A MIMIC MODEL FOR THE RELATIONSHIP BETWEEN EDUCATION AND FERTILITY

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INTRODUCTION

Over the past two decades researchers have devoted a considerable amount of attention to the relationship between age at first birth and educational attainment. Numerous studies have documented a positive association between age at onset of motherhood and amount of schooling completed (Furstenberg, 1976; Trussell, 1976; Card and Wise, 1978; Waite and Moore, 1978). While these studies provided support for the existence of a negative relationship, they did not firmly establish the direction of causality between age at first birth and education.

Much of the research on this relationship has focused on the effect of an early first birth on the amount of schooling received. This focus stems from the widespread belief that teenage childbearing has serious negative consequences for the social and economic well-being of young mothers. One such consequence is the disruption of schooling (Trussell, 1976; Card and Wise, 1978; Moore et al., 1978; Waite and Moore, 1978). A role conflict hypothesis is often posited as an explanation for this effect (Waite and Moore, 1978; Rindfuss et al., 1984). Under this hypothesis, the roles of student and mother are held to be incompatible. The demands of providing physical care and financial support for a child make it extremely difficult to continue as a student.

While the emphasis in this literature has been on the effects of age at first birth on educational attainment, some researchers have argued that the causal relationship

is, in fact, in the opposite direction. They maintain that education influences age at first birth (Cutright, 1973; Rindfuss et al., 1980; Rindfuss et al., 1984). According to this view, young women with high educational aspirations either delay motherhood until they have achieved the desired level of education, or they assume the student and mother roles simultaneously (Rindfuss et al., 1984). Those with lower educational aspirations may either lack the motivation necessary to control their fertility, or they be highly motivated to assume the mother role. Another possibility, suggested by Cutright (1973), is that these young women purposely become pregnant in order to provide themselves with an excuse for leaving school.

In later work, the use of nonrecursive path modeling helped advance our understanding of the age at first birth-education relationship. First, these techniques allowed researchers to test the hypothesis of reciprocal causation between age at first birth and education; this was an hypothesis that several researchers argued was more reasonable than those that emphasized a single direction of causality (Hofferth and Moore, 1979; Moore and Hofferth, 1980; Rindfuss et al., 1980; Rindfuss and St. John, 1983). Second, these models allowed researchers to examine the causal process which produces the positive relationship between a woman's age at first birth and her education. By including factors hypothesized as determinants of age at first birth and education, more complete causal models of fertility behavior and educational attainment were developed.

It is this second aspect of these nonrecursive path models that we focus on in this paper. Our purpose is to see what more can be said about the structure of the social process which relates a woman's social, economic, and cultural background both to a woman's educational attainment and a woman's fertility behavior. Before elaborating on this theme and presenting our hypothesis, we will briefly summarize the literature on which we wish to expand.

Moore and Hofferth (1980; see also Hofferth and Moore, 1979) used nonrecursive modeling techniques to investigate the factors affecting early childbearing. Using data for young women from the National Longitudinal Survey, they estimate a model in which a set of family background factors (number of siblings, parental socioeconomic status, cultural level of the parental home, birth cohort, race, whether the family of orientation was intact, maternal employment, farm background, and foreign background) is hypothesized to affect a woman's education, age at first marriage, and age at first birth. The woman's ideal age at marriage, her ideal family size, her parents' educational goals for her, and whether or not she was enrolled in a college preparatory curriculum are included as factors which mediate the relationship between the family background factors and the endogenous variables. The three endogenous variables are hypothesized to have reciprocal effects on each other.

Considering only those findings related to age at first birth and education, their results show, first, that age at first birth and education are reciprocally related.

The more education a woman has, the older her age at first birth, and vice versa. Race and intact family of orientation are the only variables other than education with direct effects on age at first birth. White women and those from intact families are more likely to delay their first child. The direct determinants of education, other than age at first birth, are number of siblings, home cultural level, parental socioeconomic status, intact family of orientation, and age at marriage. The effect of number of siblings is negative; the remaining effects are all positive.

Rindfuss et al. (1980) and Rindfuss and St. John (1983) develop and test a non-recursive model in which several characteristics (race, religion, farm background, region background, number of siblings, father's occupation, intact family of orientation, smoking in early adolescence, and fecundity) are hypothesized to affect age at first birth and education. Education and age at first birth are hypothesized to have reciprocal effects. Their data are from the 1970 National Fertility Survey. In their analyses they included only women aged 35-44 who had had a birth.

