Educational Differentials on the Transition to First Birth in South Korea:

Findings from the Korean Longitudinal Survey of Women and Families

December 2021

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*This paper is prepared for the 2021 IUSSP International Population Conference.

Abstract

There are inconsistent findings in the literature on the effect of educational differentials on fertility, particularly in a low fertility setting such as South Korea. Since the 1960s, South Korea's rapid education expansion and economic development have led to a transition from high to low fertility. Rising education levels have regularly been suggested as a potential contributing factor to the decline in fertility. This study examines the educational gradient in the transition to first birth across birth cohorts in South Korea using panel data of 7,914 women born between 1960 and 1984. Results from discrete-time survival analysis show that gaps in fertility between education groups may have converged during the fertility transition but are re-emerging post-transition. The convergence-divergence pattern observed over time highlights the importance of recognising how women's changing educational profile impacts patterns in the transition to first birth in an ultra-low fertility setting. Substantial gaps in fertility were found for the youngest birth cohort born between 1980 and 1984. These findings suggest it is of increasing importance for low fertility countries with rising education levels to take a more targeted approach to encourage childbearing among women of different educational attainment.

Keywords: Fertility; Educational differentials; First birth; South Korea; Asia

1. Introduction

Women's education is negatively associated with fertility in most developed countries (Caldwell 1980, 1982; Cochrane 1979; Kravdal and Rindfuss 2008). Increasing evidence suggests a convergence of fertility levels across different education groups after the fertility transition (Gray and Evans 2019; Lazzari et al. 2021). Fertility transition refers to the shift from high fertility to low fertility, characterised by the postponement and curtailment of childbearing. In Denmark, Norway and Sweden, Jalovaara et al. (2018) found that cohort fertility has become relatively comparable among women with different levels of education in younger birth cohorts born between 1965 and 1974. In a study analysing six low fertility countries – Australia, Finland, Hungary, Ireland, South Korea, and Spain – Lazzari et al. (2021) showed that declines in completed cohort fertility can be largely attributed to shifts in fertility behaviours rather than shifts in educational composition among women who were born between 1940 and 1970. However, most of the previous studies have been done in the context of developed Western countries. There are relatively few studies that have investigated the relationship between women's education and fertility behaviour in Asian countries with very low fertility rates.

In particular, South Korea has one of the highest educational attainment rates with close to 70% of 25- to 34-year-olds holding at least a university degree, but one of the lowest fertility rates in the world at 0.84 births per woman in 2020 (The Organisation for Economic Co-operation and Development [OECD] 2021; Statistics Korea 2020). Given the negative association between education and fertility, it is possible that South Korea's rapid expansion of education has resulted in the country's steep decline in fertility. However, recent findings on trends in fertility based on women's educational attainment in South Korea have been rather mixed. Using census data on completed cohort fertility in South Korea, Yoo (2014) found that differences in fertility between women with high and low education have narrowed among younger birth cohorts compared to older birth cohorts across the fertility transition. This may imply that education composition would play a less significant role in influencing fertility over time. On the other hand, Lee (2018) showed that there is a substantial increase in period fertility for women with low education, as more low-educated foreign-born women in South Korea are having births. This suggests that fertility differentials by educational attainment have not entirely diminished in South Korea.

This paper contributes to the ongoing debate on how women's educational attainment affects fertility patterns in the transition to first birth (i.e., birth of the first child) through the use of micro-level survey data. In light of the changing relationship between education and fertility, analysis of both macro- and micro-level data is necessary to investigate the association between women's education levels and fertility changes in specific contexts (James et al. 2013). While most prior studies have used vital statistics or census data to examine the relationship between women's education and fertility in South Korea (e.g., Lazzari et al. 2021; Lee 2018; Yoo 2014), there are some limitations of using such data as they may not include information on other contributing factors that might influence the relationship between education and fertility. Previous research has highlighted other crucial factors – such as individual attitudes towards family formation and intergenerational transmission of fertility preferences – that need to be accounted for when examining women's fertility behaviour (Anderton et al. 1987; Beaujouan and Solaz 2019; Kolk 2014; Preston 1976). By adjusting for other important variables associated with fertility behaviour, this study extends previous research by examining the extent to which educational differentials influence the timing and transitions to first birth between and within cohorts. Given South Korea's low-fertility context, the study focuses primarily on women's transition to first birth. It analyses data from the Korean Longitudinal Survey of Women and Families (KLoWF) using discrete-time survival analysis to examine two research questions: (1)

whether the transition to first birth among women in different education groups has become more similar with time; and (2) the extent to which the transition to first birth among women in different education groups follows a homogenous pattern as more women attain higher education qualifications.

