speculation. Nor did the number of children a woman would later have affect significantly the amount of her labor force participation in the pre-marital interval, given the length of that interval, although the negative sign does seem appropriate.

In the sample of women who did work during this interval the fact that she would re-enter the labor force at some time subsequent to B_1

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[1] (612 . 11.3 - 508 . 11.45)/(612-508) = 10.74.

Table 19

Regressions on the number of years worked between school and marriage; 1967 National Longitudinal Survey, white, non-farm mothers, aged 40-44, married once-spouse present

Regression coefficients, with t-values in parentheses

Sample: All with positive interval from school to marriage; N = 612

Eq. No.	W Ed	H Ed	Y1966	#C	dummy*	Sch-Mar	R^2
19.1	.280 (9.23)					.068 (38.55)	.71
19.2	.275 (8.92)			-.034 (.89)	.021 (.15)	.067 (39.55)	.71
19.3	.250 (6.61)	.029 (1.14)		-.036 (.94)		.067 (37.26)	.71
19.4	.254 (6.78)	.031 (1.18)			.067 (.46)	.067 (37.52)	.71
19.5	.267 (8.45)		.015 (1.06)	-.038 (.99)		.067 (38.08)	.71
19.6	.273 (8.77)		.015 (1.04)		.058 (.41)	.068 (38.16)	.71

Sample: Women who worked between school and marriage; N = 508

Eq. No.	W Ed	H Ed	Y1966	#C	dummy*	Sch-Mar	R^2
19.7	.184 (6.10)					.069 (41.39)	.77
19.8	.181 (5.91)			-.036 (.98)	.223 (1.67)	.070 (40.72)	.78
19.9	.151 (4.19)	.034 (1.42)		-.048 (1.31)		.069 (40.25)	.78
19.10	.156 (4.39)	.038 (1.59)			.270 (2.02)	.070 (40.76)	.78
19.11	.178 (5.69)		.001 (.09)	-.045 (1.22)		.069 (40.89)	.77
19.12	.185 (6.01)		.003 (.22)		.245 (1.84)	.070 (41.15)	.77

* Dummy = 1 if the woman ever worked after B_1; otherwise, dummy = 0.

Table 20

Regressions on the number of years worked between marriage and B_1; 1967 NLS

Sample: All with positive interval from marriage to B_1; N = 656

W Ed	H Ed	Y1966	#C	Dummy	Mar-B_1	R^2
.022 (.93)					.029 (13.99)	.23
.026 (1.18)				.777 (7.12)	.030 (14.95)	.29
.019 (.80)		.014 (1.29)		.794 (7.23)	.030 (14.95)	.29
.018 (.66)	.010 (.51)			.786 (7.11)	.030 (14.92)	.29
.025 (1.12)			-.010 (.31)	.772 (7.02)	.030 (14.43)	.29
.013 (.45)	.006 (.32)	.013 (1.25)	-.011 (.35)	.795 (7.10)	.030 (14.40)	.29

Sample: Women who worked between marriage and B_1; N = 250

W Ed	H Ed	Y1966	#C	Dummy	Mar-B_1	R^2
-.030 (.83)					.056 (22.17)	.67
-.032 (.90)			.054 (1.02)		.057 (21.44)	.67
-.030 (.86)				.243 (1.62)	.057 (22.82)	.67
-.033 (.95)			.065 (1.21)	2.63 (1.75)	.058 (21.59)	.68
-.030 (.72)	-.005 (.17)	.001 (.05)	.065 (1.21)	2.61 (1.71)	.058 (21.44)	.68

Table 21

Regressions on the number of years worked between school and B_1;

1967 NLS

Sample: All with positive interval from school to B_1; N = 656

W Ed	H Ed	Y1966	#C	Dummy	Sch-B_1	R^2
.207					.053	
(5.12)					(26.77)	.52
.170	.055			.823	.054	
(3.45)	(1.57)			(4.24)	(26.94)	.54
.207		.019		.802	.055	
(5.03)		(.99)		(4.14)	(27.93)	.54
.166	.051	.014		.839	.054	
(3.35)	(1.43)	(.76)		(4.29)	(26.92)	.54
.168	.051	.014	.010	.844	.055	
(3.33)	(1.43)	(.75)	(.18)	(4.27)	(26.09)	.54

Sample: Women who worked ever between school and B_1; N = 554

W Ed	H Ed	Y1966	#C	Dummy	Sch-B_1	R^2
.174					.052	
(4.00)					(25.68)	.55
.179				.803	.054	
(4.18)				(4.17)	(26.39)	.56
.151	.036			.832	.054	
(3.00)	(1.04)			(4.28)	(26.06)	.56
.150	.037	-.001	-.005	.828	.053	
(2.92)	(1.04)	(.053)	(.098)	(4.18)	(25.03)	.56

Table 22

Mean values of certain variables for the six sub-samples in Tables 19, 20, and 21

Sample: All with positive interval from --

	Sch-Mar	Mar-B_1	Sch-B_1
W Ed	11.3	11.4	11.4
H Ed	11.5	11.6	11.6
Y1966	$7.3	$7.4	$7.4
#C	3.2	3.2	3.2
Yrs LF	3.4	.9	4.1
% working after B_1	46	46	46
Length of interval (months)	51.2	28.1	75.2

Sample: All who worked during the interval --

	Sch-Mar	Mar-B_1	Sch-B_1
W Ed	11.4	11.9	11.5
H Ed	11.7	11.9	11.8
Y1966	7.5	7.8	7.6
#C	3.1	2.9	3.1
Yrs LF	4.1	2.3	4.8
% working after B_1	44	64	46
Length of interval (months)	56.8	32.7	80.7

increased significantly her work experience after school, before marriage. This relationship disappears in the sample of all women regardless of work experience before marriage. These results may be affected by the omission of the women who never worked at any time (omitted because the length of the interval from school to marriage cannot be determined); 104 women in this sample who did not work before they married did work after. Inclusion of the other women would raise the (positive) significance of the dummy variable in equations 19.4 and 19.6.

The coefficient of the interval in months, .07, indicates that lengthening the interval by one year increases the time spent in the labor force by about twelve times .07 or .84 years. The average interval for all women was 51.21 months; for those who worked, 56.77 months, indicating much shorter intervals -- about two years[1] -- for women who did not work. Some of these 104 non-workers may have had very short or even zero-length intervals. (The marriage month was reported but the month of leaving school was not; my assumption that the month of leaving school was June may have produced positive intervals where they did not exist.) Also, labor force experience was reported to the nearest year; so that any woman who married within six months of leaving school must report no labor force participation during that interval.

Only 250 or about thirty-eight percent of the 656 women who had their first birth subsequent to their marriage worked during any of the twenty-eight months (average) between the marriage and B_1.[2] The average educational level was nearly one-half year higher for the workers than for the entire sample, 11.89 as against 11.44. Their husbands had more education and income. The probability of their participating in the labor force after B_1 was much higher -- sixty-four percent for workers, forty-six percent for the total sample, and therefore thirty-five percent for the non-workers.

The only significant variable in the regression on work experience between marriage and first birth (Table 20), other than the length of the interval, is the dummy variable: if a woman plans to work after having

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[1](612 . 51.21 - 508 . 56.77)/(612-508) = 24.05.

[2]This excludes women for whom Grad is unknown; thirty-six percent (253) of the 706 women in the total sample worked between marriage and B_1.

children she is much more likely to continue working after her marriage rather than quitting her job. If she does continue working she is likely to work somewhat more than the woman who will not work once she has begun childbearing.

An additional year in this period adds less labor force experience than an additional year before marriage. Even among only those women who did work in the period between marriage and B_1 an additional year added to the interval results in only a little more than two-thirds of a year of additional labor force experience.

The dependent variable in the regressions in Table 21 is total work experience in the two intervals Sch-Mar and Mar-B_1 together. The regression coefficients in Table 21 are for those women whose first birth occurred after they left school (Grad known, N=656) and for those who worked between leaving school and having their first child -- either before or after marriage. The two important determinants of the degree of labor force participation (after leaving school) before B_1 are the wife's education and the likelihood that she will work after having children, represented by the dummy variable indicating whether or not she did actually work after B_1. Women with more education do work during more of the pre-maternal period; and ceteris paribus women with a strong enough labor force commitment to work after having children work more pre-maternally.

C. LFP After B_1

In a study of women's labor force participation after the start of the childbearing stage two phenomena are of special interest: labor force entries or re-entries before the last birth (if there are two or more births) and labor force (re)entry after the last birth only. Of the 302 women who worked after having had one or more birth,[1] 253 had worked pre-maternally. The 302 women were divided nearly evenly between those

[1] Three observations are included here that were categorized in Section A of this chapter as not working after B_1. These women were reported as having been in the labor force but having worked zero years -- i.e., either they did not work at least six months in any one year or the information on years was missing. In Section A where calculations involving years of labor force experience were used, these observations were omitted; they are included here because the number of years worked is not relevant to the analyses.

who worked between the births of their children -- i.e., before B_n, 125 women, and those who entered the labor force only after the last birth, 129 women; forty-eight of the women had only one child.

I first attempted to predict whether a woman would enter the labor force after having children, on the basis of her education, her husband's education and income, and measures of the extent of her childbearing and labor force interruption -- the number of children she bore, the length of the average interval, and the length of the total interval from B_1 to B_n. In the regressions reported in this section, I eliminated observations reporting a husband's and others' income of less than $1,000 in 1966 on the assumption that these were mainly refusals to answer or reporting errors. Although this reduced sample sizes, that cost seemed justified here, for Y1966 was expected to be an important consideration or to be correlated with important factors in determining a woman's post-B_1 labor force behavior.[1]

The dependent variable in the regressions on Table 23 is a dichotomous variable whose value is "one" if the woman ever worked after B_1 and "zero" otherwise.[2] As expected, the higher the wife's education, the more likely it is that she will work even after having children. The strong negative sign on the income variable also is not surprising: data in Table 14 indicated that many mothers who work report they do so because of family financial need.

The negative signs on the fertility variables were also predictable; for women who have many children or who have them far apart are probably less committed to market work. It should be noted however that many women do work between births, so that a long average or total interval does not automatically preclude labor force participation after B_1. The negative sign for H Ed is a bit surprising; for more educated husbands ought to be more open-minded about their wives working outside the home, and, regressions

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[1]A husband's 1966 income was not expected to be very relevant to pre-B_1 labor force participation, most of which was pre-marital; therefore, I did not bother with this refinement in Section B. Regressions excluding observations with Y1966 of less than $1000 are presented in Appendix F.

[2]Although t-values are recorded, their interpretation is not entirely identical with t-values in regressions on normally distributed dependent :iables.

Table 23

Regressions on labor force participation after B_1; 1967 NLS

Dependent Variable: 1 if woman worked after B_1, 0 if she did not.

Sample: All women; N = 664

W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
.019 (2.00)	-.026 (3.73)	-.010 (2.66)				.04
.016 (1.71)	-.027 (3.81)	-.009 (2.50)	-.030 (2.94)			.05
.019 (2.03)	-.027 (3.83)	-.010 (2.61)		-.002 (2.86)		.05
.016 (1.70)	-.028 (3.96)	-.009 (2.32)			-.001 (4.01)	.06
.017 (1.75)	-.027 (3.91)	-.009 (2.45)	-.029 (2.81)	-.002 (2.72)		.06
.02 (1.65)	-.03 (4.19)					.03
.01 (1.37)	-.03 (4.26)		-.03 (3.08)			.04
.02 (1.69)	-.03 (4.29)			-.00 (2.91)		.04
.01 (1.38)	-.03 (4.39)				-.00 (4.23)	.05
.013 (1.41)	-.030 (4.34)		-.030 (2.95)	-.002 (2.76)		.05

Table 23

(cont'd)

Sample: All women with Y1966 ≧ $1000; N = 554

W Ed	H Ed	Y1966	#C	Avt Int	Total Int	R^2
.03 (2.62)	-.02 (2.28)	-.02 (4.33)				.05
.02 (2.38)	-.02 (2.37)	-.02 (4.22)	-.03 (2.51)			.06
.03 (2.57)	-.02 (2.36)	-.02 (4.10)		-.00 (2.80)		.07
.02 (2.33)	-.02 (2.52)	-.02 (4.04)			-.00 (3.91)	.08
.024 (2.34)	-.019 (2.43)	-.020 (4.01)	-.026 (2.30)	-.002 (2.61)		.08
.02 (2.35)	-.02 (2.52)	-.02 (4.01)	.01 (.27)	-.00 (.25)	-.00 (1.58)	.08

on Total Int for the NLS data yielded negative coefficients for H Ed (Chapter V). But the sign is appropriate if child quality is education-elastic as well as income-elastic. Husbands with high H Ed may desire "high quality" children requiring large inputs of the wife's time.[1]

Given that a woman enters or reenters the labor force after having had one or more children, what factors determine whether she will work before she has completed childbearing or only after having had her last child? To answer this question, regressions were run on a dummy variable whose value was "one" if the woman worked between B_1 and B_n and was "zero" if her work experience commenced only after B_n. The results are presented in Table 24. The sample is all mothers of two or more children who worked after B_1, either before or after B_n. A positive coefficient means that larger values of that independent variable increase the probability that a woman will enter the labor force before completing childbearing.

