Urban-Rural Differentials in Fertility Behavior in Korea: Preliminary Analysis for Multilevel Approach*

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This paper describes the preliminary phase of the analysis of fertility behavior in Korea prior to the multilevel analysis. The basic reason for the study of urban — rural differentials in the fertility behavior as a preliminary phase is to treat social contexts, reflecting location along a traditional — transitional continuum. This paper thus discusses for urban and rural areas, the main differences of the macro variables, the mean levels of the fertility measures, and the regression coefficients of the micro models. It evaluates the variables which show different effects in urban and rural areas for age at first brith (AFB), early fertility (EF), and later fertility (LF) structural equations. As a result, some of the micro variables were found to show significantly different effects on fertility-related behavior in urban and rural areas.

I. Introduction

In the field of demographic research, there has recently been a shift from the analysis of either micro or macro level data to the analysis of a combination of micro and macro level data (Duncan, 1964; Srikantan, 1967; Anker, 1973; Mason and Palan, 1981; Alauddin, 1979; Nizamuddin, 1979; Chou, 1981; Chayovan, 1982). Investigation of fertility-related behavior employing multilevel analysis is, especially, a recent phenomenon (Entwisle *et al.*, 1982; Mason and Entwisle, 1982; Mason *et al.*, 1982; Entwisle and Mason, 1983; Ahmed, 1984; Kim, 1984). The main focus of such studies has been on the extent to which community-level factors have significant influence on individual demographic behavior beyond the influence of individual-level factors.

Freedman (1974) emphasizes the use of community-level data in fertility survey. He argues that the neighborhood, community, or social milieu in which couples live may affect reproductive behavior in interaction with the individual characteristics. Thus, he suggests that community-level analyses are particularly appropriate for developing countries where different communities are likely to be at different levels of development and where intracountry demographic differences are likely to be large. In showing a relationship between education and fertility, he maintains that fertility is influenced not only by the educational level of an individual but also by the educational level of the community. He further shows an interesting example;

> It is plausible that poorly educated women living in a well-educated community may have lower fertility than the national average for their educational class, because in their local communities they find models for smaller families, legitimation for limiting fertility, and more readily available birth control services (Freedman, 1974: 8).

In a paper dealing with World Fertility Survey (WFS) data, Freedman (1979) indicates that the greater the mean number of years of education in a country, the stronger is the negative relation of education to fertility. Further, in addition to the expected positive relation of indices of modernization to the level of education, the higher the level of modernization indices, the greater is the negative regression of education on fertility.

In carrying out a comparative analysis of WFS data, Hermalin and Mason (1980) suggest a

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two-stage analysis.[1] At the first stage, the researchers work with the individual data for each country. At the second stage, they work with country level data adjusted for the results of the first stage. They argue that the two-stage analysis has the procedural advantages of restricting and focusing on substantive considerations of two levels of aggregation. Furthermore, the two-stage procedure has the methodological advantages of allowing different specifications at the micro and macro levels, and thus of extracting all possible sources of macro variability from the micro-level model. For example in considering the effect of education on parity, they propose a curvilinear hypothesis such that the effect of education on parity turns from positive to negative with socioeconomic development.

Entwisle *et al* (1982) analyze socioeconomic determinants of fertility behavior using WFS data at both micro-level and macro-level stage. They expect the magnitudes, and sometimes the directions, of the effects of specific socioeconomic factors to vary across societies in meaningful ways. They also expect the coefficients of the micro equations to vary across countries. Thus, they employ a related macro-level model, the purpose of which is to explain variability in the micro coefficients. Their hypotheses regarding the effects of socioeconomic variables depend on societal context. In transitional settings there should be a positive but weak relationship between socioeconomic status and fertility. In transititonal settings, however, an inverse relationship is expected, mainly due to low levels of fertility associated with high socioeconomic status.[2]

Mason and Entwisle (1982) further developed the contextual analysis using the same WFS data. Their analysis comes from the hypothesis that the linear effect of a socioeconomic variable would travel from positive to negative as socioeconomic development proceeds. They found that in a setting where there is no official family planning program, and where GNP per capita is the lowest, urban women have more children than rural women. At the highest level of GNP per capita, however, urban women have much less children than rural women. The analysis also reveals that the higher the GNP per capita, the more sizable the education effect on children ever born; and that the higher the family planning effort score, the smaller the effect of education on children ever born. Therefore, the education effect becomes more pronounced as GNP increases and is attenuated by increases in family planning effort score.

In terms of the contextual analysis of the fertility-related behavior in Korea, there have been a few studies (Hong, 1976; Lee, 1977; Lee *et al.*, 1978). However, none of the studies have supported the assumption that the community-level variables would explain fertility-related behavior beyond individual-level variables. The reasons could be as follows. In some cases, dependent variables were inappropriately examined. The presence of measurement or sampling errors was also possible. More important, however, is the possible mis-specification of the model. Finally, the methodology did not fit for the understanding of the relative importance of the community characteristics on the individual fertility behavior in Korea. The only possible solution for the methodological problems in dealing with both individual-level and community-level data so far could be to use the multilevel analysis technique which was introduced by Entwisle *et al.* (1982).

The objective of this paper is to describe the preliminary phase of the analysis of fertility behavior in Korea prior to the multilevel analysis. The basic reason for the study of urban-rural differentials in the fertility behavior as a preliminary phase is to treat social contexts, reflecting location along a traditional-transitional continuum. The distinction between traditional and transitional settings focuses on the degree of transitionality in terms of socioeconomic development as well as fertility control. This study is based on the assumption that the effects of socioeconomic variables on fertility vary from community to community in Korea, depending on the level of socio-economic development. Actually there are large variations of fertility rates as well as of development level across communities in Korea (ESCAP, 1975; Park, 1978).

