CHAPTER 3

Marriage and Reproductive Behavior in THAILAND: A Path analysis

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1. INTRODUCTION

One of the most remarkable phenomena of mate selection in past decade in developed countries such as the United States and Japan has been individuals' postponement of the decision to marry. The delay of marriage is evident in changes in both the extent of marriage and the age at first marriage. The postponement of marriage, in other words, late marriage not only influences on the timing to have the first child, but reduces the length of reproductive periods.

This paper attempts to examine a causal relationships between late marriage, late childbearing, and low fertility, in the data of the Thailand Demographic and Health Survey. It is difficult to investigate these causal relationships using the multiple regression analysis, because they are highly correlate with each other, such as the timing of first marriage and first birth. In order to avoid a problem of multicollinearity, path analysis is employed to test this causation empirically.

Mate selection is a crucial issue to affect marriage timing. In terms of mate selection, two types of influences are investigated; one is social and personal preferences for certain mates, such as endogamy norms, and the other one is the structural composition of the population to constrain spouse choice (Surra, 1990). The following sections review past literatures relating to mate selection, the timing of marriage, and reproductive behavior in order to explicate a conceptual framework.

2. A FRAMEWORK ON MATE SELECTION AND HOMOGAMY

It is important to recognize endogamy norms in order to understand social and personal preferences for mate selection, that is homogamy. Generally, there is tendency for people to want to marry someone who possesses similar characteristics. Three major categories of homogamy can be found in past studies: socio-biological, sub-cultural, and socioeconomic. Socio-biological homogamy includes race (Lavbov and Jacobs, 1986) and age (Vera et al., 1985); sub-cultural homogamy deals with religion (Glenn, 1982) and ethnicity; and socioeconomic homogamy includes socioeconomic status (Morgan, 1981), income, education (Rockwell, 1976), etc. Of course, these three categories correlate with each other in marital events.

Exchange theory gives an effective explanation of homogamy and mate selection. Edwards (1969) illustrated four propositions employing an utility maximization perspective in order to explain homogamous mating. (1) Within any collectivity of potential mates, a marriageable person will seek out that individual who is perceived as maximizing his rewards. (2) Individuals with equivalent resources are most likely to maximize each other's rewards. (3) Pairs with equivalent resources are most likely to possess homogamous characteristics. (4) Mate selection, therefore, will be homogamous with respect to a given set of characteristics.

When a balance between resources and rewards provides equivalence in different attributes of husbands and wives, they tend to marry. Schoen and Wookdredge (1989) investigated the age, race and educational patterns of marriage choice in North Carolina and Virginia during the periods 1969-71 and 1979-81. One of their hypotheses was that marriage choice is characterized by homogamy, with deviations interpretable as reflecting the female's greater socioeconomic concerns and/or the male's greater non-economic concerns. Empirical data confirmed statistically significant interactions between a male's higher level of education and a female's younger age, and between a black male's higher educational status and a non-black female's racial status.

Rockwell (1976) also explored educational homogamy. As results of analyzing 443,520 married couples' data from the 1970 U. S. Census, he stated that educationally homogamous marriages are now occurring at levels

higher than expected by chance but lower than would occur if equality of educational attainment were determinate in mate selection. A trend for women in heterogamous marriages to marry up in educations is related to change in the relative education of husbands and wives. This change has created a pool of men of higher educational attainment from which mates can be selected.

3. EDUCATIONAL ATTAINMENT AND MARRIAGE TIMING

Several factors relating to delayed marriage timing have been empirically examined in the past. Easterlin (1978) emphasized among young men economic hardship in marrying and maintaining families after marriage. He created a measurement to compare earnings potential of a couple with their material aspirations: so called "relative income". The expectation is that if the relative income of young couples improves, marriage and childbearing will be encouraged; if it deteriorates, they will be discouraged (Easterlin, 1980). Another factor in delayed marriage timing is the age-sex composition of the population. It is recognized as the sex ratios between marriageable men and women (Akers, 1967; Heer and Grossbard-Shechtman, 1983; Anzo, 1985) and "Marriage Squeeze" (Carter and Glick, 1970; Spanier and Glick, 1980; Schoen, 1983) which refers to the imbalance of marriage eligibles in marriage market. If there is oversupply of marriage eligibles for one sex, it becomes difficult for the other sex to find desirable partners and they therefore tend to marry. Though the marriage market argument is useful to examine the availability of desirable mates using aggregate data, it is difficult to apply to the studies based on the individual data because of ecological fallacy.

Other structural factors on marriage timing embrace one's educational level, parental educational attainment (Goldscheider and Waite, 1986), family's socio-ecomonic status, appropriate age, marital experience (Spanier and Glick, 1980), labor market experience (Goode, 1963), occupational status and so on. Among these factors, educational attainment is the most significant in affecting mate selection and in delaying marriage.

Marini examined the data from a study of students in ten Illinois high schools in 1957-58 and from a fifteen-year followup survey of the same individuals in 1973-74. She claimed that educational attainment has the most important influence on the timing of marriage for both sexes, but it has a stronger effect on females than males. Each additional year of education results in an increase of .68 years in age at marriage for females but only .35 years for males. This difference arises primarily from the tendency of women to marry at younger ages than men (Marini, 1978).

Not only in the United States but also in Japan, educational level is the most significant factor in the postponement of marriage both for males and females. Anzo (1989) analyzed the Japanese time series data after 1950 utilizing Easterlin's "relative income" measure, educational levels, female labor force participation rates, and marriage squeeze measures. Among these variables, the female educational level indicates the strongest statistical value influencing both the median and mean ages at first marriage of women. It was much more influential than the male educational level on the age at first marriage of men.

4. LATE MARRIAGE AND REPRODUCTION

The relationship between age at marriage and fertility is a classic issue in population studies. Malthus argued that delayed marriage is essentially a "preventive check" of excessive population growth. Not only Malthus, but contemporary demographers also recognize the effectiveness of delayed marriage decreasing the family size.

The famous 11 intermediate variables of Davis and Blake (1956) presented a systematic classification of the mechanisms which directly affect fertility and through which all other factors must operate (Heer, 1975). The first intermediate variable in 11 ones is "age of entry into sexual unions".

In the nations of European culture a couple are not supposed to marry until the husband is able to support a wife and the family (Heer, 1975). If we assume that every reproduction occurs in marital unions, the age of entry into sexual unions influences the formation of unions in the reproductive period. In other words, age at first marriage determines the length of the reproduction terms. The higher the age at first marriage, the shorter the reproductive period.

However, there is another important intervening variable lying between the age at first marriage and fertility. The age at first childbirth is a critical variable for the total family size. Because the vast majority of births still take place within marriages or within stable consensual unions, age of entry into motherhood is measured by the woman's age at first birth. The longer the first birth is postponed, the fewer children in the completed family, so that delay in initiating childbearing result in smaller families (Kasarda et al., 1986).