2. Literature Review

There are two main theories that could potentially explain the changes in education–fertility differentials over the fertility transition: the leader-follower model and the permanent-difference model (Bongaarts 2003). The leader-follower model posits that fertility declines are a result of a diffusion of fertility patterns from more educated women to their less educated counterparts. The model proposes that there would be a widening fertility gap between women with less and more education during the initial stages of the fertility transition. Over time, the leader-follower model postulates that the education effect on fertility diminishes as fertility patterns become more homogenous across education groups (Goldin 2004). The link between education and fertility is thus seen as a transient phenomenon that dissipates as countries achieve replacement-level fertility (Cleland 2002). This model emanates from the idea that women's preference for a small family, as well as norms around the use of contraception, first developed from more educated women and are subsequently adopted by less educated women. Likewise, less conventional aspirations centred on individual self-actualisation rather than family formation may also diffuse in the same manner (van de Kaa 1987; Lesthaeghe 2010). Consequently, completed fertility across different educational categories tends to narrow as countries approach low fertility levels. A major implication of this model is that women's educational composition would play a less significant role in influencing fertility rates after the fertility transition given the convergence between education groups (Bongaarts 2003).

On the other hand, the permanent-difference model suggests that differences in fertility levels across education groups would remain salient throughout the fertility transition due to the presence of varying socioeconomic constraints, and the relative disadvantage between more and less educated women. A rise in educational attainment is likely to widen the fertility gap across education groups as more educated women have the potential to earn higher wages, resulting in higher opportunity costs of having children (Becker 1981). Women with higher potential wages may decide to have fewer children given the forgone income that accompanies childbearing and childcare responsibilities (Macunovich 1996). However, the income effect on fertility might also mean that better educated women may be more inclined to have children as they have the means to provide for their children's needs (Becker 1965). Easterlin's relative income hypothesis (1966, 1978) proposes that women are more likely to have more children if their income during adulthood exceeds their material aspirations developed during childhood. It is therefore important to take into account childhood factors and family background.

There are contrasting findings supporting both hypotheses in South Korea. Recent evidence suggests that the education-specific fertility gaps are narrowing in South Korea, where fertility levels of the more- and less-educated groups appear to have converged to similar levels at the end of the fertility transition (Yoo 2014). The universalisation of small family norms may have spread across different social and educational groups (Choe and Retherford 2009). Thus, cohort fertility patterns by women's educational attainment seem to coincide with the leader-follower model, as opposed to the permanent-difference model (Yoo 2014). If that is the case, it is expected that women's education levels will have a less significant impact on fertility. However, another recent study by Lee (2018) found that period fertility for women with low education has increased, which lends support to the permanent-difference model. These persistent educational gradients in fertility may be reflective of changes in social institutions and economic structures that are incongruent with childbearing (Yoon 2016). In sum, it remains unclear whether fertility patterns among South Korean women in different education groups followed a homogenous pattern during and after the fertility transition.

Regarding the potential effect of other contributing factors, past research suggests the presence and persistence of intergenerational transmission of reproductive behaviour (Barber 2000; Kolk 2014; Rotering 2017). The acculturation hypothesis argues that women who attain a higher socioeconomic status than their parents may not fully adapt to the family formation norms and values of their new social group; rather they tend to align more with their family of orientation (Blau 1967; Sobel 1985). In the Korean context, parental socioeconomic status and the familial setting growing up have been shown to influence women's childbearing decisions (Kim and Kim 2018). For example, in South Korea, the oldest child has greater obligations in the family and they are more likely to conform to their parents' attitudes and beliefs towards marriage and childbearing; hence, eldest daughters tend to experience the transition to marriage and motherhood earlier than their younger siblings (Kim and Kim 2018). Moreover, evidence indicates that the number of siblings is positively associated with fertility (Morosow and Kolk 2020) and high parental socioeconomic status is negatively associated with fertility (Billari, Hiekel, and Liefbroer 2019). In East Asia, traditional family values have a strong influence on women's fertility behaviours, where women with more traditional attitudes tend to get married and have children earlier than those with less traditional attitudes (Kim and Cheung 2015). In addition, Bessey (2018) found that religion contributes to the development of these attitudes, as individual religiosity is associated with traditional values and women with more traditional values tend to have more children in South Korea.

Given the contrasting findings in the literature, this study proposes that the educational gradient in fertility may be better understood by account for a range of familial and individuals characteristics beyond that provided by aggregate data. It extends previous research by (1) using micro-level data to test the two competing hypotheses above; (2) controlling for a range of factors associated with fertility behaviour; and (3) estimating the education–fertility differentials for younger cohorts that have not completed their fertility and, hence, information on these cohorts are not yet available in census data.

