PN-AAW-873

ISN 49659

Determinants of Korean birth intervals: The confrontation of theory and data

Larry L. Bumpass
Ronald R. Rindfuss
James A. Palmore

REPRINTS OF THE EAST-WEST POPULATION INSTITUTE

NUMBER 204

EAST-WEST CENTER
HONOLULU, HAWAII

THE EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

Situated on 21 acres adjacent to the University of Hawaii's Manoa Campus, the Center's facilities include a 300-room office building housing research and administrative offices for an international staff of 250, three residence halls for participants, and a conference center with meeting rooms equipped to provide simultaneous translation and a complete range of audiovisual services.

THE EAST-WEST POPULATION INSTITUTE, established as a unit of the East-West Center in 1969, carries out multidisciplinary research, training, and related activities in the field of population, placing emphasis on economic, social, psychological, and environmental aspects of population problems in Asia, the Pacific, and the United States.

THE REPRINT SERIES brings selected articles originating from Institute research but published elsewhere to the attention of population specialists who might not otherwise see them. Single copies are available upon request.

East-West Population Institute
East-West Center
1777 East-West Road
Honolulu, Hawaii 96848

This article is reprinted with permission from *Population Studies*, vol. 40, no. 3, November 1986.

Population Studies, 40 (1986), 403–423
Printed in Great Britain

Determinants of Korean Birth Intervals: The Confrontation of Theory and Data*

LARRY L. BUMPASS†, RONALD R. RINDFUSS‡ AND JAMES A. PALMORE§

Marriage and contraception have long been major variables in fertility research. Nonetheless, Bongaarts's application of Davis and Blake's schema[1] has increased the attention given to other intermediate variables such as breastfeeding, and has made it clear that changes in the various proximate variables may have countervailing effects.

It is an obvious progression to move from such aggregate analysis of the proximate variables to the use of individual data. Since socio-economic variables can only affect fertility through the proximate determinants, we should be able to account for most of the observed socio-economic variation in fertility in terms of these variables. Such an explanation should permit more clearly focused estimates of the relative effects of changing breastfeeding and contraceptive behaviour for various sub-groups of a population. Sub-group differences in fertility that cannot be so explained should provide useful clues about measurement problems and/or excluded intermediate variables.

DATA AND PROCEDURES

We consider these questions by using data from the Korean National Fertility Survey of 1974, which formed part of the World Fertility Survey. In addition to their unusually high quality these data are more suitable for our purposes than other WFS data,[2] because information on breastfeeding and contraception is available for each birth interval. WFS restriction of these measures to the last closed and open intervals introduces a severe selection on the intervals represented. Parenthetically, we have examined the effect of this restriction in another paper and, surprisingly, found that this selection creates little

† Department of Sociology, University of Wisconsin, Madison, Wisconsin, 53706, USA.
‡ Department of Sociology, University of North Carolina, Chapel Hill, North Carolina 27514, USA.
§ Department of Sociology, University of Hawaii at Manoa and East-West Population Institute, Honolulu, Hawaii, USA.

* This is a revision of a paper presented at the 1985 Annual Meetings of the Population Association of America in Boston. The authors are indebted to the Korean Institute for Population and Health (formerly the Korean Institute for Family Planning) and the Bureau of Statistics, Economic Planning Board, Korea for permission to use the data from the Korean National Fertility Survey of 1974. This paper is part of a series resulting from collaborative work between the Korean institutions and the East-West Population Institute. The research reported in this paper was supported by a grant from the National Institute of Child Health and Human Development to the East-West Population Institute (No. HD 17562). This research also benefited from a Population Center Grant from NICHD (No. HD 05876) to the Center for Demography and Ecology. The authors are also grateful to Nancy Riley for capably performing a variety of difficult tasks, and to Wayne Shima for programming assistance.

[1] Kingsley Davis and Judith Blake, 'Social structure and fertility: an analytic framework', *Economic Development and Cultural Change* 4, 4 (1956), pp. 211–235; John Bongaarts, 'A framework for analyzing the proximate determinants of fertility', *Population and Development Review* 4 1, (1978), pp. 105–132.

[2] R. R. Rindfuss, L. L. Bumpass and J. A. Palmore, 'Selectivity and the analysis of birth intervals from survey data', *Asian and Pacific Census Forum* 8, 3 (1982), pp. 5–6, 8–10 and 15–16; Anne R. Pebley, 'Evaluation of contraceptive history data in the Republic of Korea' (manuscript).

bias in estimated relationships.[3] Nonetheless, we have data for all birth intervals in the present analysis.

Korea is an advantageous setting for this analysis because it is a small country which is relatively homogeneous culturally and by religion. During the period examined (1963–74), Korea was in the midst of its fertility decline and socio-economic revolution. Thus the data provide an excellent opportunity to consider issues such as the effects of education and contraception on fertility during a period of fertility decline.

Our analysis is based on intervals begun in the decade ending two years before the survey, 1963–72. This set of intervals minimizes selection bias, while providing a sufficiently long series to allow examination of trends, and a sample large enough to permit stable estimates of the coefficients.

We have several time-dependent predictor variables; and there are strong theoretical reasons to expect that some of the effects will not be proportional, breastfeeding being the most obvious case. The procedure we use is virtually identical to that used by Rindfuss *et al.*,[4] with the addition of the summary statistics described by Guilkey and Rindfuss.[5] Each birth interval is divided into segments, and a logit regression is used to estimate the conditional probability of having a birth in this segment. Following our earlier analyses of the pace of fertility in Korea, the second and third intervals are analysed separately, but birth intervals 4 to 8 have been aggregated. We begin with the second interval because pre-marital pregnancies make it difficult to interpret the first, and because the meaning of marriage has clearly been changing in Korea.[6] Intervals for births of very high orders are not included because they are highly biased towards intervals begun close to the time of the survey, and because earlier work suggests that they are distinctive in many respects.[7] We also found clear differences in the structure of the process by distinguishing these intervals. In a recent paper Trussell *et al.* find no effect of birth order.[8] However, this conclusion was based only on the main effects. We explicitly tested for interactions between birth order and several of our predictor variables and found a sufficient number of significant interactions to make it clear that the most straightforward procedure was to analyse each of the three interval groups separately. The strong interaction effects indicate that the effects of several variables change as the process moves from the delay to the termination of fertility.

In Table 1 we show the segments used and the probabilities of closing each of these segments with a birth, conditional on survival to its beginning. Note that after the second interval the dependent variable is extremely skewed in the 11–16 month segment. Unfortunately, some of our other variables are also highly skewed in this segment. For example, virtually all Korean women breastfeed for at least two months. As a consequence, our statistical procedure would not yield estimates for this early segment, except in interval 2. Because few births occur in this segment in other intervals, excluding it makes little difference in these results at these intervals.

[3] R. R. Rindfuss, L. L. Bumpass and J. A. Palmore, 'Analyzing selected fertility histories: do the restrictions bias results?' (manuscript, 1985).

[4] *Ibid.*

[5] D. Guilkey and R. R. Rindfuss, *Logistic Regression Multivariate Analysis: A Communicable Approach*. Carolina Population Center Papers, no. 30 (1984).

[6] R. R. Rindfuss and P. Morgan, 'Marriage, sex, and the first birth interval in Asia', *Population and Development Review* **9**, 2 (1983), pp. 259–278.

[7] L. L. Bumpass, R. R. Rindfuss, J. A. Palmore, Mercedes Concepcion and Byoung Mohk Choi, 'Intermediate variables and educational differences in fertility in Korea and the Philippines', *Demography* **19**, 2 (1982), pp. 241–260.