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1. Hermalin and Mason (1980) consider a two-stage analysis as a multilevel analysis.
2. In traditional settings, there is no explicit idea or practice of fertility control, whereas in transitional settings, some explicit idea and practice exist (Entwisle *et al.*, 1982).

Given the high category of the social setting index among developing countries (Mauldin *et al.*, 1978), however, Korea as a whole should be categorized as a transitional society, although the urban sector is further along the continuum of transitionality than the rural sector. Thus, for analytical purposes, this study considers the rural sector as a relatively traditional setting and the urban sector as a relatively transitional setting instead of using the absolute distinction of traditional and transitional settings.

This paper discusses for urban and rural areas, the main differences of the macro variables, the mean levels of the fertility measures, and the regression coefficients of the micro models. Explanation of the urban-rural differentials in the regression coefficients will eventually lead to the multilevel analysis. In this paper, however, the analysis would be stopped at the preliminary phase dealing with the differential fertility for urban and rural areas, mainly due to the limited space.

II. The model

The framework of the model is formalized as a set of structural equations modelling the fertility process. The model is formed on a cohort-specific processual basis and is restricted to five-year birth cohorts. The reasons for choosing this particular model are, first, the use of five-year cohorts reduces the need to consider age as a determinant of fertility; second, it allows assessment of the differential response of cohorts to contextual change; and, finally, it provides unambiguous reference points for assessing the influence of macro fertility determinants (Entwisle *et al.*, 1982; 6). The model includes three fertility-process components; onset, early fertility, and later fertility, which are defined by reference to the age of the mother. Using Korean data, this study will trace the effects of the respondent's education and childhood residence through their intermediate consequences for work experience before and after marriage, husband's education and occupation, current residence, childhood mortality, and sex composition of offspring.

The proposed model is composed of four blocks of variables. These are illustrated in Figure 1, which shows a causal model. Block I contains the exogenous variables, and Blocks II-IV indicate the stages of the fertility process. Block II corresponds to the onset of fertility, defined as age at first birth (AFB). Block III corresponds to early fertility (EF), and Block IV to later fertility (LF). Early fertility refers to births occurring before mothers reach age 30, later fertility to births thereafter. Both early and later fertility are measured by the number of children born during those stages. The model traces the effects of age at first birth on the pace of subsequent fertility.

Blocks I and II depict a model of age at first birth, the first stage of the fertility process. Block I contains the socioeconomic and demographic variables which are predetermined with respect to AFB: respondent's childhood residence (RESCH) and education (WED). Thus, the structural equation for AFB model is formed as follows:

$$\text{AFB} = \beta_{0.1} + \beta_{2.1}\,\text{RESCH} + \beta_{2.1}\,\text{WED} \qquad (1)$$

For each coefficient the i-subscript denotes the variable number and the j-subscript denotes the equation number.

Block III of Figure I refers to early fertility, the second stage of the fertility process. All the variables in Blocks I and II (RESCH, WED, AFB, and WBM) are predetermined with respect to early fertility, forming equation as follows:

$$\text{EF} = \beta_{0.2} + \beta_{1.2}\,\text{RESCH} + \beta_{2.2}\,\text{WED} + \beta_{3.2}\,\text{AFB} + \beta_{4.2}\,\text{WBM} \qquad (2)$$

Bock IV of Figure 1 corresponds to the final stage of the fertility process. The predictions of later events are much more complicated than those of earlier events. In the model proposed here all the variables of Blocks I through III are hypothesized to be predetermined with LF. In additon, some interaction terms are included in the equation (For more detailed explanation, see Kim, 1984 or 1985). The LF equation is thus formed as follows:

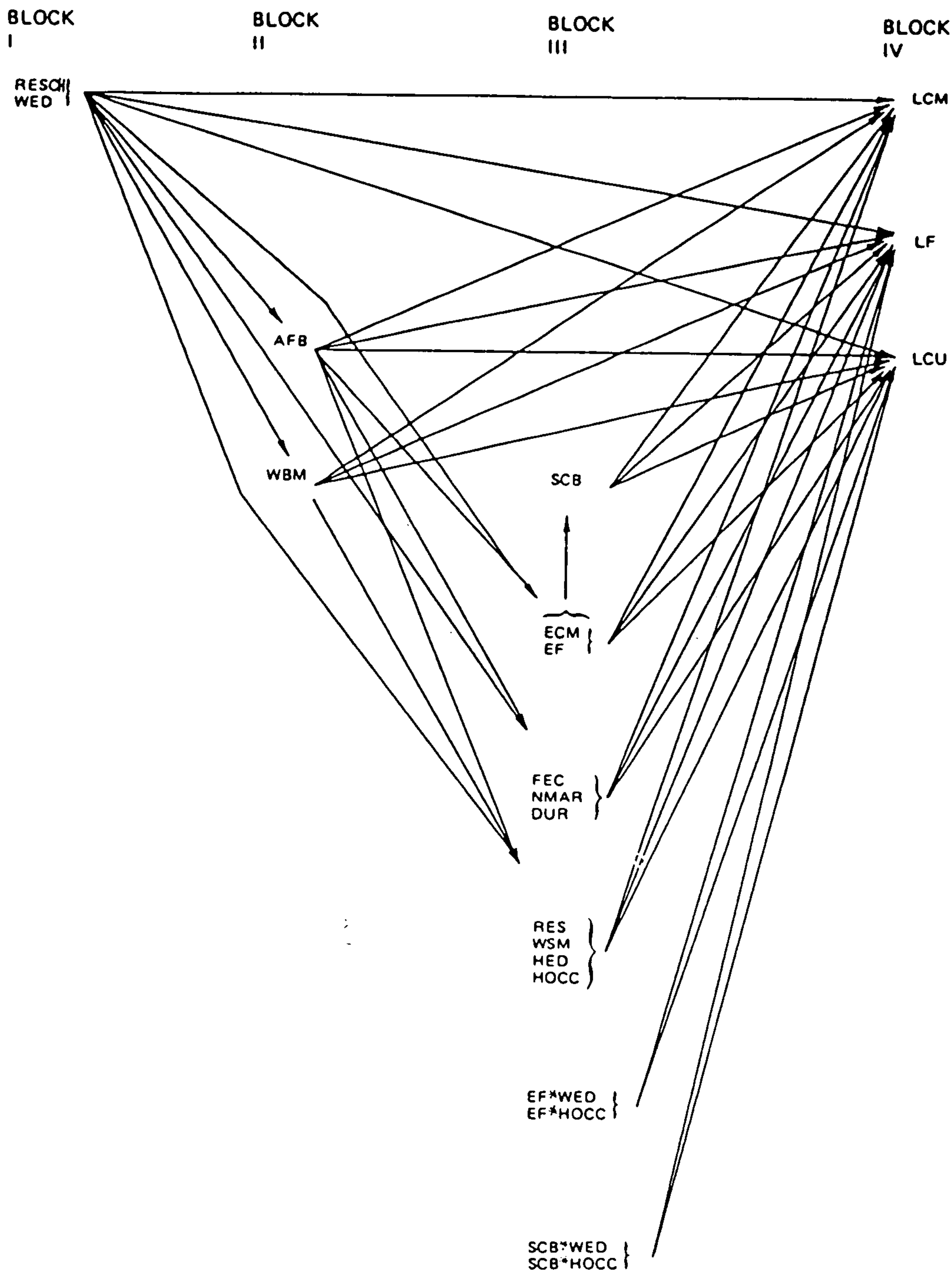

Figure I. Causal Diagram of Proposed Model
Source: Adapted from Entwisle *et al.* (1982)

Table 1. **Predicted Signs of Structural Coefficients in rural and urban Settings**

Predetermined Variables	Response Variables		
	AFB	EF	LF
RESCH	− +	+	+ −
WED	− +	+	+ −
AFB		−	−
WBM		0 +	0 −
ECM			0 +
EF			+ −
SCB			0 −
RES			+ −
WSM			0 −
HED			+ −
HOCC			+ −
NMAR			0 +
DUR			+
FEC			+
AFBSQ			0 +
EF * WED			0 −
EF * HOCC			0 −
SCB * WED			0 *
SCB * HOCC			0 *

Note: A single entry means that the predicted sign is the same in rural and urban settings. When there are two entries, the first is the sign for rural settings. An entry of zero means that the effect is hypothesized to be nonexistent in both settings. An asterisk means that no directional hypothesis has been advanced. Such coefficients can vary in direction over populations, but this variability is not expected to be related to the traditional-transitional continuum.

$$\begin{aligned} LF = {} & \beta_{0.3} + \beta_{1.3}\,RESCH + \beta_{2.3}\,WED + \beta_{3.3}\,AFB + \beta_{4.3}\,WBM \\ & + \beta_{5.3}\,ECM + \beta_{6.3}\,EF + \beta_{7.3}\,SCB + \beta_{8.3}\,RES + \beta_{9.3}\,WSM \\ & + \beta_{10.3}\,HED + \beta_{11.3}\,HOCC + \beta_{12.3}\,NMAR + \beta_{13.3}\,DUR \\ & + \beta_{14.3}\,FEC + \beta_{15.3}\,(AFB)^2 + \beta_{16.3}\,EF*WED \\ & + \beta_{17.3}EF*HOCC + \beta_{18.3}\,SCB*WED + \beta_{19.3}\,SCB*HOCC \end{aligned} \tag{3}$$

Table 1 shows predicted signs of all the structural coefficients in rural and urban areas for AFB, EF, and LF models (see Kim, 1984). This table was originally constructed on the basis of the traditional-transitional continuum (Entwisle *et al.*, 1982). However, Korea as a whole should be categorized as a transitional society. Thus, the original hypotheses could be operationally modified as follows on the basis of the relatively traditional-relatively transitional continuum. The original hypotheses would be kept if the coefficients of the variables in those two settings are in the different direction; and the absolute value of the micro effects would be greater in urban areas (relatively traditional settings) than in rural areas (relatively traditinal settings) if both effects are in the same direction.

III. Data and Methodology

The data for the micro analysis of this study come from the 1974 Korean National Fertility Survey (KNFS), which was conducted as part of the World Fertility Survey (WFS). They are derived using two different sampling procedures for urban and rural areas. The survey was done first on house-

Table 2. **Micro Variables and Their Operational Definitions**

Variables	Description
AFB	Age at first birth
EF	Number of children born before respondent reaches age 30
LF	Number of children born after respondent's 30th birthday
ECM	Number of children dying before respondent reaches age 30
LCM	Number of children dying after respondent's age 30
SCB	Dummy variable taking the value of 1 if respondent has two or more living sons on her 30th birthday; 0 otherwise
LCU	Dummy variable taking the value of 1 if respondent had used any kinds of contraception after respondent's age 30; 0 otherwise
NMAR	Number of marriages contracted by respondent
DUR	The number of months in marriage between respondent's 30th birthday and survey date
FEC	Dummy variable taking the value of 1 if respondent indicates no problems in having children; 0 otherwise
RESCH	Dummy variable indicating place of childhood residence (omitted category is rural childhood residence)
WED	Respondent's level of education (number of years)
WBM	Dummy variable taking the value of 1 if respondent was employed in the modern sector before her first marriage; 0 otherwise
WSM	Dummy variable taking the value of 1 if respondent was employed in the modern sector after her first marriage; 0 otherwise
HED	Husband's level of education (number of years)
HOCC	Dummy variable taking the value of 1 if husband was employed in the modern sector; 0 otherwise
RES	Dummy variable for current residence (omitted category is rural residence)

Table 3. **Community Variables and Their Operational Definitions**

Socioeconomic Development Variables	
ED	Average Level of education of a community
RAD	Percentage of people having a radio
CLIN	Number of clinics per 100,000 population
Family Planning Variables	
CYP	Couple-years of protection per 1,000 population
WOK	Number of family planning workers per 100,000 population

holds then on individuals. For urban areas, the household survey was done for every other household within 192 Sample Enumeration Districts (SED). The individual survey was done for every third household among the households selected for household survey. For rural areas, the household survey was done for every household within 127 SEDs, while the individual survey was done for every third household within each SED. The SEDs were generally based on the 1970 Census Enumeration District (CED), which were composed of 80 to 90 households each. Micro variables and their operational definitions are presented in Table 2.