The economic variables have little effect: W Ed and H Ed are insignificant and Y1966 is significant only when the total interval is also entered into the regression. Two plausible explanations for the positive coefficient of Y1966 and (1) that women whose husbands have high incomes can afford to hire competent child care, and (2) that for some couples this high level of income was somewhat unexpected and resulted in their revising their decision as to how many children to have. In such cases, the wife's labor force activity, when it occurred, may have been viewed by the couple as post-B_n, the decision to have another child coming only later.

The demographic variables, #C and Ave Int both are significantly positive as is the total interval (= Ave Int · (#C-1)). The coefficients of #C and Ave Int are larger and more significant when both variables are included in the regressions than when either appears alone. Ave Int has the larger t-value; the slope coefficients cannot be compared directly because the size of the coefficient of Ave Int depends on the units of measurements for Ave Int. According to the coefficients from Equations 24.4, 24.7, and 24.8, having one additional child with unchanged

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[1]If there are elements of this in W Ed apparently they are more than offset by the substitution effects.

Table 24

Regressions on labor force participation between B_1 and B_n; 1967 NLS, women with two or more children who ever worked after B_1 (or B_n)

Dependent Variable: 1 if woman worked between B_1 and B_n,
0 if she worked only after B_n (and not between).

Sample: All, N = 254

Eq. No.	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
	-.006	-.003					
24.1	(.36)	(.20)					.00
	-.005	.006		.056			
24.2	(.32)	(.48)		(2.64)			.03
	-.008	.006			.006		
24.3	(.47)	(.49)			(4.24)		.07
	-.007	.012		.076	.007		
24.4	(.44)	(.96)		(3.72)	(5.01)		.12
	.000	.011				.003	
24.5	(.02)	(.89)				(5.85)	.12
	.000	.011		-.038	.001	004	
24.6	(.03)	(.86)		(.75)	(.53)	2.44)	.14
	-.004		.018	.076	.007		
24.7	(.35)		(2.68)	(3.78)	(5.33)		.14
	-.008	.004	.017	.077	.007		
24.8	(.48)	(.34)	(2.51)	(3.78)	(5.33)		.14

Table 24

(cont'd)

Sample: All with Y1966 ≥ $1000; N = 213

Eq. No.	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
24.9	-.006 (.32)	-.000 (.01)	.126 (1.29)				.01
24.10	-.006 (.35)	.004 (.30)	.014 (1.49)	.067 (2.95)			.05
24.11	-.007 (.39)	.001 (.04)	.014 (1.52)		.006 (3.44)		.06
24.12	-.008 (.44)	.006 (.45)	.017 (1.82)	.081 (3.68)	.007 (4.10)		.12
24.13	-.003 (.15)	.007 (.51)	.017 (1.89)			.003 (5.53)	.14
24.14	-.002 (.09)	.006 (.43)	.018 (1.91)	-.043 (.78)	.000 (.08)	.004 (2.45)	.14
24.15	-.01 (.40)		.01 (1.35)				.01
24.16	-.00 (.21)		.02 (1.66)	.07 (2.94)			.05
24.17	-.01 (.45)		.01 (1.61)		.01 (3.45)		.06
24.18	-.003 (.22)		.018 (2.05)	.080 (3.66)	.007 (4.09)		.12
24.19	.00 (.18)		.02 (2.14)			.00 (5.52)	.14
24.20	-.00 (.20)		.02 (2.14)	-.04 (.80)	.00 (.07)	.00 (2.46)	.14
24.21	-.007 (.39)	.014 (1.02)		.078 (3.54)	.006 (3.96)		.11

Table 24a

Mean values of variables, by the woman's labor force status between B_1 and B_n

Variable	Worked After B_n Only: All N=129	Worked After B_n Only: $Y \geq 1000$ N=105	Worked Between B_1 and B_n: All N=125	Worked Between B_1 and B_n: $Y \geq 1000$ N=108
W Ed	11.48	11.46	11.39	11.44
H Ed	11.12	11.10	11.10	11.23
Y1966	6.258	7.679	7.233	8.360
#C	3.070	3.076	3.560	3.648
Ave Int	35.99	35.39	47.18	44.65
Total Int	71.50	71.31	108.5	108.4

spacing and lengthening the average interval by ten to eleven months, holding contant #C, have about the same quantitative effect on the probability that a woman will work before having her last child (given that she ever works after B_1). For Equations 24.12, 24.18, and 24.21, the effect of one additional child is equivalent to that of twelve to thirteen month longer intervals. A long interval probably reduces the costs (including psychic costs) of working between childbirths -- e.g., the child may be in public or nursery school; a large number of children may make such labor force participation more necessary.

A comparison of the equations not containing demographic variables (24.1, 24.9, and 24.15) with the other equations suggests that women with more education do not alter the number or spacing of their children in order either to be able to or to avoid working between child births rather than only after the child-care period. The coefficients and t-values of W Ed are affected very little by inclusion or exclusion of #C and Ave Int.

I next investigated what determines how soon after B_1 women enter the labor force and, for those who wait, what determines how long after B_n women wait before entering the labor force. Regressions on the length of the interval (in months) from B_1 to labor force entry were run on many subsamples of the women in the 1967 NLS who worked after B_1. Results of some of the regressions which used the total interval from B_1 to B_n as the fertility measures are presented in Table 25. Other of these regressions as well as comparable equations using #C, Ave Int, and both #C and Ave Int instead of Total Int are presented in Appendix G.

If one examines together the women who worked before B_n and those who worked only after B_n, no cause-and-effect relationships emerge. Focusing only on the women who worked between births provides only a little more enlightenment: the economic variables are still insignificant, while a longer total interval increases the time from B_1 to labor force entry. This appears to be almost trite; for obviously those women who have a total interval of, say, 36 months cannot average, say, 48 months from B_1 to labor force entry, while other women with a longer interval, say, 72 months, can. Also, when other regressions were run on the sub-samples used

Table 25

Regressions on the number of months from B_1 to labor force entry, for various sub-samples of women who worked after B_1 (or B_n); 1967 NLS

Eq. No.	Sample	N	W Ed	H Ed	Y1966	Total Int	R^2
25.1	Two or more C; worked after B_1 (or B_n)	254	-2.30 (.85)	-.52 (.24)	-1.10 (.96)	-.01 (.06)	.01
25.2	Two or more C; worked after B_1 (or B_n); $Y^1 \geq 1000$	213	-2.66 (.94)	-.81 (.36)	-.65 (.42)	-.03 (.32)	.01
25.3	Two or more C; worked between B_1 and B_n	125	.11 (.06)	-1.61 (1.07)	.70 (.86)	.20 (2.81)	.08
25.4	Two or more C; worked between B_1 and B_n; $Y^1 \geq 1000$	108	-.92 (.44)	-1.38 (.83)	.65 (.61)	.18 (2.36)	.08
25.5	Two or more C; worked after B_n only	129	-4.87 (2.18)	1.97 (1.14)	1.23 (1.32)	.78 (9.53)	.46
25.6	Two or more C; worked after B_n only; $Y^n \geq 1000$	105	-5.52 (2.34)	1.36 (.74)	3.37 (2.42)	.76 (8.24)	.44

in equations 25.3 - 25.6 but with the total interval replaced by its components, #C and Ave Int, the coefficients of the number of children were always more significant than those of the length of the average interval (Appendix G). A more useful exploration of the timing of the labor force entry by women who do not wait until after completing childbearing to work would require more detailed information about the dates of all child-births and of all labor force entries and exits than is available in the 1967 NLS.

Turning finally to those women who worked (after B_1) only after B_n,[1] I found much more significant results (Equations 25.5 and 25.6). Given the length of the total interval from B_1 to B_n, women with more education return to work (after B_n) sooner after B_1, while high family income (husband's and others' income) increases the length of the interval from B_1 to labor force entry. Of course, examining the effect of a variable on time out of the labor force after B_1 for women who worked only after B_n, when the interval from B_1 to B_n is included, is testing mostly the effect of that variable on the interval from B_n to labor force entry, the interval treated explicitly in the next paragraphs. The total interval variable in equations 24.5 and 24.6 is also of interest however. It indicates that a longer work hiatus is produced by a longer total birth interval; but, since the coefficient is significantly less than 1., compression of the non-working interval occurs as the birth interval lengthens. (Both the dependent variable and the total birth interval are measured in months.) An additional year between first and last births adds about nine months to the time out of the labor force, for these women who did not work until after B_n.

The average interval from B_1 to B_n for these two samples is 71.5 and 71.3 months, or about six years; from B_1 to labor force entry, 155.9 and 154.8 months, or about thirteen years. The average age of the last child when the mother begins working for these two samples, is within one-half month of seven years. The regressions on the length of time from B_n to labor force entry -- i.e., the age of the youngest child when the

[1]They may or may not have worked before B_1.

mother began market work -- in Table 26 show that women with more education begin to work significantly sooner after B_n than women with less education. Using the coefficient of W Ed in Equation 26.9, a woman with four more years of education than another will begin working when her last child is younger by almost two years (21.76 months).

The positive coefficient of H Ed becomes less significant when husband's income (Y1966) also enters the regression. The effect of higher family income is to keep the woman at home until her last child is older, as there is less need for her to supplement the earnings of her husband and other family members.[1] The coefficient of #C is negative but it becomes totally insignificant when Total Int is held constant; even if a family with a given level of income has more children within an interval of time, the wife will not return to work sooner to meet the added drain on family income. Women with more children have been out of the labor force longer; the equations showed in Table 25 that this causes an earlier labor force entry. Equations 5, 7, 10, and 12 of Table 26 also show that a longer Total Int results in a woman's entering the labor force sooner after B_n. One explanation for this may be that the time of other, older, children in the home is substituted for the mother's time in household activities, and the first children of women with longer intervals are older than for those with short intervals. Also, the woman's earnings may be needed more because they have been forgone for a longer time and/or because college expenses for the oldest child are more imminent.

These negative effects of wife's education and family size and the positive effects of husband's education and income are not observed or are much weaker when mothers of only one child are added to the sample or are studied separately. It is not clear why this should be so but it may be that many of the parents of an only child expected to have additional children later, but did not for either economic or physiological reasons, and postponed labor force participation for a long time before realizing that they had already had all the children they would ever have.

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[1]Of the working mothers of two or more children in the 1965 NFS sample, one-third worked out of necessity, one-third to provide for extras, and one-third by preference.

Table 26

Regressions on the number of months from last birth to labor force entry; women who worked after B_n but not between B_1 and B_n; 1967 NLS

Eq. No.	Sample	W Ed	H Ed	Y1966	#C	Total Int	R^2
26.1	Two or more children N = 129	-4.04	2.80				.03
		(1.77)	(1.62)				
26.2		-4.37	2.80		-5.82		.06
		(1.94)	(1.64)		(2.14)		
26.3		-4.32	2.27	1.34			.04
		(1.90)	(1.29)	(1.41)			
26.4		-4.64	2.28	1.31	-5.74		.08
		(2.06)	(1.31)	(1.39)	(2.12)		
26.5		-4.87	1.78	1.23	-.48	-.21	.10
		(2.17)	(1.14)	(1.31)	(.11)	(1.64	
26.6		-2.73		1.57	-5.74		.06
		(1.58)		(1.71)	(2.11)		
26.7		-3.24		1.45	-.09	-.23	.09
		(1.87)		(1.58)	(.02)	(1.77)	
26.8	Two or more children $Y \geq 1000$ N = 105	-5.12	1.60	3.68			.09
		(2.12)	(.84)	(2.57)			
26.9		-5.44	1.79	3.47	-6.73		.13
		(2.28)	(.96)	(2.47)	(2.20)		
26.10		-5.53	1.43	3.37	-1.36	-.21	.15
		(2.34)	(.76)	(2.41)	(.29)	(1.48)	
26.11		-4.08		3.90	-6.60		.13
		(2.14)		(2.93)	(2.16)		
26.12		-4.47		3.70	-.89	-.23	.15
		(2.34)		(2.78)	(.19)	(1.59)	

Table 26

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	R^2
One child N = 48	1.66 (.40)	-4.56 (1.21)			.03
One child Y ≥ 1000; N = 41	.73 (.16)	-.45 (.16)			.00
	3.09 (.63)	-5.73 (1.32)	.62 (.21)		.05
One or more C; N = 177	-.98 (.48)	.17 (.10)			.00
	-.95 (.47)	.15 (.09)		-.67 (.26)	.00
One or more C; Y ≥ 1000; N = 146	-2.02 (1.06)		2.38 (1.85)		.02
	-1.42 (.63)	-.93 (.50)	2.58 (1.91)		.03
	-2.00 (1.05)		2.35 (1.83)	-2.01 (.69)	.03
	-1.38 (.61)	-.92 (.50)	2.56 (1.89)	-2.02 (.69)	.03

Meanwhile the others in this sample may be women with a strong career commitment who returned to work while the child was quite young. Thus the two effects of the variables for the two groups could cancel out each other.

For all of the sub-sets of observations, adding the variables #C and Total Int to the regressions did not affect the other coefficients very much. Considering the mothers of two or more children, the longer the total interval from B_1 to B_n or, if Total Int is not held constant, the more children, the sooner the mother started working. The more education the wife had, whether or not #C or Total Int is held constant, the sooner she worked. The coefficient of W Ed was affected little by the inclusion of #C and Total Int, even though highly educated women have fewer children and have them closer together. The positive coefficients of Y1966 and of H Ed also changed only a little. If families whose Y1966 is less than $1000 are excluded, because they probably represent non-responses, the coefficient of H Ed is no longer significant while that of the income variable is highly significant. The higher the husband's income the longer these women waited to enter the labor force after B_n.