5. EDUCATION AND FERTILITY

Education plays a major role in influencing not only marriage timing but, again, fertility. The education level of both husband and wives affects fertility. Kasarda et

al. (1986) argued that the education of women and their spouse jointly influence their reproductive behavior. This means that the amount of fertility reduction expected with additional female education is predicted, in part, on the educational level of her spouse. This should be the case in societies where social status remains predicted on husband's standing and where men remain the primary decision makers for a couple's reproductive behavior.

Female education is in itself very effective for fertility control. On the basis of his analysis of the 1960 United States census, Dinkel (1965) asserted that when the education of the spouses differs, the education of the wife exerts the greater influence upon the size of their completed family. The role of the wife is the principal determinant of the number of children in the family and her role is dependent upon how many years of school she has completed.

Again, Kasarda et al. (1986) indicated that differences in education among women who marry at younger ages likely result in variations in their knowledge and use of contraception which might also account for the conditioning effect of education among those who marry early.

6. A HYPOTHETICAL MODEL

The logical explanation mentioned above are expressed graphically in Figure 1. This diagram indicates a hypothetical causation which expresses the influences of educational homogamy of marriage, timing of marriage, and timing of childbearing upon the total number of children.

From the perspective of utility maximization in exchange theory, a wife's educational level and that of her husband correlate with each other in terms of homogamy for mate selection preferences. However, they should be recognized as individual events because the spouses grew up in settings differing in such terms as parental educational levels, standard of living, etc. The timing of marriage for a woman is influenced by her own educational attainment and also by her spouse's educational level. The timing of childbearing, in other words age at first birth, is directly affected by marriage timing, and the couple's education may also be a causative factor in the decision to have a child. When a wife with higher education is in the labor market, the timing of having first baby is particularly crucial, since it affects her career.

Although a review of the literature indicates that the total number of children is apparently influenced by the marriage timing, the age at first birth appears to be an intervening variable. The age at marriage is recognized to determine the length of reproductive period of a woman. However, the age at first birth is a much more concrete measurement to define the terms of reproduction. The wife's and husband's educational levels affect the total number of children individually and/or together.

7. DATA AND METHODS

The structural equation model will be employed, so called path analysis, in order to examine the hypothetical model mentioned above. The origins of path analysis can be traced to Sewall Wright, who developed the method as a means for studying the direct and indirect effects of variables, where some variables are viewed as causes of other variables which are viewed as effects (Dillon and Goldstein, 1984).

Utilizing path analysis, variables in Figure 1 are defined as the following; wife's educational level (WE) and husband's educational level (HE) are measured exogenous variables, and wife's age at first marriage (FM), wife's age at first birth (FB), and number of children (CH) are endogenous variables. Each of the endogenous variable is typically allowed to be influenced by one unmeasured exogenous variable. There are three unmeasured exogenous variables in this path diagram: R_u to age at first marriage, R_v to age at first birth, and R_w to number of children (See Figure 1).

It is possible to draw a curved doubled headed arrow between wife's education and husband's one because of homogamy for mate selection. The effects of exogenous variables upon endogenous variables are represented in path diagrams by straight, single-headed arrows. The effects of one endogenous variable upon another are likewise represented. The only kind of arrow which may be drawn to an endogenous variable is a straight, single-headed one.

The causal model in Figure 1 is decomposed into three structural equations which are shown at the bottom of the path diagram. Equation [1] expresses the decomposition of effects from wife's educational level, husband's education, age at first birth, and residual term to number of children. Equation [2] shows the effects of a wife's education, that of her husband, age at first marriage, and residuals on age at first birth. Summarily, equation [3] decomposes the effects of wife's and husband's education, and residuals on age at first marriage of wife. All of P's represent path coefficients between variables in the structural equations. In path analysis, it customarily uses standardized variables, i.e., with mean zero and unit variance; even the residual is expressed as a standardized variable, so that it can be compared more easily to the regressors (Wonnacott and Wonnacott, 1981).

The data for this analysis come from the individual

file of Thailand DHS which was executed by the Institute of Population Studies, Chulalongkorn University in 1987. The reason why Thailand DHS data has been selected for this analysis is that the total fertility rate of Thailand was the lowest (2.2 in 1987) among developing countries which participated in Demographic and Health Surveys.

The survey was drawn on a nationally representative sample of 6,775 ever married women between the ages of 15 and 49. The mean age of the respondents is 32.71 years old. Women with any birth experiences are selected from the total sample for this analysis.

From the Thailand DHS data, the variables that represent concepts mentioned before will be as follows: The wife's educational level is operationalized by the years of education completed by a respondent, and that of her husband is shown by the years of education completed by respondent's husband. The wife's age at marriage is measured by the respondent's age at the start of first marriage, wife's age at first birth is represented by age of the respondent at first birth, and number of children is total number of living children including current pregnancy calculated from total number of living children by adding 1 if the respondent is pregnant (Institute for Resource Development, 1988).

Three sets of data are prepared for testing the hypothetical model that is represented in Figure 1 according to the following age groups: Total data set and two sub-sets of data depending on age groups, i.e., 30 to 39 years old and more than 40 years old.

8. PREVALENCE OF EDUCATIONAL EFFECTS: RESULTS OF PATH ANALYSES

1) The Model of Uncontrolled Respondent's Age

Figure 2 exhibits the results of the causal model of the total number of children without controlling the respondent's age. The first element of structural equation [2] in Figure 1 is eliminated from equation [I−2] in Figure 2 because the respondent's years of education completed was not statistically significant by standardized regression analyses of a saturated causal model, carried out before testing this model. Therefore, the straight, single-headed arrow between wife's education (WE) and age at first birth (FB) is also taken out of the path diagram. Correlation between WE and husband's educational level (HE) is .6748 and it expresses that educational homogamy exists in mate selection in Thailand. The path coefficient between age at first marriage (FM) and FB has the highest value in the causal model, and the path coefficient between WE to FB is almost twice as much as that between HE to FM.

Table I−1 indicates mean and standard deviations of variables, and actual correlation coefficients between variables and implied correlation from the causal model. The mean age at first marriage is 19.5, mean age at first birth is 21.3, and the average number of living children is 2.8. Within each pair of actual and implied correlations values are very close.

Tables I−2 to I−10 demonstrate decompositions of implied correlations from the model. The direct effect from WE to FM in its implied correlation, which is 73.49% of the total correlation in Table I−2, is stronger than the direct effect from HE to FM in Table I−3. Comparison of the indirect effects, which shows homogamous mating, in both Tables I−2 and I−3 exhibits the same evidence as direct effects. For wife's age at marriage, wife's educational attainment has stronger influence than the husband's educational level.