The community-level data come from Korea government statistics for a certain period of time. The community-level data are collected by city unit for urban areas and county unit for rural areas. For the purpose of this study, I employ projected community variables for 1974 calculated through a regression technique using the data of 1964 to 1973. This is based on the fact that comunity-level variables should affect fertility behavior for a certain period of time. The community-level data and their operational definitions are presented in Table 3.

Multiple regression is used for the estimation of AFB, EF, and LF structural equations separately for urban and rural areas. Multiple regression permits an assessment of the amount of variance of the dependent variable explained by the coefficient of R^2. Also it allows a test of the significance of each individual-level variable affecting the dependent variable.

IV. Analysis: Urban-Rural Differentials in Fertility

Table 4 presents the means and standard deviations of the fertility measures and the community variables. This table shows that age at first birth has risen consistently over successive cohorts. In all the cohorts, age at first birth is higher in urban areas (city) than in rural areas (county). And, in all the cohorts, both EF and LF are lower in urban areas than in rural areas without exception. The results for AFB, EF, and LF indicate that urban women had their first child later than rural women, and that urban women had fewer children than rural women both before and after age thirty.

Age at first birth has increased over time both in urban and rural areas. Also, younger women have experienced lower early fertility (EF) and lower later fertility (LF) than older women. But comparisons across cohorts are not meaningful because older women have been at risk of pregnancy for a longer time than younger women.

Urban-rural differentials in the mean levels of socioeconomic development variables and of family planning variables show opposite directions: For socioeconomic development variables, the means are higher in urban areas than in rural areas; in contrast, the mean levels of all the family planning variables are lower in urban areas than in rural areas. Mean levels of education (ED) are higher by roughly 2.5 years in urban areas than in rural areas. The mean number of general clinics (CLIN) per capita is much higher in urban than in rural areas. This indicates that the Korean government has invested more in urban areas than in rural areas. As for the ownership of radios (RAD), there are almost no differences between urban and rural areas. Thus, RAD will be excluded

Table 4. **Means and Standard Deviations of Fertility Measures and Community Variables, by Cohort**

Variables	Cohort 30-34					
	All		City		County	
	Mean	SD	Mean	Sd	Mean	SD
Fertility Measures						
AFB	23.42	2.93	24.01	2.98	22.72	2.70
EF	2.95	1.15	2.70	1.12	3.25	1.11
LF	.63	.69	.50	.64	.78	.72
Socioeconomic Devevelopment Variables						
ED	6.64	1.50	7.87	.76	5.18	.55
RAD	15.38	1.94	15.61	1.87	15.10	1.98
CLIN	36.69	23.42	55.15	15.31	14.90	6.42
Family Planning Variables						
CYP	33.02	20.02	24.24	6.58	43.40	25.00
WOK	6.18	4.62	2.66	2.02	10.35	3.10

Note: "SD" indicates a standard deviation.

Table 4. **(Continued)**

Variables	Cohort 35-39					
	All		City		County	
	Mean	SD	Mean	Sd	Mean	SD
Fertility Measures						
AFB	22.53	2.94	23.19	3.21	21.89	2.50
EF	3.16	1.24	2.77	1.22	3.53	1.15
LF	1.37	1.12	1.07	.98	1.66	1.17
Socioeconomic Development Variables						
ED	6.49	1.50	7.88	.74	5.17	.53
RAD	15.25	1.85	15.44	1.68	15.07	1.99
CLIN	34.73	23.55	55.83	14.89	14.61	6.51
Family Planning Variables						
CYP	33.71	17.90	24.25	6.64	42.72	20.43
WOK	6.50	4.60	2.57	1.85	10.26	3.05

Note: "SD" indicates a standard deviation.

Table 4. **(Continued)**

Variables	Cohort 40-44					
	All		City		County	
	Mean	SD	Mean	SD	Mean	SD
Fertility Measures						
AFB	21.55	3.41	22.22	3.43	21.07	3.32
EF	3.49	1.34	3.22	1.36	3.68	1.30
LF	1.99	1.41	1.37	1.14	2.44	1.42
Socioeconomic Development Variables						
ED	6.27	1.44	7.79	.74	5.15	.50
RAD	15.27	1.82	15.41	1.60	15.16	1.96
CLIN	31.28	22.10	53.78	14.78	14.79	6.52
Family Planning Variables						
CYP	34.97	15.59	24.86	6.44	42.38	16.16
WOK	7.12	4.64	2.62	1.73	10.42	3.05

Note: "SD" indicates a standard deviation.

from the multilevel analysis because it will not show any clear pattern in determning the contextual differences of fertility behavior.

In contrast to the socioeconomic development variables, the mean levels of the family planning variables are much higher in rural areas than in urban areas all through the cohorts. Mean values of the couple-years of protection (CYP) in rural areas are almost twice as large as those in urban areas. Differences in average numbers of family planning workers (WOK) are even greater: the means in rural areas are almost four times as large as those in urban areas. Thus, the results for CYP and WOK indicate that family planning efforts have been emphasized to a greater extent in the rural sector than in the urban sector.

The variability between urban and rural areas in terms of socioeconomic development and family planning efforts can reasonably lead to the variability in the effect of socioeconomic characteristics on the fertility-related behavior. Thus, on the basis of this variability, the micro-macro model, which was originally designed for an inter-country study (Entwisle *et al.,* 1982), may be applied to a within-country study, as well.

