SES differentials in reproduction during the Korean fertility transition
– Evidence from a rural village

Abstract

We examine SES differentials in reproduction during the Korean fertility transition in a rural village. SES differentials in reproduction have important implications for fertility in the past and fertility decline because these indicate how active demographic responses were to environment in the past and what a driving force of fertility decline was. By using the population registers linked to land rosters and school records, we examine how land holding and educational attainment were associated with the timing of marriage and birth. This allows us to examine how these two different measures of SES, which have different implications for fertility, were associated with reproduction. Preliminary analysis shows that the timing of reproduction depended on educational attainment. The better educated married and gave birth later than the less educated, and these educational differentials were greater for the earlier birth cohort. We discuss the implications of this finding and the future plan.

Introduction

This study examines how socioeconomic status (SES) was associated with the timing of marriage and childbearing during the Korean fertility transition using the population registers in a rural village. SES Differentials in marriage and fertility have been a key theme in demographic research for historical and contemporary populations because these are important to understand fertility in the past and fertility transition. First, reproduction was closely linked to resource availability in pre-transitional society; preventive checks were working to maintain population balance (Malthus 1953). Recent studies, using individual-level longitudinal data, have shown that demographic responses to economic conditions in pre-transitional society were dependent on SES, suggesting that human agencies actively adjusted to environment by utilizing available resources in household under constraints (Bengtsson et al. 2004; Lundh et al. 2014; Tsuya et al. 2010). These differentials are telling whose responses were more robust to environmental changes. Second, fertility decline typically proceeded in tandem with educational expansion (Bongaarts 2003). Improvement in women's education is a key engine to fertility decline because highly educated women get married later and bear a smaller number of children for various reasons such as economic independence (Becker 1974), late entrance to marriage market due to prolonged school enrolment (Mare and Winship 1991), extended spouse search period (Oppenheimer 1988), and so on. This suggests that educational differentials in marriage and fertility are crucial for understanding fertility decline.

In this study, we are using the unique individual-level longitudinal data in a rural village in South Korea, *Unyang*. We link the population registers to land registers and graduate directory in an elementary school located in this village. This linkage allows us to examine how both education and land holding were associated with the timing of marriage and fertility.

Literature review

Previous research showed that higher status people tended to marry earlier and bear more children than lower status people in pre-transitional societies. Furthermore, we have evidence that responses to economic stresses are stronger among lower status than higher status families. Such differentials in reproductive behaviors indicate that families and individuals responded to challenging circumstances utilizing available resources under constraints. For example, a comparative analysis of the timing of first marriage in various areas in the Eurasian continent in the 19th century showed that rising grain prices mattered more for lower status than higher status families with some regional variations (Bengtsson 2014). This strongly suggests that

resources available to families moderated the influences of economic conditions on reproduction to some extent. This was the case for both Europe and Asia, suggesting that conventional East-West divide in demographic regime (Hajnal 1965) may be somewhat misleading. In the Korean context, land holding was also negatively associated with birth intervals in a study using population registers combined with land rosters in *Jeju Island* during the colonial period (Kim and Park 2009). Positive association between SES and reproduction is consistent with the Malthusian framework that emphasizes the feedback between economy and population (Livi-Bacci 2017): lack of resources leads to limiting reproduction in the pre-transitional societies (i.e., preventive checks).

The relationship, however, changed during and after fertility transition. Educational attainment, which is an important determinant for individuals' status attainment in industrial societies, is known to be negatively associated with reproduction (Bongaarts 2003). Highly educated women tend to marry later and have fewer children. Such negative association between education and reproduction suggests that the relationship between SES and reproduction changed during and after fertility transition. While resource availability was a key determinant in fertility in pre-transitional societies, fertility in post-transitional world is influenced by other factors such as women's economic independence (Becker 1974), behavioral constraints such as school enrolment (Mare and Winship 1991), and spouse selection process (Oppenheimer 1988). In South Korea, the negative association between education and reproduction became stronger across birth cohorts (Kye 2008).

Shortly speaking, the association between SES and reproductive behaviors changed from positive to negative (Skirbekk 2008). This changing relationship is difficult to examine for two reasons. First, there are data limitations. Typically, historical demographic studies analyzed the data drawn from the population registers in the 19th century or earlier when fertility transition did not occur yet or was in its initial stage. Hence, most studies examined the relationship between SES and reproduction in only pre-transitional societies, leaving the changing association unexplained. Second, measures of SES are not comparable across periods. Studies of historical populations typically linked population registers to land rosters, and analyzed the relationship between landing holding and reproduction. Many studies of fertility transition in developing countries used educational attainment as a measure of SES. Hence, the changing relationship between SES and reproduction, found in previous literature (Skirbekk 2008), may reflect the differences in measures to some degree. Most studies do not have both landholding and education measures, making it difficult to produce coherent evidence

regarding the changing relationship between SES and reproduction. In this study, we use the population registers linked to land rosters and graduate directory in an elementary school in a rural village in Korea. This will help evaluate the changing relationship between SES and reproduction in a coherent manner.