Upon wife's age at first birth, in Table I−4, the indirect effect of wife's education via age at first marriage is the largest influence. The indirect effect of via husband's education and age at first marriage represents a quarter of all indirect effects. These evidences indicate that when a wife's educational level rises, not only her age at marriage increases and then her age at starting childbearing rises, but she also prefers an educated husband like herself, then her age at marriage and age at birth increases. Table I−5 indicates the same evidence.

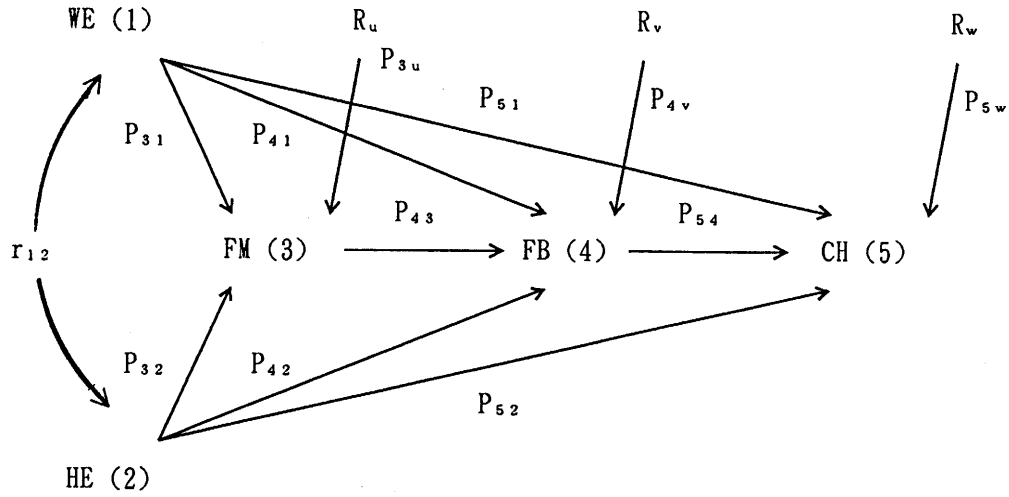
Though a wife's educational attainment does not have any direct influence on age at first birth, it accounts for more than half of the total effect on the number of living children (Table I−4). An indirect effect through HE, which involves educational homogamy, shows more than one fourth of the total correlation. These evidence is observed in Table I−7, too. We may therefore confirm the argument of Kasarda et al. (1986) that a woman's education and that of her spouse interact and jointly influence reproductive behavior.

Tables I−8 to I−10 display the decomposition of implied correlation in the center causation in Figure 2. It consists of linkages between age at first marriage, first birth, and the number of children. The direct effect of respondent's age at first marriage on age at first birth explains almost of all correlation (Table I −8), and age at first birth is the largest determinant of the number of children (Table I −10). Between marriage timing and number of children, the intervening variable, age at first birth, contributes three quarters of the total effects.

Decompositions of the variance in the endogenous variables are given in Tables I−11, I−12, and I−13. Almost half of the explained variance in age at first marriage is contributed by the wife's educational attainment, and more than one third of the explained variance comes from the path with educational homogamy(Table I−11). Almost all the explained variance in

Figure 1 A Hypothetical Model of the Number of Living Children and Structural Equations

[Hypothetical Model]



[Structural Equations]

$$CH = P_{51}*WE + P_{52}*HE + P_{54}*FB + P_{5w}*R_w \quad [1]$$
$$FB = P_{41}*WE + P_{42}*HE + P_{43}*FM + P_{4v}*R_v \quad [2]$$
$$FM = P_{31}*WE + P_{32}*HE + P_{3u}*R_u \quad [3]$$

(NOTES) WE = Wife's Educational Level,
HE = Husband's Educational Level,
FM = Wife's Age at First Marriage,
FB = Wife's Age at First Birth,
CH = Number of Children,
P's = Path Coefficients,
R's = Unmeasured Exogenous Variables, and
r = Correlation Coefficient.

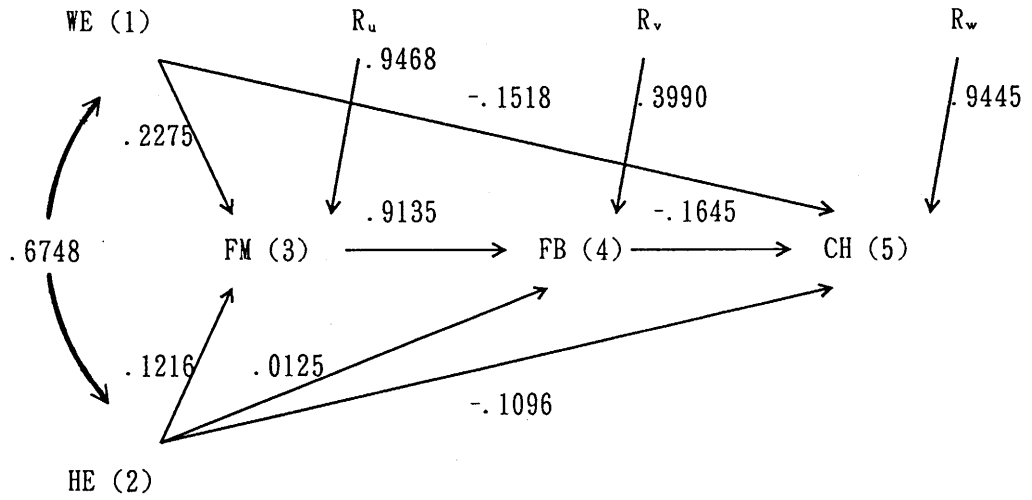
Figure 2 A Causal model of the Number of Living Children in Thailand

[Results of Structural Equations Analyzed by Standadized Regressions]

(N=5529)

$$CH = -.1518*WE -.1096*HE -.1645*FB +.9445*R_w \quad [I-1]$$
$$FB = .0125*HE +.9135*FM +.3990*R_v \quad [I-2]$$
$$FM = .2275*WE +.1216*HE +.9468*R_u \quad [I-3]$$

[Results of Causal Model]



(NOTES) Utilizing the Demogaphic and Health Survey of Thailand, the variables are operationalized the following;
WE = Wife's (Respondent's) Years of Education Completed,
HE = Husband's Years of Education Completed,
FM = Respondent's Age at First Marriage,
FB = Respondent's Age at First Birth, and
CH = Number of Living Children and Current Pregnancy.