CHAPTER VII

SUMMARY

This dissertation has analyzed some economic aspects of the timing and spacing of births and examined women's labor force participation relative to this timing and spacing. According to the model developed in Chapter II women with more education, who have a higher price of time (P_t) and a more steeply rising P_t profile over their lifetimes than do less educated women, should have their children closer together and earlier than less well educated women. This is primarily because child-related activities are time-intensive; close spacing produces more of a saving for women with high P_t than for other women. Having the first birth (B_1) early produces more of a cost reduction the greater the increase in P_t over time.

These effects are reinforced to the extent that women with more education have a greater labor force commitment and acquire more depreciable market skills. Aside from the fact that the present value of income is lowered as the receipt of that income is postponed, the most profitable timing of a woman's labor force participation is in one continuous period, after childbearing.[1] This allows the woman to acquire on-the-job training at the very start of her work experience -- maximizing her earnings -- without the problem of skill depreciation through non-use during the child-caring period and increases the likelihood of the employer paying for firm-specific investments.

The income effect depends on both the level and timing pattern of income. Families with high incomes should, other things equal, have the first birth sooner and subsequent births more widely spaced. Those with a steeply rising income, especially in the early adult years, should have B_1 later; this later start would probably cause them to have subsequent births closer together.

The empirical tests of the timing hypotheses, reported in Chapter IV, found that women with more education were significantly less than one

[1] Even more desirable is having the career first and then raising children after the career is ended; but postponement of children reduces the level of lifetime child-related activities and increases the chances of subfecundity in the woman, birth defects in the child, orphaning of the child, etc.

year older for each additional year of schooling. Since an additional year of education raises women's average age at leaving school by slightly more than one year (based on my calculation on published 1960 U.S. Census tables), the women with more education were having B_1 sooner after leaving school. This finding was confirmed by regressions on another data set which found a significant negative effect of wife's education on the interval between leaving school and B_1.

In both data sets the husband's education had a positive effect on wife's age at B_1 (given her education) and on the interval from school to B_1. In the data set with more reliable information on family income, income's effect was to shorten the interval from school to B_1.[1] If the income variable measures the level of family income and the husband's education, given income, is regarded as a proxy for the slope of the lifetime income stream then these results support the hypotheses about the income effect on the timing of B_1; for the correlation between education and the size of the slope of the income profile is positive.

Because the wife's year of birth is positively correlated with the general level of economic conditions it was used as a proxy for the (expected) level of family income. It had the expected negative effect of an income level measure on the timing of B_1. A similar result was observed in the second data set when using the year the wife left school as a cohort variable; but since those women spanned only five, not fifteen, years of age, the cohort measure is affected strongly by the level of education, as well as by the cohort, of the wife. The interpretation of the cohort effect in regressions on both first interval and total interval is muddied somewhat because the time period represented by the cohort variable limits the dependent variable; the average age at B_1 for the forty-year-old women will be slightly higher when they reach age fifty because a few women of that cohort will be added to the data set after having a first birth after the age of forty, and the average total interval will be longer because some women will have another child while they are in their forties.

[1]It was insignificant in the other data set.

The results of the regressions on the husband's age at marriage were similar except that R-squared was higher, primarily because the cohort variable (the husband's year of birth) was much more significant. Regressions on different sub-groups of the population of white, non-farm, non-Catholic Americans did not produce notable differences in the results reported above, except that for couples who received substantial financial help from their parents in the early years of marriage the t-values of the wife's education, the husband's education, the completed family size, and the cohort variable all were reduced. This is to be expected, since this raising of the family income (and flattening of the income profile) is not reflected in the independent variables.

The total effect of family income and wife's and husband's education on the interval from marriage to first birth is significant but the individual effects are not. Only the cohort variable, year married, (and the family size variables) retained their significance when the interval to B_1 was measured from the wedding date rather than from the date the woman left school.

Tests of the hypotheses about the spacing of births are described in Chapter V. The higher the wife's education the shorter the total interval between B_1 and her last birth (B_n), as predicted by the model because of the substitution effect. The effect is even stronger if family size is not held constant, as highly educated women also have fewer children.

The sign of the husband's education in regressions on the total interval is positive and insignificant for the NFS data, perhaps because it is picking up some of the income effect from that sample's less than ideal measure, Y1965; the coefficient of H Ed for the NLS data is negative. A negative sign was expected. The weakly positive coefficient in the NFS data may also represent an education-related demand for child-quality that operates in addition to the income-related demand for more quality and more child-related activities. Wider spacing of births facilitates the parents' spending more time with each child to produce more quality per child. (The positive effect is weaker when the number of children is not held constant, as there is a negative relation between husband's education level and family size.)

The family's expected 1965 income had a weak negative effect on the length of the total interval for the 1965 NFS sample; Y1966, for the 1967 NLS sample, had the predicted positive effect on Total Int. The insignificant but negative coefficient observed in the NFS data may have resulted because the income measure was inadequate or because of a possible relation between Y1965 and the price of time for women with no labor force attachment. Moreover, although closer spacing lowers the opportunity cost of children by reducing the amount of time the wife stays out of the labor force, it concentrates the money costs of children into a shorter time period. Since imperfect capital markets limit borrowing, couples with low incomes may be forced into wider spacing by monetary income constraints even though this raises the total cost of children to them. The changes in the coefficients when I standardized for family size suggest that families with higher incomes have more children. As noted above, much or all of the negative coefficient on the cohort variable, year married, used as a proxy for income levels, may be due to the fact that more recent cohorts have not had time to have long total intervals. The coefficients were not affected much by the inclusion or exclusion of the family size variables.

Although having zero or one child was more common among the older women in the sample, these low-parity women were older at marriage than those with two or more children, so that they actually had a somewhat later year of marriage. Also, women with one child were older and married longer at B_1 than mothers of two or more children. Even though they were older on the average, more of the zero- and one-parity women were in the labor force and more of them worked because they liked to than among women of parity two or higher. Many of the childless women were married to men who were not in the labor force.

Similar regression results were obtained from other subsets of the samples of white, non-farm, mothers.

When regressions were run on the length of the average interval between births, the coefficients did not change sign but generally were smaller and slightly less significant; but the reduction was very small for the variable wife's education.

The total ... of timing a... ...ing on a woman's age at
her last birth (... also determ... Although additional
education makes ... older when s... ...s school (and when she
enters the labo... and when she ...), by having fewer children
and having them ... and closer to ... she is no older at B_n than
women with less ...on. If #C is ... constant, she is only slightly
older. High le... education for ... band, by postponing the first
birth result in ... being older
The inco... as measured ... ...cted 1965 income is insig-
nificant. The ... variable is ne... perhaps because more recent
cohorts have not ... had B_n.

Since the ... ity and labor ... participation decisions are
interrelated, th... force activi... women between various events
-- leaving scho... riage, first b... ...st birth, and the interview
date -- were ex... and reported i... ...r VI. It was found that
women with highe... ...s of educatio... likely to work longer between
leaving school ... riage or betwe... ...ing school and B_1 than other
women. Women wh... d after havin... ...ren were likely to work longer
between school ... riage, between ... ...ge and B_1, and between school
and B_1. The hu... income (in 19... an insignificant positive
effect and the n... of children sh... bore had an insignificant
negative effect ... length of lab... ...e participation between
school and marri... iven the length ... that interval.

Fewer tha... as many women ... between marriage and B_1 as
worked between s... and marriage. ...ly variable affecting the
length of labor ... participation ... interval, given the
length of the in... , was the vari... ...dicating whether the woman
worked after hav... ...ildren; its co... ...nt was positive and significant.

The proba... that a woman ... work after having one or more
children is high... more educatio... ...as. It is lower the more
education and in... her husband has... ...eased child-related activities,
represented by ... family size or ... average and total birth
intervals, reduc... likelihood tha... ...an will ever work after having
her first birth.

If a woman works after having children, she is more likely to enter the labor force before completing her childbearing life-stage the higher her husband's income, the more children she has, the farther apart she has successive births, and the longer the total interval between B_1 and B_n. The level of educational attainment of the husband and of the wife have little effect in this decision.

The interval from B_1 to labor force entry is longer the longer the total interval from B_1 to B_n for both those women who entered the labor force between births and those who remained outside the labor force until after B_n. The only other discernible effect on the length of the labor force hiatus among the former group was a weak negative effect for the husband's income. Among the woman who worked after B_n but not between births the effect of the husband's education was insignificant (and positive); the effect of his income was positive and of her own education, negative. For mothers of two or more children who worked after B_n, but not between B_1 and B_n, additional education shortened the interval from B_n to labor force entry; that is, more educated women entered the labor force when their last child was younger than did other women. Women with a longer interval between B_1 and B_n entered the labor force sooner after B_n than did women with a shorter total interval. The husband's education had no significant effect on how long the wife waited after B_n to enter the labor force but if his income was high her market entry came later.

Thus it appears that not only do the price of time and the family income affect the number, timing, and spacing of births, but also that women with high potential wage rates are more likely to work after having children and enter the labor force sooner after B_n and that women with high family income are less likely to work after having children and enter the labor force later after B_n if they do work -- rational responses to economic forces.

AFTERWORD

A woman who graduates from college will have her first child two or more years sooner after finishing school that a woman who is a high school graduate only; she will be less than two years older at B_1. For women in the 1965 NFS, the additional four years of schooling increased the interval from marriage to B_1 by less than three months. The more educated women had a given number of children in an interval that was more than eight months shorter than for the less educated women; and, since the average family size is smaller for more educated women, she has her chosen number of children in a twenty to twenty-one month shorter interval. For women in the 1967 NLS the difference in the total interval was only two to four months, and the effects of H Ed were not much larger. Four more years of education for the husband resulted in the NFS wives being one year older at B_1.

For the NLS couples an additional $5,000 of income for the husband resulted in the wife having B_1 four or five months sooner after she left school and in increasing the total interval by three months, on the average. Family size, of course, had large effects on the intervals. The effect of having four rather than two children was to reduce the wife's age at B_1, ceteris paribus, by almost two years (NFS) and the interval from school to B_1 by seventeen months (NLS). The total interval will be longer by seventy (NLS) or seventy-five (NFS) months, or approximately six years.

Since some of these effects — especially for the Total Int regressions with the NLS data — are quite small, I considered the possibility that errors in variables or specification errors might be biasing the coefficients toward zero. Some of the data problems have been described in earlier chapters: the minimal income information in the NFS; the lack of a religion variable in the NLS and of labor force participation information, except current status, in the NFS; the inexactness of the constructed #C variable in the NLS, especially critical in regressions on Total Int; the fact that, in the NLS, the age of the youngest child is not given in months so that, even if he is the last child, the Total Int estimate may err by as much as six months; and the complete inaccuracy of Total Int if the youngest child still in the household does not represent the last birth of the mother.

Even if every variable was measured completely accurately, generally the information that is available can serve only as a proxy for the information actually needed to test the model's hypotheses. For example, no one has yet devised a method for determining the shadow price of time for persons not in the labor force. For those in the labor force, equating P_t with the wage rate assumes that equilibrium conditions exist. Couples with the same current income and education levels vary greatly in many unmeasured but important respects, including tastes; their income in previous years may have followed very different paths; the costs of child-related activities may differ because of differences in the availability of cheap or free child-care facilities such as relatives; World War II may have disrupted or altered family planning for many of these couples; and so on.

Because such errors in variables may bias coefficients downward, I re-ran some of the Total Int regressions for the 1967 NLS data after aggregating the data into thirty-one cells on the basis of the wife's and husband's education level.[1] These seemed to be the regressions most likely to have been affected by such problems. Although the aggregation precedure will not necessarily overcome errors in variables, if they exist, most of the coefficients were larger in the regressions on the cell mean of the aggregated data (Table 27). Of course, all of the t-values are smaller because much of the variation in the variables is eliminated by using cell means, and the values of R-square are larger because there are fewer data-points.

Even with aggregation the coefficients are small. However, Table 28, for data in the 1960 U.S. Census of Population, shows that women in successively higher education classes from nine through sixteen or more years have substantially shorter total intervals. For example, college graduates bear four children in an average of 99.8 months, which is not much longer than the 95.4 months in which high school dropouts bear only

[1]Cell size varied from seven to twenty-nine except for one cell (W Ed = 12, H Ed = 12) with 159 observations.

