MODELING THE LINKS BETWEEN FERTILITY MOTIVATIONS AND FERTILITY OUTCOMES: A PROSPECTIVE ANALYSIS OF NLSY DATA*

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ABSTRACT

We examine how the motivational sequence that leads to childbearing predicts fertility outcomes across reproductive careers. Using a motivational traits-desires-intentions theoretical framework, we test a structural equation model using prospective male and female data from the National Longitudinal Survey of Youth. Specifically, we take motivational data collected during the 1979-1982 period, when the youths were in their teens and early twenties, to predict both short-term and long-term fertility outcomes across the subsequent twenty years. The short-term outcome is the timing of the next child born after 1982 and the long-term outcome is the last number of children born by 2002. The results indicate substantial explanatory power of fertility motivations for both short-term and long-term fertility outcomes, reveal the effects of both gender role attitudes and educational expectations on these outcomes, and identify several unexpected pathways in the motivational sequence. Three validity substudies support the soundness of the results.

MODELING THE LINKS BETWEEN FERTILITY MOTIVATIONS AND FERTILITY OUTCOMES: A PROSPECTIVE ANALYSIS OF NLSY DATA

A question of longstanding interest to researchers studying human fertility is whether fertility planning matters. Do women/men/couples actually achieve their goals with respect to having children? Are their goals more likely to be achieved in terms of numbers of children or the timing of children? What contributes to the predictive successes and failures of their childbearing motivations? In this paper we further develop a model that links the motivational antecedents to childbearing to fertility outcomes by empirically testing the model using a prospective design and data from a national probability sample.

We posit two developmental phases during the life course for the motivations that promote childbearing in humans. During the first phase, biologically-based, often hereditary characteristics of the individual interact during growth and development with that individual's childhood and adolescent social environments (Belsky 2000; Miller 1992), leading to the formation of a motivational substrate for childbearing (Miller and Pasta 2002). This process culminates at about the time that the individual's body becomes physiologically capable of reproduction. The second phase begins in the adolescent and early adult periods and extends across the life course until the end of the individual's reproductive career. During this phase, established childbearing motivations find expression in conscious desires and intentions, in behavior, and ultimately in the occurrence of fertility events. The latter, in turn, have a feedback effect on the underlying motivational substrate and the forms of its conscious expression (Miller and Pasta 1995a).

It is this second phase of development with which the current paper is concerned. Using a theoretical framework that focuses on childbearing motivation and its expression, together with data from the National Longitudinal Survey of Youth (NLSY), we test a model designed to predict two critical features in the development of young adults' reproductive careers, namely the timing of childbearing and the number of children ultimately born. We are motivated in this study to examine to what degree and through what processes late adolescent and early adult motivations for childbearing affect actual childbearing two decades later.

THEORETICAL BACKGROUND

Reproductive motivation may be said to have two major components, one that drives mate selection and sexual behavior and one that drives the protection and nurturance of the resulting progeny (Foster 2000; Potts 1997). It is the motivational mechanisms that subserve this second component, what Miller and Rodgers (2001) have called nurturant schemas, that play a central role in driving those behaviors that, beginning in adolescence and the early adult period, lead to the bearing and rearing of children.

Nurturant schemas are essentially enduring dispositions to have feelings about and be motivated by babies and children. Although these trait-like schemas provide the underlying motive force for human childbearing, in order to fully understand and predict childbearing decisions, it is necessary to look beyond them and take into account both the conscious factors that lead to behavior and the behavior itself. For this, we turn to a Traits-Desires-Intentions-Behavior (TDIB) theoretical framework developed by Miller (1994). The ideas that underlie this framework are fairly simple. There is a three-step motivational sequence, in which those schema-based traits that dispose the individual toward or away from bearing and caring for children are activated into conscious desires for or against having a child. These desires are, in turn, transformed through some decision-making process into intentions to have or not to have a child. This motivational sequence then leads to the implementation of the individual's intentions through various behaviors, which in turn lead to the achievement or avoidance of conception and subsequent fertility outcomes.

Many elements of this framework have been present in the fertility research literature for a number of decades. Demographers commonly use variables that reflect numbers of children intended, expected, desired, and considered ideal by survey respondents. Based on the 1965 National Fertility Study in the United States, Ryder and Westoff (1971) showed that responses to the intended and expected number of children were "virtually indistinguishable" and that the pattern of answers to questions about intended, desired, and ideal parity in relation to current parity showed a "well ordered sequence" from ideal to desired to intended to current. In spite of these findings, considerable evidence indicated that these measures were poor or unreliable predictors of actual fertility (Morgan 1982; Trent 1980; Westoff and Ryder 1977). Morgan (2001) has pointed out that that the predictive validity of measures such as completed parity intentions is handicapped by their change over time, making their usefulness depend on the time period over which they are projected. This observation highlights the potential importance of timing desires and intentions, a topic that has undergone some exploration (Rindfuss, Morgan, and Swicegood 1988).

Our framework incorporates both child-number and child-timing measures and indicates the basic conscious pathway along which we believe underlying motivation traits are channeled into behavior. However, in the form presented above it is highly abstract. A more detailed and applicable version of the framework is shown in Figure 1, which is slightly modified from Miller (1994). On the left side of the figure, we show two types of traits that are relevant to fertility, motivational traits and attitudinal traits. Both are psychological dispositions that are strongly laden with the affective forces that motivate behavior. A good example of motivational traits would be positive and negative childbearing motivations of the type measured by Miller's (1995) Childbearing Questionnaire. A good example of attitudinal traits would be traditional and modern sex role orientations as measured by Scanzoni (1975).

Continuing to the right in the figure, desires have been divided into three types, which correspond to the three major issues that childbearing poses to the individual, namely whether to have a (another) child, how many (more) to have, and how soon to have the (next) child. The parentheses in the previous sentence help distinguish how these three questions may be framed either before any childbearing has occurred or after childbearing has begun. These three issues are, of course, not independent of each other. As Figure 1 indicates and as past research has suggested (Miller and Pasta 1994), childbearing desires are causally antecedent to child timing desires (the more you want a child, the sooner you want it), and so are child number desires (the more children you