Table I-1 Actual and Implied Correlations in a Causal Model

	(5)	(4)	(3)	(2)	(1)
CH (5) = Living Children	1.0000	-.2349**	-.2101**	-.2557**	-.2721**
FB (4) = Age at Birth	*-.1660*	1.0000	.9145**	.2644**	.2817**
FM (3) = Age at Marriage	*-.1985*	*.9150*	1.0000	.2758**	.3044**
HE (2) = Husband's Educ.	*-.2555*	*.2638*	*.2751*	1.0000	.6748**
WE (1) = Wife's Educ.	*-.2737*	*.2912*	*.3096*	*.6748*	1.0000

Means	2.7837	21.2715	19.5390	6.1966	5.1392
S.D.'s	1.7004	4.0648	3.8808	4.3298	3.8904

(NOTES) ** P< .01.
Actual correlations are found above r=1.0000 diagonal, Implied ones below.

Table I-2 Decomposition of the Correlation between Wife's Education and Age at First Marriage

Component	Symbol	Computed	%
Total Correlation	r_{13}	(.3096)	100.00
Causal Effect			
Direct Effect	P_{31}	.2275	73.49
Indirect Effect	—	.0821	26.51
VIA HE	$P_{32}*r_{12}$	.0821	26.51

Table I-3 Decomposition of the Correlation between Husband's Education and Age at First Marriage

Component	Symbol	Computed	%
Total Correlation	r_{23}	(.2751)	100.00
Causal Effect			
Direct Effect	P_{32}	.1216	44.20
Indirect Effect	—	.1535	55.80
VIA WE	$P_{31}*r_{12}$	.1535	55.80

Table I-4 Decomposition of the Correlation between Wife's Education and Age at First Birth

Component	Symbol	Computed	%
Total Correlation	r_{14}	(.2912)	100.00
Causal Effect			
Direct Effect	P_{41}	*****	*****
Indirect Effect	—	.2912	100.00
VIA FM	$P_{43}*P_{31}$	.2078	71.36
VIA HE	$P_{42}*r_{12}$	.0084	2.90
VIA HE+FM	$P_{43}*P_{32}*r_{12}$	.0750	25.74

Table I-5 Decomposition of the Correlation between Husband's Education and Age at First Birth

Component	Symbol	Computed	%
Total Correlation	r_{24}	(.2638)	100.00
Causal Effect			
Direct Effect	P_{42}	.0125	4.74
Indirect Effect	—	.2513	92.26
VIA FM	$P_{43}*P_{32}$	.1111	42.11
VIA WE+FM	$P_{43}*P_{31}*r_{12}$	.1402	53.16

Table I-6 Decomposition of the Correlation between Wife's Education and the Number of Children

Component	Symbol	Computed	%
Total Correlation	r_{15}	(-.2737)	100.00
Causal Effect			
Direct Effect	P_{51}	-.1518	55.46
Indirect Effect	—	-.1219	44.54
VIA FM+FB	$P_{54}*P_{43}*P_{31}$	-.0342	12.50
VIA HE	$P_{52}*r_{12}$	-.0740	27.02
VIA HE+FB	$P_{54}*P_{42}*r_{12}$	-.0014	.51
VIA HE+FM+FB	$P_{54}*P_{43}*P_{32}*r_{12}$	-.0123	4.51

Table I-7 Decomposition of the Correlation between Husband's Education and the Number of Children

Component	Symbol	Computed	%
Total Correlation	r_{25}	(-.2555)	100.00
Causal Effect			
Direct Effect	P_{52}	-.1096	42.90
Indirect Effect	—	-.1459	57.10
VIA FB	$P_{54}*P_{42}$	-.0021	.81
VIA FM+FB	$P_{54}*P_{43}*P_{32}$	-.0183	7.16
VIA WE	$P_{51}*r_{12}$	-.1024	40.10
VIA WE+FM+FB	$P_{54}*P_{43}*P_{31}*r_{12}$	-.0231	9.04

Table I-8 Decomposition of the Correlation between Age at First Marriage and Age at First Birth

Component	Symbol	Computed	%
Total Correlation	r_{34}	(.9150)	100.00
Causal Effect			
Direct Effect	P_{43}	.9135	99.83
Indirect Effect	—	.0015	.17
VIA HE	$P_{42}*P_{32}$	.0015	.17

Table I-9 Decomposition of the Correlation between Age at First Marriage and the Number of Children

Component	Symbol	Computed	%
Total Correlation	r_{35}	(-.1985)	100.00
Causal Effect			
Direct Effect	P_{53}	*****	*****
Indirect Effect	—	-.1985	100.00
VIA FB	$P_{54}*P_{43}$	-.1504	75.76
VIA WE	$P_{51}*P_{31}$	-.0345	17.40
VIA HE	$P_{52}*P_{32}$	-.0133	6.71
VIA FB+HE	$P_{54}*P_{42}*P_{32}$	-.0003	.13

Table I-10 Decomposition of the Correlation between Age at First Birth and the Number of Children

Component	Symbol	Computed	%
Total Correlation	r_{45}	(-.1660)	100.00
Causal Effect			
Direct Effect	P_{54}	-.1646	99.18
Indirect Effect	—	-.0014	.83
VIA HE	$P_{52}*P_{42}$	-.0014	.83

Table I-11 Decomposition of the Variance in Age at First Marriage

Component	Symbol	Computed	%
Total Variance	V_3	1.0000	*****
Explained	$D_{3:12}$	.1039	100.0
WE	$P_{31}*P_{31}$	.0518	49.8
HE	$P_{32}*P_{32}$	.0148	14.2
WE•HE	$2P_{31}*R_{12}*P_{32}$	.0373	35.9
Unexplained	$P_{3Rw}*P_{3Rw}$	.8961	*****

Table I-12 Decomposition of the Variance in Age at First Birth

Component	Symbol	Computed	%
Total Variance	V_4	1.0000	*****
Explained	$D_{4:23}$	.8346	100.00
HE	$P_{42}*P_{42}$	.0002	.02
FM	$P_{43}*P_{43}$	.8345	99.98
Unexplained	$P_{4Rv}*P_{4Rv}$	.1654	*****

Table I-13 Decomposition of the Variance in the Number of Children

Component	Symbol	Computed	%
Total Variance	V_5	1.0000	*****
Explained	$D_{5:124}$	.0992	100.0
WE	$P_{51}*P_{51}$	.0230	23.2
HE	$P_{52}*P_{52}$	.0120	12.1
FB	$P_{54}*P_{54}$	.0271	27.3
WE•FM•FB	$2P_{51}*P_{31}*P_{43}*P_{54}$	.0104	10.5
WE•HE	$2P_{51}*R_{12}*P_{52}$	.0225	22.6
WE•HE•FB	$2P_{51}*R_{12}*P_{42}*P_{54}$	.0004	.4
WE•HE•FM•FB	$2P_{51}*R_{12}*P_{32}*P_{43}*P_{54}$	.0037	3.8
Unexplained	$P_{5Rw}*P_{5Rw}$	.9008	*****

birth timing is given by marriage timing (Table I−12). Three quarters of the variance in the number of children is explained by age at first birth, wife's education, and homogamous mating (Table I−13).