Table 27

Comparison of regressions on Total Int for aggregated and micro-data; 1967 NLS, white, non-farm, married once-spouse present mothers of one or more children; 706 observations aggregated by W Ed and H Ed into 31 cells

Regression coefficients with t-values in parentheses

Aggregated Data

W Ed	H Ed	Y1966	#C	$\#C^2$	Yrs LF	LFPR	1=LF After B_1	$\bar{R}^2$	R^2
-1.05	-1.22	1.97	99.23	-11.11					
(.77)	(1.28)	(1.08)	(2.39)	(1.78)				.71	.76
-.41	-1.45	1.01	91.60	-10.46	-2.69				
(.31)	(1.60)	(.57)	(2.33)	(1.78)	(2.04)			.74	.79
.39	-1.44	.70	83.40	-9.34		-86.18			
(.28)	(1.66)	(.40)	(2.17)	(1.63)		(2.47)		.76	.80
.48	-2.44	1.56	82.65	-8.81			-36.40		
(.28)	(1.97)	(.87)	(1.96)	(1.40)			(1.49)	.72	.78
					Age				
.48	-2.44	1.56	83.22	-8.90	-.43		-36.22		
(.28)	(1.93)	(.85)	(1.89)	(1.36)	(.06)		(1.44)	.71	.78
						Age YC			
-.18	-2.85	1.74	80.44	-9.17		-1.96	-31.59		
(.11)	(2.35)	(1.00)	(1.99)	(1.52)		(1.72)	(1.33)	.74	.80

Micro-data

W Ed	H Ed	Y1966	#C	$\#C^2$	Age	Age YC	1=LF After B_1	$\bar{R}^2$	R^2
-.81	-.81	.71	42.41	-1.92					
(.86)	(1.13)	(1.48)	(12.24)	(6.42)					.49
					Yrs LF				
-.50	-.87	.48	41.32	-1.89	-1.08				
(.54)	(1.23)	(1.02)	(12.04)	(6.38)	(3.57)				.50
						LFPR			
-.30	-.84	.44	41.34	-1.89		-28.27			
(.32)	(1.20)	(.93)	(12.05)	(6.39)		(3.70)			.50
-.07	-1.12	.39	47.70	-2.27			-8.80		
(.09)	(2.02)	(.128)	(22.89)	(11.70)			(2.83)		.63
					Age				
-.07	-1.12	.39	47.67	-2.27	.76		-8.90		
(.10)	(2.01)	(1.28)	(22.87)	(11.70)	(.70)		(2.86)		.63
						Age YC			
-.78	-1.75	.42	35.24	-1.70		-4.99	2.36		
(1.24)	(3.63)	(1.63)	(17.86)	(9.93)		(15.43)	(.85)		.73

Table 28

Total Int (in months) for mothers of two to four children, by wife's education; derived from Table 25, *Childspacing*, for white women aged 35 to 39 in 1960

		Elementary		High School		College	
Children Ever Born	Total	less than 8 years	8 years	1 - 3 years	4 years or more	1 - 3 years	4 years or more
2	52.0	54.3	55.3	56.0	51.8	47.5	42.5
3	90.2	93.3	93.0	95.4	90.1	84.1	76.3
4	116.1	119.8	119.2	121.6	115.5	108.6	99.8

three children. In my regressions such effects are spread over several variables -- W Ed, H Ed, income, labor force activity, etc.; the effect of any one of these alone could be smaller because of the correlations among these variables, although some of the effects are offsetting: High levels of W Ed and H Ed shorten the total interval while the high income associated with more education tends to lengthen it.

Certainly at least part of the explanation for the small coefficients in some of the NLS regressions is the inclusion of Catholics in those datasets. Certain of the independent variables have completely opposite effects on the dependent variables for Catholic and for non-Catholic couples. (See Appendix H.) Still another possible partial explanation may lie in the inclusion of women with less than nine years of education. Although a linear relationship was assumed between W Ed and Total Int, for example, from the data of Table 28 it appears that the length of the total interval does not change at all for education levels from zero through nine to eleven years but that it decreases for education classes "nine to eleven" through "sixteen and over." Of the 706 observations in the NLS sample, 103 had eight or fewer years of education, enough to bias downward the coefficient.

Finally, the observed relationships may have been blurred or weakened if knowledge of contraceptive techniques is correlated with education or income. Many births to women in the NFS were reported as occurring sooner than desired because of contraceptive failure or non-use; (also, a few women reported difficulty in conceiving when desired.) Women who are inefficient contraceptors may have shorter intervals. On the other hand, women who know that they are efficient contraceptors may have children sooner than others because they need not fear a long fertile interval after their last desired birth. Thus, the effect of differential knowledge of fertility control is ambiguous.

The findings presented in this dissertation apply to white American women born between 1910 and 1927. Extrapolation of the results to other populations, at different times or different places, must be done with care. For example, as noted in Chapter VI, Section A, a change in labor force participation after marriage before childbearing occurred even within the narrow (five year) span of the NLS cohort. The average values of all the variables have probably been changing over time.

As an example, since women have been obtaining more education in recent years the average age at first birth ought to have risen, as it has. In addition, the average increase in W Age B_1 ought to be less than the average increase in education, but I have not seen data presented in such a way as to make that comparison possible. Before attributing this change in fertility behavior for women currently in their twenties to changes in W Ed, one should note that the average level of husband's education also has been rising, although perhaps not as much as W Ed; that this cohort's equivalent of Y1965 or Y1966 is not known, or, conversely, that the income of the sample women when they were in their twenties is not known; and that #C is not yet known for the current cohort. Since #C has a positive effect on W Age B_1, the observed rise in that age may have resulted in part because women who will have, say, only two or three children are being compared to that most fertile of twentieth century cohorts -- women born between 1930 and 1934.

Even the most robust of fertility relationships for the American women may not apply to women in very different cultures. For example, both in the NFS and NLS and in the 1960 U.S. Census of Population and the 1967 Survey of Economic Opportunity I found that larger family size was associated with shorter average intervals between births. Using data for women in Sierra Leone, Snyder found that couples with larger numbers of children had longer average intervals; he suggested that those couples who wanted more children may have, for the same reasons, also wanted to have children around for a longer time to avoid the "empty nest" syndrome.[1]

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[1]Snyder, op. cit., pp. 36-37. I have not seen Snyder's calculations, but if he defined Ave Int as Total Int divided by #C, rather than (#C-1), his calculations of Ave Int could yield an increasing interval, while mine would be decreasing for the same data set. For example, if average Total Int for two- through five-child families were 40, 70, 96, and 125 months, respectively, division by #C yields average intervals of 20, 23.3, 24, and 25 months, while division by (#C-1) yields decreasing intervals of 40, 35, 32, and 31.2 months.

In the regressions on Ave Int in Table 13 the coefficient of #C is very significantly negative. The simple correlation between Ave Int and #C is significantly negative for families with two or more children, although it is insignificantly positive if one-child families also are included.(and assigned an Ave Int = 0.) This negative correlation exists despite the negative correlations between Ave Int and W Ed and between #C and W Ed.

Much about timing and spacing decisions -- especially the income effect on spacing -- still is not completely understood, as I have noted throughout this dissertation; but much has been added to our knowledge. Among the most significant contributions was the separating of the effects of wife's education, noted in Childspacing and other publications, into at least some of its components; the effect of the level of her education was assessed separately from that of correlated variables such as her husband's education or income. Secondly, I have demonstrated that non-Catholic couples respond differently to education and income than Catholic couples in their timing and spacing of births. Finally, as the model predicted and the empirical evidence bore out, researchers have in the past been analyzing the "wrong" first birth interval; instead of the traditional "interval from marriage to first birth," the timing decision variable that differs across couples in response to economic forces is the interval from leaving school to having the first child, (or the age at B_1 given the education level.) This seems to be an important innovation; I hope analysis of this interval will be pursued in the future.

If one had to compare the relative impact on couples of timing and spacing decisions and of the decision on family size, it is likely that on the average an additional child raises the costs of child-related activities more than do changes in the timing or spacing of a given number of births. An additional child probably also reduces labor force participation by the wife by more than do wider birth intervals, although the 1960 Census did show women with W Ed $\geq$ 16 having four children in nearly the same length of time that women with W Ed = 9-11 had three children. Although completed family size can assume only discrete, integer values, the level of child-related activities produced and consumed in a household is a continuous variable because parents can alter the quality per child, the timing and spacing of births, and the time inputs per child per time period. Thus, variations in timing and spacing serve as a vehicle for "fine tuning" the quantity of child-related activities.

Appendix A

Among married women, aged 20 to 44, with husband present, more than half of those with no own children aged less than 18 years were employed:

Age	Percent Employed
20-24	63.9
25-29	66.7
30-34	62.7
35-39	58.1
40-44	52.7

The labor force participation rates for mothers of young children are low, especially if there is more than one child; but the LFPR rises with the age of the youngest child:

	Labor Force Participation Rates				
Age:	20-24	25-29	30-34	35-39	40-44
One child,					
age ≥ 6 yrs	.41	.45	.47	.46	.44
5 yrs	.36	.40	.36	.31	.28
3 - 4 yrs	.34	.34	.30	.27	.25
0 - 2 yrs	.23	.23	.21	.22	.26
Two children,					
younger aged 6+	.33	.38	.39	.40	.39
5	.27	.28	.26	.25	.25
3 - 4	.26	.24	.22	.21	.21
0 - 2	.16	.16	.16	.17	.18

SOURCE: Above figures all were calculated from Table 8 "Women Ever Married, 14-59 Years Old, by Number and Ages of Own Children, Children Ever Born, Employment Characteristics, Marital Status, Age, and Color, for the U.S.: 1960," in PC(2)-6A "Employment Status and Work Experience," U.S. Census of Population, 1960.

The labor force participation rates for women in the 1:1000 sample from the 1960 U.S. Census who, with their husbands, were white-other, married once-spouse present, had no missing children, no premarital pregnancies, from one to ten children, and at least one child aged less than three years old are:

	Education of Wife					
Age of Wife	0-8	9-11	12	13-15	16+	Totals
25-29	.094	.145	.146	.157	.157	.144
30-34	.136	.133	.116	.094	.136	.121
35-39	.149	.091	.162	.169	.179	.150
Totals	.122	.130	.139	.135	.152	.137

Appendix A

(cont'd)

The labor force participation rates for all white women indicate that, within each age category, women with more education are more likely to be in the labor force:

Education	Proportion of Women Who Worked One or More Months in 1959, by Age					
	20+	20-24	25-34	35-54	55-64	65+
0-8	.291	.381	.357	.420	.319	.105
9-11	.426	.468	.411	.488	.421	.167
12	.472	.647	.417	.499	.453	.173
13-15	.512	.739	.457	.529	.504	.218
16+	.599	.853	.549	.625	.656	.306
Totals	.414	.608	.421	.485	.393	.135

SOURCE: Calculated from Table 20, "Years of School Completed for Persons 20 Years Old and Over, by Weeks Worked in 1959, Age, Color, and Sex, For the United States...1960," pp.208-09, in "Employment Status and Work Experience."

APPENDIX B

Estimation of earnings function used to assign values to the variables Y40, Y EXP 20, and Y W Ed + 20, for each observation in the 1965 NFS:

Sample: men whose wives are 25-54 years old, non-farm, etc., with at least one child; (all religions).

$$
\begin{aligned}
Y = {} & \underset{(t=4.4709)}{3.9094} - \underset{(2.9799)}{.40278\ H\ Ed} - \underset{(2.3575)}{.39809\ S} + \underset{(6.5449)}{.037340\ H\ Ed^2} + \\
& \underset{(7.9355)}{.24606\ Exp.} - \underset{(7.0681)}{.0050416\ Exp.^2} + \underset{(9.9462)}{.73334}\ SMSA \\
& + \underset{(3.8289)}{1.0296\ Mgr} - \underset{(3.0140)}{.85668\ Clr} - \underset{(3.2852)}{.94511\ Crf} - \underset{(5.4982)}{1.6818\ Op} \\
& - \underset{(6.3440)}{2.2871\ Other}
\end{aligned}
$$

$R^2 = .3434$

N = 2174

S = 1 if South, 0 if non-South.

Exp. = Age in 1965 minus assumed age at LF entry of 14 if H Ed = 0-7, 16 if Ed = 8, 18 if Ed = 9-11, 20 if Ed = 12, 23 if Ed = 13-15, 26 if Ed = 16, 28 if Ed = 17+.

SMSA = 1 if rural, 2 if size = 25,000 - 49,999, 3 if city or more than 50,000 but not 14 largest or rings of those cities, 4 if 14 largest SMSAs - central city or ring.

Mgr = 1 if occupation is managers, officials, and proprietors (non-farm).

Clr = 1 if clerical and kindred or sales.

Crf = 1 if craftsmen, foremen, and kindred.

Op = 1 if operatives and kindred (or farm-related employment but not living on a farm).

Other = 1 if any other occupation, except professional, technical, and kindred. (All occupation dummies = 0 if professional, technical and kindred.)

APPENDIX C

Two-Stage Least Squares Procedure; 1965 NFS, non-Catholics; N = 585

First Stage: Dependent Variable = Number of Children

Independent Variables								
W Ed	W Ed^2	Y40*	Y40^2	Age	H Ed	SMSA	Intercept	R^2
-.51101 (3.42)	.018049 (2.82)	-.21419 (1.18)	.013061 (1.34)	-.034384 (2.15)	-.050310 (1.18)	-.075769 (.90)	9.4510	.077
-.53323 (3.62)	.019034 (3.02)	-.25450 (1.45)	.013565 (1.39)	-.034257 (2.16)	-.036556 (.91)		9.5167	.075
-.55224 (3.79)	.019261 (3.06)	-.25773 (1.47)	.012002 (1.25)	-.033591 (2.11)			9.3961	.074

*A coding error for two occupations was found after these regressions were run. The regressions were not re-run because the effects of correcting the error in other regressions have been very small.