Hypotheses

Based on the discussion above, we will test the following hypotheses using the linked data of population registers, land rosters, and graduate directory in a Korean rural village, *Unyang*.

Hypothesis 1: The changing relationship between landholding and reproduction

- *More landholding led to earlier marriage and childbearing.*
- *This association was weaker for recent birth cohorts.*

Hypothesis 2: The changing relationship between education and reproduction

- *Higher educational attainment led later marriage and childbearing.*
- *This association was stronger for recent birth cohorts.*

Hypothesis 3: Gender differences in association

- *Association between SES and reproduction was stronger for men than women*

Research design

In our previous study, we examined marital fertility decline using the *Unyang* population registers (Kye and Park 2016). In this study, we focused on the implications of child survival and parity-specific control for fertility decline in Korea. The current study is an extension of this earlier study. The most importantly, the current study uses the *Unyang* registers linked to land rosters and graduate directories in an elementary school in this village. This data construction is the unique feature of the current study. We can examine the implications of both land holding and educational attainment for fertility. Hence, we can evaluate the SES-reproduction association in a coherent manner.

We link the *Unyang* population registers to land rosters and graduate directory in the following way. First, the *Unyang* population registers are the baseline data set. The registers include individuals' records on births, marriage, and deaths in this rural village between 1909 and 1977. Because the data are of poor quality before 1920, we analyze the records collected afterwards. Second, the land rosters include land holders' names, addresses, and land type (e.g., farmland or lot) in *Unyang*. We classify individuals' land holding based on how large their

parental land was when individuals were around age 10 to avoid complicated endogeneity problem between wealth accumulation during adulthood and reproduction. Third, the graduate directory in *Unyang Elementary School* include information on alumni's birth date, graduation date, and parent's name since 1927. Based on this information, we classify individuals into two groups: less than elementary school graduate vs. higher. We match the land rosters and graduate directory to *Unyang* registers to construct our analytic data set.

Matching cannot be perfect for several reasons. First, because all land in *Unyang* was not owned by *Unyang* residents, some records in land rosters cannot be matched to population registers. In addition, "landless families" in our data may include those who had land elsewhere. Hence, our classification of landholding should have non-negligible measurement errors. Second, we have the same kind of problem in educational attainment because two other elementary schools were founded in this area in the 1930s. Hence, we should misclassify some individuals graduating from other than *Unyang Elementary School* as less than elementary school graduates. Although our information is far from ideal and limited, we can partly assess SES differentials in reproduction by comparing those who are matched and unmatched. The unmatched individuals are composed of heterogeneous groups; landless plus landholders in elsewhere, or less than elementary school graduates plus elementary school graduates in other schools. If there were SES differentials in reproduction, we are likely to underestimate SES differentials. Hence, if we can find significant differences between the groups in our analysis, this strongly suggests that there were truly SES differentials in reproduction.

We apply survival analysis to examine SES differentials in the timing of marriage and fertility. We apply a standard survival analysis for the timing of first marriage, and account for repeated nature of births to analyze fertility.

Preliminary findings and future plan

Table 1 shows preliminary results. We present the number of children ever born, the age at first marriage, age at first birth, and the prevalence of infant and child mortality by birth cohort and education. Infant mortality and child mortality measures show how many women experienced infant deaths (before age 1) and child death (before age 5) per 1,000. Educational attainment is coded as "graduate" if individuals are matched to graduate directories in the *Unyang* Elementary School and "no graduate" otherwise. We use name and birth year to link these two data. We are fairly sure that the matched individuals indeed graduated from this school, but unmatched ones should include some individuals who graduated from adjacent

other elementary schools than the *Unyang* Elementary school as we mentioned earlier. In this sense, they are composed of heterogeneous groups, yielding underestimation of educational differentials in outcomes. We are currently working on digitizing graduate directories in other elementary schools in this area, and should be able to lessen this problem at the time of presentation to PAA next spring. We are also working on matching population registers to land rosters, and this will be done until the time of presentation.