Through these analyses, we can state that a wife's educational attainment by itself tends to delay her marriage timing, and also educational homogamy tends to affect her age at first marriage. Marriage timing controls first birth timing and birth timing constrains the number of children. Couple's educational level jointly influences their reproductive behavior. However, this analysis utilized the Thailand DHS data without controlling age. In the next section, data for two different age groups will be employed for the same scheme of causation.

2) The Model for Wives Aged 30 to 39

Although it is possible to state that wives aged 30 to 39 are beyond high reproductivity, they are still in reproduction periods. Figure 3 demonstrates a causal model of this age group. Two straight lines, that is, single-headed arrows, in Figure 1 are eliminated in Figure 3 because standardized regression analyses of a saturated causal model did not show statistically significant levels for these elements. The wife's educational level directly affects only marriage timing. The path coefficient between the wife's education and age at marriage is much larger than that in Figure 2. The average age at first marriage of this age group is 20.2 and the mean age at first birth is 21.9. Both figures are higher than in the case of the data with uncontrolled age.

Tables II−2 and II−3 display the influence of both the wife's and husband's educational levels on age at first marriage. WE, that is wife's education, has stronger effect on FM than that of the husband, even through educational homogamy of mate selection, i.e., the indirect impacts of both paths. The same trends can be found in both Tables II−3 and II−4. A wife's education via age at marriage contributes almost 80% of the correlation with age at first birth (Table II−3). Also, the husband's education via wife's education and marriage timing explains one third of the total correlation (Table II−4).

Decomposition of the implied correlation between WE and CH (Table II−5) and between HE and CH (Table II−6) indicates stronginfluences of a path with husband's education, wife's education,marriage timing, and birth timing on number of children. The results in Tables II−8, II−9, and II−10 support the effect of this causal path on reproduction behavior.

From Table II−11, two thirds of the explained variance inage at first marriage is brought by the wife's educational attainment, and almost one third comes from homogamous mating. Undoubtedly, age at first marriage explains the variance in first birth timing and first birth timing explains the variance in number of children, because paths from the wife's education to birth timing and number of children are eliminated in this causal model.

A possible explanation for this age group causal model is the following: women tend to marry men with the same educational background, women's marriage timings are largely dependent on their own educational levels, timings of first births are influenced directly by their age at marriage, and then age at first birth constrains the number of living children.

3) The Model for Wives Aged More than 40

Women in this age group are almost terminating reproductive behavior. Therefore, the number of living children is almost equivalent to the completed number of children. There are 1,478 female respondents in this age group. Their average number of living children is 4.15, which is a much larger figure than in the case for younger age groups. Mean ages at first marriage and first birth are 20.2 and 22.1, respectively.

A causal model for this age group is represented in Figure 4. A straight and single-headed arrow line from WE to FB and one from HE to FB are deleted in the path diagram for the same reasons as in the case of the former two models. Two path coefficients, P31 and P32, have closer values in comparison with the other models. Furthermore, P52 (−.1229) is larger than P51 (−.0944) in Figure 4, which are inverse in Figure 2.

The direct effect of wife's education on age at first marriage contributes 64% of the total correlation (Table III−2), and the husband' educational level influences directly 56% of the total (Table III−3). These two figures are the closest among the three causal models. Simultaneously, magnitude of indirect effects in both Tables are similar. We can find the same evidence in decompositions of implied correlations both between WE and FB (Table III−4) and between HE and FB (Table III−5).

A husband's educational attainment directly affects the number of living children and indirectly does much more than wife's education (Tables III−6 and III−7). Because of no causal path from both wife's and husband's education, implied correlation between the age at first marriage and the first birth are decided by direct effect from marriage timing to birth timing in Table III−8. Table III−9 shows the decomposition of indirect effect to number of children. Though 90% of total correlation is explained by the center line of the causal model, indirect effect via husband' education is slightly stronger than via wife's.

Decomposition of the variances shows similar results

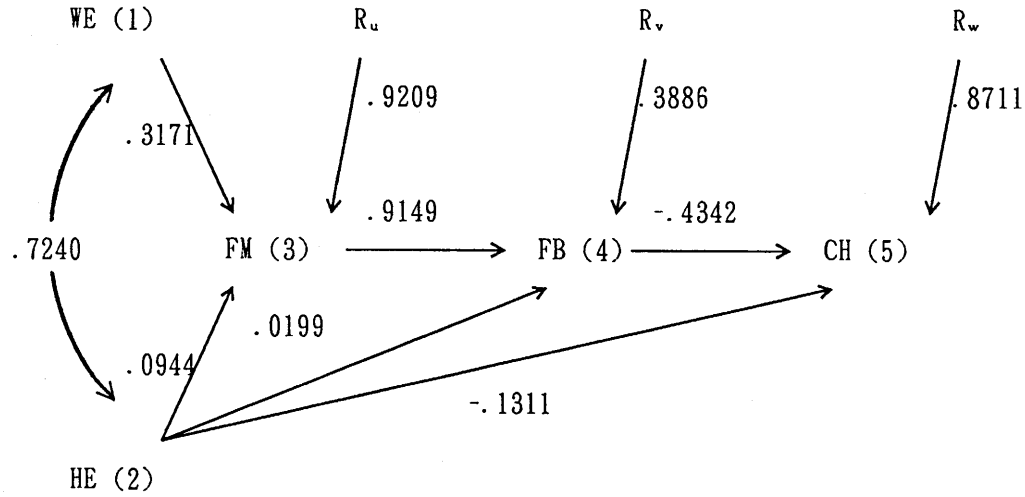
Figure 3 Models of the Number of Living Children in Thailand, Wives 30 to 39 Years Old

[Results of Structural Equations Analyzed by Standadized Regressions]

(N=2163)

$$CH = -.1311*HE -.4342*FB +.8711*R_w \quad [IIb\text{-}1]$$
$$FB = +.0199*HE +.9149*FM +.3886*R_v \quad [IIb\text{-}2]$$
$$FM = .3171*WE +.0944*HE +.9209*R_u \quad [IIb\text{-}3]$$

[Causal Model]



Tabe Ⅱ-1 Actual and Implied Correlations in Causal Models, Wives 30 to 39 Years Old

	(5)	(4)	(3)	(2)	(1)
CH (5) = Living Children	1.0000	-.4719**	-.4312**	-.2684**	-.2695**
FB (4) = Age at Birth	*-.4368*	1.0000	.9208**	.3174**	.3594**
FM (3) = Age at Marriage	*-.4104*	*.9168*	1.0000	.3249**	.3831**
HE (2) = Husband's Educ.	*-.2684*	*.3163*	*.3240*	1.0000	.7240**
WE (1) = Wife's Educ.	*-.2543*	*.3671*	*.3854*	*.7240*	1.0000

Means	2.7527	21.9126	20.1694	6.4483	5.3580
S.D.'s	1.3253	4.1952	4.0062	4.5282	4.1261

(NOTES) ** P< .01.
Actual correlations are found above r=1.0000 diagonal, Implied ones below.