[8] J. Trussell, Linda G. Martin, R. Feldman, J. A. Palmore, Mercedes Concepcion, Datin Nor Laily Bte and Datu Abu Bakar, 'Determinants of birth interval length in the Philippines, Malaysia and Indonesia: a hazards-model analysis', *Demography* **22**, 2 (1985), pp. 145–168.

Table 1. *Conditional proportion experiencing a birth and number of cases by birth order and segment*

Interval	Segment				
	11–16	17–22	23–28	29–34	35–40
	Conditional proportion experiencing a birth				
2	0.08	0.23	0.41	0.40	0.39
3	0.04	0.13	0.30	0.34	0.34
4–8	0.03	0.06	0.17	0.21	0.17
	Number of cases				
2	1,957	1,801	1,375	793	457
3	1,822	1,757	1,515	1,034	640
4–8	4,895	4,761	4,438	3,560	2,689

The logistic regression results are evaluated to yield multivariate values of q_r's for women with a given set of characteristics. (Unless otherwise stated, all other variables are set at their means, when the effects of a variable are evaluated.) These in turn are further manipulated to obtain standard life-table measures. Thus we obtain a multivariate life table for which we have assumed neither a functional form nor proportionality – the latter is particularly important for breastfeeding. Throughout the paper we refer to these life-table type results. The actual logistic regression results are presented in the Appendix.

Our strategy is first to examine the effects of socio-economic variables, and then to observe how these effects change with the introduction of the various intermediate variables. We explored a range of variables and kept only those with significant independent effects for the analysis with the proximate variables.

EFFECTS OF THE INTERMEDIATE VARIABLES

The first task is to examine whether the intermediate variables have the expected effects. These estimates are based on models that include both socio-economic and intermediate variables, with other variables set at their means.[8]

Contraceptive use

Because we only know whether particular methods were used in an interval, and not dates of use, each birth interval in which contraception was reported has to be treated as if use were continuous throughout the entire interval. This is likely to result in an underestimate of the effects of contraception because some of the 'contraceptive' segments will in fact be non-contraceptive. Nonetheless, the effect of contraception is clear. (In the top panel of Table 2 we report the estimated values of q_r and in the bottom panel the cumulative proportions who would have a birth by the end of each segment, given the estimated values of q_r. In Figure 1 these cumulative proportions are shown diagrammatically. The probability of a user having a birth is consistently lower than that of a non-user throughout the table. The differences in conditional probabilities are almost always in the expected direction and significant. The major exception is in the 35–40

[8] The reader unfamiliar with logistic regression should recognize that different predictions could be obtained with the other variables set to different values. However, for our purposes the means are the most appropriate values to use, and provide results that conform to the expectations formed by examining the values of β shown in Appendix A.

Table 2. *Conditional percentage having a birth in the segment, and cumulative percentage having had a birth by the end of the segment by contraceptive use status and interval*

Interval and contraception	Segment				
	11–16	17–22	23–28	29–34	35–40
	Conditional percentage having a birth in the segment				
Interval 2					
None	6	23	43	41	38
Non-medical	2	14	31	29	30
Pill, IUD, sterilization	1	18	21	25	40
Interval 3					
None	—	14	35	41	42
Non-medical	—	6	10	18	19
Pill, IUD, sterilization	—	4	1	17	18
Intervals 4–8					
None	—	6	20	27	23
Non-medical	—	2	8	5	6
Pill, IUD, sterilization	—	2	5	6	5
	Cumulative percentage with a birth by the end of the segment				
Interval 2					
None	6	28	59	76	85
Non-medical	2	15	42	59	71
Pill, IUD, sterilization	1	18	35	52	71
Interval 3					
None	—	14	44	67	81
Non-medical	—	6	16	31	44
Pill, IUD, sterilization	—	4	5	21	35
Intervals 4–8					
None	—	6	25	46	58
Non-medical	—	2	10	14	19
Pill, IUD, sterilization	—	2	6	12	16

month segment of the second interval. Since virtually all Korean women wish to have a second birth, this result may well reflect intentional 'making up' of delayed fertility among women who had been most successful in delaying a second pregnancy.

Similarly, intentional pregnancies earlier in the second interval may explain why the differences become larger for birth intervals of higher orders 3 and 4–8. At the higher parities, most women are attempting to end childbearing, rather than merely to delay another birth. Hence, contraceptive use was probably more consistent throughout the intervals. The differences between the estimated cumulative proportions are quite large, even in the second birth interval. Users are far less likely to have had a birth, and those who had used medical methods less likely than those who had used other methods – but the contrast here is not as great.

While the effects of contraceptive use are strong as expected, the differences between different methods are much smaller and less consistent than expected. The cumulative differences are largest at 28 months for the second and third birth intervals. A higher frequency of unrecorded abortion among the users of the less effective methods probably explains part of the virtual lack of any difference by method at the higher parities. Others have noted that abortion may be severely under-reported in Korea, in spite of its legality and general lack of stigma.[10]

[10] Charles F. Westoff, 'Abortions averted by sterilization in Korea: 1977–78' *International Family Planning Perspectives* 6 (1980), pp. 60–64.

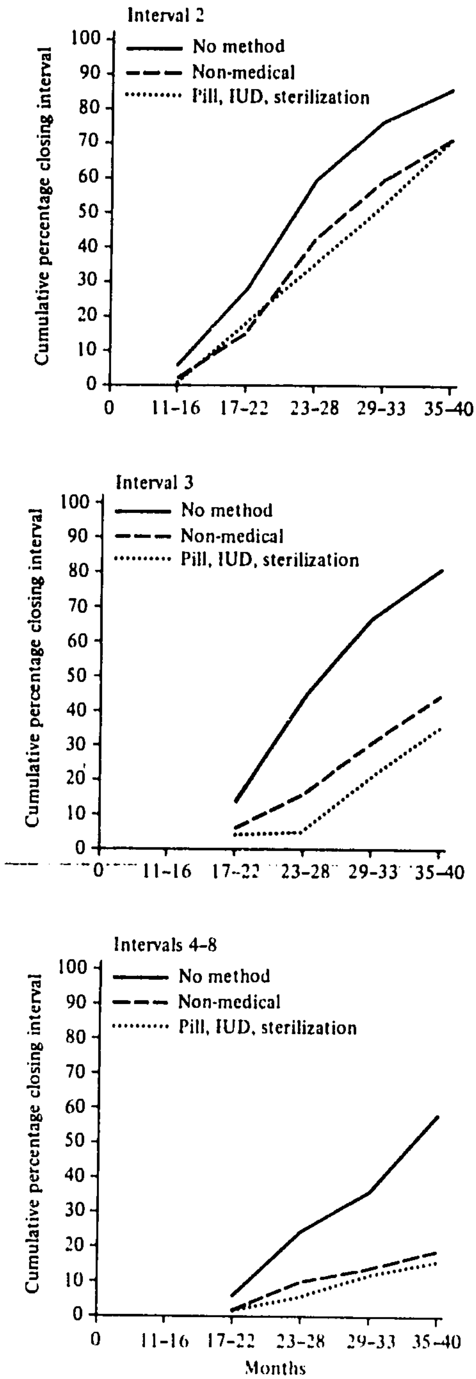

Figure 1. Contraceptive use status differences in the cumulative proportion with a birth.