Table 5 presents the minimum and maximum values of community variables. The range of values indicates that there is high variability in socioeconomic development status and family planning efforts among communities in Korea. This variability remains high, even among communities within urban areas or among communities within rural areas. The extent of the observed variability between communities within Korea provides a rationale to justify substantively the multilevel analysis of the fertility behavior, on the basis of the traditional-transitional continuum.

The regression coefficients of the fertility measures in urban and in rural areas are compared next. Table 6 presents the regression coefficients of the models for age at first birth (AFB) for the cohorts aged 30-34, 35-39, and 40-44. First, in urban areas the hypothesized positive effects of RESCH are found in the cohorts aged 30-34 and 35-39, but statistically significant only in the cohort aged 35-39. In the cohort aged 40-44, the direction of the coefficient of RESCH is statistically significant, and opposite to that hypothesized. That is, for 35-39 year old women in urban areas, the experience of having lived in urban areas during their childhood positively influences the age at first birth. For the 40-44 year old women, however, the experience of having lived in urban areas negatively affects the age at frst birth.

In rural areas (county), the hypothesized negative effects are not found in any cohort. However, the statistical significance is found only in the 30-34 years old cohort. For the 30-34 years olds, the positive coefficient of RESCH for rural areas indicates that among rural women the experience of having lived in urban areas during their childhood positively influences the age at first birth.

Table 5. **Minimum and Maximum Values of Community Variables**

Variables		Setting		
		All	City	County
ED	Minimum	4.10	4.81	4.10
	Maximum	8.63	8.63	7.38
RAD	Minimum	11	11	11
	Maximum	24	24	22
CLIN	Minimum	2	9	2
	Maximum	71	71	34
CYP	Minimum	18	18	26
	Maximum	346	45	346
WOK	Minimum	1	1	5
	Maximum	19	14	19

Table 6. **Regression Coefficients of the Micro Models for AFB**

Variables	City			County		
	30-34	35-39	40-44	30-34	35-39	40-44
RESCH	.01	.74	−1.05	1.35	.72	.51
	(.02)	(2.18)*	(−2.30)*	(2.70)**	(1.10)	(.78)
WED	.30	.19	.22	.23	.15	.11
	(8.73)**	(4.96)**	(4.16)**	(6.22)**	(3.77)**	(1.93)*
Intercept	21.76	21.71	21.21	21.57	21.39	20.74
	(82.03)**	(75.91)**	(59.43)**	(104.87)**	(127.32)**	(93.06)**
R^2	.142	.080	.060	.103	.034	.012
N	550	452	296	466	474	404

Notes: t-ratios are in parentheses.
*) $.01 \leq p < .05$
**) $p < .01$

Comparing the RESCH coefficients of urban and rural areas, the coefficient is generally higher in rural areas than in urban areas, which is not compatibele with the hypothesis.

The effects of women's education (WED) on age at first birth are positive and statistically significant for all through the cases. This study hypothesized that the WED effect would be negative in rural areas but positive in urban areas or the effect would be greater in urban areas. The hypothesized positive effects of WED are found in urban areas. But the hypothesized negative effects are not found in rural areas. Despite the postive coefficients of WED in rural areas, however, the WED effect in general could be compatible with the hypothesis, given the higher coefficients of WED in urban areas than in rural areas. But its statistical significance should be tested later. Thus, women's education may be considered as an important variable influencing the age at first birth both in urban and rural areas.

The overall sketch of all the cohorts indicates that R^2 is inversely related to age cohort, both in urban and rural areas. And, for all cohorts, R^2's are much higher in urban areas than in rural areas, although the overall R^2's are low. These observations may indicate that the model for AFB is better explained in urban areas than in rural areas and in younger cohorts than in older cohorts. Considering that urban areas are more transitional than rural areas and younger women have more chances of enjoying higher level of socioeconomic development than older women, the results substantively suggest that childhood residence and women's education function as the determinants of age at first birth better as going to the more developed settings.

In sum, the effects of the exogenous socioeconomic variables on age at first birth are mixed. In the case of RESCH, the results are contrary to the hypothesis. That is, the coefficients of RESCH in urban areas are found to be lower instead of higher than those in rural areas. On the other hand, the coefficients of WED are higher in urban areas than in rural areas, which is compatible with the hypothesis. In each case, however, it is not known from Tabel 6 whether the differences in the magnitudes of the coefficients are statistically significant or not. In order to evaluate the statistical significance of the different effects in urban and rural areas, it is necessary to pool the data of urban and rural areas together and then include the micro variables interacted with current residence (RES) in the regression equation.[3]

3. RES is a dummy variable taking the value of 1 if respondent lived in urban areas; 0 otherwise. If the effect of an interaction term on the dependent variable is found to be statistically significant, it indicates that the effects of the variable interacted with RES are significantly different in urban and rural areas.

Table 7. **Regression coefficients of the Micro Models for AFB for Pooled-Data**

Variables	Cohort 30-24		Cohort 35-39		Cohort 40-44	
	Coeff.	t	Coeff.	t	Coeff.	t
RESCH	1.26	2.44**	.66	.90	.38	.59
WED	.27	10.67**	.17	6.34**	.17	4.35**
RES	.56	2.89**	.52	2.40**	.91	3.04**
RESCH∗RES	−1.15	−2.01*	.13	.17	−1.30	−1.66*
Intercept	21.40	125**	21.31	136**	20.58	104**
R^2	.165		.107		.057	
N	1016		926		700	

Note: *) $.01 \leq P < .05$
**) $P < .01$

Table 7 presents the regression coefficients of the micro models for AFB for pooled-data. Originally, in the regression equation for pooled-data, both RESCH∗RES and WED∗RES could be included. However, the effects of WED∗RES on AFB are not statistically significant in any of the cohorts. Thus, WED∗RES is dropped but RESCH∗RES is included in the regression equation for pooled-data. The coefficients of RESCH∗RES for both 30-34 year old cohort and 40-44 year old cohort are negative and statistically signifcant at the p = .05 level for one-tailed test. The results substantively indicate that the effect of RESCH on AFB is greater with statistical significance in rural areas than in urban areas. These are not compatible with the hypothesis that the coefficient of micro socioeconomic variables would be greater in urban areas than in rural areas if the coefficients in both areas are in the same direction. On the other hand, the coefficients of WED are higher in urban areas than in rural areas as expected, but further analysis shows that the differences in the magnitudes of the coefficients between urban and rural areas are not statistically significant in any cohorts. We may thus conclude that the effects of women's education on age at first birth are positive in any settings and that there are actually no differences of the effects between urban and rural areas in any cohorts.

