Extended Abstract for PAA 2009 Annual Meeting

Fertility Transition in South Korea, 1960 – 2005: Tempo Effect and Demographic Translation

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Research Questions

Korea transited from a high fertility country to a 'lowest-low fertility' country in less than a half century. The total fertility rate (TFR) in Korea was around 6.0 until the 1960s, but has rapidly declined since then. The TFR dropped below the replacement level (2.1) in 1983, and has continued to decline. According to *World Health Statistics 2008* (World Health Organization 2008), the TFR in Korea was 1.2 in 2007, which is the lowest among the countries examined. In this paper, I will examine the fertility transition in South Korea, accounting for tempo effect and demographic translation.

Given the importance of delayed marriage and childbearing to the initiation of fertility decline in Korea (Kwon 1993) and the continuously rising mean age of childbearing (Jun 2002), period fertility measures like TFR suffer from '*tempo distortion*' (Bongaarts and Feeney 1998). Furthermore, the discrepancy between period measures and cohort experiences should be great ('*demographic translation*', Ryder 1964). This large discrepancy also provides a good opportunity to examine how cohort variation accounts for the observed fertility change. Recent developments in formal demography offer alternative measures to account for 'tempo effect' and to deal with 'demographic translation' (Bongaarts and Feeney 1998; Scheon 2004; Guillot 2003). In this study, I will examine the following research questions by applying these measures to Korean fertility data and compare new measures with traditional measures:

- *How did the level fertility change over time in South Korea?*
- *How important is the tempo effect to observed period fertility change?*
- *How large are the discrepancies between period fertility measures and cohort fertility experiences? How can we reduce these discrepancies?*
- *Does cohort variation in fertility account for the fertility transition in Korea?*

Alternative Fertility Measures

Period measures are most widely used in demographic research partly because of quick availability. These measures, however, may be badly influenced by idiosyncratic periodic fluctuations ('tempo distortion') and would deviate from a cohort's experiences if demographic behaviors changed from one cohort to another ('demographic translation'). By contrast, completed cohort measures reflect 'real' cohort experiences, but require cohorts to have completed relevant demographic behaviors. Recent developments in formal demography offer alternative measures to complement these weaknesses. In this section, I review three alternative measures: 'adjusted TFR', Average Cohort Fertility, and Cross-sectional Average Fertility.

Tempo-adjusted measures

Two tempo-adjusted measures are used in this study. First, I use Bongaarts-Feeney's 'tempo-adjusted TFR(t)'. The formula for 'adjusted TFR(t)' is given in equations (1) and (2) (Bongaarts and Feeney 1998: 278):

$TFR'_i\,(t) = TFR_i(t)/(1\text{-}r_i) - (1)$, 'adjusted TFR(t)' $= \Sigma TFR'_i\,(t) - (2)$

(where $TFR_i(t)$ is the observed TFR in a given period for parity i, and r_i is the change in mean age of childbearing for parity i in a given period).

The 'adjusted TFR(t)' is different from conventional period TFR(t) in two ways: (1) it adjusts changing mean age of childbearing in a given period and (2) it accounts for parity-specificity of fertility behaviors. This measure represents quantum of fertility in a given year accounting for tempo distortion. If there were no change in mean age of childbearing for each parity during time t, 'adjusted TFR(t)' would equal period TFR (t).

The second tempo-adjusted measure is Average Cohort Fertility (ACF(t), Schoen 2004). The ACF(t) is defined as follows: *ACF(t) = TFR(t)/(Timing index*[1]*) – (3).* Here, adjustment is given by the timing index, which represents fractions of reproductive women's completed total births that occur during time t. Higher timing index implies more births in time t than usual. This adjustment accounts for the distribution of childbearing over a reproductive span whereas Bongaarts-Feeney's 'adjusted TFR(t)' only considers the change in mean age of childbearing in time t. However, we need completed cohort fertility of reproductive women in time t to compute the timing index, so the ACF(t) is not available for recent periods without making assumptions about future fertility patterns.