Abortion

The argument for the poor quality of the abortion data is further illustrated by the effects of reported abortion (see Table 3). Theoretically, virtually no woman with an abortion during the ten months preceding a segment should have a birth during that segment. Nonetheless, in both the second and third intervals the conditional probabilities of birth are substantial for women who reported an abortion; and in only two instances in these intervals is the difference between those who reported an abortion and those who did not significant.

Table 3. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by abortion status and interval*

Interval and abortion status	Segment 11-16	17-22	23-28	29-34	35-40
	Conditional percentage with a birth in the segment				
Interval 2					
Abortion	4	26	30	15	31
No abortion	5	22	40	31	38
Interval 3					
Abortion	—	19	16	24	16
No abortion	—	11	26	32	32
Intervals 4–8					
Abortion	—	7	8	5	5
No abortion	—	4	14	17	13
	Cumulative percentage with a birth by the end of the segment				
Interval 2					
Abortion, month 13-22	5	26	48	68	80
Abortion, month 19-28	5	26	55	62	76
None	5	26	55	73	83
Interval 3					
Abortion, month 14-19	—	11	26	49	66
Abortion, month 20-25	—	11	34	50	66
None	—	11	34	55	70
Intervals 4-8					
Abortion, month 14-19	—	4	11	26	36
Abortion, month 20-25	—	4	17	22	32
None	—	4	17	31	40

The case is made most dramatically under the assumption that a woman has an abortion before each segment, i.e. four abortions at approximately six-month intervals. While such instances are unlikely, we would expect *no* birth to occur during the first 40 months of an interval under this assumption. Nonetheless, under this assumption, the results (not shown in the table) predict cumulative proportions with a birth of 70, 56 and 23 per cent respectively for the different birth intervals. Clearly, abortions are grossly under-reported and misdated. It could be argued that our procedures push the data too hard by the constraints on dating; however, relaxing this constraint to consider any abortion before the segment did not improve our models.

It is, of course, not at all surprising that women do not accurately report the occurrence and correct date of each abortion. No matter how common abortion might be, an abortion is never a pleasant experience, and there is no strong motivation for accurate recall. Nonetheless, the implications for the study of fertility are clear: in the absence of good data on abortion it *will not be possible* to explain fully the role of fertility control behaviour in socio-economic differentials in fertility – except, perhaps, in populations without abortion. Prospective studies seem the only recourse on this point, provided a procedure to collect information on early pregnancies is built into the study.

Breastfeeding

The measurement of breastfeeding is also difficult. Not only is the distribution heaped at six and twelve months, but there is considerable risk of mis-specifying the causal relationship. The problem, quite simply, is that the longer a birth interval the greater the opportunity for prolonged breastfeeding. Consequently, using the length of the period of breastfeeding to predict interval lengths (or duration-specific transition rates) would attribute to breastfeeding the effects of any unmeasured variable that delayed fertility. Our sequential approach provides a structure within which this issue can be clearly considered. For each segment, we code whether the child whose birth initiated the interval was breastfed continuously for at least as long as nine months before the beginning of the segment.

This survey was unusual in containing questions on when breastfeeding ended and also on when solid foods were first introduced. Breastfeeding without supplementation should have the greatest effect on fertility, because of the link between amenorrhoea and the

Table 4. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by breastfeeding status and interval*

Interval and breastfeeding status	Segment 11–16	17–22	23–28	29–34	35–40
Conditional percentage with a birth in the segment					
Interval 2					
None	30	24	45	38	40
≥ Segment beginning – 9 months	4	22	37	38	30
Interval 3					
None		14	31	35	31
≥ Segment beginning 9 months		11	23	28	30
Interval 4–8					
None		9	19	17	13
≥ Segment beginning 9 months		4	12	15	10
Cumulative percentage with a birth by the end of the segment					
Interval 2					
None	30	47	71	82	89
≥ 2 months	4	28	60	76	85
≥ 8 months	4	25	59	75	85
≥ 14 months	4	25	53	71	82
≥ 20 months	4	25	53	71	82
≥ 26 months	4	25	53	71	80
Interval 3					
None	—	14	41	62	74
≥ 8 months	—	11	39	60	73
≥ 14 months	—	11	31	56	69
≥ 20 months	—	11	31	50	66
≥ 26 months	—	11	31	50	65
Intervals 4–8					
None	—	9	26	39	47
≥ 8 months	—	4	22	36	44
≥ 14 months	—	4	15	29	39
≥ 20 months	—	4	15	28	37
≥ 26 months	—	4	15	28	35

extent of suckling. We expected this variable to provide one of the real advantages of the Korean data. However, a comparison of the two measures is disappointing. Women, indeed, give different (and reasonable) reports about total and unsupplemented breastfeeding. Nevertheless, the separate effects of the two variables are virtually indistinguishable, and no additional predictive information is gained by distinguishing between full and partial breastfeeding.

This seems to imply that the 'reasonable' answers given about the beginning of supplementary feeding are essentially random with respect to the biologically relevant aspects. Perhaps this is not surprising, given that supplementation is a continuous process. Relevant behaviour ranges from giving occasional extra foods to breastfeeding only at night-time, and women may well vary in what they both remember and in what they define as 'supplemental'.

Women who know that breastfeeding reduces fecundity may use contraception less diligently while they are breastfeeding. We tested for this interaction, but it was not significant. Thus, our final models only include the additive effects of contraception and breastfeeding.

As figures for the second interval in Table 4 make clear, we find that the primary effect of breastfeeding occurs during the early months. There is a significant and large difference in the probability of a birth in months 11–16 between those who did not breastfeed for at least two months and those who did (30 per cent compared to 4 per cent). For women who had a second birth within 40 months of the first, the mean interval was four months shorter among women who did not breastfeed their children for at least two months than among those who did. This is a large difference for the second birth interval. For those who breastfed beyond two months, however, there was essentially no difference in the mean length of the interval. (Indeed, the significant, though small, effect of breastfeeding for 26 months or more for the birth intervals of orders 4 to 8 suggests that some unrelated variable rather than breastfeeding itself may be responsible.)

Given that the effects of breastfeeding are largest for the segment 11–16 months it is unfortunate that we do not have estimates for this segment at the higher parities. Nonetheless, there are clear differences during duration of breastfeeding in cumulative fertility between months 17 and 40.

Measurement error undoubtedly attenuates both the estimated effect of breastfeeding and our ability to reveal contraceptive effects in those instances where they are masked by differential breastfeeding. In a country with a high prevalence of breastfeeding in the first eight months, these effects are so predominant that there are too few births to estimate the independent effects of contraception during the early period. Beyond that point, contraception is the most important variable.

Infant and child mortality

Infant and child mortality could have an impact for both social and biological reasons. Some couples may respond to the death of a child by trying to conceive again as quickly as possible, by avoiding contraception they otherwise would have used and possibly by increasing coital frequency. Biologically, the death of an infant terminates the contraceptive effects of breastfeeding. The results (which are not shown here) suggest that the primary effect is biological. The death of the child whose birth initiated the interval is only important in the segment 17–22 months, which is exactly where it would have the greatest effect through the cessation of breastfeeding. Our final models include a mortality measure for the segment 17–22 months only.

Marital separation

In addition to the usual marriage history our data include dates of periods of marital separation which lasted at least three months. We have coded intervals in which there was any episode of marital separation or disruption during the period of conception risk relevant to each segment – i.e. nine months before the upper and lower bounds of the segments. While separation was relatively rare among the birth intervals of higher orders (two to three per cent), it was more common in the later segments of the second interval. This difference would have been expected, because women were, on average, younger during the lower birth intervals. For example, 14 per cent of women in their second birth interval experienced a separation.