These authors find that while education has a positive effect on age at first birth, age at first birth does not have a significant effect on education. Both race and adolescent cigarette smoking have negative effects on age at first birth and education. Blacks and those who smoke during early adolescence have earlier first births and complete less years of schooling. Religion, or being Catholic, has a negative impact on education but a positive impact on age at first birth. Fecundity has a positive

effect on age at first birth. Other variables with significant effects on education are number of siblings, region background, intact family of orientation, and father's occupation. Number of siblings is negatively related to education. Growing up in the South and in a family with one or both parents missing are both associated with lower levels of educational attainment. Finally, father's occupational status has a positive impact on years of schooling completed.

COMPARING STRATIFICATION PROCESSES

Embedded in the models considered in Rindfuss et al. (1980) and Rindfuss and St. John (1983) are two stratification processes. One is the process by which a woman's educational attainment is determined and the other is the process by which the age at which a woman has her first birth is determined. Our objective in this paper is to compare these two processes by reanalyzing the Rindfuss and St. John (1983) data.

Each process can be described by a linear equation. The variables and equations are as follows:

VARIABLES:

race = RACE
number of siblings = NOSIB
farm background = FARMBACK
region background = REGNBACK
intact family during adolescence = ADOLFAM
religion = RELIGION
young cigarette smoker = YOUNGCIG

fecundity = FECUND
father's occupational status = DADSOCC

age at first birth = AGEFST
educational attainment = ED

EQUATIONS:

$$EDUC = a + b_1 * RACE + b_2 * NOSIB + b_3 * FARMBACK + b_4 * REGNBACK + b_5 * ADOLFAM + b_6 * RELIGION + b_7 * YOUNGCIG + b_8 * DADSOCC + b_9 * AGEFST$$

$$AGEFST = c + d_1 * RACE + d_2 * NOSIB + d_3 * FARMBACK + d_4 * REGNBACK - d_5 * ADOLFAM - d_6 * RELIGION + d_7 * YOUNGCIG + d_8 * FECUND - d_9 * EDUC$$

The stratification processes, as specified by Rindfuss et al. (1980) and Rindfuss and St. John (1983), which determine a woman's educational attainment and the age at which a woman has her first birth share seven independent variables. The processes differ in that the educational attainment equation includes *occupational status*, an instrument for identification of the reciprocal relationship between *educational attainment* and *age at first birth*, and *age at first birth*, an endogenous variable. The age at first birth equation includes *fecundity*, also an instrument for identification of the reciprocal relationship, and *educational attainment*, an endogenous variable.

In comparing the processes which determine educational attainment and age at first birth, we will compare the patterns of coefficients for the seven variables which appear in both equations. What we are interested in is to what degree the processes are similar.

Our hypothesis is that in a relative sense the processes are similar. The variables which are most important for determining educational attainment will be the most important for determining age at first birth. The variables which are least important in determining educational attainment will be least important in determining age at first birth. In addition, the relative sizes of the coefficients in each model will be the same. That is, the ratio of any two coefficients in one model will be the same as the ratio of those two coefficients in the other model.

Our theoretical rationale for this hypothesis is that for most women attending school and raising children are alternative ways of spending time during the early adult years. First, aspirations for high educational attainment do not tend to go hand in hand with the motivation to assume motherhood at an early age. In other words, young women who are motivated to achieve a high level of education are less likely to desire an early first birth.. Conversely, young women who are motivated to begin childbearing at a young age are less likely to have high educational aspirations. Second. young women are likely to be aware of the potential incompatibility between the mother and student roles. Therefore. young women will tend not to try to assume both roles simultaneously. One will take precedence.

Further, these two alternative activities share a set of determinants. Both are influenced by the family background characteristics and experiences of adolescence which form aspirations and, hence, determine behavior. Therefore, we would expect

that the factors which are most important in encouraging a young woman to pursue an education will be most important in encouraging her to delay childbearing.

Researchers commonly compare stratification processes across populations. For example, the occupational status attainment process among whites may be compared to the occupational status attainment process among blacks. We are comparing stratification processes also. However, rather than comparing processes between two populations we are comparing two processes within one population. These processes are the ones which determine a woman's educational attainment and a woman's age at the onset of childbearing.

Before proceeding, we will briefly describe the expected effects of the independent variables on the dependent variables as indicated in Rindfuss et al. (1980) and Rindfuss and St.John (1983). Black women are expected to have a lower educational attainment and a younger age at first birth because fewer educational and employment opportunities make motherhood a better alternative. In addition, blacks engage in intercourse at earlier ages than whites, have lower rates of contraceptive use, and use less effective contraceptives. These three factors contribute to a higher rate of pregnancy among young black women.