	Second Stage						Ordinary Least Squares					
	H Ed	W Ed	Y40	# est	# est^2	R^2	H Ed	W Ed	Y40	#C	#C^2	R^2
W Age B_1	1.88 (1.44)	4.29 (2.99)	1.08 (.69)	-54.10 (1.62)	6.16 (1.35)	.16	2.28 (1.86)	4.64 (4.16)	1.18 (.80)	-19.09 (5.28)	1.12 (2.83)	.24
Total Int	.78 (.48)	-3.33 (1.85)	-.97 (.49)	16.97 (.41)	-.25 (.04)	.05	.70 (.71)	-2.10 (2.31)	-.59 (.49)	53.62 (18.20)	-2.66 (8.24)	.64

Because of the dramatic decline in R-square and the decrease in every t-value, as compared with regressions using the actual number of children as independent variables, it did not appear fruitful to pursue further the 2SLS approach.

APPENDIX D

Supplement to Table 3: Regressions on Sch-B1 using different NLS sub-samples

Sample: Sch-B_1, positive (and known); N = 656.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	Yrs LF	LFPR	1=LF After B_1	Age	R^2
-6.39 (6.93)	2.92 (4.41)	-.37 (1.02)	-12.19 (4.93)	.64 (2.78)						.12
-2.98 (2.77)	3.08 (4.75)	-.36 (1.01)	-12.31 (5.10)	.63 (2.79)	-4.98 (5.76)					.16
-6.32 (6.94)	3.03 (4.63)	-.27 (.76)	-10.94 (4.45)	.60 (2.66)		1.18 (4.26)				.14
-3.16 (2.96)	3.16 (4.92)	-.27 (.79)	-11.23 (4.66)	.60 (2.68)	-4.62 (5.36)	1.02 (3.72)				.18
-6.53 (7.15)	3.01 (4.57)	-.27 (.76)	-11.10 (4.50)	.61 (2.66)			25.67 (3.68)			.14
-3.16 (2.96)	3.16 (4.92)	-.26 (.76)	-11.25 (4.67)	.59 (2.67)	-4.91 (5.74)		24.87 (3.65)			.18
-5.97 (6.57)	2.37 (3.59)	-.53 (1.49)	-12.47 (5.14)	.61 (2.72)				-18.61 (5.13)		.16
-2.40 (2.27)	2.51 (3.90)	-.52 (1.52)	-12.61 (5.34)	.60 (2.72)	-5.18 (6.12)			-19.52 (5.53)		.20
-6.07 (6.74)	2.43 (3.72)	-.55 (1.58)	-12.52 (5.21)	.59 (2.65)				-19.20 (5.34)	4.50 (3.58)	.17
-5.82 (6.15)	2.96 (4.32)	-.50 (1.36)								.06
-5.40 (5.76)	2.48 (3.63)	-.65 (1.78)						-16.20 (4.33)		.09
-5.84 (6.31)	3.08 (4.60)	-.36 (.98)				1.50 (5.44)				.10
-6.11 (6.56)	3.06 (4.54)	-.36 (.97)					33.98 (4.87)			.09

APPENDIX D

(cont'd)

Sample: Sch-B_1 positive and Y1966 $\geq$ 1000; N = 547.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	Yrs LF	LFPR	1=LF After B_1	Age	R^2
-6.80 (6.91)	3.12 (4.27)	-.68 (1.39)	-14.59 (5.23)	.89 (3.30)						.15
-3.23 (2.76)	3.16 (4.43)	-.72 (1.51)	-14.39 (5.29)	.84 (3.18)	-4.97 (5.33)					.19
-6.83 (6.98)	3.10 (4.27)	-.48 (.98)	-13.78 (4.96)	.87 (3.25)		.91 (3.00)				.16
-3.45 (2.95)	3.14 (4.42)	-.55 (1.16)	-13.74 (5.05)	.82 (3.14)	-4.70 (5.02)	.73 (2.45)				.20
-6.98 (7.10)	3.09 (4.24)	-.49 (1.00)	-13.93 (4.99)	.87 (3.25)			18.50 (2.42)			.16
-3.44 (2.94)	3.13 (4.40)	-.54 (1.12)	-13.76 (5.06)	.82 (3.13)	-4.92 (5.29)		17.54 (2.35)			.20
-6.25 (6.41)	2.72 (3.76)	-1.05 (2.16)	-14.73 (5.38)	.86 (3.25)				-18.13 (4.58)		.18
-2.49 (2.15)	2.74 (3.90)	-1.11 (2.35)	-14.52 (5.46)	.80 (3.11)	-5.20 (5.68)			-19.19 (4.98)		.23
-6.31 (6.52)	2.77 (3.87)	-1.10 (2.28)	-14.73 (5.43)	.84 (3.18)				-18.91 (4.81)	4.35 (3.23)	.20
-6.27 (6.17)	3.21 (4.24)	-.83 (1.64)								.08
-5.73 (5.66)	2.86 (3.80)	-1.17 (2.31)						-16.27 (3.96)		.10
-6.38 (6.36)	3.16 (4.23)	-.54 (1.07)				1.24 (4.03)				.10
-6.60 (6.52)	3.15 (4.20)	-.54 (1.07)					26.84 (3.47)			.10

APPENDIX D

(cont'd)

Sample: Grad Known, Y1966 ≥ 1000; N = 551.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	Yrs LF	Age YC	1=LF After B_1	R^2
-6.36 (6.51)	2.60 (3.58)	-1.18 (2.44)	-15.41 (5.59)	.91 (3.41)				-17.99 (4.51)	.19
-7.21 (8.86)	1.70 (2.80)	-.76 (1.90)	-31.98 (12.65)	1.68 (7.35)			-6.40 (15.62)	-2.15 (.62)	.44
-1.65 (1.85)	1.70 (3.10)	-.75 (2.05)	-33.04 (14.43)	1.65 (7.97)	-7.78 (11.02)		-7.04 (18.75)	-2.22 (.71)	.54
-6.40 (6.26)	3.07 (4.02)	-.96 (1.91)							.08
-5.89 (5.79)	2.74 (3.62)	-1.30 (2.59)						-16.01 (3.85)	.11
-5.96 (6.06)	2.47 (3.37)	-1.21 (2.47)					-2.56 (6.32)	-8.52 (2.04)	.17
-2.48 (2.05)	3.16 (4.26)	-.96 (1.96)			-5.41 (5.68)				.13
-1.82 (1.51)	2.82 (3.84)	-1.32 (2.71)			-5.58 (5.95)			-17.05 (4.23)	.16
-2.84 (2.37)	3.12 (4.25)	-.69 (1.42)			-5.00 (5.29)	1.13 (3.73)			.16
-1.39 (1.21)	2.54 (3.60)	-1.22 (2.61)			-6.26 (6.95)		-2.84 (7.28)	-8.86 (2.21)	.24

APPENDIX E

Supplement to Table 11:

Regressions on Total Int for other sub-samples from the 1967 NLS

Sample: all observations; N = 706.

W Ed	H Ed	Y1966	#C	$\#C^2$	1=LF After B_1	Age YC	Age	Yrs LF	LFPR	R^2
-.35 (.48)	-.87 (1.58)	.45 (1.50)	47.88 (22.88)	-2.26 (11.60)						.63
-.07 (.09)	-1.12 (2.02)	.39 (1.28)	47.70 (22.89)	-2.27 (11.70)	-8.80 (2.83)					.63
-.78 (1.24)	-1.75 (3.63)	.42 (1.63)	35.24 (17.86)	-1.70 (9.93)	2.36 (.85)	-4.99 (15.43)				.73
-.22 (.30)	-.98 (1.79)	.41 (1.37)	47.03 (22.48)	-2.23 (11.54)				-.79 (3.41)		.63
-.07 (.10)	-.97 (1.78)	.40 (1.33)	46.98 (22.46)	-2.23 (11.52)					-20.72 (3.56)	.63
-.07 (.10)	-1.12 (2.01)	.39 (1.28)	47.67 (22.87)	-2.27 (11.70)	-8.90 (2.86)		.76 (.70)			.63
-2.96 (2.54)	-1.29 (1.45)	1.17 (2.40)								.03
-2.28 (1.96)	-1.83 (2.06)	1.01 (2.08)			-19.26 (3.89)					.05
-2.40 (2.12)	-1.59 (1.84)	1.00 (2.11)						-2.34 (6.60)		.08
-1.98 (1.74)	-1.56 (1.81)	.96 (2.03)							-59.69 (6.63)	.08

APPENDIX E

(cont'd)

Sample: all with Y1966 ≥ 1000; N = 582.

W Ed	H Ed	Y1966	#C	$\#C^2$	1=LF After B_1	Age YC	Age	Yrs LF	LFPR	R^2
-.50 (.61)	-.77 (1.26)	.61 (1.49)	50.36 (21.17)	-2.50 (10.93)						.65
-.09 (.11)	-1.02 (1.65)	.39 (.96)	50.22 (21.29)	-2.51 (11.09)	-11.25 (3.30)					.65
-.76 (1.08)	-1.72 (3.22)	.76 (2.13)	37.16 (16.56)	-1.89 (9.40)	1.40 (.45)	-5.00 (13.96)				.74
-.36 (.46)	-.79 (1.29)	.44 (1.07)	49.47 (20.89)	-2.47 (10.93)				-.90 (3.55)		.65
-.18 (.22)	-.77 (1.26)	.40 (.97)	49.41 (20.88)	-2.47 (10.91)					-23.57 (3.68)	.65
-.11 (.14)	-1.00 (1.62)	.38 (.93)	50.17 (21.28)	-2.52 (11.12)	-11.54 (3.38)		1.50 (1.29)			.65
-3.54 (2.67)	-1.09 (1.07)	1.20 (1.76)								.03
-2.73 (2.05)	-1.52 (1.50)	.79 (1.16)			-20.53 (3.67)					.05
-2.96 (2.30)	-1.10 (1.11)	.67 (1.01)						-2.48 (6.19)		.09
-2.48 (1.91)	-1.04 (1.05)	.58 (.87)							-63.25 (6.22)	.09

APPENDIX E

(cont'd)

Sample: Total Int > 0, Y1966 ≥ 1000; N = 490.

W Ed	H Ed	Y1966	#C	$\#C^2$	1=LF After B_1	Age YC	Age	Yrs LF	LFPR	R^2
-.81	-.81	.71	42.41	-1.92						
(.86)	(1.13)	(1.48)	(12.24)	(6.42)						.49
-.21	-1.13	.41	41.84	-1.91	-13.51					
(.23)	(1.59)	(.86)	(12.19)	(6.44)	(3.37)					.50
-1.17	-1.86	.78	25.71	-1.13	1.34	-6.11				
(1.50)	(3.15)	(1.98)	(8.49)	(4.54)	(.39)	(15.06)				.66
-.50	-.87	.48	41.35	-1.89				-1.08		
(.54)	(1.23)	(1.02)	(12.04)	(6.38)				(3.67)		.50
-.30	-.84	.44	41.34	-1.89					-28.27	
(.32)	(1.20)	(.93)	(12.05)	(6.39)					(3.70)	.50
-.20	-1.16	.40	41.66	-1.91	-14.29		2.31			
(.21)	(1.63)	(.84)	(12.16)	(6.45)	(3.55)		(1.68)			.50
-3.58	-.94	.89								
(2.82)	(.97)	(1.36)								.03
-2.47	-1.48	.38			-22.79					
(1.94)	(1.54)	(.58)			(4.22)					.07
-2.78	-1.05	.43						-2.17		
(2.24)	(1.11)	(.67)						(5.46)		.09
-2.42	-.99	.36							-54.91	
(1.93)	(1.05)	(.56)							(5.43)	.09

APPENDIX E

(cont'd)

Sample: Grad known; N = 660.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	LFPR	Age YC	R^2
1.03	-.81	.53	47.37	-2.22	-2.24					
(1.10)	(1.43)	(1.74)	(22.34)	(11.24)	(3.00)					.63
1.17	-.88	.47	46.47	-2.20	-2.53		-.82			
(1.26)	(1.55)	(1.53)	(21.92)	(11.20)	(3.41)		(3.43)			.64
1.17	-.87	.45	46.47	-2.19	-2.30			-20.27		
(1.26)	(1.55)	(1.50)	(21.92)	(11.18)	(3.12)			(3.38)		.64
-.33	-1.13	.44	47.23	-2.22		-8.04				
(.42)	(1.96)	(1.43)	(22.22)	(11.22)		(2.53)				.63
-.90	-1.82	.51	34.44	-1.65		3.64			-5.09	
(1.33)	(3.65)	(1.91)	(17.10)	(9.44)		(1.28)			(15.14)	.72
1.80	-1.73	.54	33.62	-1.63	-3.97	3.67			-5.42	
(2.28)	(3.58)	(2.09)	(17.13)	(9.60)	(6.27)	(1.33)			(16.38)	.74

Sample: Grad known, Y1966 ≥ 1000; N = 551.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	LFPR	Age YC	R^2
1.06	-.87	.72	50.08	-2.49	-2.30					
(1.03)	(1.39)	(1.74)	(20.94)	(10.72)	(2.86)					.65
1.32	-.84	.52	49.22	-2.47	-2.65		-.94			
(1.30)	(1.36)	(1.25)	(20.69)	(10.75)	(3.32)		(3.59)			.66
1.32	-.83	.49	49.20	-2.47	-2.39			-23.02		
(1.30)	(1.34)	(1.18)	(20.67)	(10.73)	(3.00)			(3.53)		.66
-.29	-1.13	.49	49.81	-2.48		-10.55				
(.34)	(1.79)	(1.18)	(20.85)	(10.68)		(3.05)				.65
-.96	-1.84	.82	36.58	-1.87		2.10			-5.11	
(1.32)	(3.40)	(2.29)	(16.18)	(9.16)		(.68)			(13.95)	.74
1.88	-1.84	.83	36.04	-1.89	-3.99	2.07			-5.44	
(2.20)	(3.50)	(2.38)	(16.42)	(9.52)	(5.89)	(.69)			(15.10)	.76

APPENDIX E

(cont'd)

Sample: Grad known, Total Int > 0; N = 557.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	LFPR	Age YC	R^2
.65 (.61)	-.89 (1.38)	.73 (2.10)	39.21 (13.18)	-1.67 (6.68)	-2.48 (2.93)					.48
.98 (.93)	-.98 (1.54)	.64 (1.86)	37.98 (12.84)	-1.63 (6.58)	-2.89 (3.43)		-1.06 (3.74)			.49
.98 (.92)	-.98 (1.53)	.63 (1.82)	37.97 (12.83)	-1.62 (6.57)	-2.62 (3.14)			-26.15 (3.73)		.49
-.72 (.79)	-1.31 (1.99)	.60 (1.71)	38.62 (12.96)	-1.64 (6.56)		-10.17 (2.78)				.48
-1.52 (2.01)	-2.08 (3.82)	.69 (2.38)	23.60 (8.96)	-.97 (4.59)		3.47 (1.11)			-6.05 (16.02)	.64
1.76 (2.06)	-1.98 (3.80)	.75 (2.71)	22.74 (9.02)	-.96 (4.79)	-4.92 (7.22)	3.35 (1.12)			-6.55 (17.82)	.68

Sample: Grad known, Total Int > 0, Y1966 ≥ 1000; N = 460.