Table 5. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by whether a separation occurred and interval*

Interval and separation status	Segment				
	11–16	17–22	23–28	29–34	35–40
	Conditional percentage with a birth in the segment				
Interval 2					
Separation	2	8	9	9	24
No	6	24	43	43	40
Interval 3					
Separation	—	1	15	8	8
No	—	12	26	33	33
Intervals 4–8					
Separation	—	2	4	4	3
No	—	4	14	16	13
	Cumulative percentage with a birth by the end of the segment				
Interval 2					
Separation	2	9	18	26	43
No	6	28	59	77	86
Interval 3					
Separation	—	1	16	22	29
No	—	12	35	57	71
Intervals 4–8					
Separation	—	2	5	9	11
No	—	4	17	31	40

Unlike in the case of abortion, we would not expect the probability of birth to be zero for those coded 'yes' on this variable, since a separation during only one of the six months would qualify for the coding, and a separation does not necessarily mean complete absence of sexual relations. The effects of separation are significant in all the 13 segments which we could examine (Table 5). The cumulative percentages of those who had a birth within 40 months were 43 and 86 respectively for those with and without a separation during the second birth interval. The corresponding figures for the third, and fourth and higher intervals were 29 and 71, and 11 and 40 per cent. This is the only variable we have examined that is significant in all of the interval-by-segment combinations, and these are very large effects. These figures reaffirm the general quality of the Korean data relating to dates (at least the marriage, separation and birth dates employed in this instance). The strong effects for this variable suggest that it would be useful to collect information about separations for reasons other than marital discord in other settings as well.

Age at beginning of interval

The final intermediate variable[11] considered here is age at the beginning of an interval. Age is less readily interpretable than might initially seem apparent. In addition to indexing fecundity, age indicates birth cohort and a variety of sociological and life-cycle processes. It may also represent a number of unmeasured variables more directly related to other intermediate variables. Women who have achieved a given parity at a much younger age than others may be more fertile for a number of reasons not measured (or poorly measured) in the data. Thus, it is possible that age may act as a surrogate for many unmeasured variables affecting the pace of fertility in addition to aspects that are directly age-related through fecundity. So age effects must be interpreted with caution.

As expected, age is negatively related to fertility, particularly at parities 4–8. The estimates in Table 6 compare expected conditional and cumulative rates for women who are relatively young and relatively old at the beginning of the interval. Age differences are small early in an interval, as would be expected if breastfeeding were suppressing fecundity for most women regardless of age. Only after the role of breastfeeding diminishes do age differences become fully evident. The six years spanning the mean age result in proportional reduction of cumulative fertility by 40 months of 10, 29 and 42 per cent respectively for second, third, and fourth to eighth intervals (the figures are 78

Table 6. *Differences by relative age* at beginning of interval, conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by relative age at beginning of interval*

Interval and relative age	Segment 11–16	17–22	23–28	29–34	35–40
	Conditional percentage with a birth in segment				
Interval 2					
Young	5	24	44	42	46
Old	6	21	36	34	29
Interval 3					
Young	–	12	31	42	42
Old	–	10	21	22	22
Intervals 4–8					
Young	–	6	19	21	18
Old	–	3	9	12	8
	Cumulative percentage with a birth by the end of the segment				
Interval 2					
Young	5	27	59	76	87
Old	6	25	52	68	78
Interval 3					
Young	–	12	40	65	80
Old	–	10	29	45	57
Intervals 4–8					
Young	–	5	23	39	50
Old	–	3	12	22	29

* Estimated three years before and three years after the mean age for each segment. For segments 23–28 the mean ages are 23.4, 25.8 and 30.8 for intervals 2, 3 and 4–8 respectively.

[11] Examination of models including and excluding this age variable makes it clear that other results are not generally affected by its inclusion. In most cases, other effects are unaltered by the inclusion of age and, in addition, the age effect is unaltered by the inclusion of other variables. In the exceptions where changes between models do occur, they tend to occur in birth intervals of fourth or higher orders and the coefficients become larger. In particular, the inclusion of age increases the education coefficient and that of contraception increases the age effect.

and 87 per cent, 57 and 80 per cent, and 29 and 50 per cent). It is difficult to say what the expected age effect should be; but such large declines in only a six-year span are most probably another indicator of the importance of unmeasured (or poorly measured) variables. Women who are older at the beginning of an interval may be selected for lower coital frequency, longer breastfeeding, higher frequency of contraceptive use or of abortion, even though such selection is hidden in the data presently available.

Socio-economic variables

We began our analysis of the socio-economic variables by exploring an array of theoretically important variables to identify those with significant independent effects to be included in our models with the proximate variables. The variables retained were wife's education, residence history, presence of living sons, whether the couple ever lived with the husband's relatives, and time period.

Education

We focus first on education because of its central theoretical importance. The primary question of this paper is the extent to which the effects of the socio-economic variables are reduced once the intermediate variables are controlled. This is considered in the comparison of models for each segment. The first column in Table 7 shows the estimated probabilities of having a birth for categories of education 'net' of the effects of the other four socio-economic variables (Model A); the second column (Model B) reports the estimated effects after the intermediate variables are also included.

Education is a key variable, and the results illustrate the range of insight, success and frustration that this analysis yielded. The lower set of lines in each graph in Figure 2 are drawn from the model without the intermediate variables, and the upper set of lines from the model with these variables. The results for education are distinctly different across intervals.

We expected education to have a negative impact on fertility, presumably through an array of mechanisms including child cost, greater knowledge and access to contraception, alternative values, and the like. While this pattern is clear for the birth intervals beyond the second, it is very weak for cumulative births at 40 months in the second interval. On the contrary, the main finding for the second birth interval is the *positive* effect of education during the early segments. During months 17–22 of the second birth interval the conditional probability of a birth is almost *twice* as high among women with 12 or more years of education than among those with no education. These differences are unaffected by the inclusion of the measured intermediate variables.

What factors might produce this relationship? It seems possible that some more highly educated women may prefer a shorter second interval specifically because they intend to have only two children. If family building is to stop at two, they may be anxious to assure the second birth and particularly a son. A related possible explanation concerns the interface between education, changing marriage arrangements and coital frequency (including patterns of spousal separation). If, as Rindfuss and Morgan have argued,[12] changes in Asian marriage patterns away from arranged marriage are tending to increase coital frequency, such changes would be expected to be associated with education, and hence to increase the fertility of the more educated differentially at lower parities.

The only results which closely approximate our original expectations are those for the third birth interval: of the five coefficients that are significant before the intermediate

[12] *Loc. cit.* in footnote 6.