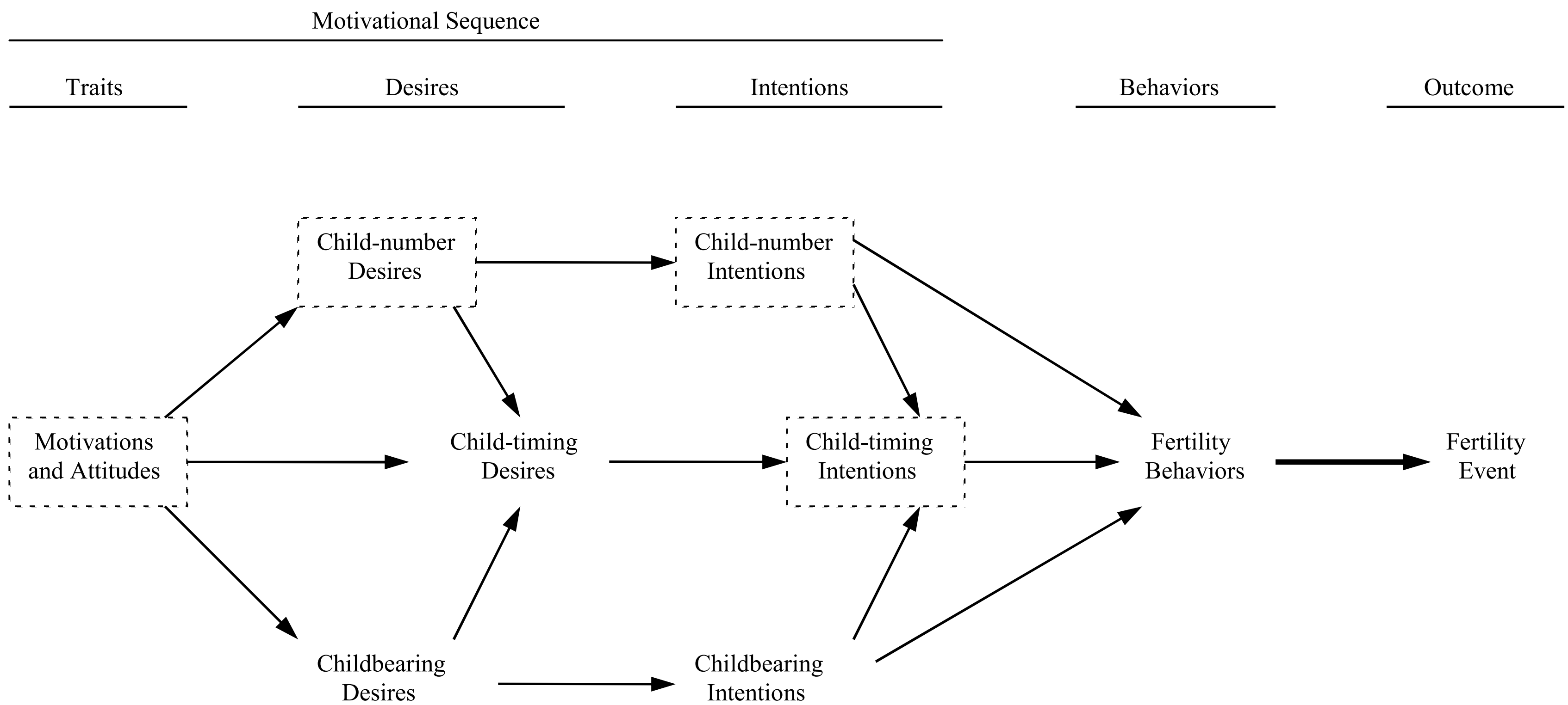

Figure 1. An expansion of the TDIB model to show the interactions of two types of traits, three types of desires, and three types of intentions in their effect on fertility behavior. Dashed boxes indicate those components of the motivational sequence available in the NLSY data that will be used in testing the theoretical framework.

want, the sooner you want to start having them). The relationship between childbearing and child number desires appears to be bidirectional and is perhaps best represented within the context of a model like that shown in Figure 1 as a correlation.

Continuing again to the right in the figure, intentions have been divided according to the same three issues and are causally related to each other in the same way. This completes the three-step motivational sequence and leads to conception-oriented behavior, of which there are two primary types. Contraceptive behavior is oriented to the prevention of conception and itself has several different subforms that derive from the separate acts of choosing and using a contraceptive method (Miller and Pasta 1996). Proceptive behavior is oriented to the achievement of conception (Miller 1986). Miller and Pasta (1995b) have shown that all three of the types of intentions identified above played a role in predicting proceptive behavior in a longitudinal study. Of course, sexual behavior is implicit in and entangled with both of these conception-oriented behaviors but operates to a large extent on the basis of a separate motivational mechanism, one that is based on mating schemas (Miller and Rodgers 2001). Finally, on the far right Figure 1 shows that the two conception-oriented behaviors result in the occurrence (or not, in the case of contraception) of fertility events.

In existing data sets that are available for secondary analysis, not all of the constructs shown in Figure 1 are likely to have been measured. One of the advantages of the kind of complexity hypothesized for the motivational sequence is that it broadens the number of data sets in which relationships between some subset of constructs from within the overall framework (i.e., of a submodel) can be tested. This situation is true for the NLSY, which nonetheless has an extensive number of fertility-related questions that allow the testing of just such a submodel. In Figure 1 we have highlighted with dashed boxes those components of the motivational sequence leading to fertility that are available in the NLSY data; these dashed boxes identify the submodel of the overall framework that we treat in this paper.

Figure 2 represents the hypothesized model to be fitted to the NLSY data and includes a number of modifications to the broad framework in Figure 1. First, we have named the constructs to match the terms used during NLSY data collection. Second, we have selected gender role attitudes as the trait predictor in the motivational sequence. Unfortunately, no good measures of childbearing motivation are available in the data. However, the presence of a good measure of gender role attitudes in the NLSY data gives us the opportunity to use a closely related motivational trait that has not been adequately explored in the prediction of fertility outcomes. Research has shown that embedded within the gender role attitudes construct are both motivations for childbearing and motivations for female education, work, and other aspects of a modern lifestyle. Perhaps the best study of these issues was conducted by Scanzoni (1975) who showed that for wives aged 18-29 sex role modernity (as opposed to traditionalism) not only predicted lower birth intentions, lower parity, and higher effectiveness of contraceptive use, but was also positively associated with greater education and predicted greater work force participation and higher income. An early study by Miller (1981) found that a traditional role attitude was strongly associated with both positive and negative childbearing motivations in women ($r = 0.59$ and -0.46, respectively). Overall, these findings suggest that in a multivariate context, especially one that includes a modern life-style variable such as motivation for education as a predictor (see below), the residual predictive effects

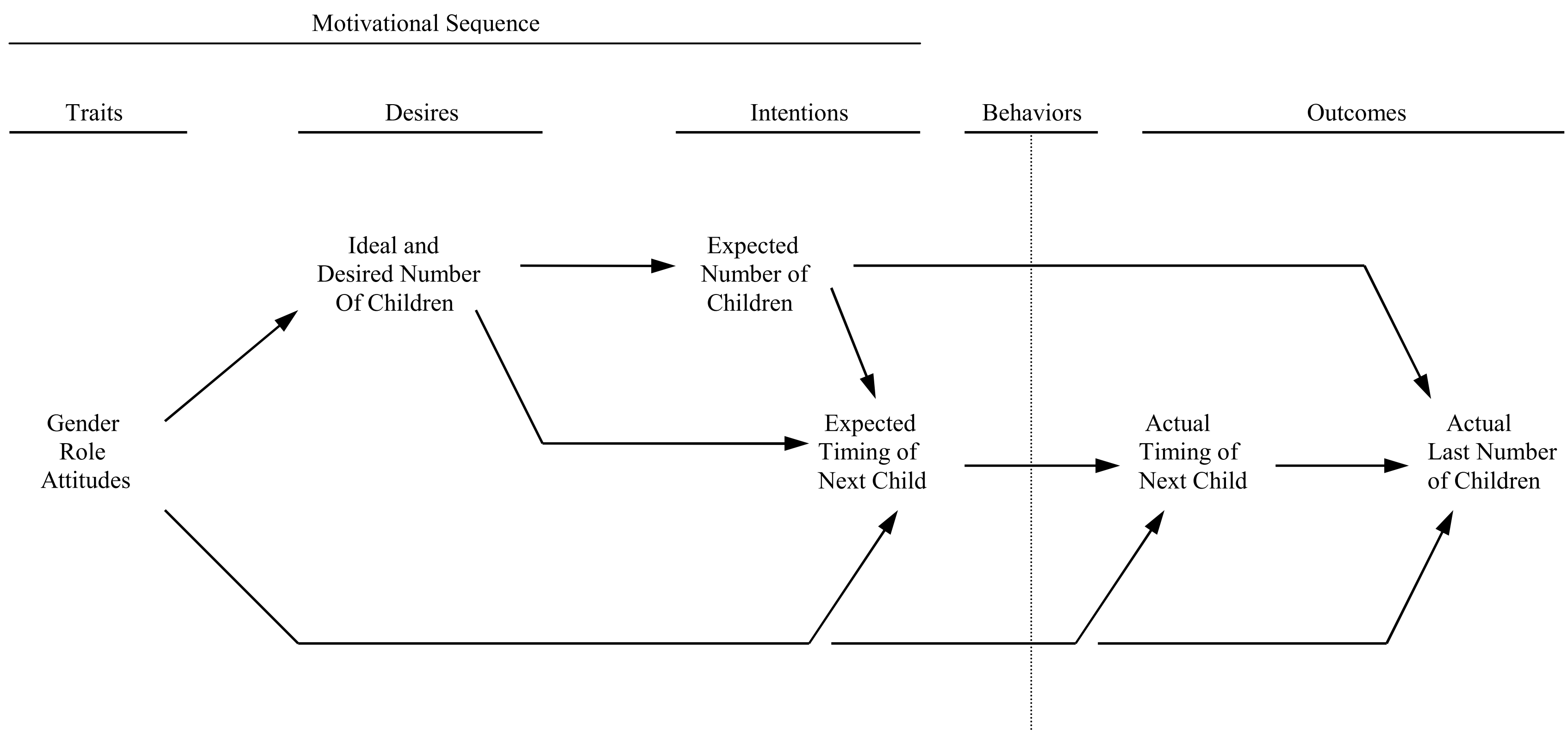

Figure 2. The hypothesized fertility structural equation model that was fitted to the NLSY data. Fertility traits, desires, and intentions were measured during 1979 to 1982. Fertility behaviors (indicated by the vertical dotted line) were not measured but were assumed to occur subsequent to 1982, resulting in fertility outcomes. Two fertility outcomes were measured beginning in 1983 and ending in 2002.

of a gender role attitudes variable may substantially reflect motivations for the bearing and rearing of children.