3. Data and Methods

This study uses data from the KLoWF, collected by the Korean Women's Development Institute. It is a nationally representative survey of South Korean women aged between 19 and 64. The KLoWF contains information on women's fertility, familial background, demographic and socioeconomic characteristics. The first wave of data was collected in 2007 and it had a response rate of 95.7%, which is relatively high compared to other national surveys such as the Korean National Health and Nutrition Survey, with response rates of around 70% to 80%. The retention rate for successive waves ranged from 84% to 95%. Refreshment samples were added in each wave to replace respondents lost to attrition and to ensure that the sample remains nationally representative. The latest wave (wave 7) of data was collected in 2018 from 9,602 women (7,562 from the original panel; 2,040 from sample top-ups).

As this study is interested in whether first births occurred for women born between 1960 and 1984, five-year cohorts were created based on the year that the women were born. They were split into five birth cohorts: 1960–1964, 1965–1969, 1970–1974, 1975–1979 and 1980–1984. At the time of the last survey, they were aged 54–58, 49–53, 44–48, 39–43 and 34–38 respectively. These birth cohorts capture the progression and conclusion of the fertility transition in South Korea. Right censoring is applied to women who did not have a first birth by the end of the observation period. Despite fertility not being complete for women born in the 1975–1979 and 1980–1984 cohorts, the majority of first births tend to occur before age 34 in South Korea (Statistics Korea 2020). Thus, the impact of right-censoring as a result of incomplete information about potential first births for these cohorts is relatively small. The sample is restricted to women aged 34 and above in 2018 (i.e., born before 1985). The sample excludes an outlier who had a birth before menarche (i.e., before age 12) and cases with missing values on the timing of first birth or covariates. Listwise deletion was used since the proportion of cases lost to missing data is relatively small. The final sample comprised 7,914 women (130,078 person-years).

3.1 Dependent Variable

The KLoWF asked about the women's actual fertility behaviour, including the month and year of their first childbirth. The dependent variable is the occurrence of a first birth and the time-to-event is the length of time from age of menarche until the transition to first birth. This is derived by subtracting the birth year of the women's first child from the women's own birth year. The time origin, age of menarche, is age 12 as the average age of menarche is between 12 and 13 years of age for Korean girls (Lee et al. 2016). Prior to menarche, the risk (or hazard) of having a birth is consider to be zero. The observation period ends when a first birth occurs, or until the women are censored if they have not had a first birth before the last interview or have reached age 45. The cut-off age of 45 years was used because only a negligible proportion of all births in South Korea are to women aged over 45 years (about 1% in 2019) (Statistics Korea 2020).

3.2 Independent Variable

To examine the relationship between education and the transition to first birth, the independent variable is the women's highest educational attainment. The respondents were asked the question: "*What is your highest level of education*?" and the response categories were no education, preschool education, middle school education, high school education, two- or three- year college, four-year university, and graduate school. The education variable was recoded into three categories to distinguish between women who attained high school or lower education, college education, and university or higher education. This variable represents the key educational qualifications in the Korean education system and is widely used in previous studies (e.g., Kim and Cheung 2015; Lee 2019).

3.3 Control Variables

Women's familial background and other individual characteristics, such as religion and family formation attitudes, were shown to influence their fertility behaviour (Kim and Cheung 2015; Kim and Kim 2018). *Women's number of siblings,* ranging from one to 15, was included as a control variable. A dummy variable was created for *women who were first-borns*. *Women's place of residence at the age of 15* was classified into four categories: large cities; medium and small cities; rural towns and villages; and abroad. *Parental education* was created using the highest level of education achieved by either parent: no education, elementary school, middle school, high school, and college or higher education. *Father's occupation* was classified into four categories: no job/no father, white collar (professional, managerial, or administrative work), pink collar (sales or services-oriented work) and blue collar (manual labour or trade work). *Religion* was classified into four categories: no religion, Buddhism, Christianity, and others. As in previous studies (e.g., Cheung and Kim 2018), *women's family formation attitudes* were combined using principal components analysis, ranging from -2.2 (most traditional) to 2.4 (least traditional).

3.4 Method

Discrete-time survival analysis was used to model the transition to first birth for the five cohorts born between 1960 and 1984. This method makes use of all the information present in the sample for analysis and accounts for the right-censoring of women who have not had a first birth by the end of the survey (Allison 2013). The data was organised as person-years, with one record for each fully observed person-year. Binary logistic regression was used to examine the association between women's educational attainment and the transition to first birth and estimate the differences between and within cohorts. Three models were estimated: (1) the transition to first birth by birth cohort with controls; (2) the transition to first birth by birth cohort and educational attainment, with controls; and (3) the transition to first birth by the interaction of birth cohort and educational attainment, with controls. The quadratic term for timing to first birth from age 12 was included to account for the quadratic relationship between time and the transition to first birth. The final model (i.e., third model) was summarised using predictive probabilities to examine (1) the transition to first birth by birth cohort; (2) the transition to first birth by education; and (3) the transition to first birth by birth cohort and education.