Cross-sectional Average Fertility (Guiilot 2003)

This measure was originally developed to measure 'cross-sectional' average life expectancy (CAL(t), Guiilot 2003). CAL(t) is sum of cohort survival probability at time t and reflects past survival experience of cohorts alive at time t. Hence, it is arguably a better summary measure of mortality experience of present population than period life expectancy. In addition, CAL(t) suffers less from problem of 'demographic translation' than period life expectancy because this measure reflects cohort's real experiences rather than those of 'synthetic cohort'.

In this study, I develop a new fertility measure, 'cross-sectional average fertility (CAF), adopting the idea behind CAL(t). Whereas conventional TFR(t) is a sum of period age-specific fertility rates , CAF(t) is a sum of cross-sectional average age-specific fertility rates of currently reproductive women. The formula of CAF(t) is given in equations (4) and (5):

$$\textit{Cross-sectional average age specific fertility rate } (\phi_{ca}(x,t)) = \sum_{t=t-49}^{t-x} \phi_c(x,t)/(50-x) \text{ - } (4)$$

[1] Mathematical formula for timing index is too long to present in this abstract. Please see Schoen (2004: 806) for a more complete description of timing index.

$$CAF(t) = \sum_{x=15}^{49} \phi_{ca}(x,t) - (5)$$

(where $\phi_c(x,t)$ is the fertility rate of a cohort born at time *t* at age *x* (*x*=15, 16, ….49)).

CAF(t) is different from period TFR(t) in that the former reflects past childbearing experience of currently reproductive women whereas the latter only accounts for childbearing patterns at time *t*. In this sense, CAF(t) is a better summary measure of childbearing experience of currently reproductive women and suffer less from problem of 'demographic translation' than period TFR(t). If there were no difference in the timing and quantum of fertility among currently reproductive women, CAF(t) would be equal to period TFR(t). Change in timing or quantum of childbearing across cohorts would yield difference between the two measures.

Cohort Change vs. Period Change

This study will also examine if period variation was more important than cohort variation to explain fertility change in Korea, which has been found to be the case in the Western countries (Ní Brolchaín 1992). First, I compare the trends in each fertility measure. Previous studies (e.g., Foster 1990) showed that cohort fertility trends were much smoother than period trends in the Western countries, which suggests the asymmetry between the influence of cohort variation and of period variation on fertility change: one is more important than another. Similar rates of change of cohort and period fertility measures would imply equal influence of cohort and period variation on fertility change. Second, I will use the decomposition methods developed by Foster (1990) to see relative importance of cohort and period variation to the fertility transition. His decomposition showed that variations in cohort fertility are fully accounted for by changes in period fertility in the Western countries but not vice versa. Applying this method, I will evaluate relative importance of cohort and period variation to the fertility transition in Korea.