Third, we have focused specifically on those desires and intentions constructs from the motivational sequence that were measured in the NLSY data. As a consequence, ideal/desired number of children and gender role attitudes are both directly connected to the expected timing of the next child, with both pathways expected to capture much of the explanatory power presumed to be passing through the two desires and one intentions variable that are missing in the data.

Fourth, we have not included explicit behavioral variables in the model. Although some questions about contraceptive behavior or attempts to become pregnant (proceptive behavior) were asked of the NLSY participants, none was well suited for use in this kind modeling. Further, in order to predict across the period of time covered by this study –twenty years- too many different types of behavior would have had to be taken into account and the model would have become unmanageably complex. For these reasons, we elected to test what may more accurately be called a TDI framework and have simply assumed that the fertility outcomes reflect a complex of behaviors over time, indicating the on-going occurrence of these behaviors in Figure 2 with a vertical dotted line placed between the antecedent motivational sequence and the consequent fertility outcomes.

Various social science theorists have conceptualized fertility decision-making as a one-stage process (Becker 1960; Willis 1973), a two-stage process (Fawcett, Albores, and Arnold 1972; Namboodiri 1974), or a multistage process (Bulatao 1981). In considering most modern, developed societies, we are inclined to conceptualize fertility decision-making as occurring one birth at a time, a process that has been called conditional (McClelland 1983), successive (Fawcett 1983), or sequential (Namboodiri 1983) decision-making. This means that the framework represented in Figure 2 could be applied to any single birth, whether it was the first, second, third, etc. For this study we wanted to focus on both the short-term predictive validity of fertility motivation and on the prediction of fertility outcomes that address the entire fertility career of the NLSY participants. Thus in developing our theoretical framework (see Figure 2), we have selected two fertility outcomes that are central to the definition of a fertility career, namely the timing of the next birth and the final number of children born. We expect the timing of the next birth to predict the final number born (the sooner you have a child, the more children you are likely to have). We also expect number intentions to predict the final number actually born and timing intentions to predict the actual timing of the next child. By confining our sample to those NLSY participants who are without children (i.e., those who have zero parity) at the beginning of the study, the two fertility outcome variables in the model would span their entire fertility careers. By including some participants who have already had one or more children, we would be adding to the model elements of the participants' fertility careers that occur following the birth of the first, second, third, etc., child. Comparing these two models can then inform an across-fertility career, developmental perspective.

There is one final feature of our theoretical approach that requires discussion. Up to this point we have focused exclusively on motivations within the behavioral domain of reproduction. However, there are other sources of motivation that can affect childbearing and further inform our modeling efforts. An important such source is education, which derives from the behavioral domain that Miller and Rodgers (2001) have called exploration/mastery. Education has a complex, multi-pathway effect on fertility, one that is predominantly, but not exclusively, negative (Cochrane 1979; Kohler and Rodgers 2002). We will not try to model the motivation for education with the same type of sequence that we have developed for childbearing, but rather will use a trait-like measure of educational intentions. We expect that this measure will be negatively related to all of the childbearing motivational sequence and to the fertility outcomes. Because we believe a traditional gender role attitude to be positively related to fertility outcomes but also negatively associated with educational expectations, especially in women, we anticipate that the educational expectations and gender role attitude variables will to some extent reduce each other's explanatory power.

METHODS

Design

The data used to test our theoretical framework were collected during the National Longitudinal Survey of Youth, which was conducted under the auspices of the U. S. Department of Labor (National Longitudinal Survey of Youth, 1979, 2003). Beginning in 1979, a national probability sample of young men and women was surveyed annually through 1994 and thereafter biennially, with the most recent available data collected in 2002. As described in the caption for Figure 2, we used data bearing on the motivational sequence leading to childbearing that was collected during the 1979-1982 period to predict our two fertility outcome variables as measured beginning after 1982 and continuing through 2002. This allowed us to study the link between fertility motivation and fertility outcomes in the context of a prospective design.

Participants

The beginning NLSY79 participants consisted of a sample of 6,111 youths representative of the U.S. as a whole, an oversample of 5,295 minority and economically disadvantaged youths, and a military sample of 1,280 youths, for a total of 12,686 youths. However, because some members of the economically disadvantaged and military samples were dropped from the survey after 1990 and 1985, the sample size from which we could actually draw our participants was 5,022 for males and 4,942 for females. As a result of attrition during the 23 years of data collection, the number of participants for whom data were available for the entire 1979-2002 period was 3,683 for males and 3,883 for females, giving retention rates of 73.3% and 78.6% respectively. In order to test whether the model generated with these two samples was affected by this amount of attrition, we applied the final model to the data available through 1990 only. The number of participants in these samples, which had a retention rate of 89.9% and still included the economically disadvantaged youths, was 5,241 for males and 5,401 for females.

The male and female youths who participated in the NLSY79 were all born in 1957 through 1964, were ages 14 through 22 in 1979, and were ages 37 through 45 in 2002. This means that childbearing for this cohort is virtually complete and that problems with selection bias caused by fertility timing differences across educational and SES strata have been substantially resolved. Additional selected background characteristics of the study participants are shown in Table 1. Because it is obvious that many of these variables are strongly affected by even a few years change in age, we

Table 1. Frequency Counts for Selected Background Variables, Separately by Sex.

Variable	Males (n=3,683)		Females (n=3,883)	
Category	Frequency	Column %	Frequency	Column %
Race/Ethnicity, 1979				
Hispanic	676	18.4	721	18.6
Non-Hispanic black	1,126	30.6	1,192	30.7
Non-Hispanic, non-black	1,881	51.1	1,970	50.7
Religious Affiliation, 1982				
Protestant	1,969	53.6	2,186	56.5
Roman Catholic	1,168	31.8	1,249	32.3
Other	86	2.3	100	2.6
None	448	12.2	334	8.6
Highest grade completed, 1982				
8th grade or less	183	5.0	163	4.2
9th-11th grade	1,277	34.8	1,133	29.3
12th grade	1,385	37.7	1,511	39.1
1 or 2 years of college	547	14.9	741	19.2
3 or 4 years of college	252	6.9	305	7.9
Graduate school	29	0.8	16	0.4
Employment status, 1982				
Employed	2,167	58.8	2,030	52.3
Unemployed	571	15.5	526	13.6
Out of labor force	683	18.5	1,303	33.6
Armed services	262	7.1	24	0.6
Marital status, 1982				
Never married	3,035	82.4	2,639	68.0
Married	560	15.2	1,003	25.8
Separated, divorced, or widowed	87	2.4	240	6.2
Number of children ever born, 1982				
0	3,097	84.1	2,600	67.0
1	416	11.3	781	20.1
2	135	3.7	376	9.7
3+	34	1.0	126	3.3

Note. The number of missing cases in a variable column ranges from 0 to 14.

report their values as of 1982 (except for race/ethnicity) when the motivational sequence in our model ends and the fertility outcomes begin. Two continuous variables not included in the table are age in 1982 with a mean (s.d.) of 20.5 (2.3) and total net family income in 1982 with a mean (s.d.) of $21,902 ($17,155).

Measures

Ten variables from the fertility domain were used in estimating the model base on Figure 2. All of these variables were based on single questions asked in the course of the annual or biennial survey interviews about the participant's ideal number of children for family, how many children the participant wanted altogether, how many children the participant expected to have, when the participant expected to have the first/next child, whether the participant had given birth to a child since the previous interview, and how many total children the participant had born.

An exception to the single question basis for variables involved the two gender role attitude variables from 1979 and 1982. Each of these was based on five of the eight attitudinal statements read to the participants, which they were asked to rate on a strongly agree, agree, disagree, or strongly disagree scale. The five statements we selected, which were strongly intercorrelated, included "A woman's place is in the home, not the office or shop", "A wife with a family has no time for outside employment", "Employment of wives leads to more juvenile delinquency", "It is much better if the man is the achiever outside the home and the woman takes care of the home and family", and "Women are much happier if they stay home and take care of children". Responses to these five questions were then combined additively for each year. Cronbach's coefficient alpha for males/females was .75/.76 in 1979 and .81/.81 in 1982.

Three additional variables from the education domain were also used in the model estimation. Each of these was based on the same question asked in 1979, 1981, and 1982 about the highest grade the participant thought he/she would actually complete. For more complete information regarding the fertility, gender role, and education questions and question sequencing, see Chapter 3 in the NLS Handbook (National Longitudinal Survey of Youth, 1979, 2003).