W Ed	H Ed	Y1966	#C	$\#C^2$	Grad	1=LF After B_1	Yrs LF	LFPR	Age YC	R^2
.81 (.68)	-.93 (1.28)	.88 (1.83)	42.07 (11.94)	-1.92 (6.27)	-2.54 (2.73)					.48
1.31 (1.11)	-.94 (1.31)	.62 (1.30)	40.93 (11.74)	-1.89 (6.25)	-3.04 (3.27)		-1.16 (3.72)			.50
1.31 (1.11)	-.92 (1.28)	.59 (1.22)	40.91 (11.73)	-1.88 (6.23)	-2.73 (2.97)			-28.83 (3.70)		.50
-.52 (.52)	-1.26 (1.72)	.54 (1.10)	40.83 (11.63)	-1.83 (6.02)		-12.97 (3.18)				.49
-1.52 (1.88)	-2.02 (3.38)	.83 (2.10)	23.75 (7.77)	-1.03 (4.09)		1.84 (.53)			-6.38 (15.36)	.66
2.12 (2.29)	-2.07 (3.65)	.89 (2.36)	23.48 (8.08)	-1.10 (4.56)	-5.16 (7.05)	1.47 (.45)			-6.92 (17.21)	.70

APPENDIX F

Supplement ... 19, 20, and 21; but Husband's and Other Income (1966) $\geq$ \$1000; One or More Children

Depende... ...le: Years of LFP between school and marriage

Sample: ...h positive interval from school to marriage; N = 510

W Ed		Y1966	#C	dummy*	Sch-Mar	R^2
.28					.06	
(8.79)					(33.16)	.68
.28			-.06		.06	
(8.42)			(1.49)		(32.66)	.69
.28				.16	.06	
(8.81)				(1.07)	(33.06)	.69
.25	3		-.06		.06	
(6.13)	3)		(1.50)		(31.80)	.69
.25	4			.19	.06	
(6.31)	3)			(1.25)	(32.25)	.69
.27		.02	-.06		.06	
(7.58)		(.85)	(1.54)		(32.66)	.69
.27		.02		.19	.07	
(7.90)		(.99)		(1.25)	(33.07)	.69
.28			-.06	.13	.06	
(8.45)			(1.36)	(.88)	(32.47)	.69
.25	3	.01		.21	.06	
(6.12)	2)	(.69)		(1.35)	(32.21)	.69
.24	3	.01	-.06	.18	.06	
(5.88)	9)	(.73)	(1.37)	(1.16)	(31.68)	.69

*1 if w... ...fter B_1, 0 if not.

APPENDIX F

(cont'd)

Dep. Var.: LF S-M

Sample: Women who worked between school and marriage; N = 430

W Ed	H Ed	Y1966	#C	dummy*	Sch-Mar	R^2
.20 (6.04)					.07 (34.87)	.74
.19 (5.74)			-.06 (1.62)		.07 (34.53)	.74
.20 (6.08)				.31 (2.16)	.07 (35.04)	.74
.16 (4.13)	.04 (1.42)		-.07 (1.71)		.07 (33.86)	.74
.17 (4.32)	.04 (1.60)			.34 (2.34)	.07 (34.48)	.75
.18 (5.26)		.01 (.61)	-.07 (1.66)		.07 (34.51)	.74
.19 (5.49)		.02 (.91)		.33 (2.29)	.07 (35.04)	.74
.19 (5.81)			-.06 (1.38)	.28 (1.98)	.07 (34.62)	.75
.16 (4.17)		.04 (1.43)	.01 (.56)	.35 (2.40)	.07 (34.41)	.75
.15 (3.90)	.04 (1.48)	.01 (.60)	-.06 (1.48)	.33 (2.23)	.07 (33.98)	.75

*1 if worked after B_1, 0 if not.

APPENDIX F

(cont'd)

Dependent Variable: Years of LFP between marriage and B_1

Sample: All with positive interval from marriage to B_1; N = 549

W Ed	H Ed	Y1966	#C	dummy	Mar-B_1	R^2
.03 (1.21)					.03 (13.42)	.25
.03 (1.11)			-.03 (.80)		.03 (12.83)	.25
.03 (1.37)				.90 (7.38)	.03 (14.60)	.32
.04 (1.18)	-.01 (.48)		-.03 (.80)		.03 (12.83)	.25
.02 (.74)	.01 (.64)			.91 (7.39)	.03 (14.57)	.32
.04 (1.51)		-.02 (1.26)	-.03 (.75)		.03 (12.83)	.25
.03 (1.17)	.00 (.24)			.91 (7.25)	.03 (14.58)	.32
.03 (1.37)			.00 (.08)	.90 (7.33)	.03 (14.14)	.32
.02 (.70)	.01 (.60)	.00 (.10)		.92 (7.27)	.03 (14.55)	.32
.02 (.71)	.01 (.60)	.00 (.09)	.00 (.10)	.92 (7.22)	.03 (14.10)	.32

APPENDIX F

(cont'd)

Dep. Var.: LF M-B_1

Sample: All who worked between marriage and B_1; N = 219

W Ed	H Ed	Y1966	#C	dummy	Mar-B_1	R^2
-.04 (.98)					.06 (21.80)	.69
-.04 (1.05)			.06 (1.11)		.06 (21.05)	.70
-.04 (.99)				.28 (1.75)	.06 (21.91)	.70
-.04 (.81)	-.00 (.16)		.06 (1.11)		.06 (20.96)	.70
-.04 (.91)	.00 (.14)			.28 (1.75)	.06 (21.82)	.70
-.03 (.76)	-.02 (.74)		.06 (1.13)		.05 (21.06)	.70
-.03 (.78)		-.01 (.62)		.26 (1.62)	.06 (21.89)	.70
-.04 (1.07)			.08 (1.36)	.31 (1.93)	.06 (21.25)	.70
-.04 (.83)	.01 (.31)	-.01 (.68)		.27 (1.64)	.06 (21.80)	.70
-.04 (.87)	.01 (.24)	-.01 (.68)	.08 (1.35)	.30 (1.80)	.06 (21.13)	.70

PPENDIX F

(cont'd)

Dependent Variable: :f LFP between school and B_1

Sample: All with po: nterval between school and B_1; N = 547

W Ed	H Ed	Y	#C	dummy	Sch-B_1	R^2
.22 (5.03)					.05 (22.98)	.49
.21 (4.81)			-.04 (.73)		.05 (22.12)	.49
.23 (5.34)				1.03 (4.92)	.05 (23.94)	.51
.17 (3.19)	.05 (1.20)		-.04 (.76)		.05 (21.62)	.49
.17 (3.18)	.07 (1.90)			1.08 (5.15)	.05 (23.46)	.52
.22 (4.60)	-.01 (.34)		-.04 (.72)		.05 (22.09)	.49
.22 (4.72)		. (		1.06 (4.95)	.06 (23.93)	.51
.23 (5.23)			-.00 (.02)	1.03 (4.86)	.05 (23.08)	.51
.17 (3.09)	.07 (1.78)	. (		1.09 (5.10)	.05 (23.36)	.52
.17 (3.05)	.07 (1.78)	. (	-.00 (.02)	1.09 (5.04)	.05 (22.55)	.52

APPENDIX F

(cont'd)

Dep. Var.: LF $S-B_1$

Sample: Worled between school and B_1; N = 470

W Ed	H Ed	Y1966	#C	dummy	$Sch-B_1$	R^2
.20 (4.31)					.05 (22.71)	.53
.19 (4.11)			-.06 (.95)		.05 (21.84)	.53
.20 (4.49)				1.01 (4.94)	.05 (23.74)	.55
.18 (3.25)	.02 (.45)		-.06 (.98)		.05 (21.48)	.53
.17 (3.27)	.04 (1.06)			1.04 (5.04)	.05 (23.42)	.55
.21 (4.13)		-.02 (.79)	-.05 (.91)		.05 (21.80)	.53
.20 (4.20)		.00 (.11)		1.01 (4.86)	.05 (23.66)	.55
.20 (4.39)			-.01 (.24)	1.00 (4.85)	.05 (22.86)	.55
.18 (3.23)	.04 (1.06)	-.00 (.14)		1.03 (4.94)	.05 (23.26)	.55
.17 (3.14)	.04 (1.07)	-.00 (.13)	-.02 (.29)	1.02 (4.85)	.05 (22.37)	.55

APPENDIX G

Supplement to Table 25

Dependent Variable: Number of months from B_1 to labor force entry

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked after B_n only; N = 129	-5.53 (2.62)						.05
	-6.62 (2.29)	1.21 (.55)					.05
	-6.05 (2.73)		.91 (.78)				.06
	-6.79 (2.33)	.89 (.40)	.81 (.67)				.06
						.79 (9.76)	.43
	-2.46 (1.48)					.76 (9.32)	.44
	-4.62 (2.07)	2.44 (1.45)				.77 (9.45)	.45
	-3.25 (1.88)		1.45 (1.59)			.77 (9.46)	.45
	-4.87 (2.18)	1.97 (1.14)	1.23 (1.32)			.78 (9.52)	.46
				19.97 (6.46)			.25
	-4.41 (2.38)			19.28 (6.32)			.28
	-5.52 (2.17)	1.24 (.64)		19.28 (6.30)			.28
	-4.99 (2.57)		1.04 (1.00)	19.34 (6.33)			.29
	-5.72 (2.24)	.86 (.44)	.94 (.88)	19.33 (6.31)			.29
					1.02 (3.56)		.09
	-4.96 (2.44)				.96 (3.41)		.13
	-6.47 (2.33)	1.68 (.80)			.97 (3.45)		.14
	-5.73 (2.70)		1.41 (1.23)		1.00 (3.55)		.14
	-6.73 (2.41)	1.19 (.55)	1.27 (1.09)		1.01 (3.55)		.14

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked after B_n only N = 129				21.79 (7.68)	1.24 (5.21)		.38
	-3.59 (2.11)			21.16 (7.51)	1.19 (5.05)		.40
	-5.22 (2.25)	1.82 (1.04)		21.19 (7.52)	1.21 (5.11)		.41
	-4.49 (2.54)		1.67 (1.76)	21.33 (7.63)	1.25 (5.28)		.42
	-5.52 (2.39)	1.23 (.69)	1.53 (1.57)	21.34 (7.62)	1.25 (5.29)		.42
Two or more children, worked after B_n only, Y $\geq$ 1000 N = 105	-4.64 (2.13)						.04
	-6.13 (2.04)	1.64 (.72)					.05
	-6.29 (2.60)		2.57 (1.52)				.06
	-6.76 (2.23)	.62 (.26)	2.42 (1.35)				.06
						.75 (8.07)	.39
	-2.22 (1.26)					.73 (7.74)	.40
	-4.68 (1.96)	2.75 (1.52)				.74 (7.88)	.41
	-4.49 (2.37)		3.69 (2.78)			.75 (8.24)	.44
	-5.52 (2.34)	1.36 (.74)	3.37 (2.42)			.76 (8.24)	.44
				18.74 (5.32)			.22
	-3.90 (2.00)			18.23 (5.24)			.25
	-5.13 (1.91)	1.36 (.67)		18.17 (5.21)			.25
	-5.81 (2.71)		3.00 (2.00)	18.60 (5.42)			.27
	-5.88 (2.19)	.10 (.05)	2.98 (1.88)	18.59 (5.38)			.27