<Table 1> about here

Despite this limitation and incomplete matches of data, we can see some educational gradients in reproduction. First, we can see clear cohort changes in reproductive measures; fewer births, later marriage and birth, and lower infant and child mortality among the later born. The most dramatic changes across birth cohorts are found in children's survival. While more than 20% of women born before 1940 had at least one child who died before age 1, this figure dropped to 1.5% for women born afterwards. Second, we can also see educational differentials in reproductive behaviors; elementary graduate had fewer children, married earlier, gave birth earlier, and were less likely to experience children's death. However, this educational differentials should be confounded with cohort changes. The last four rows show within-cohort comparison by educational attainment. Within each birth cohort, educational differentials are not substantial in terms of the number children and the timing of first marriage and first birth. In terms of children's mortality, we can see sizeable educational differentials in earlier birth cohort, but this difference fade away for the later born. Given that some elementary graduates are classified as no graduate in the current analysis, we think that actual educational differences would have been larger than this result. We are working on matching, which will enable us to estimate educational differentials more precisely.

Until the time of presentation, we will conduct the following works. First, we will link graduate directories in other two schools to the data. This will reduce misclassification of educational attainment. Second, we will link land rosters to the data to measure landholdings. This will enable us to compare the influence of economic asset with that of educational attainment. This analysis will help us how SES differentials in reproduction changed during and after the Korean fertility transition.

References

Bengtsson, T. (2014). The influence of economic factors in first marriage in historical Europe and Asia. In Lundh et al. (eds.). *Similarity and Difference – Marriage in Europe and Asia, 1700 – 1900*. (pp.121-168). Cambridge, MA: MIT Press.

Hajnal, J. (1965). European marriage patterns in perspective. In D. Glass & E. David (Eds.), *Population in history: Essays in historical demography* (pp. 101–143). London: Edward Arnold.

Kye, B. (2008). Delay in First Marriage and First Childbearing in Korea - Trends in Educational Differentials. CCPR Working Paper-036-08

Kye, B., & Park, H. (2016). Marital fertility during the Korean demographic transition: Child survival and birth spacing. *The History of the Family*, 21, 483–501.

Livi-Bacci, M. (2017). *A concise history of world population* (6th ed. ed.). Chichester: John Wiley & Sons Ltd.

Malthus, T. (1953). A summary view of the principle of population. In D. V. Glass (Ed.), Introduction to Malthus (pp. 115–181). New York, NY: Wiley.

Bengtsson, T., Campbell, C., Lee, J., Feng, W., Alter, G., Neven, M., . . . Nystedt, P. (2004). *Life under pressure: Mortality and living standards in Europe and Asia, 1700–1900*. Cambridge, MA: MIT Press.

Tsuya, O.N., Wang, F., Alter, F., Lee, J.Z. (2010). Prudence and pressure: Reproduction and human agency in Europe and Asia, 1700–1900. Cambridge, MA: MIT Press

Lundh, C., Kurosu, S., Dribe, M., Manfredini, M., Oris, M., Bengtsson, T., . . . Lee, J. (2014). *Similarity and Difference – Marriage in Europe and Asia, 1700 – 1900*. Cambridge, MA: MIT Press.

Becker, G. S. 1974. A theory of marriage, in T. W. Schultz (ed.), *Economics of the Family: Marriage, Children, and Human Capital*. Chicago: University of Chicago Press. pp. 299-344

Bongaarts, J. 2003. Completing the fertility transition in the developing world: the role of educational differences and fertility preferences, *Population Studies* 57(3): 321-335.

Mare, R. D. and C. Winship. 1991. Socioeconomic change and the decline of marriage for blacks and whites, in C. Jencks and P. Peterson (eds.), *The Urban Underclass*. Washington, D. C.: The Brookings Institution. pp. 175-202

Oppenheimer, V. K. 1988. A theory of marriage timing, *American Journal of Sociology* 94(3): 563-591.

Skirbekk, V. (2008). Fertility trends by social status. *Demographic Research* 18: 145-180.

Table 1 Descriptive statstics by cohort and education

	# of births		age at first marriage		age at first birth		Infant mortality	Child mortality	N
Cohort and education	Mean	S.D	Mean	S.D	Mean	S.D	(1,000)	(1,000)	
All	4.0	2.4	20.4	3.8	21.5	3.5	175.4	265.4	4,732
1895-39	4.3	2.5	19.9	3.8	21.3	3.6	211.9	319.0	3,856
1940-60	2.5	1.3	22.8	2.6	22.8	2.7	14.8	29.7	876
No graduate	4.1	2.5	20.3	3.7	21.5	3.5	186.6	281.0	4,292
Graduate	3.3	2.0	22.0	3.7	22.2	3.2	65.9	113.6	440
1895-39, no graduate	4.4	2.5	19.8	3.7	21.2	3.6	218.8	328.0	3,615
1895-39, graduate	4.0	2.2	21.0	4.1	21.6	3.4	107.9	182.6	241
1895-39, no graduate	2.5	1.3	22.6	2.6	22.7	2.7	14.8	29.5	677
1895-39, graduate	2.4	1.3	23.2	2.7	22.9	2.8	15.1	30.2	199