Table 8 presents the regressions for early fertility (EF). The regression coefficients of RESCH on EF are all negative rather than positive, but statistically significant only in the cohort aged 40-44 in rural areas. The regression coefficients of WED are statistically significant only in the cohort aged 30-34 in both areas. That is, a woman's education is important in influencing the fertility level before age thirty, but only among the youngest cohort (30-34) of women. This study hypothesized that WED should positively affect the early fertility, regardless of the social context. However, the results show negative coefficients of WED instead of positive coefficients in both urban and rural areas. This unexpected result may be attributable to younger women with higher education limiting family size even before they reach age thirty.

Next, the effects of age at frst birth (AFB) on EF are negative and statistically significant in all the cases, as hypothesized in this study. For all cohorts, values of R^2 are about .5, although AFB is the single significant variable. This is mainly due to the exposure after the age at first birth. This result indicates that age at first birth is obviously an indispensable variable in explaining fertility before age thirty.

In the cases of later fertility (LF), the regression equations for cohort aged 30-34 are excluded because many women in this cohort have not completed their childbearing. Thus, the regression equations for LF are evaluated for the cases of the cohorts aged 35-39 and 40-44.

Table 9 presents the regression coefficients of the models for LF for the cohort aged 35-39. As in the case of AFB, the hypothesis could be operationally modified as follows. The hypotheses originally constructed would be kept as in Table 1 if the coefficients of the variables in both urban

Table 8. **Regression Coefficients of the Micro Models for EF**

Variables	City			County		
	30-34	35-39	40-44	30-34	35-39	40-44
RESCH	−.07	−.11	−.08	−.05	−.13	−.36
	(−.97)	(−1.16)	(−.55)	(−.32)	(−.61)	(−1.90)*
WED	−.03	−.02	−.01	−.03	−.02	−.002
	(−.2.68)**	(−1.42)	(−.80)	(−2.66)**	(−1.47)	(−.11)
AFB	−.27	−.27	−.27	−.30	−.32	−.28
	(−24.01)**	(−21.17)**	(−15.45)**	(−22.46)**	(−21.01)**	(−20.64)**
WBM	.01	.06	.25	−.10	−.20	.11
	(.14)	(.59)	(1.40)	(−.85)	(−1.09)	(.52)
Intercept	9.43	9.16	9.32	10.14	10.61	9.63
	(36.89)**	(31.80)**	(24.00)**	(34.86)**	(32.16)**	(33.35)**
R^2	.583	.540	.471	.577	.513	.525

Notes: t-ratios are in parentheses.
*) $.01 \leq p < .05$
**) $p < .01$

Table 9. **Regression Coefficients of the Micro Models for LF for Cohort 35-39**

Variables	City				County			
	Equation (1)		Equation (2)		Equation (1)		Equation (2)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
RESCH	1.15	1.56	.15	1.62	.06	.20	.08	.29
WEDa	−.02	−8.3	−.04	−2.36**	−.06	−1.17	−.07	−3.32**
AFB	.18	1.60	.18	1.57	.35	2.04*	.35	2.05*
WBM	.10	.89	.13	1.11	−.02	−.10	−.04	−.17
ECM	.27	3.11**	.26	3.17**	.17	1.98*	.16	1.94*
EFa	.41	1.53	−.05	−.95	−.07	−.35	.02	.27
FEC	.63	3.98**	.65	4.14**	.70	3.49**	.69	3.50**
NMAR	.55	2.68**	.56	2.71**	.10	.38	.09	.38
DUR	.01	2.78**	.01	2.74**	.01	4.96**	.01	4.97**
WSM	−.07	−.56	−.07	−.56	−.61	−1.76*	−.60	−1.76*
HED	−.02	−1.21	−.02	−1.25	−.02	−1.10	−.02	−1.17
HOCCa	.17	1.15	−.09	−1.37	−.16	−.85	−.05	−.81
SCBa	−.53	−.77	−.56	−5.96**	−.84	−1.98*	−.68	−6.45**
AFBSQ	−.003	−1.21	−.003	−1.17	−.01	−1.81	−.01	−1.81*
EF * WED	−.01	−.58			.001	.08		
EF * HOCC	−.01	−1.62			.02	.43		
SCB * WED	.01	.32			−.01	−.40		
SCB * HOCC	−.02	−.13			.06	.50		
Intercept	−3.57	−2.10*	−2.28	−1.44	−3.74	−1.65*	−4.04	−1.87*
R^2	.281		.273		.238		.236	

Notes: a) EF, WED, HOCC, SCB play an interactive as well as additive role in the micro equation (1).
*) $.01 \leq p < .05$ **) $p < .01$

and rural areas are in the different direction; and the absolute value of the micro effects would be greater in urban areas than in rural areas if both effects are in the same direction. The global significance test of all the interaction terms shows that none of the interaction terms in the model is statistically significant either in city or county. Thus, the effect of each variable can be read directly from model(2) which does not include the interaction terms in either case. In this table, the coefficients of each variable are directly compared in urban and rural areas. The significance test of the differences in the magnitudes of the coefficients in the same direction is provided next in Table 10.