Table 7. *Conditional percentage with a birth in the segment and cumulative percentage with a birth by the end of the segment by education level, interval and model*

Interval and education level	Segment and model[a] 11–16 A	11–16 B	17–22 A	17–22 B	23–28 A	23–28 B	29–34 A	29–34 B	35–40 A	35–40 B
	Conditional percentage with a birth in the segment									
Interval 2										
None	6	4	16	15	40	37	47	43	36	36
1–6 years	7	6	23	22	42	41	42	40	42	40
7–11 years	5	4	22	22	41	40	34	33	42	40
12+ years	11	8	28	29	37	38	35	36	25	28
Interval 3										
None	4	—	10	8	37	32	37	32	40	37
1–6 years	3	—	13	11	30	25	38	33	36	32
7–11 years	3	—	12	11	27	25	30	29	33	31
12+ years	5	—	13	15	18	23	21	27	19	25
Interval 4										
None	3	—	5	4	16	14	22	17	18	14
1–6 years	2	—	6	4	18	14	20	16	17	13
7–11 years	3	—	7	5	13	10	16	14	10	8
12+ years	2	—	4	4	16	13	7	7	8	6
	Cumulative percentage with a birth by the end of the segment									
Interval 2										
None	6	4	21	18	53	49	75	71	84	81
1–6 years	7	6	28	27	59	56	76	74	86	84
7–11 years	5	4	26	25	56	55	71	70	83	82
12+ years	11	8	36	34	60	59	74	74	80	81
Interval 3										
None	—	—	10	8	44	37	65	58	79	73
1–6 years	—	—	13	11	39	34	62	56	76	70
7–11 years	—	—	12	11	35	33	55	52	70	67
12+ years	—	—	13	15	29	34	44	52	55	64
Interval 4										
None	—	—	5	4	20	17	38	31	49	41
1–6 years	—	—	5	4	22	17	37	30	48	40
7–11 years	—	—	6	5	19	15	32	27	39	32
12+ years	—	—	4	4	20	16	25	22	31	27

[a] Figure 1 shows the variables included in models A and B.

variables are added, four lose significance when the intermediate variables are included. There is a marked change in the contrast between the lowest and highest educational group. Without controlling from the intermediate variables, the probability that the most educated women will have a birth within 40 months is 30 per cent lower than that for the least educated; after these variables are controlled the difference is only 12 per cent. Thus, while not all of the educational difference is explained by the intermediate variables, there is substantial mediation.

In contrast, the results for birth intervals of orders 4 to 8 show very little mediation on the part of the proximate variables. Contraceptive use is strongly and significantly related to education, and has strong and significant negative effects on fertility in these intervals. It is disconcerting that in spite of these relationships, virtually none of the effect of education can be explained by differences in contraceptive use. It is possible that not only is abortion severely under-reported, but that it is differentially so, especially at the higher parities where women risk unwanted fertility.

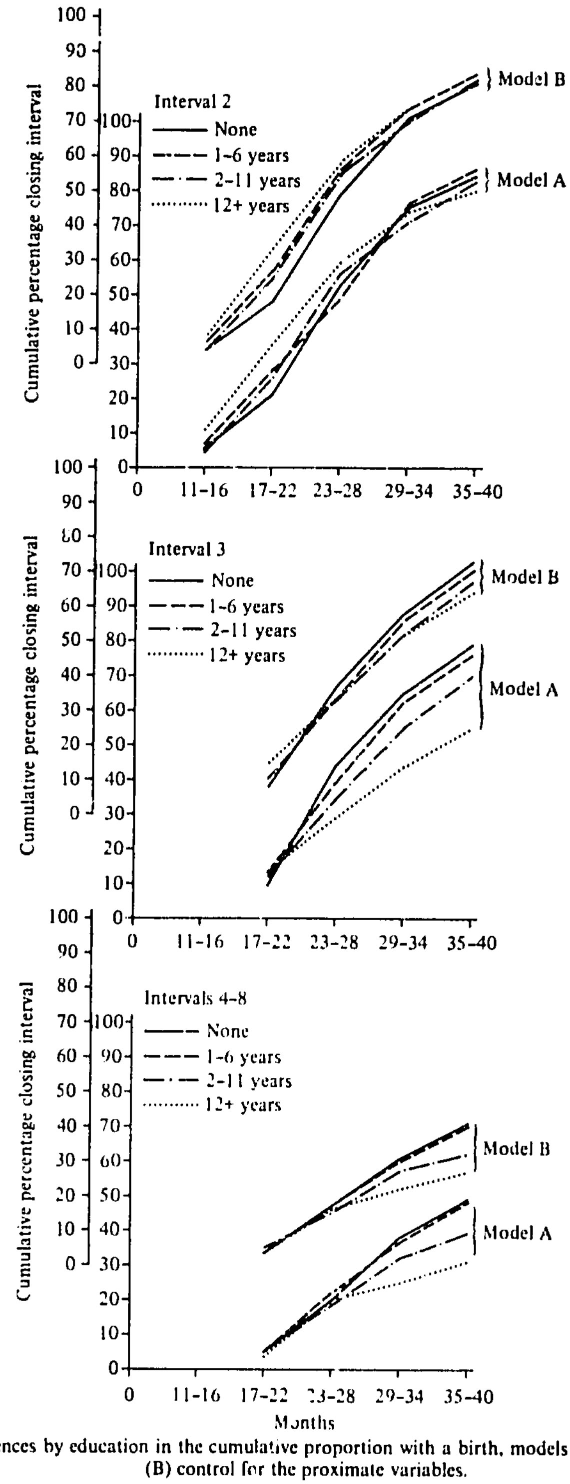

Figure 2. Differences by education in the cumulative proportion with a birth, models with (A) and without (B) control for the proximate variables.

Residence

Urban environments provide new ideas, a technological setting altering the costs and benefits of children, and usually greater access to modern health care and family planning services. In Korea, however, the government programme emphasized rural areas in the early years.[13] In the Korean WFS, as in many other studies, information on residence of origin as well as current residence was collected. Unfortunately, however, we have no way of knowing when migration from rural to urban areas occurred. Some migrants may have moved during childhood, others may have done so during the year preceding interview. Consequently, we have simply used these two variables to identify women with only rural residence, and the residual category, i.e. those with at least some urban residence. In Korea, the vast majority of the latter are current urban residents. The results are shown in Table 8.

Table 8. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by residence, interval and model*

Interval and urban residence	Segment and model									
	11–16		17–22		23–28		29–34		35–40	
	A	B	A	B	A	B	A	B	A	B
	Conditional percentage with a birth in the segment									
Interval 2										
Some urban residence	7	5	24	21	40	38	40	38	34	33
No urban residence	7	6	20	24	43	43	40	39	49	48
Interval 3										
Some urban residence	3	—	12	10	26	23	34	31	31	30
No urban residence	4	—	14	12	33	29	34	32	38	33
Intervals 4–8										
Some urban residence	3	—	4	3	14	12	15	12	12	10
No urban residence	3	—	7	5	18	15	24	19	20	15
	Cumulative percentage with a birth by the end of the segment									
Interval 2										
Some urban residence	7	5	27	25	56	54	74	71	83	81
No urban residence	7	6	30	28	60	59	76	75	88	87
Interval 3										
Some urban residence		—	12	10	35	32	57	53	70	67
No urban residence		—	14	12	42	38	62	58	76	71
Intervals 4–8										
Some urban residence	—	—	4	3	17	14	30	25	38	32
No urban residence	—	—	7	5	24	19	42	34	54	44

Contrary to our expectations, urban experience has a consistent and important effect on fertility only at the higher parities. In each segment of birth intervals of orders 4–8, the conditional probabilities are significantly lower among those with some urban residence. These differences result in a cumulative fertility which, after 40 months, is 30 per cent lower among those with some urban residence than among those with only rural residence.

When we control for the intermediate variables, the absolute, but not the relative size of the difference is reduced: the absolute difference of 16 percentage points becomes 12

[13] Sawon Hong, *Population Status Report Korea*. (Seoul, Korea: Development Institute, 1978). Taek Il Kim, J. A. Ross and G. C. Worth. *The Korean National Family Planning Program* (New York: The Population Council, 1972).

percentage points, but the ratios of the cumulative fertility of those with some urban residence to that of others are 70 per cent and 73 per cent respectively. Hence intermediate variables (as measured here) appear to explain little, if any, of the difference in fertility associated with some urban residence. The very small differences between second and third birth intervals in the two groups are virtually unchanged.