Table 2 provides descriptive statistics, separately by sex, for all thirteen of the above variables, as well as two reciprocal forms of the timing variables. A suffix indicates the year in which each variable was measured. For the variables with a 2002 suffix, that date should be interpreted as an "as of" date, given that a very small proportion of participants will have a first/next child and a larger last number of children after 2002, the most recent year of data collection. Two variables, the expected and the actual timing of the next child, were coded as years and fractions of years. For example, those who reported that they expected their next child in one year and three months were coded 1.25. In order to achieve more of a Normal distribution for these two variables and to reduce outlier effects, each score was transformed using a reciprocal transformation. Although these reciprocal variables were the ones actually used in the analyses, for comparison purposes we report both the original variables as well as their reciprocal versions in the table. One consequence of using the reciprocal variables was that all predictions within the fertility domain part of the model were expected to be positive. In contrast, all predictions from the education domain variable were expected to be negative.

We adopted special coding conventions for certain variables in order to avoid outlier effects. For the four ideal and desired number of children variables, we set all

Table 2. Means and Standard Deviations, Minimum (Min) and Maximum (Max) Values, and Numbers of Missing Cases (Mis) of All Variables Used in the Structural Equation Modeling[a], Separately by Sex.

Variable	Males (n=3,683)					Females (n=3,883)				
	M	SD	Min	Max	Mis	M	SD	Min	Max	Mis
Gender role attitude, 1979	2.36	0.54	1.00	4.00	7	2.09	0.56	1.00	4.00	4
Gender role attitude, 1982	2.21	0.54	1.00	4.00	1	1.97	0.55	1.00	4.00	2
Ideal number of children, 1979	3.01	1.33	0	10	15	2.95	1.29	0	10	10
Desired number of children, 1979	2.58	1.41	0	10	38	2.49	1.48	0	10	16
Ideal number of children, 1982	2.72	1.11	0	10	21	2.65	1.07	0	10	46
Desired number of children, 1982	2.49	1.32	0	10	31	2.36	1.28	0	10	15
Expected number of children, 1982	2.42	1.24	0	10	23	2.33	1.23	0	10	16
Expected timing of next child, 1982	6.21	5.61	0.08	20	167	6.91	6.69	0.08	20	180
Reciprocal, exp. timing of next child, 1982	0.47	1.17	0.05	12	167	0.55	1.41	0.05	12	180
Actual timing of next child, 2002	11.45	9.18	0.00	25	0	10.33	9.34	0.00	25	0
Reciprocal, actual timing of next child, 2002	0.23	0.29	0	1.00	0	0.29	0.33	0	1.00	0
Actual last number of children, 2002	1.83	1.46	0	10	0	2.05	1.42	0	11	0
Expected years of education, 1979	13.78	2.39	3	18	32	13.78	2.32	1	18	30
Expected years of education, 1981	13.77	2.41	1	18	56	13.86	2.29	3	18	55
Expected years of education, 1982	13.84	2.40	3	18	9	13.92	2.31	3	18	13

[a]Although not used in the modeling, the non-reciprocal form of the expected and actual timing variables are included in the table for purposes of comparison with the inverse form.

variables greater than 10 to 10. For the expected timing of the next child variable, we set all responses greater than "20 years from now" to 20. We adopted additional coding conventions in order to keep participants in the sample when their responses were categorically different from the continuous variable but we felt their position on the continuum could reasonably be approximated. Thus for the expected timing of the next child variable, we set all those who expected no (more) children and the few who were unable to say what their expectations were to 20, indicating the most extreme expectation score possible within our coding scheme. We kept those who were pregnant at the time of the 1982 interview in the sample and coded how soon they expected to give birth. For example, the minimum of 0.08 for the expected timing variable in Table 2 represents participants who expected to give birth in one month. For the actual timing of next child variable, we arbitrarily set all those who had not yet had a first/next child in 2002 to 25 and for the reciprocal of that variable, we arbitrarily set those same participants to 0 (i.e., a slightly rounded version of the reciprocal of 25).

Data Analysis

We estimated the hypothesized model shown in Figure 2, using the latent variable and the linear structural equation capabilities of LISREL (Joreskog and Sorbom, 1996). We analyzed separate covariance matrices for males and females but assumed the null hypothesis of no sex differences in both the measurement and the structural equation models. Therefore, we constrained parameter estimates to be equal across the two sex subsamples, relaxing those constraints only when it significantly improved overall model fit, beginning with those having the largest modification indices and progressing downward. Once no further statistically significant improvement in fit could be accomplished by removing constraints, we dropped pathways with non-significant coefficients and added new pathways where modification indices suggested doing so would significantly improve model fit. In the Appendix we present the separate correlation matrices for males and females of all variables used in the LISREL modeling. In order to maximize the number of cases and because of the proportionally small number of missing cases (see Table 2), these correlations are based on the pairwise missing option.

Measurement model. An important consideration in testing our SEM was to reduce measurement error wherever possible through the use of latent variables. Because the important variables of ideal and desired number of children were measured only twice, in 1979 and 1982, and because analyses indicated that all four were well intercorrelated, we created a single latent variable to represent child-number desires, using these four indicators.

In parallel with this, we created a second latent variable using the 1979 and 1982 measures of gender role attitudes. Efforts to create similar across-year latent variables for child-number expectations and child-timing expectations were less successful. The reason for this was that expectations were less stable over the three year interval and appeared to be particularly affected by changes in marital status and by childbearing (see Rodgers and Doughty, 2000, for empirical analysis and discussion of the stability of these NLSY fertility expectation indicators). As a result of this relative instability, the inclusion of the two across-year latent expectations variables induced a large number of within year correlations between the four latent variable indicators and added strain to the overall model. For these reasons we decided not to include latent expectations variables in the model but rather to base these two variables on single indicators from 1982.

Finally, we included a latent variable which represented motivation within the domain of education. We based it on expected years of education as measured in 1979, 1981, and 1982. Unlike the fertility expectations variables, it was more stable across that time period.

Structural Equation Model. The connections hypothesized for the fertility motivational sequence were measured in the 1979-1982 period and predicted the two fertility outcomes, which were measured beginning in 1983 and continuing until the most recent survey in 2002. Because we did not wish to model the relationships between the trait of gender role attitudes and the trait of expected years of education, these two latent variables were treated as exogenous (ksi variables in LISREL) and allowed to freely correlate with each other and to predict the remaining variables (eta variables in LISREL).

Testing Variants of the Base Model. We conducted three validity substudies, one on the effects of sample attrition and two that tested developmental issues, by applying the base model derived through the steps described above to the data from different subsamples. First, we examined whether loss to follow-up may have appreciably affected our findings by applying the base model to data from the considerably larger sample available ten years earlier, in 1990. Second, we tested whether the eight year age spread in the base sample was large enough to obscure some important developmental differences by splitting that sample into two parts, one composed of respondents 18 years of age or older in 1979 and one composed of those younger than age 18, and testing the base model on data from both the older and younger subsamples, applying the same across-sex constraints in each case. Third, given that one-sixth of the males and one-third of the females reported having given birth to a child by 1982, we split the sample into a no childbearing subsample and a previous childbearing subsample and tested the base model on data from both subsamples, again applying across-sex constraints in each case.

RESULTS

With 110 degrees of freedom, the chi-square of the base model was 353.08, the root mean square error of approximation (rmsea) was 0.024, and the p-value for a test of close fit (rmsea < 0.05) was 1.00. These fit indicators indicate a good fit to the data. Most of the poor fitting parts of the model occurred between latent variable indicators that were not in the same latent variables and, largely, between indicators that were measured in the same year. These findings indicate both a small within-indicators measurement effect and somewhat larger within-years measurement effect that were not completely accounted for in the overall model.

The Measurement Model

Table 3 presents the parameter estimates and t-values for all indictors in each of the overall model's three latent variables. For all three latent variables, male and female equality constraints remained in place, with the exception of the desired number of children in 1979. That indicator had a significantly larger parameter estimate among females, suggesting they placed a slightly greater emphasis than males on desires relative to ideals for the 1979 year. In general, for the ideal/desired number of children latent

Table 3. The LISREL Measurement Model, Showing Unstandardized Parameter Estimates (P.E.) and T-Values for all Indicators of Latent Variables, Separately by Sex.