The effects of WED are negative and statistically significant in both areas. The WED effect in urban areas is compatible with the hypothesis in terms of the direction, but is not in rural areas. The evaluation of the differences in the magnitudes of the coefficients will be provided later. The effects of AFB are positive in both city and county, but the effect is not significant in city. This result is different from the expectation that the AFB effect would be negative regardless of the setting. The effects of $(AFB)^2$ on LF are both negative and not statistically significant in city but significant in county. Contrary to the hypothesis, none of the effects of the endogenous socioeconomic variables (WBM, WSM, HED, and HOCC) is statistically signifcant in either city or county, except the case of WSM in county. The effect of WSM on LF in county is negative, as hypothesized.

The effects of ECM on LF for 35-39 year olds are positive and statistically significant in both urban and rural areas. The effects of FEC and DUR are all positive and significant, as expected. The effects of NMAR are compatible with the hypothesis that there be no NMAR effect in relatively traditional contexts, but a positive effect in relatively transitional contexts. Finally, the effects of SCB are negative and highly significant in both cases of city and county. In sum, in the cohort aged

Table 10. **Regression Coefficients of the Micro Models for LF for Pooled-data for Cohort 35-39**

Variables	Corfficient	t
RESCH	.16	1.60
WEDa	−.17	−4.08**
AFB	.21	2.30*
WBM	.07	.64
ECM	.21	3.45**
EF	−.01	−.34
FEC	.67	5.32**
NMARa	−.06	−.27
DUR	.01	5.65**
WSMa	−.68	−2.20*
HED	−.02	−1.63
HOCC	−.06	−1.42
SCB	−.63	−8.94**
AFBSQ	−.003	−1.82*
RESa	−1.32	−3.83**
WED * RES	.04	1.88*
NMAR * RES	.69	2.23*
WSM * RES	.61	1.81*
Intercept	−1.95	−1.55
R^2	.296	
N	926	

Notes: a) WED, NMAR, WSM, and RES play an interactive as well as additve role in the equation.
*) $.01 \leq p < .05$
**) $P < .01$

35-39, the effects of the adjustment variables on LF are generally consistent with the hypothesis, but those of the socioeconomic variables are not. Overall, the coefficients of the micro variables in urban and rural areas are all in the same direction, except the cases of WBM and EF. But, none of the coefficients of WBM and EF are statistically significant.

Table 10 presents the regression coefficients of the micro models for LF for pooled-data for cohort aged 35-39. The main purpose of presenting this table is to show the significance of differences in the magnitudes of the coefficients in the same direction. Originally, all the variables interacted with RES could be included in the regression equation. Exclusion of the statistically insignificant interaction terms produces the final regression equation in Table 10. In this equation, three of the interaction terms (WED∗RES, NMAR∗RES, WSM∗RES) turned out to be statistically significant. Combining with the negative effects of WED in both urban and rural areas in Table 9, the positive effect of WED∗RES indicates that the effect of WED on LF is significantly greater in negative direction in rural areas than in urban areas. This result is contrary to the hypothesis that the absolute value of the micro effects would be greater in urban areas than in rural areas if both effects are in the same direction. The result of WSM is the same as in the case of WED. Substantively, Women's education as well as women's work experience after marriage has a greater effect on later fertility among rural women than among urban women. On the other hand, the positive effect of NMAR∗RES is compatible with the hypothesis that the effect of NMAR on LF would be positive in relatively transitional society.

Table 11 presents the regression coefficients of the models for LF for 40-44 year olds. As in the case of the cohort aged 35-39, none of the interaction terms for the cohort aged 40-44 is statistically significant. Thus, the effect of each variable can be read directly from model (2) in both case of city and county.

Table 11. **Regression Coefficients of the Micro Models for LF for Cohort 40-44**

Variables	City				County			
	Equation (1)		Equation (2)		Equation (1)		Equation (2)	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
RESCH	−.12	−.77	−.12	−.79	−.22	−.77	−.23	−.83
WEDa	−.04	−.76	−.04	−1.95*	.002	.03	−.04	−1.64
AFB	.23	1.50	.25	1.76*	.21	1.62	.21	1.60
WBM	.27	1.36	.27	1.37	.14	.46	.20	.66
ECM	.02	.18	.02	.18	.30	2.98**	.30	3.12**
EFa	−.38	−.89	−.05	−.69	−.02	−.09	−.06	−.77
FEC	.28	2.03*	.30	2.16*	.33	2.11*	.32	2.08*
NMAR	.01	.04	.01	.03	−.40	−1.64	−.39	−1.62
DUR	.01	3.44**	.01	3.50**	.02	5.11**	.02	5.06**
WSM	−.48	−2.18*	−.50	−2.31*	−.16	−.26	−.24	−.41
HED	−.001	−.03	−.001	−.05	−.03	−1.68*	−.03	−1.63
HOCCa	−.46	−1.46	−.18	−1.85*	−.23	−.85	−.24	−2.81**
SCBa	−.57	−.63	−.41	−2.88**	−.33	−.54	−.50	−3.29**
AFBSQ	−.004	−1.28	−.004	−1.52	−.004	−1.42	−.004	−1.46
EF∗WED	.001	.04			−.005	−.26		
EF∗HOCC	.07	.76			−.001	−.02		
SCB∗WED	−.02	−.57			−.05	−1.08		
SCB∗HOCC	.06	.30			−.01	−.04		
Intercept	−.97	−.35	−2.53	−1.21	−1.57	−.76	−1.12	−.61
R^2	.190		.186		.235		.231	

Notes: a) EF, WED, SCB play an interactive as well as additive role in the micro Equation (1).
*) $.01 \leq P < .05$ **) $P < .01$

The effects of WED are negative in both urban and rural areas, but statistically singificant only in urban areas. The effects of AFB are negative rather than positive, but the effect is statistically significant only in urban areas. The effects of ECM are positive in both cases, but statistically significant only in rural areas. The result is not consistent with the hypothesis of this study.