A larger number of siblings will result in lower educational attainment and younger age at first birth because of economic and psychological pushes to leave home and pursue adult roles. In addition, mothers of large families are more likely to have

begun childbearing at an early age and to subscribe to a norm of early childbearing which they may transmit to their daughters. Farm background and growing up in the South will result in lower educational attainment and younger age at first birth because limited educational and employment opportunities for women make motherhood a more attractive alternative. Growing up in a single parent household results in lower educational attainment and younger age at first birth because of more limited family financial resources and less parental guidance. Catholic women have historically had a later age at marriage which should result in a later age at first birth. Counteracting this effect is the fact that Catholics have lower levels of contraceptive use. Catholic women have also had historically lower levels of educational attainment. Women who smoked cigarettes at a young age are expected to have a lower educational attainment and a younger age at first birth because smoking at a young age indicates possible involvement with a peer group which is less oriented towards educational achievement and more oriented towards assuming adult roles such as motherhood at a young age.

Higher occupational status of the father leads to higher educational attainment for the daughter because of greater financial resources and parental aspirations. Father's occupational status is assumed to affect age at first birth only indirectly through educational attainment. Women who are less fecund, as measured by having experienced a miscarriage before the first birth, will have a later age at first

birth because of the resulting delay in conceiving and carrying the subsequent pregnancy to term. Fecundity is expected to have an effect on educational attainment only indirectly through age at first birth.

Since educational attainment and childbearing compete for a young woman's time, energy, and interest, a higher educational attainment is expected to result in a later age at first birth. Likewise, a younger age at first birth is expected to result in a lower educational attainment.

DATA AND METHODS

We use the published correlation matrix and standard deviations from Rindfuss and St. John (1983).[1] The data is from the 1970 National Fertility Study which is a national probability sample of ever-married women under 45 years of age. Rindfuss and St. John's (1983) subsample consisted of women aged 35-44 who had had a first birth. Woman in this age group were old enough to have had a first birth if they were ever going to have one.

[1] We adjusted the published correlation matrix because we were unable to replicate Rindfuss and St. John's (1983) results using the unadjusted correlation matrix. We determined that the problem was with the correlation between *intact family* and *age at first birth*. The published correlation was positive but Rindfuss and St. John's (1983) theory and results would suggest that the correlation should be negative (family disruption during adolescence results in younger age at first birth). After changing the sign of this correlation to negative, we were able to closely replicate Rindfuss and St. John's (1983) results.

Table 1, reproduced from Rindfuss and St. John (1983), provides a description. mean, and standard deviation for each of the variables used in the analysis. *Educational attainment*, *age at first birth*, *occupational status*, and *number of siblings* are continuous variables while the other variables are dummy variables. *Educational attainment* is years of schooling completed at marriage. *Age at first birth* is completed years of age. *Occupational status* is measured by Duncan's SEI score for the father's occupation. *Number of siblings* is the number of brothers and sisters. *Race* is coded one if the respondent is black and zero otherwise. *Farm background* is coded one if the respondent grew up on a farm and zero otherwise. *Region background* is coded one if the respondent grew up in the South and zero otherwise. *Intact family* is coded one if the respondent lived with no parent or one parent and zero if the respondent lived with both parents. *Religion* is coded one if the respondent was brought up as a Catholic and zero otherwise. *Young smoker* is one if the respondent smoked at a young age and zero if not. *Fecund* is one if the respondent had had a miscarriage before the first birth and zero if not. Table 2. also reproduced from Rindfuss and St. John (1983), shows the correlation matrix for the data.

In our reanalysis, we estimate a simultaneous structural equation model using a maximum likelihood method (Joreskog and Sorbom, 1981). Among the advantages of using this method of model estimation is that the method produces a likelihood test statistic, L^2, which measures the fit between observed (unrestricted) sample

moments and those estimated under a given model. The likelihood test statistic can be used to test for differences between hierarchical models.

ANALYSIS

Figure 1 shows the model estimated by Rindfuss and St. John (1983). Table 3 shows Rindfuss and St. John's (1983) two-stage least squares (2SLS) estimates and our maximum likelihood (ML) estimates. The results from the two analyses are quite similar. One difference worth noting is that the coefficient for *young smoker* in the age at first birth equation is significant in the 2SLS analysis but not in the ML analysis. This occurred because the variable was barely twice its standard error in the 2SLS analysis and thus barely significant. In the ML analysis, the regression coefficient was a bit smaller and the standard error was a bit larger. The result was that in the ML analysis the regression coefficient was slightly less than twice its standard error and thus was barely insignificant.