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked after B_n only, $Y \geq 1000$, N = 105					1.09 (3.29)		.10
	-4.02 (1.92)				1.03 (3.14)		.13
	-6.19 (2.15)	2.40 (1.10)			1.07 (3.24)		.14
	-6.03 (2.62)		3.20 (1.97)		1.10 (3.39)		.16
	-6.95 (2.41)	1.21 (.53)	2.92 (1.71)		1.11 (3.41)		.16
				20.12 (6.18)	1.25 (4.42)		.34
	-3.12 (1.72)			19.66 (6.08)	1.21 (4.26)		.36
	-5.12 (2.06)	2.22 (1.18)		19.60 (6.07)	1.24 (4.37)		.37
	-5.47 (2.81)		3.79 (2.76)	20.24 (6.44)	1.30 (4.70)		.41
	-6.03 (2.47)	.74 (.38)	3.62 (2.50)	20.19 (6.40)	1.31 (4.70)		.41
Two or more children, worked between B_1 and B_n, N = 125	-1.66 (1.02)						.01
	-.23 (.12)	-1.97 (1.33)					.02
	-1.68 (1.02)		.11 (.13)				.01
	-.17 (.09)	-2.18 (1.41)	.42 (.50)				.02
						.21 (3.06)	.07
	-.89 (.55)					.20 (2.92)	.07
	.01 (.01)	-1.29 (.88)				.19 (2.73)	.08
	-.97 (.60)		.49 (.61)			.21 (2.97)	.08
	.11 (.06)	-1.61 (1.07)	.70 (.86)			.20 (2.81)	.08

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked between B_1 and B_n N = 125				4.84			
				(1.97)			.03
	-1.33			4.62			
	(.82)			(1.87)			.04
	-.29	-1.47		4.11			
	(.15)	(.98)		(1.63)			.04
	-1.36		.17	4.64			
	(.83)		(.21)	(1.87)			.04
	-.25	-1.67	.40	4.10			
	(.13)	(1.07)	(.48)	(1.62)			.05
					.09		
					(.55)		.00
	-1.68				.09		
	(1.03)				(.58)		.01
	-.28	-1.92			.07		
	(.15)	(1.28)			(.48)		.02
	-1.73		.21		.10		
	(1.05)		(.25)		(.61)		.01
	-.24	-2.15	.51		.09		
	(.12)	(1.29)	(.60)		(.58)		.03
				5.92	.21		
				(2.29)	(1.28)		.04
	-1.30			5.70	.21		
	(.80)			(2.19)	(1.27)		.05
	-.46	-1.20		5.18	.19		
	(.24)	(.79)		(1.92)	(1.13)		.05
	-1.39		.42	5.85	.23		
	(.85)		(.51)	(2.22)	(1.35)		.05
	-.41	-1.47	.61	5.29	.21		
	(.21)	(.94)	(.72)	(1.96)	(1.24)		.06
Two or more children, worked between B_1 and B_n, $Y \geq 1000$ N = 108	-2.38						
	(1.37)						.02
	-1.03	-1.85					
	(.49)	(1.16)					.03
	-2.36		-.13				
	(1.34)		(.13)				.02
	-1.00	-1.95	.22				
	(.47)	(1.17)	(.20)				.03

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked between B_1 and B_n, $Y \geq 1000$, N = 108						.19 (2.66)	.06
	-1.79 (1.04)					.18 (2.49)	.07
	-1.00 (.49)	-1.13 (.71)				.17 (2.30)	.08
	-1.85 (1.07)		.43 (.42)			.19 (2.51)	.07
	-.92 (.44)	-1.38 (.83)	.65 (.61)			.18 (2.36)	.08
				4.82 (1.87)			.03
	-2.03 (1.16)			4.46 (1.72)			.04
	-1.20 (.57)	-1.19 (.72)		3.92 (1.45)			.05
	-2.05 (1.17)		.17 (.17)	4.54 (1.72)			.04
	-1.15 (.55)	-1.34 (.78)	.38 (.36)	4.02 (1.47)			.05
					.09 (.50)		.00
	-2.44 (1.39)				.10 (.58)		.02
	-1.08 (.51)	-1.86 (1.16)			.10 (.59)		.03
	-2.42 (1.37)		-.10 (.09)		.10 (.57)		.02
	-1.05 (.50)	-1.97 (1.18)	.26 (.24)		.11 (.60)		.03
				5.56 (2.08)	.19 (1.04)		.04
	-2.07 (1.19)			5.21 (1.94)	.19 (1.07)		.05
	-1.32 (.63)	-1.07 (.66)		4.70 (1.67)	.19 (1.02)		.06
	-2.12 (1.21)		.30 (.29)	5.37 (1.95)	.20 (1.09)		.06

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked between B_1 and B_n, $Y \geq 1000$, N = 108	-1.28 (.61)	-1.26 (.73)	.49 (.46)	4.86 (1.71)	.19 (1.06)		.06
One or more children, worked after B_n only; N=177	-1.70 (.78)						.00
	-.06 (.02)	-2.13 (.94)					.01
	-2.02 (.88)		.58 (.45)				.00
	-.29 (.10)	-2.44 (1.06)	.86 (.66)				.01
						.95 (12.67)	.48
	-.88 (.56)					.95 (12.61)	.48
	-.93 (.46)	.06 (.04)				.95 (12.51)	.48
	-1.64 (.99)		1.37 (1.49)			.96 (12.73)	.49
	-1.33 (.65)	-.44 (.26)	1.42 (1.51)			.96 (12.61)	.49
One or more children, worked after B_n only, $Y \geq 1000$; N=146	-1.83 (.79)						.00
	-.50 (.17)	-1.69 (.72)					.01
	-2.72 (1.07)		1.49 (.87)				.01
	-1.04 (.34)	-2.55 (1.04)	2.06 (1.14)				.02
						.91 (10.56)	.44

APPENDIX G

(cont'd)

Sample	W Ed	H Ed	Y1966	#C	Ave Int	Total Int	R^2
Two or more children, worked after B_n only, Y ≥ 1000; N = 146	-.72 (.41)					.91 (10.49)	.44
	-.71 (.31)	-.01 (.01)				.91 (10.41)	.44
	-2.08 (1.09)		2.30 (1.79)			.92 (10.66)	.45
	-1.38 (.61)	-1.06 (.57)	2.54 (1.88)			.91 (10.56)	.45

APPENDIX H

COMPARISON OF TIMING AND SPACING FOR ROMAN CATHOLICS AND NON-CATHOLICS

As indicated in Chapter III the research on the 1965 National Fertility Study reported in this dissertation focused on non-Catholic women. Because Ryder and Westoff[1] reported finding anomalies in the relation between education and completed fertility for Catholics, I investigated the education/fertility relation more intensively. One of the most striking differences between Catholics and non-Catholics was observed when timing and spacing regressions included as dependent variables not only the wife's education and completed fertility but also an interaction term W Ed · #C. The table below shows that when regressions

Coefficients and t-values

Dependent Variable: First Interval

W Ed	H Ed	#C	W Ed·#C	Y1965	R^2	N	Sample
2.27	.50	2.17	-.64	.24			
(1.89)	(.77)	(.70)	(2.19)	(.64)	.06	585	non-Catholic
-3.67	1.20	-12.31	.79	.48			
(2.41)	(1.67)	(3.46)	(2.41)	(.92)	.12	257	Roman Catholic
.86	.67	-1.90	-.23	.32			
(.90)	(1.35)	(.80)	(1.03)	(1.03)	.07	842	All

Dependent Variable: Total Interval

W Ed	H Ed	#C	W Ed·#C	Y1965	R^2	N	Sample
-5.26	1.14	19.27	1.16	-.61			
(3.53)	(1.42)	(5.05)	(3.20)	(1.31)	.60	585	non-Catholic
2.68	-1.42	31.76	-.45	-.47			
(1.10)	(1.24)	(5.62)	(.86)	(.57)	.62	257	Roman Catholic
-2.72	.36	23.41	.58	-.60			
(2.16)	(.54)	(7.42)	(1.97)	(1.48)	.60	842	All

[1] Reproduction in the United States: 1965.

were run on the combined samples of Catholics and non-Catholics, the coefficients of some variables were less significant than for each group separately, often because of the coefficients having opposite signs in the two samples.

Many of the timing and spacing regression results presented in this dissertation for non-Catholics are listed in the tables at the end of this appendix along with the results for the comparable sample of Roman Catholics. In regressions on the wife's and husband's ages at B_1 and on the length of the first interval the coefficient of W Ed is much smaller for Catholics than for non-Catholics and the t-values drop dramatically -- by fifty to eighty percent. Even more startling is the coefficient of W Ed in regressions on the length of the total interval from B_1 to B_n; the coefficients are negative for the non-Catholic sample and positive for the Catholic sample. (The coefficient is very weakly negative in the Roman Catholic sample when cohort and family size variables are left out; but in similar equations for non-Catholics the coefficients are very strongly negative.)

Although the husband's education is, like the wife's, less significant for Catholics than for non-Catholics in regressions on W Age B_1 and H Age B_1, it is more significant for Catholics in regressions on the length of the first interval (from marriage to B_1). As the W Ed coefficient switched signs in regressions on the total interval, so also did the sign of H Ed, but in this case the coefficient was positive for non-Catholics and negative for Catholics (and occasionally significant in each sample.) A further apparent difference by religion in H Ed's effect on the total interval is that if a family size measure is dropped from the regressions the coefficient of H Ed becomes less significant in the non-Catholic regressions but more significant in the Catholic regressions. This really is a similar phenomenon in the two instances, of a more negative or less positive coefficient when #C is excluded; probably for both samples the family size declines as H Ed is larger.

Y1965 and Y40 are insignificant in regressions on W Age B_1, H Age B_1, and total interval for both religion groups, except when H Ed is omitted from the equations.[1] In regressions on H Age B_1 all t-values of H Ed are less than one. In all regressions on the total interval the coefficient of Y1965 is more positive (or less negative) for Catholics than for non-Catholics; if #C is excluded it even approaches (positive) significance. The income variables are more significant for Catholics than for non-Catholics in regressions on the first interval.

The negative cohort effect on W Age B_1 for non-Catholics virtually disappears in regressions for Catholics; in regressions on H Age B_1 the significance declines by about one-half but the sign is still significant (and negative.) The significance of the cohort variable declines by about one-third for Catholics in regressions on the first interval, but the sign is still significant. In regressions on the total interval the cohort variable is less significant for Catholics if #C is excluded, more significant if #C is included and nearly unchanged if #C and $\#C^2$ both are included!

The completed family size is less important for Catholic regressions on W Age B_1, first interval, and total interval, than for non-Catholics. For regressions on H Age B_1 the coefficient of #C is more significant in regressions on non-Catholics; however, when both #C and $\#C^2$ are in the equation their coefficients are more significant for regressions on Catholics.

In view of the many differences in fertility responses to economic variables between the two groups, studies of the timing and spacing of births should examine separately Catholics and non-Catholics.

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[1]There is one t-value of 1.65 for Catholics in a regression on the total interval.

APPENDIX H

(cont'd)

Comparison of regression results on Catholics (N=257) and non-Catholics (N=585); 1965 NFS - white, non-farm, married once-spouse present, one or more children

Dependent Variable: W Age B_1

Roman Catholics							non-Catholics						
W Ed	H Ed	Y1965	#C	#C^2	W Yr B	R^2	W Ed	H Ed	Y1965	#C	#C^2	W Yr B	R^2
2.50	2.61				-1.12		5.52	3.29				-2.15	
(1.41)	(1.94)				(1.25)	.06	(4.83)	(3.68)				(4.22)	.18
2.19	2.26		-6.63		-.84		4.50	2.99		-9.20		-1.91	
(1.27)	(1.73)		(4.05)		(.96)	.12	(4.08)	(3.49)		(7.23)		(3.89)	.25
2.31	2.18		-11.67	.55	-.85		4.68	3.09		-17.41	.96	-1.77	
(1.34)	(1.67)		(2.42)	(1.11)	(.98)	.12	(4.24)	(3.62)		(4.82)	(2.43)	(3.59)	.26
4.67					-1.03		8.39					-2.08	
(3.39)					(1.15)	.04	(9.96)					(4.02)	.16
4.12			-12.29	.60	-.77		7.09			-9.41		-1.83	
(3.06)			(2.55)	(1.21)	(.89)	.11	(8.59)			(7.34)		(3.70)	.23
4.06			-6.82		-.76		7.33			-17.02	.89	-1.70	
(3.02)			(4.16)		(.87)	.10	(8.84)			(4.67)	(2.23)	(3.42)	.24
4.21		.73			-.98		7.81		.81			-2.10	
(2.79)		(.75)			(1.09)	.05	(8.48)		(1.56)			(4.07)	.17
3.25		1.24	-7.09		-.66		6.49		.84	-9.43		-1.86	
(2.20)		(1.32)	(4.29)		(.76)	.11	(7.22)		(1.68)	(7.36)		(3.75)	.24
3.35		1.17	-12.17	.55	-.69		6.72		.86	-17.12	.90	-1.72	
(2.26)		(1.24)	(2.53)	(1.12)	(.78)	.12	(7.45)		(1.72)	(4.71)	(2.26)	(3.47)	.24
2.47	2.55	.11			-1.11		5.51	3.24	.06			-2.16	
(1.38)	(1.79)	(.11)			(1.23)	.06	(4.81)	(3.32)	(.11)			(4.21)	.18

APPENDIX H

(cont'd)