The effects of WSM are compatible with the hypoehtsis that there should be no effect of WSM in relatively traditional contexts, and a negative effect in relatively transitional contexts. The effects of HOCC are both negative and statistically significant. Considering that the absolute values of the coefficients are greater in rural areas, however, this result may not be compatible with the hypothesis.

The effects of FEC and DUR on LF are both positive and statistically significant in all the cases. These effects are compatible with the hypothesis that they should be positive, regardless of social contexts. Finally, the effects of SCB are negative and statistically significant. Overall, the coefficients of the micro variables in urban and rural areas are all in the same direction, except the case of NMAR. But, the coefficients of NMAR are not statistically significant in either city or county. Thus, it is necessary to test the statistical significance of the differences in the magnitudes of the coefficients between urban and rural areas.

Table 12 shows the regression coefficients of the micro models for LF for pooled-data for cohort aged 40-44. As in Table 10 the main purpose here is to show the evaluation of the differences in the magnitudes of the coefficients in the same direction. In Table 12, two of the interaction terms (ECM∗RES, HED∗RES) are found to be statistically significant at the level of p=.05 for one-tailed test. Combining with the psotiive effects of ECM in both urban and rural areas in Table 11, the negative effect of ECM∗RES indicates that the effect of ECM on LF is significantly greater in positive direction in rural areas than in urban areas. This is not compatible with the hypothesis.

Table 12. **Regression Coefficients of the Micro Models for LF for Pooled-Data for Cohort 40-44**

Variables	Coefficent	t
RESCH	−.19	−1.34
WED	−.05	−2.60**
AFB	.22	2.34**
WBM	.24	1.42
ECMa	.32	3.81**
EF	−.06	−1.15
FEC	.29	2.82**
NMAR	−.23	−1.29
DUR	.01	6.25**
WSM	−.43	−1.98*
HEDa	−.03	−2.01*
HOCC	−.23	−3.59**
SCB	−.46	−4.37**
AFBSQ	−.004	−2.09*
RESa	−.80	−3.62**
ECM∗RES	−.32	−2.48**
HED∗RES	.04	1.70*
Intercept	−1.09	−.82
R^2	.321	
N	700	

Notes: a) ECM, HED, and RES play an interactive as well as additive role in the equation.
*) $.01 \leq P < .05$
**) $P < .01$

Substantively, early child mortality has a greater positive impact on later fertility among rural women than among urban women. That is, there tends to be a higher level of replacement of dead child in rural areas. On the other hand, the positive effect of HED*RES, in combination with the negative effects of HED, indicates that the effect of HED on LF is significantly greater in negative direction in rural areas than in urban areas. This is contrary to the hypothesis. Again, the effect of husband's education on later fertility is greater in rural areas than in urban areas.

In conclusion, the effects of the variables on later fertility are mixed throughout the cohorts. Table 13 shows the variables which are statistically significant in LF structural equations across cohorts for pooled-data. First, among adjustment variables, the variables which have shown a consistent pattern of significant effects across the cohorts are FEC, DUR, and SCB. The effects of FEC and DUR on LF are all positive, as hypothesized. The effects of SCB are all negative in both urban and rural areas. This result implies that Korean women have a very strong son preference, regardless of the setting type. In contrast to the significant effects of FEC, DUR, and SCB, the effects of RESCH, WBM, EF, and NMAR are not statistically significant in any cohorts.

Next, the effects of women's education (WED) on LF are all negative and statistically signifcant. The effects of AFB as well as ECM on LF are all positive and statistically significant. The effects of WSM are all negative. This is also true in the case of HED. The HOCC effect is negative and statistically significant for 40-44 year olds, but not for 35-39 year olds. The effects of $(AFB)^2$ on LF are all negative and statistically significant. Finally, the effects of RES on LF are all negative and statistically significant, implying that the patterns of later fertility are different in urban and rural areas.

V. Concluding Remarks

We have so far evaluated the variables which show different effects in urban and rural areas for

Table 13. **Instances in Which the Variables are Statistically Significant in LF Structural Equations**

Variables	Cohort 35-39	Cohort 40-44
RESCH	N.S.	N.S.
WED	–	–
AFB	+	+
WBM	N.S.	N.S.
ECM	+	+
EF	N.S.	N.S.
FEC	+	+
NMAR	N.S.	N.S.
DUR	+	+
WSM	–	–
HED	–	–
HOCC	N.S.	–
SCB	–	–
AFBSQ	–	–
RES	–	–
EF*WED	N.S.	N.S.
EF*HOCC	N.S.	N.S.
SCB*WED	N.S.	N.S.
SCB*HOCC	N.S.	N.S.

Notes: "+" indicates that the effect is positive and statistically significant.
"–" indicates that the effect is negative and statistically significant.
"N.S." indicates that the effect is not statistically significant.

AFB, EF, ad LF structural equations. Some of the micro variables show significantly different effects on fertility-related behavior in urban and rural areas. The extent of the differences of the effects in these settings provides a rationale to justify the multilevel analysis of the fertility behavior in Korea, on the basis of the relatively traditional-relatively transitional continuum. We could expect that the differences would be due to the different social contexts in terms of socioeconomic development and family planning. In the multilevel analysis, only those variables which are found to be statistically significant in determining the fertility-related behavior in the micro models will be included in the regression equation.

In the multilevel analysis, first derivatives of the effects of the explanatory variables would be used in evaluating the validity of the macro hypotheses about micro coefficient variability. These derivatives would be either actual regression coefficents, or transformations of them evaluated at particular values of the relevant explanatory variables which contain interaction terms. Thus, the multilevel analysis would clarify the effect of the micro-macro relationship in determining the fertility behavior in Korea.

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