To begin our examination of the pattern in the effects of the exogenous variables on the two endogenous variables, we introduce an unobservable, intermediate factor which is an exact function of *race*, *number of siblings*, *farm background*, *region background*, *intact family*, *religion*, and *young smoker* (Figure 2). *Occupational status* and *fecundity* cannot be allowed to work through the intermediate factor because these variables are needed as instruments for the estimation of the reciprocal relationship between *educational attainment* and *age at first birth*.

The purpose of adding the intermediate factor to the model is that it acts as a proportionality constraint. The ratio of the coefficient for the effect on *educational attainment* to the coefficient for the effect on *age at first birth* is constrained to be the same for *race*, *number of siblings*, *farm background*, *region background*, *intact family*, *religion*, and *young smoker*. This portion of the model, where seven endogenous variables affect an unobserved variable which in turn affects two endogenous variables, is a multiple-indicator/multiple-cause (MIMIC) model (Hauser and Goldberger, 1971).

While it is possible to interpret the latent or unobserved variable in a MIMIC model in the same way as other variables, we are using the MIMIC model in our analysis in a specific, limited way. We are using the MIMIC model to set up proportionality constraints.

In the Rindfuss and St. John (1983) model, there are seven variables which affect both *educational attainment* and *age at first birth*. Our objective is to test if the pattern of coefficients for the effects of these variables on *educational attainment* is similar to the pattern of coefficients for the effects of these variables on *age at first birth*. The proportionality constraints set by the MIMIC model allow us to make this test.

The model pictured in Figure 2 has an L^2 of 44.9 with 6 degrees off freedom; it does not fit the data very well. A likely source of the problem involves the *number*

of siblings and *religion* variables. In the unconstrained model pictured in Figure 1, *number of siblings* and *religion* had negative effects on *educational attainment* and positive effects on *age at first birth.* The constraints in the model pictured in Figure 2 force these variables to have the same sign in their effects on *educational attainment* and *age at first birth.* The result is that the model does not fit the data very well.

In order to allow number of siblings and religion to have different signed effects on *educational attainment* and *age at first birth*, we estimate the model pictured in Figure 3. In this model, *number of siblings* and *religion* are allowed to have unconstrained effects on both *educational attainment* and *age at first birth.* This model fits the data quite well. It has an L^2 of 3.5 with 4 degrees of freedom. A model fits the data when the L^2 is less than the degrees of freedom.

Table 4 shows the estimated metric coefficients for the model pictured in Figure 3. The ratio of the paths from the latent variable, L, to *educational attainment* and *age at first birth* represents the proportionality factor. The ratio of the effect of *race*, *farm background*, *region background*, *intact family*, and *young smoker* on *educational attainment* to the effect of the variables on *age at first birth* is 1.36. We tested to see if this ratio was significantly different than 1.0. When this ratio is 1.0, the model constrains the effects of the five variables on *educational attainment* to be equal to the respective effects on *age at first birth.* This model has an L^2 of 12.1

with 5 degrees of freedom. The difference in L^2 between the models is 8.6 with 1 degree of freedom which indicates a significant deterioration in model fit when the equality constraint is added.

We also tested to see if the ratio of the effect of *number of siblings* on *educational attainment* to the effect on *age at first birth* is the same as the ratio of the effect of *religion* on *educational attainment* to the effect on *age at first birth.* Here, we introduced a second intermediate factor in order to test a second proportionality constraint. This model is pictured in Figure 4. The model has an L^2 of 9.5 with 5 degrees of freedom. The difference between the model with two proportionality constraints and the model with one proportionality constraint is 6.0 with 1 degree of freedom. This difference indicates a significant deterioration in fit. The pattern of effects of *number of siblings* and *religion* on *age at first birth* is significantly different than the pattern of effects on *educational attainment.*

Thus, the model pictured in Figure 3 is the model which provides the best fit to the data. Returning to Table 4, among the five variables with proportional effects on *educational attainment* and *age at first birth*, four were significant. *Young smoker* had the strongest effect (-.86 on *educational attainment* and -.64 on *age at first birth*); *race* had the second strongest effect (-.76 and -.56, respectively) while *intact family* (-.57 and -.42, respectively) and *region background* (-.51 and -.38, respectively) followed. The effects for *farm background* were negative and

insignificant. It appears that racial and attitudinal differences have larger effects than family structure or residential differences.