Tabel Ⅱ-2 Decomposition of the Correlation between Wife's Education and Age at First Marriage, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{13}	(.3854)	100.00
Causal Effect			
Direct Effect	P_{31}	.3171	82.27
Indirect Effect	—	.0683	17.73
VIA HE	$P_{32}*r_{12}$	.0683	17.73

Tabel Ⅱ-3 Decomposition of the Correlation between Husband's Education and Age at First Marriage, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{23}	(.3240)	100.00
Causal Effect			
Direct Effect	P_{32}	.0944	29.13
Indirect Effect	–	.2296	70.86
VIA WE	$P_{31}*r_{12}$	.2296	70.86

Tabel Ⅱ-4 Decomposition of the Correlation between Wife's Education and Age at First Birth, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{14}	(.3671)	100.00
Causal Effect			
Direct Effect	P_{41}	*****	*****
Indirect Effect	–	.3671	100.00
VIA FM	$P_{43}*P_{31}$	.2901	79.04
VIA HE	$P_{42}*r_{12}$	.0144	3.93
VIA HE+FM	$P_{43}*P_{32}*r_{12}$	.0625	17.04

Tabel Ⅱ-5 Decomposition of the Correlation between Husband's Education and Age at First Birth, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{24}	(.3163)	100.00
Causal Effect			
Direct Effect	P_{42}	.0199	6.29
Indirect Effect	–	.2964	93.71
VIA FM	$P_{43}*P_{32}$	.0863	27.30
VIA WE+FM	$P_{43}*P_{31}*r_{12}$	.2100	66.40

Tabel Ⅱ-6 Decomposition of the Correlation between Wife's Education and the Number of Children, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{15}	(-.2543)	100.00
Causal Effect			
Direct Effect	P_{51}	*****	*****
Indirect Effect	—	-.2543	100.00
VIA FM+FB	$P_{54}*P_{43}*P_{31}$	-.1260	49.54
VIA HE	$P_{52}*r_{12}$	-.0949	37.33
VIA HE+FB	$P_{54}*P_{42}*r_{12}$	-.0063	2.46
VIA HE+FM+FB	$P_{54}*P_{43}*P_{32}*r_{12}$	-.0272	10.68

Tabel Ⅱ-7 Decomposition of the Correlation between Husband's Education and the Number of Children, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{25}	(-.2684)	100.00
Causal Effect			
Direct Effect	P_{52}	-.1311	48.84
Indirect Effect	—	-.1373	51.16
VIA FB	$P_{54}*P_{42}$	-.0086	3.22
VIA FM+FB	$P_{54}*P_{43}*P_{32}$	-.0375	13.97
VIA WE+FM+FB	$P_{54}*P_{43}*P_{31}*r_{12}$	-.0912	33.97

Tabel Ⅱ-8 Decomposition of the Correlation between Age at First Marriage and Age at First Birth, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{34}	(.9168)	100.00
Causal Effect			
Direct Effect	P_{43}	.9149	99.80
Indirect Effect	—	.0019	.20
VIA HE	$P_{42}*P_{32}$	.0019	.20

Tabel Ⅱ-9 Decomposition of the Correlation between Age at First Marriage and the Number of Children, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{35}	(-.4104)	100.00
Causal Effect			
Direct Effect	P_{53}	*****	*****
Indirect Effect	—	-.4104	100.00
VIA FB	$P_{54}*P_{43}$	-.3973	96.79
VIA HE	$P_{52}*P_{32}$	-.0124	3.02
VIA FB+HE	$P_{54}*P_{42}*P_{32}$	-.0008	.20

Tabel Ⅱ-10 Decomposition of the Correlation between Age at First Birth and the Number of Children, Wives Aged 30-39

Component	Symbol	Computed	%
Total Correlation	r_{45}	(-.4368)	100.00
Causal Effect			
Direct Effect	P_{54}	-.4342	99.40
Indirect Effect	—	-.0026	.60
VIA HE	$P_{52}*P_{42}$	-.0026	.60

Table Ⅱ-11 Decomposition of the Variance in Age at First Marriage, Wives Aged 30-39

Component	Symbol	Computed	%
Total Variance	V_3	1.0000	*****
Explained	$D_{3:12}$	.1528	100.0
WE	$P_{31}*P_{31}$	.1006	65.8
HE	$P_{32}*P_{32}$	.0089	5.8
WE•HE	$2P_{31}*R_{12}*P_{32}$	.0433	28.4
Unexplained	$P_{3Rw}*P_{3Rw}$	.8472	*****

Table Ⅱ-12 Decomposition of the Variance in Age at First Birth, Wives Aged 30-39

Component	Symbol	Computed	%
Total Variance	V_4	1.0000	*****
Explained	$D_{4:23}$	.8374	100.00
HE	$P_{42}*P_{42}$	.0004	.05
FM	$P_{43}*P_{43}$	.8370	99.95
Unexplained	$P_{4Rv}*P_{4Rv}$	.1626	*****

Table Ⅱ-13 Decomposition of the Variance in the Number of Children, Wives Aged 30-39

Component	Symbol	Computed	%
Total Variance	V_5	1.0000	*****
Explained	$D_{5:24}$	.2057	100.0
HE	$P_{52}*P_{52}$	.0172	8.4
FB	$P_{54}*P_{54}$	.1885	91.6
Unexplained	$P_{5Rw}*P_{5Rw}$	.7943	*****

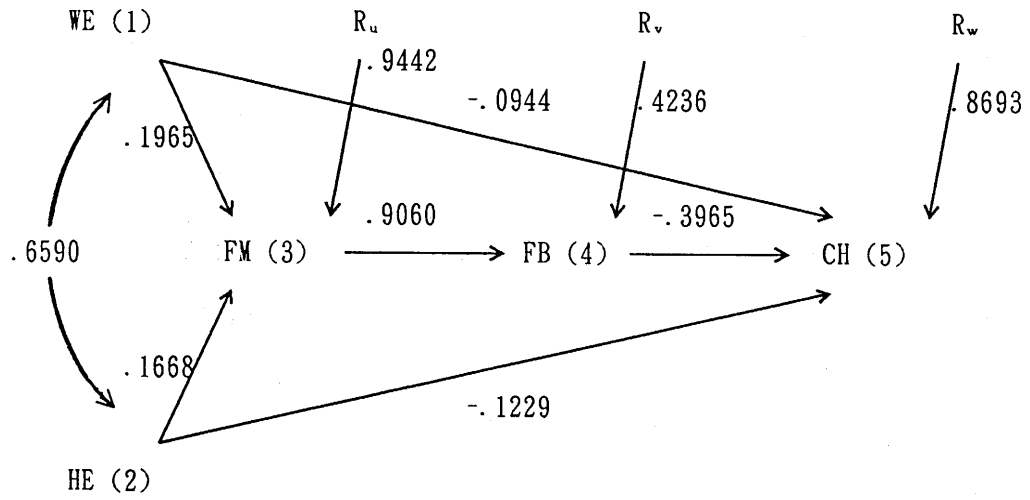
Figure 4 Models of the Number of Living Children in Thailand, Wives more than 40 Years Old