Presence of living sons

The strong preference for at least one living son in Korea is well known.[14] We noted in an earlier analysis that virtually the whole of the increase in the pace of the third birth interval occurred among women with two daughters but no sons.[15] Consequently, we tested for and found a significant interaction between the presence of living sons and the year the third birth interval began. This interaction has, therefore, been retained in the estimates in Table 9. The presence of sons has a significant effect in virtually all segments and the differences are large for birth intervals beyond the second. In fact, these

Table 9. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by presence of sons, interval cohort and model*

Interval and presence of sons	Segment and model									
	11–16		17–22		23–28		29–34		35–40	
	A	B	A	B	A	B	A	B	A	B
	Conditional percentage with a birth in the segment									
Interval 2										
Sons	5	7	20	19	36	36	38	38	40	36
No son	10	6	26	26	46	44	42	38	44	39
Interval 3										
Began 1963–7										
Sons	—	—	11	9	24	21	30	26	35	31
No son	—	—	11	8	28	22	36	29	47	41
Began 1968–72										
Sons	—	—	13	12	27	27	35	36	26	27
No son	—	—	23	20	50	44	42	39	54	36
Intervals 4–8										
Sons	2	—	5	4	15	,3	18	15	15	12
No son	4	—	12	8	29	19	34	22	31	20
	Cumulative percentage with a birth by the end of the segment									
Interval 2										
Sons	5	4	24	23	51	50	70	69	82	80
No son	10	7	34	31	65	61	79	76	38	86
Interval 3										
Began 1963–7										
Sons	—	—	11	9	33	28	47	47	69	64
No son	—	—	11	8	36	28	59	49	79	70
Began 1968–72										
Sons	—	—	13	12	37	36	59	59	70	70
No son	—	—	23	20	61	56	78	73	86	82
Intervals 4–8										
Sons	—	—	5	4	19	16	34	29	44	37
No son	—	—	12	8	38	25	59	41	72	53

[14] Nancy E. Williamson, *Sons and Daughters: A Cross Cultural Study of Parental Preferences* (Beverly Hills, California: Sage, 1976).

[15] *Loc. cit.* in footnote 6.

differences are among the largest effects for any of our socio-economic variables. While the effects are significant in the second birth interval, the differences are only moderate and are largest in the middle of the interval. After 28 months the cumulative proportions with a birth are 65 per cent for those without sons compared to 51 per cent for those with sons. This difference contracts to six percentage points at 40 months (82 per cent compared with 88 per cent).

Differences at the third birth interval are rather small for the first half of the decade sampled but very large for the more recent period. Among women who had a second birth between 1968 and 1972, the probability of having a birth for those with no sons was nearly double that for the rest in several duration segments. The maximum cumulative difference is again reached by month 28: 61 per cent of those without sons had borne another child, compared to 37 per cent of those with sons. Cumulative fertility at this point is nearly 40 per cent lower among women with a son. As in the second interval, the difference then contracts to about 19 per cent, again reflecting effects on the timing of births.

Differences at the higher parities reflect primarily differential termination of childbearing rather than just timing. Here the differences are largest and most persistent. While only about ten per cent of fourth birth intervals and those of higher orders are begun by women with no living son,[16] those that are indicate strong motivation to try to have a son, even among women who already have large families. The probability of another birth within 40 months is two-thirds higher for those without sons 72 compared with 44 per cent). This is our strongest social predictor, yet control for the intermediate variables explains only about one-third of the difference.

Whether ever lived with husband's parents

We included replies to the question on whether or not the respondent had ever lived with her in-laws because of its strong theoretical interest. Extended family living may accelerate the pace of fertility for a number of reasons, including a sharing of the costs of child rearing, social pressure, and possibly earlier supplemental feeding coincident with assistance in child care. On the other hand, greater housing densities might tend to offset these effects somewhat by reducing coital frequency. The figures in Table 10 suggest that the positive effects predominate, but they are not strong. In every interval, those who ever lived with their husband's parents are more fertile. Introducing the intermediate variables has almost no effect on the differences associated with co-residence.

Trend

We divided the decade in half, expecting on the basis of our earlier work[17] that the pace of fertility would be somewhat faster for the lower parities between 1968 and 1972. Given our earlier detailed examination of Korean birth interval trends, we will focus here only on the extent to which the intermediate variables mediate this trend. Also, as before, an interaction with living sons is included in the figures for the third birth interval.

The trend results are shown in Table 11. As expected in Model A, the pace of fertility is somewhat faster during the more recent period. In the third birth interval, this

[16] This is slightly higher than we would expect on a random basis because of the selectivity into higher parity orders of those without sons, while those with at least one son terminate childbearing.

[17] *Loc. cit.* in footnote 6.

Table 10. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by whether the wife ever lived with husband's parents, interval and model*

Interval and co-residence	Segment and model									
	11-16		17-22		23-28		29-34		35-40	
	A	B	A	B	A	B	A	B	A	B
	Conditional percentage with a birth in the segment									
Interval 2										
Lived with husband's parents	8	6	25	25	41	40	40	39	41	39
Did not live with husband's parents	6	4	19	19	40	39	39	37	35	35
Interval 3										
Lived with husband's parents	—	—	13	12	38	28	36	33	33	31
Did not live with husband's parents	—	—	12	10	20	23	31	29	33	31
Intervals 4–8										
Lived with husband's parents	—	—	6	4	17	19	20	16	16	13
Did not live with husband's parents	—	—	6	4	15	14	19	15	15	1
	Cumulative percentage with a birth by the end of the segment									
Interval 2										
Lived with husband's parents	8	6	31	29	60	58	76	74	86	84
Did not live with husband's parents	6	4	24	22	55	52	72	70	83	80
Interval 3										
Lived with husband's parents	—	—	13	12	40	36	61	57	74	70
Did not live with husband's parents	—	—	11	10	34	31	54	51	69	66
Intervals 4–8										
Lived with husband's parents	—	—	5	4	22	18	37	31	47	40
Did not live with husband's parents	—	—	5	4	19	15	35	28	45	36

difference is substantially larger for those without sons than for those who have already had one or more living sons. Once again, however, controlling for the various intermediate variables does not diminish these trend effects – in fact, it tends to increase them. Thus, again, some combination of poor measurement and unmeasured variables seems to be responsible here.

SUMMARY AND CONCLUSION

In summary, we were unable to explain observed socio-economic differences in terms of the mediating effects of our measures of the proximate variables. Overall, our first models including just the socio-economic variables contained 44 significant coefficients. With the introduction of the intermediate variables, only 11 of these coefficients became insignificant (while six others became significant). Thus, though using excellent data, we cannot begin to reproduce what theory predicts.