Number of siblings and *religion*, while not having proportionally equal effects, had effects with same signs. Both variables had negative effects on *educational attainment* (-.16 for *number of siblings* and -.52 for *religion*) and positive effects on *age at first birth* (+.06 for *number of siblings* and +.77 for *religion*).

Religion is the only variable which plays a dramatically different role in the two stratification processes. Being Catholic results in lower educational attainment than not being Catholic and also results in a later age at first birth. For the other variables, when educational attainment is discouraged, earlier childbearing is encouraged.

CONCLUSION

What does the model pictured in Figure 3 tell us about the processes which determine educational attainment and age at first birth? First, we have shown that *race*, *region background*, *intact family*, and *young smoker* each had a significant negative effect on *age at first birth*. These variables had a negative effect on *educational attainment* that was 1.36 times as large as their effect on *age at first birth*. Thus, we learned that being black as compared to white, from the South rather than another region, from a single-parent household rather than a two-parent household, and a

smoker at a young age rather than non-smoker had negative effects on age at first birth and a 36% greater negative effect on educational attainment. The stratification processes which link these four variables to *age at first birth* and *educational attainment* have similar patterns but different magnitudes.

While we hesitate to interpret the intermediate factor as a latent variable, these four variables could be interpreted as representing an underlying factor. This factor might be labeled career marginality. Those women who are black, from the South, from a disrupted family, or who engaged in possibly deviant adolescent behaviors are marginal in regard to career orientation and/or opportunities. The marginality in work careers may make motherhood a more salient means for achieving adult status.

We also learned that number of *siblings* and *religion* did not fit this pattern. While number of *siblings* and *religion* had negative effect on *educational attainment* as did the other five non-instruments, *number of siblings* and *religion* had positive effects on *age at first birth*. We also found that the pattern of effect of *number of siblings* and *religion* were not the same. A larger number of siblings resulted in lower educational attainment but had no significant effect on age at first birth. Being Catholic rather than non-Catholic resulted in a lower educational attainment attainment and in a later age at first birth. While the other variables in the model discouraged educational attainment and encouraged early childbearing, being Catholic discouraged

both.

More generally, we illustrated the utility of an analytical approach which involves comparing two stratification processes within one population. The result was a simplified model of the causal processes which determine educational attainment and age at first birth as well as the relationship between the two variables. Since the data we used was from 1970 and the number of variables was limited, we look forward to using more recent data with more variables to further our understanding of these processes.

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TABLE 1

DESCRIPTIONS, MEANS, AND STANDARD DEVIATIONS FOR VARIABLES IN RINDFUSS AND ST. JOHN MODEL

Variable Label	Variable Name	Units of Measurement	Description	Mean	Standard Deviation
DADSOCC	Respondent's father's occupation	Duncan's SEI scores	Missing data were given the mean value	30.148	20.456
RACE	Respondent's race	Dummy variable	Blacks are coded 1, all others coded 0	0.109	0.312
NOSIB	Respondent's number of siblings	Actual number is coded		3.866	3.012
FARMBACK	Respondent's farm background	Dummy variable	Coded 1 if respondent grew up on a farm, all others coded 0	0.316	0.465
REGNBACK	Region where respondent grew up	Dummy variable	Coded 1 if respondent grew up in the South, all others coded 0	0.363	0.481
ADOLFAM	Household composition when respondent was 14	Dummy variable	Coded 1 if respondent lived with 0 or 1 of her parents at age 14, coded 0 if she lived with both parents at age 14	0.220	0.414
RELIGION	Respondent's religious preferences when growing up	Dummy variable	Coded 1 if Catholic, all others coded 0	0.229	0.420
YOUNGCIG	Whether respondent smoked at a young age	Dummy variable	Coded 1 if respondent smoked before age 16, coded 0 otherwise	0.137	0.344
FECUND	Whether respondent had a miscarriage before the first birth	Dummy variable	Coded 1 if respondent had a miscarriage before the first birth; coded 0 otherwise	0.100	0.301
ED	Respondent's education	Years of schooling completed	This is education at first marriage	11.551	2.363
AGEFST	Respondent's age at first birth	Years		21.973	4.100