[Results of Structural Equations Analyzed by Standadized Regressions]

(N=1478)

$$CH = -.0944*WE \quad -.1229*HE \quad -.3965*FB \quad +.8693*R_w \qquad [III\text{-}1]$$
$$FB = \qquad\qquad\qquad\qquad +.9060*FM \quad +.4236*R_v \qquad [III\text{-}2]$$
$$FM = \quad .1965*WE \quad +.1668*HE \quad +.9442*R_u \qquad [III\text{-}3]$$

[Causal Model]



Tabe Ⅲ-1 Actual and Implied Correlations in Causal Models, Wives Aged more than 40 Years Old

	(5)	(4)	(3)	(2)	(1)
CH (5) = Living Children	1.0000	-.4569**	-.4140**	-.2946**	-.2848**
FB (4) = Age at Birth	*-.3965*	1.0000	.9014**	.2763**	.2817**
FM (3) = Age at Marriage	*-.3983*	*.9060*	1.0000	.2962**	.3038**
HE (2) = Husband's Educ.	*-.2916*	*.2684*	*.2963*	1.0000	.6590**
WE (1) = Wife's Educ.	*-.2855*	*.2776*	*.3064*	*.6590*	1.0000

Means	4.1495	22.0896	20.2174	5.4608	4.2650
S.D.'s	2.0234	4.6844	4.4374	4.2935	3.7427

(NOTES) ** P< .01.
Actual correlations are found above r=1.0000 diagonal, Implied ones below.

Table Ⅲ-2 Decomposition of the Correlation between Wife's Education and Age at First Marriage, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{13}	(.3064)	100.00
Causal Effect			
Direct Effect	P_{31}	.1965	64.13
Indirect Effect	—	.1099	35.87
VIA HE	$P_{32}*r_{12}$	.1099	35.87

Table Ⅲ-3 Decomposition of the Correlation between Husband's Education and Age at First Marriage, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{23}	(.2963)	100.00
Causal Effect			
Direct Effect	P_{32}	.1668	56.30
Indirect Effect	—	.1294	43.70
VIA WE	$P_{31}*r_{12}$	.1294	43.70

Table Ⅲ-4 Decomposition of the Correlation between Wife's Education and Age at First Birth, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{14}	(.2776)	100.00
Causal Effect			
Direct Effect	P_{41}	*****	*****
Indirect Effect	—	.2776	100.00
VIA FM	$P_{43}*P_{31}$	.1780	64.13
VIA HE+FM	$P_{43}*P_{32}*r_{12}$	.0996	35.87

Table Ⅲ-5 Decomposition of the Correlation between Husband's Education and Age at First Birth, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{24}	(.2684)	100.00
Causal Effect			
Direct Effect	P_{42}	*****	*****
Indirect Effect	—	.2684	100.00
VIA FM	$P_{43}*P_{32}$	.1511	56.30
VIA WE+FM	$P_{43}*P_{31}*r_{12}$	.1173	43.70

Table Ⅲ-6 Decomposition of the Correlation between Wife's Education and the Number of Children, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{15}	(-.2855)	100.00
Causal Effect			
Direct Effect	P_{51}	-.0944	33.07
Indirect Effect	—	-.1911	66.93
VIA FM+FB	$P_{54}*P_{43}*P_{31}$	-.0706	24.73
VIA HE	$P_{52}*r_{12}$	-.0810	28.37
VIA HE+FM+FB	$P_{54}*P_{43}*P_{32}*r_{12}$	-.0395	13.83

Table Ⅲ-7 Decomposition of the Correlation between Husband's Education and the Number of Children, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{25}	(-.2916)	100.00
Causal Effect			
Direct Effect	P_{52}	-.1229	42.15
Indirect Effect	—	-.1687	57.85
VIA FM+FB	$P_{54}*P_{43}*P_{32}$	-.0599	20.55
VIA WE	$P_{51}*r_{12}$	-.0622	21.34
VIA WE+FM+FB	$P_{54}*P_{43}*P_{31}*r_{12}$	-.0465	15.96

Table Ⅲ-8 Decomposition of the Correlation between Age at First Marriage and Age at First Birth, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{34}	(.9060)	100.00
Causal Effect			
Direct Effect	P_{43}	.9060	100.00
Indirect Effect	—	*****	*****

Table Ⅲ-9 Decomposition of the Correlation between Age at First Marriage and the Number of Children, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{35}	(-.3983)	100.00
Causal Effect			
Direct Effect	P_{53}	*****	*****
Indirect Effect	—	-.3983	100.00
VIA FB	$P_{54}*P_{43}$	-.3592	90.20
VIA WE	$P_{51}*P_{31}$	-.0185	4.66
VIA HE	$P_{52}*P_{32}$	-.0205	5.15

Table Ⅲ-10 Decomposition of the Correlation between Age at First Birth and the Number of Children, Wives Aged more than 40

Component	Symbol	Computed	%
Total Correlation	r_{45}	(-.3965)	100.00
Causal Effect			
Direct Effect	P_{54}	-.3965	100.00
Indirect Effect	—	*****	*****

Table Ⅲ-11 Decomposition of the Variance in Age at First Marriage, Wives Aged more than 40

Component	Symbol	Computed	%
Total Variance	V_3	1.0000	*****
Explained	$D_{3:12}$	.1096	100.0
WE	$P_{31}*P_{31}$	.0386	35.2
HE	$P_{32}*P_{32}$	.0278	25.4
WE•HE	$2P_{31}*R_{12}*P_{32}$	.0432	39.4
Unexplained	$P_{3Rw}*P_{3Rw}$	.8904	*****

Table Ⅲ-12 Decomposition of the Variance in Age at First Birth, Wives Aged more than 40

Component	Symbol	Computed	%
Total Variance	V_4	1.0000	*****
Explained	$D_{4:3}$	.8208	100.00
FM	$P_{43}*P_{43}$	.8208	100.00
Unexplained	$P_{4Rv}*P_{4Rv}$	.1792	*****