Dependent Variable: W Age B_1

Roman Catholics

W Ed	H Ed	Y1965	#C	$\#C^2$	W Yr B	R^2
1.99	1.89	.76	-6.83		-.77	
(1.15)	(1.36)	(.76)	(4.12)		(.87)	.12
2.13	1.84	.71	-11.69	.53	-.79	
(1.22)	(1.32)	(.71)	(2.43)	(1.01)	(.90)	.12
2.07	2.42	.23				
(1.18)	(1.70)	(.22)				.05
1.71	1.79	.86	-6.97			
(1.00)	(1.29)	(.86)	(4.22)			.11
		Y40				
2.50		4.81			-1.04	
(1.58)		(2.64)			(1.17)	.07

non-Catholics

W Ed	H Ed	Y1965	#C	$\#C^2$	W Yr B	R^2
4.48	2.87	.17	-9.21		-1.91	
(4.05)	(3.06)	(.32)	(7.23)		(3.89)	.25
4.66	2.98	.17	-17.42	.96	-1.77	
(4.22)	(3.19)	(.31)	(4.82)	(2.43)	(3.89)	.26
5.57	3.11	.03				
(4.79)	(3.14)	(.05)				.16
4.50	2.74	.15	-9.55			
(4.01)	(2.89)	(.27)	(7.43)			.23
		Y40				
6.42		3.43			-2.07	
(6.09)		(3.06)			(4.05)	.18

Dependent Variable: W Age B_n

Roman Catholics

W Ed	H Ed	Y1965	R^2
1.64	-1.40	2.15	
(.71)	(.75)	(1.60)	.01

non-Catholics

W Ed	H Ed	Y1965	R^2
.51	3.01	-.21	
(.34)	(2.35)	(.28)	.02

APPENDIX H

(cont'd)

Dependent Variable: H Age B_1

Roman Catholics							non-Catholics						
W Ed	H Ed	Y1965	#C	$\#C^2$	H Yr B	R^2	W Ed	H Ed	Y1965	#C	$\#C^2$	H Yr B	R^2
4.18	1.43				-4.18		5.33	2.01				-4.69	
(1.04)	(2.34)				(6.14)	.15	(4.47)	(2.14)				(10.95)	.22
3.89	1.00		-7.19		-3.91		4.49	1.78		-7.61		-4.68	
(2.25)	(.75)		(4.32)		(5.91)	.21	(3.83)	(1.94)		(5.64)		(11.21)	.26
4.11	.78		-18.08	1.18	-3.78		4.57	1.83		-11.66	.48	-4.65	
(2.40)	(.59)		(3.70)	(2.37)	(5.74)	.23	(3.89)	(1.99)		(3.05)	(1.13)	(11.12)	.27
5.35					-4.09		7.06					-4.57	
(3.87)					(6.05)	.15	(8.04)					(10.73)	.22
4.70			-7.28		-3.84		6.00			-7.72		-4.57	
(3.50)			(4.39)		(5.87)	.21	(6.86)			(5.72)		(11.02)	.26
4.75			-18.34	1.20	-3.72		6.12			-11.44	.44	-4.54	
(3.56)			(3.78)	(2.42)	(5.72)	.22	(6.93)			(2.99)	(1.04)	(10.93)	.26
5.62		-.44			-4.08		6.92		.20			-4.59	
(3.73)		(.45)			(6.02)	.15	(7.22)		(.37)			(10.70)	.22
4.67		.05	-7.30		-3.84		5.84		.23	-7.73		-4.59	
(3.18)		(.05)	(4.35)		(5.85)	.21	(6.14)		(.43)	(5.72)		(11.00)	.26
4.81		-.11	18.35	1.20	-3.72		5.95		.24	-11.47	.44	-4.56	
(3.30)		(.11)	(3.77)	(2.42)	(5.71)	.22	(6.21)		(.45)	(2.99)	(1.04)	(10.92)	.26
4.37	1.83	-.87			-4.18		5.36	2.21	-.30			-4.68	
(2.43)	(1.25)	(.84)			(6.14)	.15	(4.48)	(2.16)	(.50)			(10.90)	.22
3.94	1.11	-.22	-7.14		-3.91		4.51	1.92	-.20	-7.59		-4.67	
(2.26)	(.78)	(.22)	(4.22)		(5.90)	.21	(3.84)	(1.92)	(.35)	(5.63)		(11.16)	.26
4.19	.94	-.34	-18.06	1.19	-3.78		4.60	1.97	-.21	-11.65	.48	-4.64	
(2.42)	(.67)	(.33)	(3.69)	(2.38)	(5.74)	.23	(3.90)	(1.97)	(.36)	(3.05)	(1.13)	(11.08)	.27
3.43	.71	-.84					5.48	1.08	-.63				
(1.79)	(.46)	(.75)				.03	(4.18)	(.96)	(.97)				.07
3.00	-.03	-.10	-8.11				4.62	.78	-.53	-7.64			
(1.62)	(.02)	(.10)	(4.53)			.10	(3.57)	(.71)	(.84)	(5.14)			.11

APPENDIX H

(cont'd)

Dependent Variable: 1st Int

Roman Catholics							non-Catholics						
W Ed	H Ed	Y40	#C	$\#C^2$	Yr Mar	R^2	W Ed	H Ed	Y40	#C	$\#C^2$	Yr Mar	R^2
-.07	1.39		-9.35	.59	-.66		.73	1.01		-11.25	.79	-.90	
(.08)	(2.07)		(3.77)	(2.33)	(2.11)	.13	(.95)	(1.72)		(4.58)	(2.93)	(3.19)	.08
			-9.71	.61	-.47					-10.87	.69	-.64	
			(3.89)	(2.38)	(1.56)	.11				(4.40)	(2.56)	(2.37)	.07
-.10	1.67				-.60		1.06	1.04				-.84	
(.11)	(2.37)				(1.82)	.04	(1.37)	(1.71)				(2.91)	.03
1.08			-9.73	.62	-.62		1.57			-11.12	.77	-.84	
(1.54)			(3.91)	(2.44)	(1.95)	.12	(2.68)			(4.52)	(2.85)	(3.00)	.08
	1.36		-9.36	.59	-.67			1.37		-11.22	.78	-.86	
	(2.59)		(3.79)	(2.34)	(2.17)	.13		(3.04		(4.57)	(2.88)	(3.10)	.08
-.10	.56	1.66	-9.50	.61	-.68		.67	.46	.94	-11.25	.79	-.89	
(.11)	(.61)	(1.32)	(3.83)	(2.39)	(2.17)	.14	(.87)	(.54)	(.87)	(4.58)	(2.94)	(3.16)	.09
		2.27	-9.62	.62	-.67				1.84	-11.18	.77	-.81	
		(2.84)	(3.91)	(2.45)	(2.18)	.14			(3.04)	(4.56)	(2.86)	(2.96)	.08
-.14	.89	1.56			-.62		1.00	.45	1.01			-.83	
(.15)	(.93)	(1.18)			(1.87)	.04	(1.28)	(.51)	(.91)			(2.88)	.03
.14		2.19	-9.63	.62	-.68		.82		1.36	-11.23	.79	-.87	
(.17)		(2.39)	(3.90)	(2.45)	(2.16)	.14	(1.16)		(1.85)	(4.58)	(2.93)	(3.12)	.09
	.52	1.66	-9.51	.61	-.69			.75	1.02	-11.23	.78	-.86	
	(.63)	(1.32)	(3.85)	(2.41)	(2.23)	.14		(.93)	(.95)	(4.58)	(2.90)	(3.07)	.08

APPENDIX H

(cont'd)

Dependent Variable: 1st Int

Roman Catholics W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2	non-Catholics W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2
-.18	1.18	.44	-9.36	.58	-.65		.70	.84	.25	-11.23	.79	-.90	
(.20)	(1.65)	(.86)	(3.77)	(2.28)	(2.06)	.13	(.91)	(1.30)	(.68)	(4.58)	(2.93)	(3.19)	.09
		.89	-9.62	.58	-.53				.70	-11.04	.72	-.73	
		(2.01)	(3.88)	(2.30)	(1.76)	.12			(2.20)	(4.48)	(2.69)	(2.68)	.08
-.13	1.60	.14			-.60		1.04	.90	.20			-.84	
(.14)	(2.14)	(.26)			(1.80)	.04	(1.24)	(1.36)	(.52)			(2.91)	.03
.61		.74	-9.65	.59	-.60		1.26		.44	-11.18	.76	-.86	
(.79)		(1.51)	(3.87)	(2.34)	(1.91)	.13	(2.00)		(1.30)	(4.55)	(2.87)	(3.07)	.08
	1.11	.43	-9.38	.58	-.66			1.17	.27	-11.24	.78	-.87	
	(.82)	(.84)	(3.79)	(2.30)	(2.14)	.13		(2.21)	(.73)	(4.58)	(2.88)	(3.11)	.08

Dependent Variable: Total Int

Roman Catholics W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2	non-Catholics W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2
1.73	-1.36		26.71		-1.65		-1.29	.95		30.64		-1.05	
(1.25)	(1.29)		(20.30)		(3.35)	.64	(1.35)	(1.28)		(27.98)		(2.98)	.60
.24	-1.17		53.17	-2.86			-2.14	.36		53.64	-2.67		
(.19)	(1.22)		(14.96)	(7.86)		.70	(2.36)	(.51)		(18.23)	(8.26)		.64
1.11	-.92		52.93	-2.85	-1.63		-1.71	.68		54.09	-2.76	-1.27	
(.89)	(.97)		(15.26)	(8.03)	(3.71)	.71	(1.90)	(.97)		(18.57)	(8.61)	(3.80)	.65
-.02	-2.93						-5.08	-.26					
(.01)	(1.71)					.02	(3.49)	(.23)					.04
1.08	-2.60				-2.06		-4.37	.25				-1.89	
(.48)	(1.53)				(2.58)	.04	(3.00)	(.22)				(3.50)	.06

APPENDIX H

(cont'd)

Dependent Variable: Total Int

Roman Catholics							non-Catholics						
W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2	W Ed	H Ed	Y1965	#C	$\#C^2$	Yr Mar	R^2
-0.43	-3.82	1.93					-5.06	-.09	-.24				
(.19)	(2.11)	(1.48)				.03	(3.47)	(.08)	(.33)				.04
.68	-3.41	1.73			-1.99		-4.35	.40	-.22			-1.88	
(.30)	(1.89)	(1.34)			(2.50)	.05	(2.98)	(.33)	(.31)			(3.50)	.06
1.90	-1.03	-.67	26.88		-1.67		-1.22	1.37	-.61	30.68		-1.05	
(1.35)	(.92)	(.84)	(20.19)		(3.39)	.64	(1.28)	(1.70)	(1.31)	(28.02)		(2.98)	.60
.30	-1.06	-.24	53.18	-2.85			-2.06	.78	-.61	53.68	-2.67		
(.23)	(1.03)	(.32)	(14.93)	(7.82)		.70	(2.27)	(1.02)	(1.38)	(18.25)	(8.26)		.64
1.21	-.73	-.39	52.94	-2.84	-1.65		-1.64	1.09	-.60	54.12	-2.76	-1.26	
(.96)	(.73)	(.54)	(15.24)	(7.99)	(3.73)	.71	(1.82)	(1.43)	(1.37)	(18.60)	(8.61)	(3.79)	.65
.97	-1.37	-.52	27.02				-1.58	1.10	-.62	30.96			
(.69)	(1.20)	(.63)	(19.90)		<u>1st Int</u>	.62	(1.66)	(1.37)	(1.32)	(28.19)		<u>1st Int</u>	.60
-.75	-2.83	2.06			-.67		-4.75	.20	-.15			-.43	
(.34)	(1.61)	(1.65)			(4.59)	.10	(3.33)	(.16)	(.22)			(5.59)	.09
.87	-1.20	-.43	26.40		-.16		-1.55	1.18	-.58	30.32		-.15	
(.62)	(1.05)	(.53)	(18.72)		(1.57)	.63	(1.63)	(1.47)	(1.25)	(27.23)		(2.88)	.60
-2.50							-5.31						
(1.47)						.01	(5.00)						.04

APPENDIX I

Supplement to Table 16 -- Regressions on Total Int, with and without W Age B_1 held constant, 1965 National Fertility Study.

Sample: Married once, one or more children; N = 585.

W Ed	H Ed	Y 1965	#C	$\#C^2$	W Age B_1	R^2
-5.06	- .09	- .24				.04
(3.46)	(.08)	(.33)				
-2.57	1.30	-.22			- .45	.16
(1.84)	(1.10)	(.33)			(9.17)	
-2.06	.78	-.61	53.68	-2.67		.64
(2.27)	(1.02)	(1.38)	(18.25)	(8.26)		
-1.35	1.21	- .59	50.78	-2.50	- .15	.65
(1.49)	(1.60)	(1.35)	(17.15)	(7.81)	(4.54)	

Sample: All married, one or more children; N = 748.

W Ed	H Ed	Y 1965	#C	$\#C^2$	W Age B_1	R^2
-2.24	.61	-.33	56.93	-2.98		.65
(2.88)	(.92)	(.80)	(21.16)	(9.81)		
-1.33	.85	-.31	54.64	-2.80	- .14	.66
(1.69)	(1.30)	(.77)	(19.97)	(9.33)	(5.12)	

Sample: All married, two or more children; N = 619.

W Ed	H Ed	Y 1965	#C	$\#C^2$	W Age B_1	R^2
-3.01	.79	-.33	49.18	-2.32		.50
(3.20)	(.99)	(.66)	(12.04)	(5.63)		
-1.81	1.26	-.35	46.22	-2.18	- .22	.50
(1.92)	(1.61)	(.73)	(11.51)	(5.41)	(5.74)	

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