TABLE 2

ZERO-ORDER CORRELATIONS BETWEEN VARIABLES
IN RINDFUSS AND ST. JOHN MODEL

	DAD-SOCC	RACE	NOSIB	FARM-BACK	REGN-BACK	ADOL-FAM	RELI-GION	YOUNG-CIG	FECUND	ED	AGE-FST
DADSOCC	1.000										
RACE	- .144	1.000									
NOSIB	- .244	.156	1.000								
FARMBACK	- .323	.088	.274	1.000							
REGNBACK	- .129	.315	.150	.218	1.000						
ADOLFAM	- .056	.150	- .039	- .030	.071	1.000					
RELIGION	.053	- .152	.014	- .149	- .292	- .052	1.000				
YOUNGCIG	- .043	.030	.028	- .060	- .011	.067	- .010	1.000			
FECUND	.037	.035	.002	- .032	- .027	.018	- .002	.009	1.000		
ED	.370	- .222	- .328	- .185	- .211	- .157	- .012	- .171	.038	1.000	
AGEFST	.186	- .189	- .115	- .118	- .177	.111	.098	- .122	.216	.380	1.000

TABLE 3

METRIC COEFFICIENTS FROM RINDFUSS AND ST. JOHN MODEL
AND FROM REANALYSIS USING MAXIMUM LIKELIHOOD METHOD.

RINDFUSS AND ST. JOHN

Dependent Variables	Predetermined Variables										
	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y1	Y2
Y1	+.030*	-.685*	-.172*	-.113	-.555*	-.669*	-.495*	-.943*	-	-	+.075
Y2	-	-.784*	+.071	-.217	-.368	-.160	+.754*	-.612*	+2.652*	+.741*	-

*significant at .05 level

MAXIMUM LIKELIHOOD

Dependent Variables	Predetermined Variables										
	X1	X2	X3	X4	X5	X6	X7	X8	X9	Y1	Y2
Y1	+.029*	-.617*	-.168*	-.110	-.544*	-.638*	-.515*	-.893*	-	-	+.084
Y2	-	-1.028*	+.067	-.203	-.297	-.239	+.739*	-.576	+2.745*	+.750*	-

*significant at .05 level

Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND
Y1: ED
Y2: AGEFST

TABLE 4

METRIC COEFFICIENTS FOR SINGLE INTERMEDIATE FACTOR MODEL WITH DIRECT PATHS TO EDUCATIONAL ATTAINMENT AND AGE AT FIRST BIRTH FROM NUMBER OF SIBLINGS AND RELIGION.

Dependent Variables	Predetermined Variables								
	X1	X2	X3	X4	X5	X6	X7	X8	X9
I	–	−.559*	–	−.103	−.377*	−.422*	–	−.636*	–
Y1	+.029*	–	−.165*	–	–	–	−.523*	–	–
Y2	–	–	+.063	–	–	–	+.774*	–	+2.728*

Dependent Variables	Predetermined Variables		
	I	Y1	Y2
Y1	+1.36*	–	+.085
Y2	+1.00[1]	+.776*	–

*significant at .05 level
[1]fixed parameter

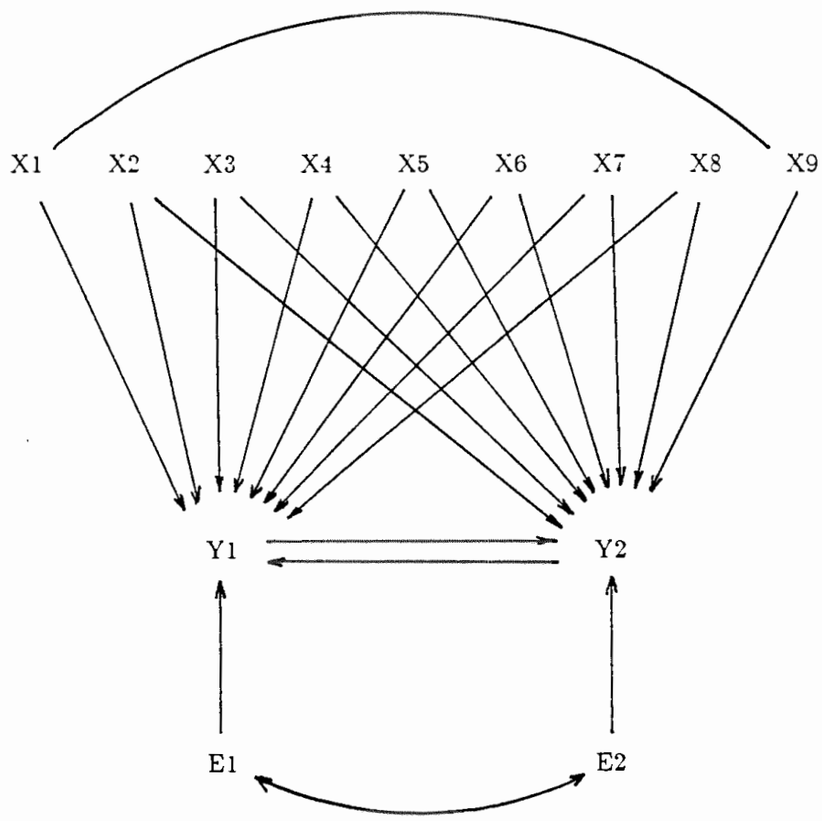
Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND

I: INTERMEDIATE FACTOR
Y1: ED
Y2: AGEFST

FIGURE 1

RINDFUSS AND ST. JOHN MODEL

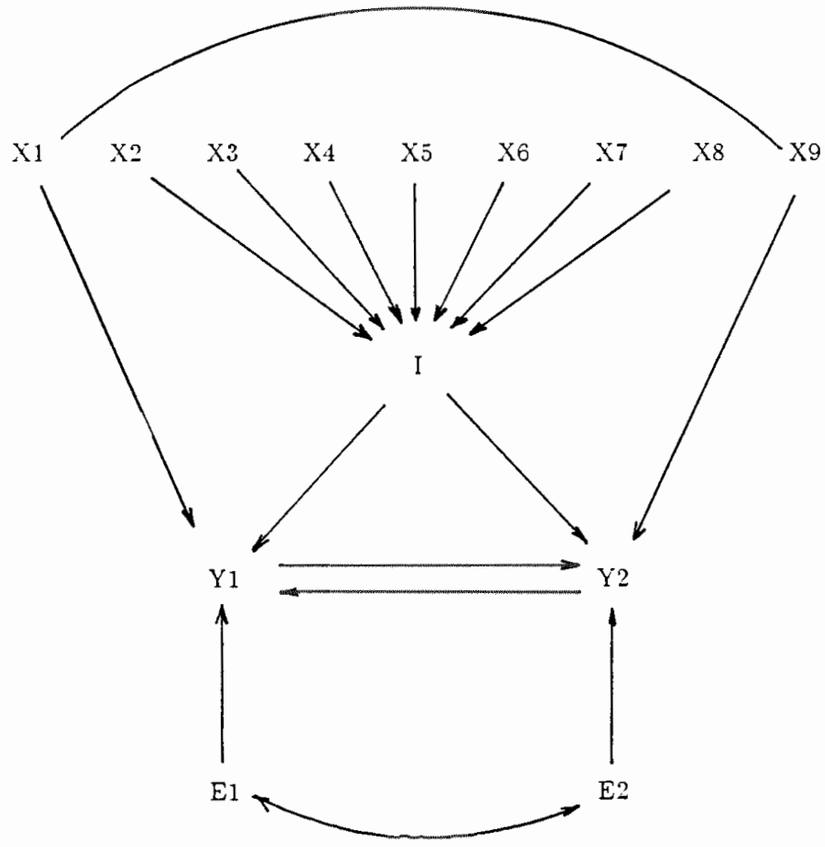


Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X8: YOUNGCIG
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND
Y1: ED
Y2: AGEFST
E1: ERROR - ED
E2: ERROR - AGEFST

FIGURE 2

SINGLE INTERMEDIATE FACTOR MODEL



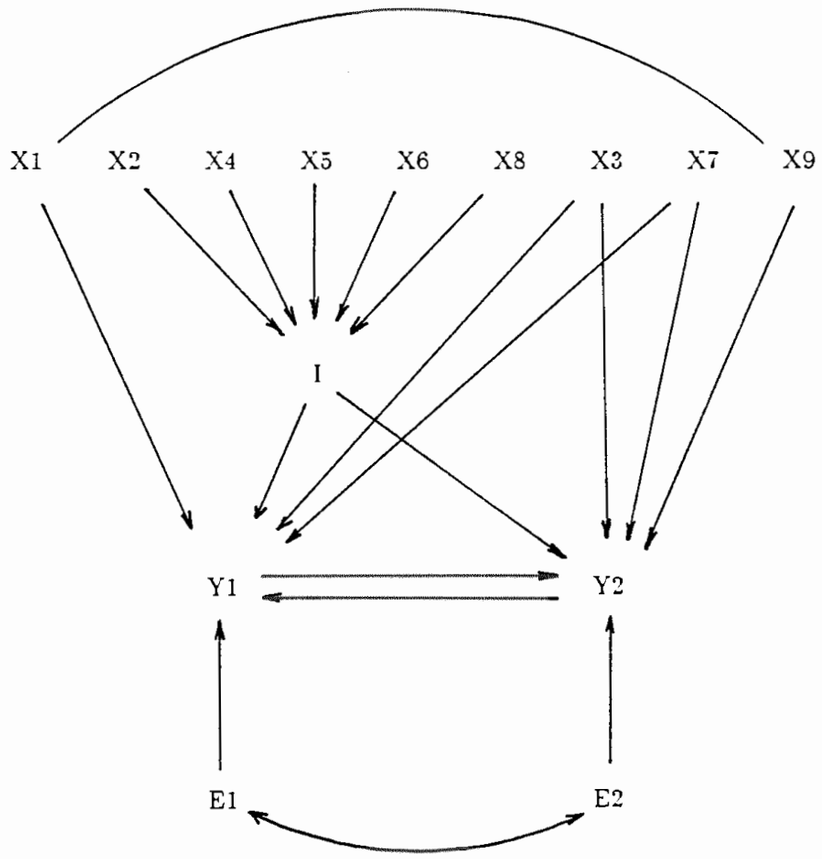
Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND

Y1: ED
Y2: AGEFST
E1: ERROR - ED
E2: ERROR - AGEFST
I: INTERMEDIATE FACTOR

FIGURE 3

SINGLE INTERMEDIATE FACTOR MODEL WITH DIRECT PATHS
TO EDUCATIONAL ATTAINMENT AND AGE AT FIRST BIRTH
FROM NUMBER OF SIBLINGS AND RELIGION

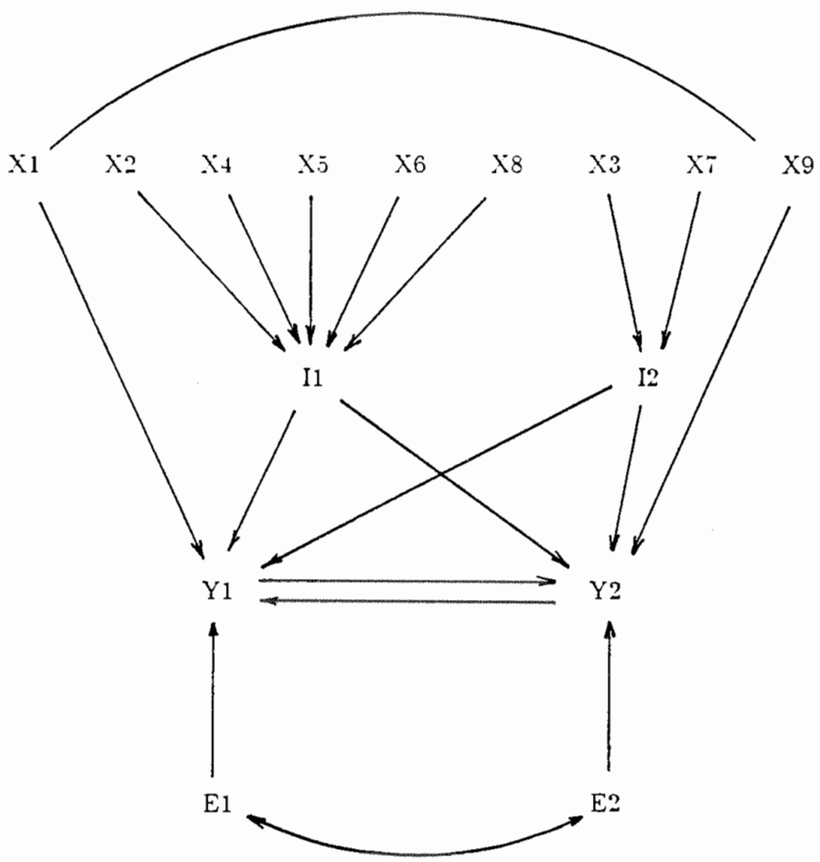


Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND
Y1: ED
Y2: AGEFST
E1: ERROR - ED
E2: ERROR - AGEFST
I: INTERMEDIATE FACTOR

FIGURE 4

DOUBLE INTERMEDIATE FACTOR MODEL



Variable Definitions

X1: DADSOCC
X2: RACE
X3: NOSIB
X4: FARMBACK
X5: REGNBACK
X6: ADOLFAM
X7: RELIGION
X8: YOUNGCIG
X9: FECUND

Y1: ED
Y2: AGEFST
E1: ERROR - ED
E2: ERROR - AGEFST
I1: INTERMEDIATE FACTOR
I2: INTERMEDIATE FACTOR

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