Table 11. *Conditional percentage of women who have a birth in the segment and cumulative percentage who have had a birth by the end of the segment by when the interval began, interval, presence of sons and model*

	Segment and model									
	11–16		17–22		23–28		29–34		35–40	
Interval and when begun	A	B	A	B	A	B	A	B	A	B
	Conditional percentage with a birth in the segment									
Interval 2										
1963–7	5	4	19	18	35	34	38	35	44	40
1968–72	9	7	27	26	46	46	42	42	38	34
Interval 3										
Sons 1963–7	—	—	11	9	24	21	30	26	35	31
1968–72	—	—	13	12	27	27	35	36	26	27
No son 1963–7	—	—	11	8	28	22	36	29	47	41
1968–72	—	—	23	20	50	44	42	39	54	36
Intervals 4–8										
1963–7	—	—	5	4	17	12	21	15	17	12
1968–72	—	—	5	5	16	15	18	17	14	12
	Cumulative percentage with a birth by the end of the segment									
Interval 2										
1963–7	5	4	23	21	50	48	69	66	83	80
1968–72	9	7	33	31	64	63	79	78	87	86
Interval 3										
Sons 1963–7	—	—	11	9	33	28	47	47	69	64
1968–72	—	—	13	12	37	36	59	59	70	70
No son 1963–7	—	—	11	8	36	28	59	49	78	70
1968–72	—	—	23	20	61	56	78	73	86	82
Intervals 4–8										
1963–7	—	—	5	4	21	15	35	28	44	37
1968–72	—	—	5	5	21	19	37	32	48	41

In addition to measurement error, several places in the analysis suggest that important intermediate variables have been omitted.[18] Coital frequency is one such variable, but there are likely others. Such potential additional intermediate variables may not be measurable in retrospective surveys – certainly not with sufficient precision to permit the kind of analysis attempted here.

This essentially pessimistic conclusion is unfortunately not a consequence either of our particular procedures or our particular data. Similar conclusions may be reached from the analysis of others – e.g. those of Hobcraft and Little, Trussell *et al.* or Palloni,[19] who used a range of different procedures and data from several Asian and Latin American countries. There are strong theoretical reasons for wanting to explain socio-economic differences in fertility in terms of the proximate variables by using micro-retrospective data. The evidence of such attempts, including the present paper, strongly suggests that this is not likely to be a fruitful line of endeavour.

[18] There is, of course, a third possibility. We may have incorrectly specified the nature of the relationships between our measured variables. However, we experimented with so many different specifications that we consider this possibility less likely.

[19] J. Hobcraft and R. J. A. Little, 'Fertility exposure analysis: a new method for assessing the contribution of proximate determinants to fertility differentials', *Population Studies* **38**, 1 (1984), pp. 21–45; Alberto Palloni, 'Assessing the effects of intermediate variables on birth interval-specific measures of fertility', *Population Index* **50**, 4 (1984), pp. 623–657; Trussell *et al., loc cit.* in footnote 8.

Appendix Table A. *Results of a conditional logit analysis of the determinants of having a birth in each segment: models excluding (A) and including (B) the intermediate variable*

	Interval 2									
Segments	11–16		17–22		23		29		35	
	A	B	A	B	A	B	A	B	A	B
Education										
1–6 yrs	0.23	0.44	0.42	0.48**	0.06	0.14	−0.25	−0.14	0.20	0.18
7–11 yrs	−0.13	0.03	0.37	0.43	0.02	0.13	0.55	−0.42	0.23	0.18
12 yrs	0.65	0.75	0.72*	0.82*	−0.08	0.02	−0.47	−0.30	−0.32	−0.34
Some urban residence	0.02	−0.12	−0.11	−0.16	−0.11	−0.21	0.05	−0.04	−0.51**	−0.64*
Living sons	−0.75*	−0.54*	−0.40	−0.36*	−0.41*	−0.35*	−0.13	−0.03	−0.18	−0.13
Live with in-laws	0.41**	0.43**	0.32*	0.35*	0.02	0.07	0.03	0.11	0.15	0.19
Parity cohort	0.64*	0.62	0.45*	0.46*	0.47*	0.50*	0.21	0.29	−0.20	−0.22
Age at beginning	0.04	0.03	−0.02	−0.03	−0.04**	−0.06*	−0.04	−0.06**	−0.11*	−0.12**
Separation	—	−0.99	—	−1.34*	—	−2.02*	—	−2.01*	—	−0.73**
Infant mortality	—		—	0.46	—	—	—	—	—	—
Breastfeeding	—	2.22*	—	−0.13	—	−0.35*	—	—	—	−0.41
Methods										
Non-medical	—	−1.20**		−0.64**	—	−0.50**	—	−0.50	—	−0.36
Medical	—	−2.11**	—	−0.34	—	−1.04*	—	−0.71**	—	−0.90
Abortion	—	−0.22	—	0.23	—	−0.43	—	−1.27**	—	−0.27

Appendix Table A (*Continued*)

	Interval 3							
Segments...	17–22		23		29		35	
	A	B	A	B	A	B	A	B
Education								
1–6 yrs	0.27	0.38	−0.40**	−0.30	−0.02	0.06	−0.29	−0.21
7–11 yrs	0.20	0.33	−0.47**	−0.32	−0.33	−0.16	−0.40	−0.26
12 yrs	0.25	0.67**	−0.89*	−0.45	−0.69**	−0.26	−1.01**	−0.56
Some urban residence	−0.16	−0.16	−0.27**	−0.30**	0.06	—	−0.21	−0.12
Living sons	−0.45*	−0.30	−0.59*	−0.41*	−0.26	−0.13	−0.50**	−0.41
Live with in-laws	0.16	0.16	0.30**	0.27**	0.21	0.21	—	−0.01
Parity cohort	0.42*	0.55*	0.36*	0.54*	0.29	0.45*	−0.36**	−0.20
Age at beginning	−0.02	−0.04	−0.08*	−0.09*	−0.13*	−0.15*	−0.12*	−0.16*
Separation	—	−2.30**	—	−0.74**	—	−1.76*	—	−1.71*
Infant mortality	—	1.24*	—	—	—	—	—	—
Breastfeeding	—	−0.28	—	−0.42	—	−0.36**	—	−0.05
Methods								
Non-medical	—	−0.89*	—	−1.53*	—	−1.18*	—	−1.09*
Medical	—	−1.31*	—	−1.63*	—	−1.25*	—	−1.21*
Abortion	—	0.61	—	−0.59	—	−0.42	—	−0.92**

Appendix Table A (*Continued*)

	Interval 4							
Segments...	17–22		23		29		35	
	A	B	A	B	A	B	A	B
Education								
1–6 yrs	−0.01	0.07	−0.10	0.01	−0.29*	−0.12	−0.22	−0.05
7–11 yrs	0.18	0.32	−0.48*	−0.33	−0.54*	−0.26	−0.85*	−0.65*
12 yrs	−0.25	−0.07	−0.22	−0.08	−1.44*	−1.04*	1.13*	−0.87**
Some urban residence	−0.60*	−0.62*	−0.29*	−0.30*	−0.54*	−0.47*	−0.58*	−0.51*
Living sons	−1.02*	−0.73*	−0.71*	−0.45*	−0.74*	−0.45*	−0.87*	−0.67*
Live with in-laws	0.07	0.05	0.23	0.24**	0.05	0.07	0.08	0.12
Parity cohort	0.16	0.36*	0.01	0.21**	−0.17	0.13	−0.27**	0.01
Age at beginning	−0.09*	−0.10*	−0.13*	−0.14*	−0.09*	−0.12*	−0.11*	−0.15*
Separation	—	−1.03	—	−1.45*	—	−1.57*	—	−1.69*
Infant mortality	—	0.92*	—	—	—	—	—	—
Breastfeeding	—	−0.89*	—	−0.60*	—	−0.15	—	−0.29**
Methods								
Non-medical	—	−1.15*	—	−1.14*	—	−1.99*	—	−1.55*
Medical	—	−1.51*	—	−1.65*	—	−1.70*	—	−1.70*
Abortion	—	0.55	—	−0.67**	—	−1.27*	—	−0.96*

* Significant at 0.05. ** Significant at 0.01.