Data

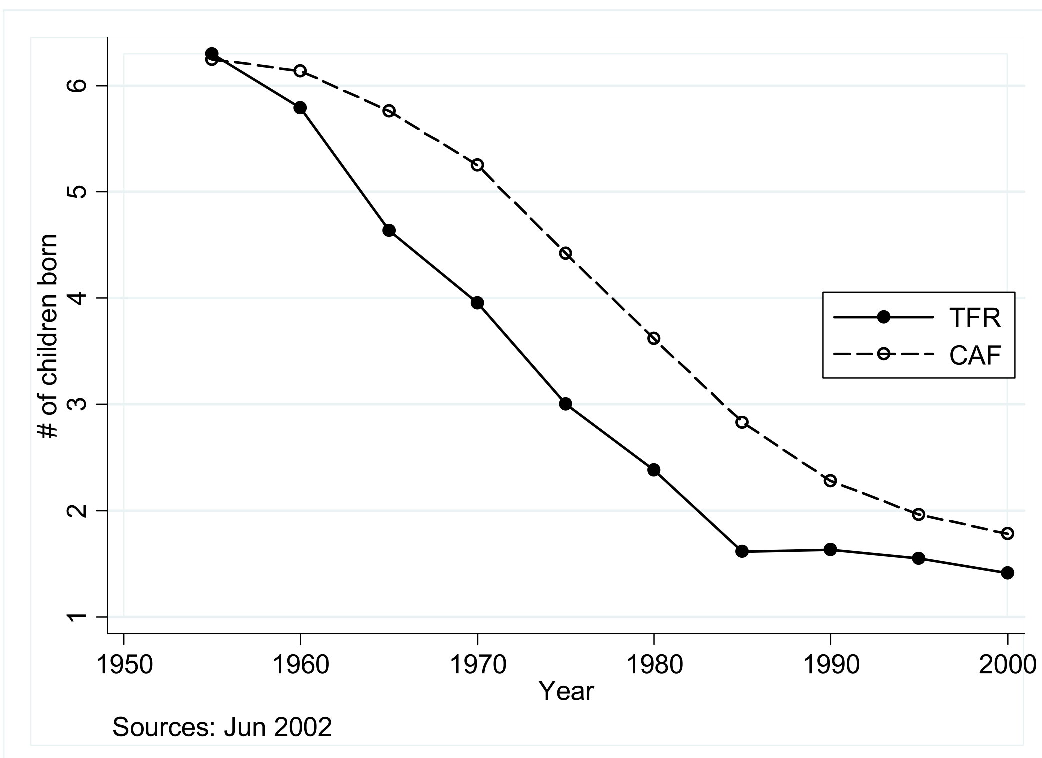
To compute conventional and alternative measures, I need a long series of age-specific fertility rates (age 15 – 49). Jun (2002) provided such a time-series between 1925-30 and 1995-2000. This time-series adjusts reporting errors of various sources, following Kwon (1977). Using this information, I will compute TFR(t), CAF(t), ACF(t), and completed cohort fertility. However, parity-specific fertility rates are not given, which is necessary to compute 'adjusted TFR(t)'. To compute parity-specific TFR($TFR'_i(t)$) and change in mean age of childbearing (r_i), I will use census and vital statistics after 1960.

Preliminary and Expected Findings

Figure 1 shows a time-series of TFR(t) and CAF(t) between 1955 and 2005. CAF(t) is consistently higher than TFR(t), suggesting that an average woman in currently reproductive cohorts would produce more births than would a woman in 'synthetic cohorts'. More interestingly, the rates of change are almost identical for these two measures (-.117 decrease in TFR(t) per year vs. -.115 decrease in CAF(t) per year). Because the CAF(t) captures past cohort experiences, this similarity suggests the similar importance of period and cohort variation to the fertility transition in Korea. Inclusion of completed cohort fertility in the full paper will provide more insight into the relative importance of cohort and period variation to the fertility transition.

The followings are plans for the full paper and expected findings. First, a comparison between 'adjusted TFR(t)' and period TFR(t) will tell us the magnitude of tempo distortion. I expect 'adjusted TFR(t)' is quite different from period TFR(t) because delayed childbearing has been important to the fertility transition in Korea. Second, comparing 'adjusted TFR(t)' with ACF(t) will show us the implications of variation in age at childbearing for the fertility transition. Given the continuous increase in age at childbearing, the variation in childbearing would not be influential. Finally, following Foster (1990) and Calot (1993), I will apply the demographic translation formula to the Korean data to evaluate importance of cohort variation over period variation to the fertility transition in Korea. This application will allow us to see the unique feature of the fertility transition in Korea, compared with the Western countries. I expect cohort variation is more responsible for the fertility change in Korea than in the Western countries because it is hard to imagine the rapid fertility transition was solely driven by the period change.

Figure 1 TFR and CAF in Korea, 1955 - 2000



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