Latent Variable	Males		Females	
Indicator	P.E.	T-Value	P.E.	T-Value
Ideal/desired number of children				
Desired number of children, 1982	1.00		1.00	
Ideal number of children, 1982	0.57	61.24	0.57	61.24
Desired number of children, 1979	0.45	24.38	0.58	30.72
Ideal number of children, 1979	0.35	26.47	0.35	26.47
Gender role attitude				
Gender role attitude, 1982	1.00		1.00	
Gender role attitude, 1979	0.92	29.88	0.92	29.88
Expected Education				
Highest grade expected, 1982	1.00		1.00	
Highest grade expected, 1981	1.01	93.58	1.01	93.58
Highest grade expected, 1979	0.89	81.07	0.89	81.07

variable, the 1982 desired number of children indicator contributed the most weight and the 1979 ideal number of children indicator contributed the least, suggesting a change across years that would be expected with a construct that has state-like as well as trait-like features. For the gender role attitude latent variable, the 1982 indicator contributed only slightly greater weight than the 1979 indicator. For the expected education latent variable, both the 1982 and 1981 contributed only slightly greater weight than the 1979 indicator. Although there is a slight change across years for these two latent variables, it is minimal and is consistent with constructs that have primarily trait-like features.

The Structural Equation Model

We present the results for the structural equation model in two ways. First, Table 4 presents the parameter estimates and t-values for all the variables predicting each

Table 4. The LISREL Structural Equation Model, Showing Unstandardized Parameter Estimates (P.E.) and T-Values for All Prediction Pathways and R^2s for Outcome Variables, Separately by Sex.

Outcome Variable	Males			Females		
Predictor Variable	P.E.	T-Value	R^2	P.E.	T-Value	R^2
Actual last number of children			0.29			0.31
Actual timing of next child	2.69	37.01		2.04	32.45	
Expected timing of next child	- 0.10	- 8.62		- 0.10	- 8.62	
Expected number of children	0.14	8.62		0.24	15.52	
Gender role attitude	0.24	4.66		0.24	4.66	
Expected education	0.03	2.44		- 0.08	- 7.05	
Actual timing of next child			0.17			0.21
Expected timing of next child	0.09	36.91		0.09	36.91	
Ideal/desired number of children	0.02	5.84		0.02	5.84	
Gender role attitude				0.06	3.84	
Expected education	- 0.02	- 10.68		- 0.02	- 10.68	
Expected timing of next child			0.02			0.02
Expected number of children	0.10	8.18		0.10	8.18	
Expected education	- 0.05	- 4.90		- 0.08	- 6.88	
Expected number of children			0.84			0.80
Ideal/desired number of children	0.95	18.51		0.95	18.51	
Expected education				- 0.02	- 3.82	
Ideal/desired number of children			0.02			0.02
Gender role attitude	0.48	8.73		0.48	8.73	
Expected education	0.08	8.21		0.08	8.21	

outcome variable, starting with an equation for the final outcome variable in the LISREL beta matrix, the actual last number of children, and moving backward and ending with an equation for the initial outcome variable in the beta matrix, ideal/desired number of children. The R^2 is also given for each of the five prediction equations. The strongest two predictors for the first equation and the strongest single predictors for the next three equations (as judged by the t-values) are the ones hypothesized in Figure 2. The hypothesized prediction of the expected timing of the next child by the ideal/desired number of children is not observed (although see the no childbearing/previous childbearing substudies discussed below). Further, several hypothesized predictions of gender role attitudes are not observed and the predictions of expected education are not consistently negative, as hypothesized. We discuss all of these observations further below. There are one or two instances in each equation, except for the last one, where sex differences occur, including opposite signs for the prediction of the actual last number of children by expected education. The R^2 of three of the equations are substantial but the R^2s for predicting the expected timing of the next child and the ideal/desired number of children are small.

In the second method used to portray our results, Figure 3 shows the pathways through which antecedent variables toward the left of the model directly and indirectly influence the consequent variables toward the right and, therefore, presents a visual image of how motivational force flows from traits through desires and intentions to fertility outcomes. The figure also shows the sign and relative strength by gender of each predictive pathway. If we focus initially on just the fertility domain part of the model (everything except expected education and its connections), we can observe some

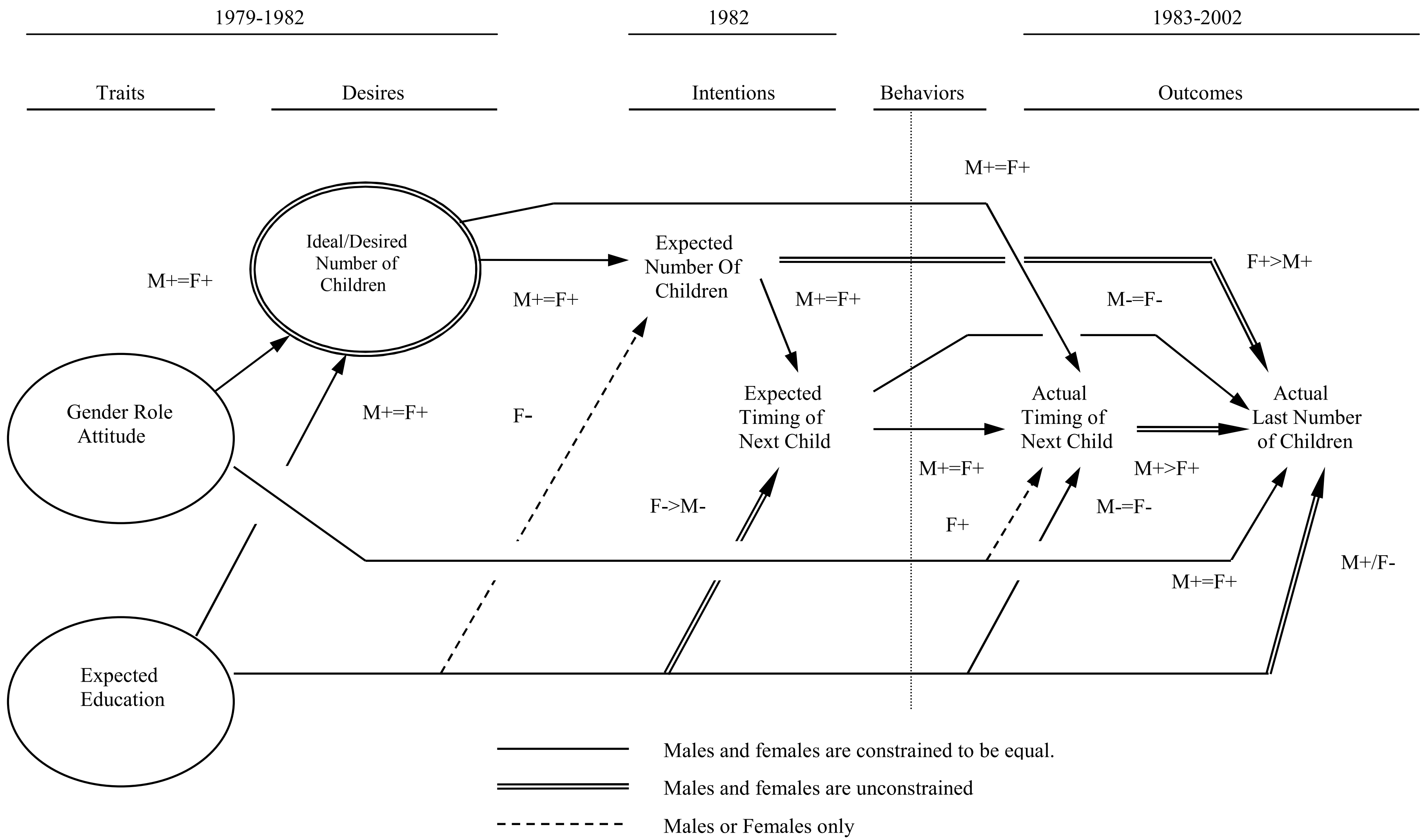

Figure 3. The LISREL structural equation model that results from fitting the hypothesized fertility model shown in Figure 2, together with the hypothesized connections of the education variable, to the NLSY data. Ellipses indicate latent variables. The sign and relative strength by gender of each pathway is indicated. Dates indicate year(s) of measurement.

predictions other than the stronger, hypothesized ones seen in Table 4. First, ideal/desired number of children has a direct effect on the actual timing of the next child. The effect is equal across the sexes and is positive, as expected, meaning that the more children the respondent desires, the sooner he/she actually has them. Second, the expected timing of the next child has a direct effect, equal for the sexes, on the actual last number of children. Surprisingly, the effect is negative, meaning that the sooner the respondents expect a child, the fewer they actually have. Third, several hypothesized effects of gender role attitudes are absent, including its effects on expected number of children, expected timing of next child, and –for males- actual timing of next child. Preliminary analyses of just the fertility domain variables (results not shown) indicated that gender role attitudes did predict those three variables in that submodel –with the exception of expected number of children for males– indicating that it was the presence of the expected education variable in the base model that eliminated those connections. As can be seen, expected education exactly replaces those three connections, indicating an important covariance between it and gender role attitudes with expected education dominating in those three predictions.