Table Ⅲ-13 Decomposition of the Variance in Number of Children, Wives Aged more than 40

Component	Symbol	Computed	%
Total Variance	V_5	1.0000	*****
Explained	$D_{5:124}$	.2173	100.0
WE	$P_{51}*P_{51}$	.0089	4.1
HE	$P_{52}*P_{52}$	.0151	7.0
FB	$P_{54}*P_{54}$	.1572	72.3
WE•FM•FB	$2P_{51}*P_{31}*P_{43}*P_{54}$	.0133	6.1
WE•HE	$2P_{51}*R_{12}*P_{52}$	.0153	7.0
WE•HE•FM•FB	$2P_{51}*R_{12}*P_{32}*P_{43}*P_{54}$	.0075	3.4
Unexplained	$P_{5Rw}*P_{5Rw}$	.7827	*****

which we have observed so far in decomposition analyses of implied correlations (Tables III−11 to III−13). The causal linkage between marriage timing, birth timing, and number of children has a very strong explanatory power in this age group model. Furthermore, although husband's educational level plays a larger role for decision making of the number of children, education of both woman and her husband interact and jointly influence the reproductive behavior according to the causal model.

9. CONCLUSION

There are many demographic events in one's lifetime from birth to death. Goldscheider and Waite (1986) stated that among the many decisions young people have made as they enter adulthood, marriage is perhaps the most important determinant for being an adult. It is the clearest transition from childhood to adulthood, and it conditions, to a great extent, the patterning of adult roles. Forming a family is also striking feature of transition to adulthood and it requires adult roles for both wives and husbands.

Although many elements exist in the process of decision making to marry, the educational attainment has been focused in this chapter. It influences on the mate selection in terms of homogamy. If we accept an assumption that people tends to marry one who posses similar characteristics, the similarity of educational background is one of the most significant factors to constrain the mate selection and the decision of marriage. Education affects on one's way of thinking, socioeconomic status, standards of living, family formation, and reproductive behavior. Furthermore, couple's educational level interacts each other in many stages of life.

The empirical results mostly supported the hypothetical model in Figure 1 which is extracted from previous studies. The number of children of a couple is affected by age at first birth of wife and couple's educational levels. Though couple's educational attainment level interacts and jointly influences reproductive behavior, in the model of wives aged more than 40, husband's education has stronger influences on it than that of wife's in Thailand. Age at first birth is an intervening variable between age at first marriage and number of living children, and it is not directly affected by wife's education. Wife's age at first marriage which obliges the length of her reproductive period is influenced essentially by her own educational attainment, and by the educational homogamous with her spouse.

Altering an expression, later marriage which is inspired by female educational level and educational homogamy at mate selection inclines to delay the first childbearing and to shorten reproductive terms of women. Educational level influences not only marriage behavior but also reproductive behavior.

REFERENCES

Akers, D. S. 1967. "On measuring the marriage squeeze," *Demography* 4: 907-924.

Anzo, Shinji. 1986. "Measurement of the marriage squeeze and its application," *The Journal of Population Studies*. 1985:1-10.

——. 1989. "The determinants of age at first marriage--Analysis on Japanese time series data," *The Review of Economics and Political Science* 57, 173-204 (in Japanese).

Carter, H. and P. C. Glick. 1970. *Marriage and Divorce: A Social and Economic Study*, Harvard University Press, Mass.

Davis, Kingsley and Judith Blake. 1956. "Social structure and fertility: An analytic framework," *Economic Development and Cultural Change* 4: 211-235.

Dillon, William R. and Matthew Goldstein. 1984. *Multivariate Analysis, Methods and Applications*, John Wiley & Sons, New York.

Dinkel, Robert M. 1965. "Education and fertility in the United States," in *Population and Society*, ed. Charles B. Nam, 1986, Houghton Mifflin Company, Boston, pp.517-520.

Easterlin, Richard, A. 1978. "What will 1984 be like? Socioeconomic implications of recent twists in age structure," *Demography*, 15: 397-421.

——. 1980. *Birth and Fortune: The Impact of Number on Personal Welfare*, Basic Books, New York.

Edwards, John N. 1969. "Family behavior as social exchange," *Journal of Marriage and the Family* 31: 518-526.

Glenn, Norval D. "Interreligious marriage in the United States: Patterns and recent trends," *Journal of Marriage and the Family* 42: 555-566.

Goldscheider, Frances, K. and Linda J. Waite. 1986. "Sex differences in the entry into marriage," *American Journal of Sociology* 92: 91-109.

Goode, W. J. 1963. *World Revolution and Family Patterns*, The Free Press, New York.

Heer, David M. 1975. *Society and Population, Second Edition*, Prentice-Hall, Inc., New Jersey.

——, and A. Grossbard-Shechtman. 1983. "The impact of the female marriage squeeze and the contraceptive revolution on sex roles and the women's liberation movement in the United States, 1960 to 1975," *Journal of Marriage and the Family* 43: 49-65.

Institute for Resource Development. 1988. *Description of the Demographic and Health Surveys Individual Recode Data File*, Macro System, Inc.

Kasarda, John D., John O. G. Billy, and Kirsten West. 1986. *Status Enhancement and Fertility, Reproductive Responses to Social Mobility and Educational Opportunity*, Academic Press, Inc., New York.

Labov, Teresa, and Jerry A. Jacobs. 1986. "Intermarriage in Hawaii, 1950-1983," *Journal of Marriage and the Family* 48: 79-88.

Morgan, Barrie S. 1981. "A contribution to the debate on homogamy, propinquity, and segregation," *Journal of Marriage and the Family* 41: 909-921.

Rockwell, Richard, C. 1976. "Historical trends and variations in educational homogamy," *Journal of Marriage and the Family* 38: 83-95.

Schoen, Robert. 1983. "Measuring the tightness of a marriage squeeze," *Demography* 20: 61-78.

——, and John Wooldredge. 1989. "Marriage choices in North Carolina and Virginia, 1969-1971 and 1979--81," *Journal of Marriage and the Family* 51: 465-481.

Surra, Catherine A. 1990. "Research and theory on mate selection and premarital relationships in the 1980's," *Journal of Marriage and the Family* 52: 844-865.

Spanier, G. B. and P. C. Glick. 1980. "Mate selection differentials between whites and blacks in the United States," *Social Forces* 58: 705-725.

Vera, Hernan, Donna H. Berardo, and Felex M. Berardo. 1985. "Age heterogamy in marriage," *Journal of Marriage and the Family* 47: 553-566.

Wonnacott, Thomas H., and Ronald J. Wonnacott. 1981. *Regression: A Second Course in Statistics*, John Wiley & Sons, New York.