RECENT AVAILABLE REPRINTS OF THE EAST-WEST POPULATION INSTITUTE

No.

171. **Cultural ideals, socioeconomic change, and household composition: Karen, Lua', Hmong, and Thai in Northwestern Thailand,** by Peter Kunstadter, reprinted from *Households: Comparative and Historical Studies of the Domestic Group,* Robert McC. Netting, Richard W. Wilk, and Eric J. Arnould, eds., University of California Press, Berkeley, 1984

172. **Conclusion,** by Lee-Jay Cho, reprinted from *The Industrial Future of the Pacific Basin,* Roger Benjamin and Robert T. Kudrle, eds., Westview Press, Colorado, 1984

173. **Asian Labor Migration to the Middle East,** by Fred Arnold and Nasra M. Shah, reprinted from *International Migration Review,* Summer 1984

174. **Repeatability of infant deaths in Korea,** by Chai Bin Park and Alfred C. Hexter, reprinted from *International Journal of Epidemiology,* September 1984

175. **Comparative analysis of fertility orientations: World Fertility Survey findings,** by Lee-Jay Cho and Louise Kantrow, reprinted from *Predicting Fertility: Demographic Studies of Birth Expectations,* Gerry E. Hendershot and Paul J. Placek, eds., Lexington Books, D.C. Heath and Company, Massachusetts, 1981

176. **Census-derived estimates of fertility by duration since first marriage in the Republic of Korea,** by Robert D. Retherford, Lee-Jay Cho, and Nam-Il Kim, reprinted from *Demography,* November 1984

177. **The value of daughters and sons: A comparative study of the gender preferences of parents,** by Fred Arnold and Eddie C.Y. Kuo, reprinted from *Journal of Comparative Family Studies,* Summer 1984

178. **Analysing open birth interval distributions,** by Griffith Feeney and John A. Ross, reprinted from *Population Studies,* November 1984

179. **Population dynamics and policy in the People's Republic of China,** by Lee-Jay Cho, reprinted from *The Annals of The American Academy of Political and Social Science: China in Transition,* vol. 476, Marvin E. Wolfgang, ed., Sage Publications, Beverly Hills, California, 1984

180. **Personal networks and the adoption of family planning in rural Korea,** by Joung Im Kim and James A. Palmore, reprinted from *Journal of Population and Health Studies,* December 1984

181. **Determinants of birth-interval length in the Philippines, Malaysia, and Indonesia: A hazard-model analysis,** by James Trussell, Linda G. Martin, Robert Feldman, James A. Palmore, Mercedes Concepcion, and Datin Noor Laily Bt. Dato' Abu Bakar, reprinted from *Demography,* May 1985

182. **Shadow households and competing auspices: Migration behavior in the Philippines,** by Fe Caces, Fred Arnold, James T. Fawcett, and Robert W. Gardner, reprinted from *Journal of Development Economics,* January–February 1985

183. **Perceptions of the value of children: Satisfaction and costs,** by James T. Fawcett, reprinted from *Determinants of Fertility in Developing Countries,* vol. 1, Rodolfo A. Bulatao and Ronald D. Lee, eds., Academic Press, Inc., 1983

184. **Diffusion processes affecting fertility regulation,** by Robert D. Retherford and James A. Palmore, reprinted from *Determinants of Fertility in Developing Countries,* vol. 2, Rodolfo A. Bulatao and Ronald D. Lee, eds., Academic Press, Inc. 1983

185. **The impact of age at marriage and proportions marrying on fertility,** by Peter C. Smith, reprinted from *Determinants of Fertility in Developing Countries,* vol. 2, Rodolfo A. Bulatao and Ronald D. Lee, eds., Academic Press, Inc., 1983

186. **Migration of women to cities: The Asian situation in comparative perspective,** by Siew-Ean Khoo, Peter C. Smith, and James T. Fawcett, reprinted from *International Migration Review,* Special Issue: *Women in Migration,* Winter 1984

187. **Measuring the effect of sex preference on fertility: The case of Korea,** by Fred Arnold, reprinted from *Demography,* May 1985

188. **Exploring the normative basis for age at marriage in Thailand: An example from focus group research,** by Anthony Pramualratana, Napaporn Havanon, and John Knodel, reprinted from *Journal of Marriage and the Family,* February 1985

189. **The non-economic consequences of Asian labor migration to the Middle East,** by Nasra M. Shah and Fred Arnold, reprinted from International Union for the Scientific Study of Population, *International Population Conference, Florence 1985,* vol. 3, 1985

190. **Parity progression projection,** by Griffith Feeney, reprinted from International Union for the Scientific Study of Population, *International Population Conference, Florence 1985,* vol. 4, 1985

191. **A theory of marital fertility transition,** by Robert D. Retherford, reprinted from *Population Studies,* July 1985

192. **Cultural variations in the transition to marriage in four Asian societies,** by Paul Cheung, Josefina Cabigon, Aphichat Chamratrithirong, Peter F. McDonald, Sabila Syed, Andrew Cherlin, and Peter C. Smith, reprinted from International Union for the Scientific Study of Population, *International Population Conference, Florence 1985,* vol. 3, 1985

193. **Decision making and sex selection with biased technologies,** by Neil G. Bennett and Andrew Mason, reprinted from *Sex Selection of Children,* Neil G. Bennett, ed., Academic Press, Inc., 1983

194. **U.S. farm migration: An application of the Harris-Todaro model,** by Daniel B. Suits, reprinted from *Economic Development and Cultural Change,* vol. 33, no. 4, 1985

195. **Health of Hmong in Thailand: Risk factors, morbidity and mortality in comparison with other ethnic groups,** by Peter Kunstadter, reprinted from *Culture, Medicine and Psychiatry,* vol. 9, no. 4, 1985

196. **Evaluation of contraceptive history data in the Republic of Korea,** by Anne R. Pebley, Noreen Goldman, and Minja Kim Choe, reprinted from *Studies in Family Planning,* January/February 1986

197. **Circulation between 'home' and other places: Some propositions,** by Murray Chapman and R. Mansell Prothero, and **Me go 'walkabout'; you too?** by Murray Chapman, reprinted from *Circulation in Population Movement: Substance and Concepts from the Melanesian Case,* Murray Chapman and R. Mansell Prothero, eds., Routledge & Kegan Paul, 1985

198. **Fijians and Indo-Fijians in Suva: Rural–urban movements and linkages,** by Shashikant Nair, reprinted from *Circulation in Population Movement: Substance and Concepts from the Melanesian Case,* Murray Chapman and R. Mansell Prothero, eds., Routledge & Kegan Paul, 1985

199. **Linkages between internal and international migration: The Ilocos Norte experience,** by Fred Arnold and Ricardo G. Abad, reprinted from *Philippine Population Journal,* June 1985

200. **An economic analysis of recent fertility in Japan,** by Naohiro Ogawa and Andrew Mason, reprinted from *Jinko Gaku Kenkyu,* vol. 9, May 1986

201. **Averting crisis in Asia?** by Lee-Jay Cho, reprinted from *Bulletin of the Atomic Scientists,* vol. 42, no. 4, 1986

202. **Sex preference, fertility, and family planning in China** by Fred Arnold and Liu Zhaoxiang, reprinted from *Population and Development Review,* vol. 12, no. 2, 1986

203. **The place of child-spacing as a factor in infant mortality: A recursive model** by Chai Bin Park, reprinted from *American Journal of Public Health,* vol. 76, no. 8, 1986