Expanding our focus to include the education domain reveals several patterns that match predictions, along with some unexpected findings. Although the just-discussed three predictions of expected education have the hypothesized negative sign, its predictions of ideal/desired number of children and –for males- actual last number of children are positive. Additional findings discussed below shed some light on this pattern.

Variants of the Base Model

Attrition Substudy. In 1990 NLSY data from 5,241 males and 5,401 females were available for examining whether sample attrition affected our final model. These numbers also include 664 male and 819 female economically disadvantaged participants who were dropped after the 1990 survey. We tested the base model on data from this larger sample. There were almost no changes in the model. No existing connections became non-significant, most actually having slightly increased t-values. Equation R^2s remained virtually the same. The only change suggested by modification indices was removal of the equality constraint from the connection between expected timing of the next child and the actual timing of the next child, thereby allowing the male connection to become more positive. These findings suggest that attrition bias is at most relatively minor in this study.

Age-split Substudy. We next split the 2002 sample into two age-based subsamples: males (n = 1,896) and females (n = 1,926) under 18 years of age in 1979 and males (n = 1,787) and females (n = 1,957) 18 years of age and above. We then tested the base model on data from each of those two samples separately, with the usual across-sex equality constraints applied in both cases. The R^2s were closely similar across the two models and only minor changes occurred in the pattern of connections. Specifically, two existing connections became non-significant: 1. expected education predicting actual last number of children in males 18 and over; and 2. expected education predicting expected number of children in females under 18. Additionally, there were two modification indices that indicated significant additions: 1. ideal/desired number of children positively predicting actual final number of children in younger females; and 2. expected education positively predicting expected number of children in younger males.

No Childbearing/Previous Childbearing Substudy. Finally, we split the 2002 sample into two childbearing-based subsamples: males (n = 3,056) and females (n = 2,593) who had not borne a child as of 1982 (the year defining the boundary in our study between motivations and outcomes) and males (n = 627) and females (n = 1,290) who had borne a child. We then tested the base model from each of the two subsamples separately, applying the usual across-sex equality constraints in each case. The results of these analyses revealed that for both models, some connections became non-significant, some connections needed to be added on the basis of high modification indices, and several coefficients reversed signs while remaining significant. The number of changes, which often differed across the sexes, required several additional fitting steps and the generation of a new model for both the no childbearing and the previous childbearing subsamples. However, the resulting structural equation models for males and females in both subsamples are very similar to those for males and females in the base model where there are comparable connections and the large R^2s for the two behavioral outcome variables are also quite similar. With 110 degrees of freedom, the chi-square of the no childbearing model was 351.49, the root mean square error of approximation (rmsea) was 0.028, and the p-value for a test of close fit (rmsea < 0.05) was 1.00. With 114 degrees of freedom, the chi-square of the previous childbearing model was 236.36, the root mean square error of approximation (rmsea) was 0.026, and the p-value for a test of close fit (rmsea < 0.05) was 1.00. In both cases, these results indicate a good fit to the data.

For both subsamples, the new final model included changes from the base model that fell into two related and interpretable patterns: those having to do with the fertility submodel, encompassing the fertility motivational antecedents and the fertility outcomes; and those having to do with gender role attitude and educational expectations predicting the fertility motivational antecedents and fertility outcomes. We consider first the fertility submodel. The results for both subsamples are depicted graphically in Figure 4, which shows the no childbearing fertility submodel for both sexes on the left and the previous childbearing fertility submodel for both sexes on the right.

In the no childbearing fertility submodel, for both sexes the prediction of the expected timing of the next child (Exp Tim) by the expected number of children (Exp #) was dropped and the prediction of the expected timing variable by ideal/desired number of children (Des #) was added, with an estimated coefficient (p-value) of 0.09 (7.83) in both sexes. Note that this addition represents one of the hypothesized connections that was not observed in the base model. For females only, the predictions of actual last number of children (Act #) by expected number of children and of actual timing of next child (Act Tim) by ideal/desired number of children were both dropped and a prediction of actual last number of children by ideal/desired number of children was added, with an estimated coefficient (p-value) of 0.15 (8.39). As can be seen, for the female participants in the no childbearing subsample the expected number of children has lost all predictive connections and the ideal/desired number of children has acquired several new predictive connections, as well as losing one. For the male participants the changes are not as radical; in particular, both the desired and the expected number of children variables retain their predictive connections to actual fertility outcomes, although –as with the

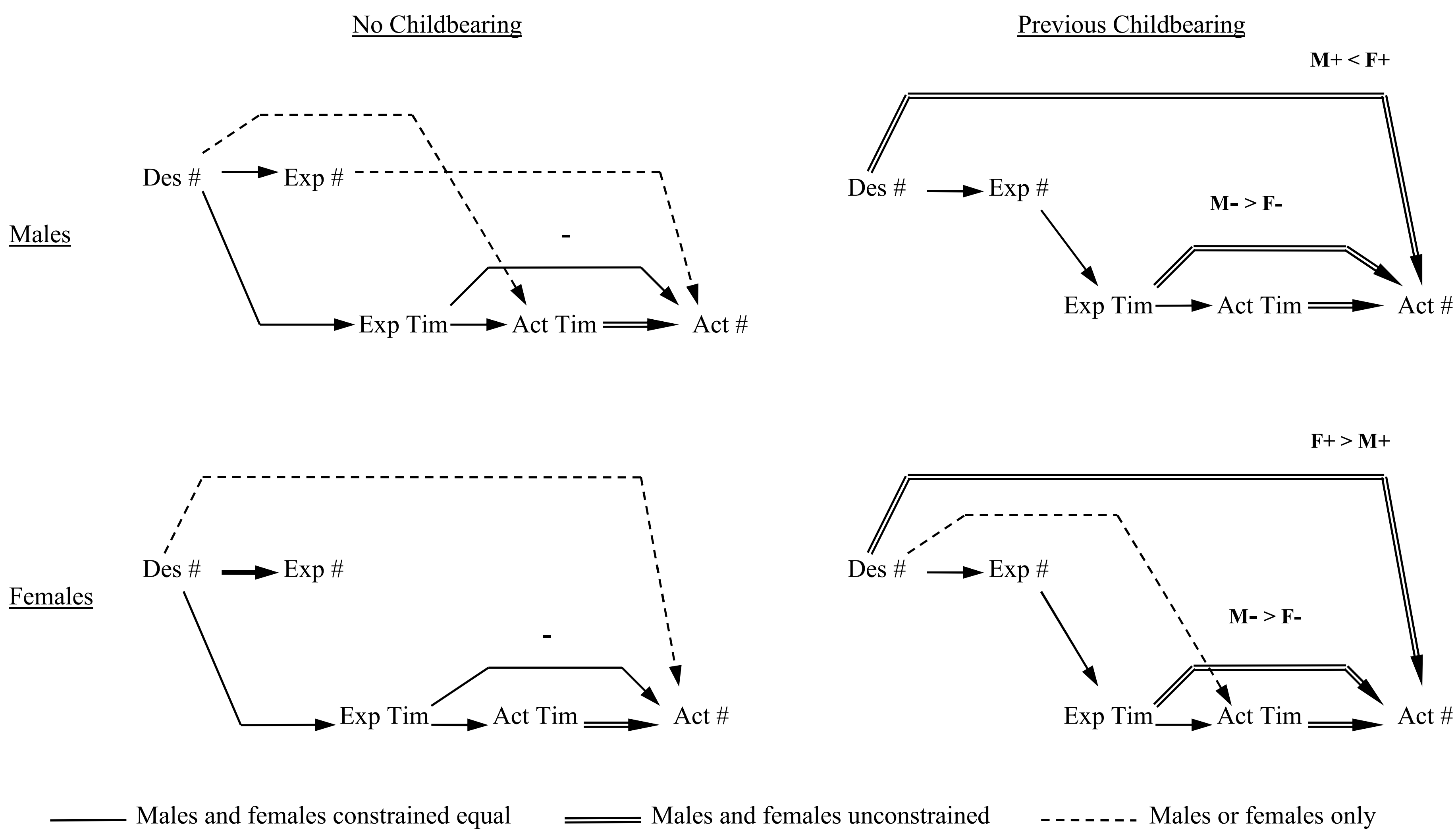

Figure 4. Four LISREL structural equation fertility submodels, two constrained across males and females in the no childbearing subsample (left column) and two constrained across males and females in the previous childbearing subsample (right column).

females– the expected timing variable is no longer predicted by the expected number variable but rather by the ideal/desired number variable.

In the fertility submodel of the previous childbearing subsample, a different type of change occurs. Expected number of children no longer predicts the actual last number of children; instead, ideal/desired number of children predicts the actual last number, with an estimated coefficient (p-value) of 0.25 (4.70) in males and 0.48 (16.55) in females. For males there are two additional changes: they lose the connection between ideal/desired number of children and actual timing; and the negative relationship between expected timing and actual number of children becomes significantly stronger than it is in females.

Next we consider the extent to which gender role attitudes and educational expectations change in their prediction of the fertility submodel for both the no childbearing and the previous childbearing subsamples. There are no changes for gender role attitude but for educational expectations, the changes are quite different for the two subsamples. In the no childbearing subsample, expected education predicts the expected number of children with a positive coefficient that is constrained equal (thus the females are reversed in sign from the base model) and for females it positively predicts the actual last number of children (and thus again has reversed signs), although in this case with less strength than for males. In the previous childbearing subsample, quite in contrast, expected education has lost all predictive power, with two exceptions: it remains positively predictive of ideal/desired number of children in males and negatively predictive of actual last number of children in females.

DISCUSSION

The findings of this study demonstrate appreciable power in the prediction of fertility events from antecedent fertility motivations across the life course of both male and female youths, beginning when they are in their late teens and early twenties. These events include both the timing of the next child born and the total number of children actually born, two aspects of childbearing that are causally related in our model and provide a framework linking both the early and late phases of each participant's fertility career. There are several threats to the validity of our findings; these include the 26% loss to follow-up that occurred by 2002, the eight year age range in the sample, and inclusion in the sample of some participants with previous childbearing. We have addressed these issues through special analyses. The results were reassuring with respect to both attrition and age range. The results for the two groups with and without previous childbearing were highly informative and are discussed below. Taken together, the results reported here provide substantial support for the value of the TDI framework as a theoretical guide to the organization of the motivations that lead to childbearing and to the developmental expression of those motivations across reproductive careers.

Although the amount of variance explained is small for two of the motivational sequence variables - ideal/desired number of children and expected timing of the first (next) child, this finding is not at all surprising given what we know from previous research. Miller and Pasta (1993) showed that the variables most predictive of desired number of children are childbearing motivational traits. In the case of the expected timing of the next child, research (Miller and Pasta 1994) has shown the desired timing of the next child to be the major predictor. Neither of these two types of variables was available in the NLSY data set, but there is little doubt that inclusion of these types of antecedents in the model would have strengthened prediction at the two weakest points in the causal chain that we modeled.

Within the fertility submodel of our findings, there are two important non-hypothesized predictions. First, the desired number of children directly predicts the actual timing of the next child, above and beyond predicting child-number intentions directly and child-timing intentions indirectly. An assumption of the TDIB and related models is that each step in the sequence is a major predictor of the next step; in this case, desires are expected to strongly predict intentions and they do. However, this does not mean that a variable at one step can not by-pass the next step to predict further downstream in the sequence as well; in this case, desires directly predict a fertility timing outcome. There are at least three possible explanations for this phenomenon. It may be that the antecedent variable is much better measured than the ones it was hypothesized to predict directly. This is certainly the case for ideal/desired number of children, which is a latent variable with four indicators compared to the two single-indicator expectations variables that it has by-passed to predict a fertility outcome. It may also be that when desires bypass intentions, it represents imperfect decision-making. In other words, the two expectations variables, which are both intentions constructs and therefore presumably reflect decisions made, may be less stable than the desires construct because the decisions are not well founded at this early point in the participants' reproductive careers. We will see evidence that supports this interpretation when we discuss the no-childbearing and previous childbearing models. Finally, whereas desires express the participant's own wishes, intentions typically take into account the partner's wishes as well (Miller, Severy, and Pasta, 2004). This means that intentions at one point in time may change as a result of having a different partner. With the extended follow-up of the present study, this kind of intentional change is very likely to have occurred.

The second non-hypothesized prediction observed in the fertility submodel is the negative connection of the expected timing variable to the actual last number of children. In order to understand this finding, one must keep in mind that these two variables, as hypothesized, have a strong positive connection through the intermediate actual timing variable. This means that for many of the respondents in our sample timing intentions are positively predictive of actual timing of the first/next child and the latter is positively predictive of the actual last number of children. The non-hypothesized, negative coefficient for expected timing predicting actual number of children may be interpreted, then, as accommodating certain types of situations that are prevalent but not compatible with the two consecutive positive connections. One of these situations would be where individuals intended in 1982 to delay having their first/next but instead had an unplanned pregnancy and a baby born relatively soon after 1982. This would have left them with a relatively long period to have more children, either planned or unplanned, which in turn would have made them likely to have more children than their original timing intentions assumed. The other situation that would fit with the observed negative coefficient would be where individuals intended in 1982 to have a child soon but instead found that they were limited by subfecundity or infecundity and, therefore, ended up having a child much later than they had intended, if at all. This would leave them with much less time to complete their family building and this, together with their continuing subfecundity, would make them likely to have less children than their original timing intentions assumed.

Both of these scenarios would tend to produce a negative relationship between the expected timing of the next child and the actual last number of children. And, of course, there are other situations that could produce the same negative association. Miller and Pasta (1995b) observed that in addition to intentions, unplanned childbearing, subfecundity, and marital dissolution all predicted the actual timing of the onset of proceptive behavior. Bongaarts (2001, 2002) and Morgan (Morgan 2001; Hagewen and Morgan 2005) have developed models that condition the extent to which intentions are actually realized. These authors hypothesize three factors that augment intended fertility: unwanted fertility, replacement of children who have died, and children needed to satisfy strong gender preferences. In the U.S., the first factor has by far the greatest impact. In addition they hypothesize three factors that reduce fertility relative to intentions: subfecundity and infecundity, postponement of intended fertility, and competition between intended fertility and other energy and time-intensive activities such as employment or health care. The last two factors are very broad categories that probably include a number of distinct reasons that fertility is delayed or foregone. Thus the work of these authors supports our interpretation that unplanned pregnancies and subfecundity/infecundity explain our finding of a negative coefficient connecting timing intentions and last number of children, and at the same time suggests other factors that may operate in a similar way.

The two main predictive pathways for the gender role attitude trait reveal that a traditional attitude is associated with a larger desired number of children in the 1979-

1982 period and a larger last number of children actually achieved by 2002. This latter connection operates independently of the other variables in the fertility submodel and thus represents an important substantive finding, namely that the gender role attitudes variable measures a stable trait, and as such, continues to operate across the twenty years of follow up independently of the initially measured motivational sequence. The predictive pathway from gender role attitude to actual timing of the next child for females probably represents the same kind of effect in the area of birth timing. Its presence for women only is not surprising, given the traditional woman's larger role in childcare and the modern woman's need to coordinate childcare with employment.

When the gender role attitude variable was tested in the prediction of the five variables of the fertility submodel without the expected education variable present (results not shown), there were significant connections to all five submodel variables. As anticipated, the addition of expected education eliminated about half of those connections, indicating a substantial overlap between the domains of those two independent variables. However, the connections observed in the base model for expected education in the presence of the gender role attitude variable are not consistently negative as we had anticipated and they reveal some interesting sex differences, as well. It will be simpler and more coherent to present our interpretation of these findings when the no childbearing/previous childbearing models are examined, and so we will defer our discussion of them until further below.

The two variants of the base model that emerged when it was applied separately to the no childbearing and the previous childbearing subsamples and modified to improve fit each show interesting differences from the base model, including a number of sex differences. Some of these differences may reflect motivational differences between the two childbearing subsamples that were in place before any childbearing occurred in the group with previous childbearing. However, the overall similarity of the two variant models and the specific patterns of their differences suggest that these differences have been strongly influenced by the bearing and caretaking of one or more children.

Considering all four submodels shown in Figure 4, we have identified four noteworthy patterns. First, there are the two different ways that child-number desires affect the expected timing of the next child; directly in both the no childbearing males and females and indirectly through child-number intentions in both the previous childbearing males and females. This pattern suggests that child-number intentions are not sufficiently well formulated in the no childbearing group to meaningfully govern child-timing intentions. That said, it must also be noted that in the no childbearing males, child-number intentions are sufficiently well formulated to directly affect the last number of children. Thus it is the relationship between child-number and child-timing intentions that is different before and after the initiation of child bearing. We conjecture that the arrival of a child makes child-number intentions not only relevant to the intended timing of the next child, but a better conduit for the effect of child-number desires on that intended timing. Further, because of the observed effect of number intentions on actual last number of children in males, it may be that females are more dependent upon actual childbearing for the definition of their intentions; either explicitly or implicitly they may wait until after they have borne a child to firm up their plans for future childbearing. This would mean that their fertility planning is more conditional upon past childbearing. In contrast, male fertility planning may be closer to a fixed process and relatively unconditional upon childbearing status.

The second noteworthy pattern is that there are the different ways by which the two child-number variables affect the actual last number of children directly. In the no childbearing males, number intentions directly predict actual last number. This is the hypothesized connection and we know that it is significant when the total sample is modeled, so the other three subgroups must have at least some tendency toward that connection. Its strength in the males prior to any childbearing suggests that they have well-formulated intentions at that time when it comes to numbers of children. In contrast, the number intention connection to final number of children is replaced in the no childbearing females by a number desire connection, emphasizing the irrelevance for these women of the number intentions construct, at least at this point in their reproductive careers. Both of these conclusions fit well with our interpretation of the first pattern discussed above.

When we look at the two fertility submodels for the previous childbearing males and females, both the sexes have the same connection between number desires in 1982 and actual last number in 2002 as do the no childbearing women. Although strong child-number desires may have been the reason that the previous two childbearing groups have already started having children, the presence of the same number desires-actual number connection in the no childbearing women suggests an alternative interpretation, namely that being female and having borne a child both dispose youths toward having a direct desired number/actual number connection. The overall pattern suggests an interaction effect in that females in the previous childbearing group have a much stronger connection than do the males in that group, who in turn have a much stronger connection than do the females in the no childbearing group.

A third noteworthy pattern in Figure 4 involves the direct effect of child-number desires on the actual timing of the first/next child, an effect that is independent of the pathways that proceed through timing intentions. Again, this connection is present in the base model so it must represent something common in all subsamples; however, when the no childbearing males and females are compared, it is only present in the males, and similarly when the previous childbearing males and females are compared it is only present in the females. This appears to represent another type of sex-by-childbearing interaction effect but the interpretation is not so intuitively apparent. Why would number desires bypass intentions in the determination of actual timing and why in particular in these two groups? One possible explanation is that it reflects disagreement about timing at the dyadic level. Intentions reflect decisions taken and plans made. The two major influences on an individual's childbearing decisions are his or her own desires and the desires of the partner. So this bypassing of timing intentions may reflect the expression of a desire that was thwarted by the partner when a joint decision was made and subsequently expressed as the individual's intentions. The implication of this interpretation is that the no childbearing females and the previous childbearing males dominated in the formation of joint timing decisions, the former perhaps because of an eagerness (relative to males) for having a baby and the latter perhaps because of the traditional wage earner role of the male and the influence of that role (relative to females) due to the cost of additional childbearing.

The fourth pattern involves the appearance in the previous childbearing group of a differential strength across the sexes of the negative connection between timing intentions and final number of children, with the connection being more important in males. Recalling our surmise that unplanned childbearing and infecundity might account for this negative connection, it may be conjectured further that the first of these two factors accounts for the sex difference in the negative connection. This would be true if males were more likely than females to experience an additional pregnancy as being in conflict with their timing intentions and resulting in their having more children than planned.

We turn finally to an interpretation of the patterns of gender role attitudes and expected education in predicting variables within the fertility submodel as observed in the no childbearing and previous childbearing groups. On one hand, the predictions for gender role attitudes are quite unchanged from the base model: in both sexes, those with a traditional role attitude desire more children in 1982 and by 2002 they actually have more children. In females, those with a traditional gender role attitude also have their first/next child sooner. On the other hand, the predictions for educational expectations are different from the base model and this difference clarifies the interpretation of how this variable is working. In the no childbearing subsample, male and female respondents who have higher educational expectation both desire and expect more children but at the same time they expect to have them later and actually do have them later. The net result of these potentially conflicting motivations is that they actually do have more children, although this effect on the final number outcome is considerably stronger in males. In the previous childbearing group, all but two of the ten possible connections (five fertility variables by two sexes) are gone and one of those remaining -the prediction of actual number of children by high educational expectations in females- actually turns negative. This pattern of findings indicates that educational expectations have an effect on every step of the motivational sequence and on both of the childbearing outcomes before the youth in the study have had any children. However, such expectations have virtually no effect once at least one child has been born, although the unimportance of educational plans may also have been a characteristic of this group that played a role in their starting childbearing to begin with.

We interpret the positive effect of educational expectations on number desires and intentions to mean that the high aspirations of youth infuse both the educational and childbearing domains with the same positive feelings. Further, we interpret the negative effect of educational expectations on the two timing variables to mean that these youth want and intend to delay childbearing until after completing their educational plans. Finally, we interpret the positive effect of educational expectations on actual last number of children as reflecting a type of wealth effect, one in which the earning power that results from higher educational achievement leads to more children once the delaying effect of greater education on child timing has been partialed out. Hakim (2003) has argued that lifestyle preferences determine women's employment pattern and fertility over the life course. Although we have not included a measure of employment desires or intentions in these analyses, it seems that the combination of the gender role attitudes and educational expectations captures a good portion of the lifestyle preference construct that is central to her argument. Perhaps the most interesting result from that perspective, and somewhat in contrast to Hakim's emphasis on women, is that the consequences for child bearing of gender role attitudes and educational preferences are so similar for our sample's no childbearing males and females.

CONCLUSIONS

In this paper we have modeled the motivations for childbearing that pass through desires and intentions to affect actual childbearing. Our theoretical framework links antecedent desires and intentions to both the timing of childbearing and the number of children born and reveals the complex and interesting pathways that link both timing and number motivations to the actual timing of the next child and the actual last number of children, both of which are themselves causally linked together. We have included in our model measures of gender role attitude and educational expectations, showing how these variables, which we believe reflect lifestyle preferences, affect both the flow of motivation and the actual childbearing outcomes.

Our findings underscore the importance of combining timing and number outcomes in the same framework. Demographers struggle constantly to improve their forecast of fertility trends from period fertility rates, which represent a confounding of quantum (birth number) effects with tempo (birth timing) effects (Bongaarts 2002). It seems likely that the inclusion of both number and timing antecedent motivations, which have together contributed to making our model both successful and meaningful, might fruitfully be employed in demographic modeling.

An important factor driving the work reported here has been our interest in exploring the extent to which fertility motivations have a biological basis. In spite of long held beliefs that traits related to reproductive success tend to become fixed by evolution, with little or no genetic variation, there is now considerable evidence that the natural variation of fertility within populations is genetically influenced and that a significant portion of that influence is related to motivational factors (Rodgers et al. 2001; Kohler et al. 2005). In the future, we plan to explore behavioral genetic variation of the motivational constructs in the observed model, not by themselves in isolation but in the context of predicting the actual timing and number of children born.

APPENDIX

Intercorrelations between the thirteen variables used in the LISREL modeling, with females above and males below the diagonal.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender role attitude, 1979		.50	-.28	-.27	-.27	.10	.05	.07	.04	.05	.03	.06	.06
2. Gender role attitude, 1982	.50		-.28	-.30	-.30	.09	.03	.10	.05	.04	.04	.08	.08
3. Expected years of education, 1979	-.33	-.33		.70	.70	-.09	.03	-.06	.02	.04	-.05	-.13	-.04
4. Expected years of education, 1981	-.30	-.33	.70		.79	-.06	.04	-.04	.06	.07	-.08	-.14	-.05
5. Expected years of education, 1982	-.30	-.32	.67	.77		-.06	.03	-.04	.06	.07	-.06	-.14	-.06
6. Ideal number of children, 1979	.07	.05	.02	.01	-.01		.57	.38	.31	.30	.02	.04	.06
7. Desired number of children, 1979	.03	.03	.07	.07	.06	.54		.31	.36	.35	.04	.04	.08
8. Ideal number of children, 1982	.09	.12	-.01	-.01	-.01	.41	.35		.61	.57	.07	.05	.09
9. Desired number of children, 1982	.06	.09	.03	.03	.04	.31	.47	.62		.83	.10	.10	.15
10. Expected number of children, 1982	.07	.10	-.01	-.00	.01	.27	.40	.55	.82		.10	.10	.17
11.Reciprocal, exp. timing of next child, 1982	.03	.05	-.08	-.10	-.11	.02	.02	.02	.07	.08		.39	.14
12. Reciprocal, act. timing of next child, 2002	.10	.13	-.15	-.17	-.20	.08	.03	.07	.08	.09	.42		.52
13. Actual number of children, 2002	.16	.18	-.19	-.20	-.22	.09	.10	.15	.21	.25	.14	.48	

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