4. Results

Table 1 presents the descriptive statistics for the women's familial background and other individual characteristics by birth cohorts. Overall, the proportion of women who had a first birth has declined across the birth cohorts. The proportion of women who had a first birth decreased from 95% for the 1960–1964 cohort to 54% for the 1980–1984 cohort. Women in the older birth cohorts had lower levels of educational attainment than women in the younger birth cohorts. A large majority of women in the 1960–1964 cohort (78%) had a high school or lower education, and only around 16% had a university or higher education. In comparison, only about 27% of women had a high school or lower education for the 1980–1984 cohort and 45% of women had a university or higher education for that cohort.

In terms of familial background and individual characteristics, parental education improved across birth cohorts. The proportion of parents with either high school, or college or higher education increased from 21% for the 1960–1964 cohort to 60% for the 1980–1984 cohort. The majority of women in the 1980–1984 cohort were residing in cities at the age of 15, as opposed to rural towns and villages for the 1960–1964 cohort. Father's occupation gradually shifted from blue collar jobs to white collar jobs across birth cohorts. The number of siblings declined from around five siblings for the 1960–1964 cohort, to 4.76, 4.05, 3.42 and 2.69 for the 1965–1969, 1970–1974, 1975–1979 and 1980–1984 cohorts respectively. Therefore, more women were first-born daughters for the younger birth cohorts than older birth cohorts. In general, women in younger birth cohorts were less religious than women in older birth cohorts. The proportion of women not affiliated with any religion increased from 44% for the 1960–1964 cohort to 66% for the 1980–1984 cohort. Women in younger birth cohorts held less traditional attitudes towards family formation than women in older birth cohorts.

Table 1 Descriptive statistics by birth cohort

	Birth cohort									
	1960–1964		1965–1969		1970–1974		1975–1979		1980–1984	
Variables	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Dependent variable										
Transition to first birth										
No	78	(0.05)	102	(0.06)	161	(0.08)	274	(0.18)	508	(0.46)
Yes	1,486	(0.95)	1,605	(0.94)	1,857	(0.92)	1,247	(0.82)	596	(0.54)
Independent variable										
Educational attainment										
High school or lower	1,218	(77.88)	1,073	(62.86)	1,017	(50.40)	586	(38.53)	302	(27.36)
College	96	(6.14)	185	(10.84)	348	(17.24)	407	(26.76)	303	(27.45)
University or higher	250	(15.98)	449	(26.30)	653	(32.36)	528	(34.71)	499	(45.20)
Women's familial background										
Parental education										
Elementary school or lower	936	(59.85)	806	(47.22)	738	(36.57)	393	(25.84)	196	(17.75)
Middle school	299	(19.12)	383	(22.44)	553	(27.40)	390	(25.64)	241	(21.83)
High school	221	(14.13)	367	(21.50)	525	(26.02)	580	(38.13)	511	(46.29)
College or higher	108	(6.91)	151	(8.85)	202	(10.01)	158	(10.39)	156	(14.13)
Residence at 15										
Large cities	427	(27.30)	559	(32.75)	802	(39.74)	612	(40.24)	537	(48.64)
Medium and small cities	364	(23.27)	410	(24.02)	494	(24.48)	479	(31.49)	330	(29.89)
Rural towns and villages	769	(49.17)	730	(42.77)	715	(35.43)	421	(27.68)	226	(20.47)
Abroad	4	(0.26)	8	(0.47)	7	(0.35)	9	(0.59)	11	(1.00)
Father's occupation at 15										
No job/no father	122	(7.80)	129	(7.56)	151	(7.48)	92	(6.05)	51	(4.62)
White collar	257	(16.43)	350	(20.50)	446	(22.10)	386	(25.38)	321	(29.08)
Pink collar	163	(10.42)	260	(15.23)	346	(17.15)	298	(19.59)	214	(19.38)
Blue collar	1,022	(65.35)	968	(56.71)	1,075	(53.27)	745	(48.98)	518	(46.92)
First born child										
No	1,220	(78.01)	1,308	(76.63)	1,452	(71.95)	963	(63.31)	592	(53.62)
Yes	344	(21.99)	399	(23.37)	566	(28.05)	558	(36.69)	512	(46.38)
Number of siblings (mean)	5.07	(0.04)	4.76	(0.04)	4.05	(0.03)	3.42	(0.04)	2.69	(0.03)
Individual characteristics										
Religion										
No religion	684	(43.73)	873	(51.14)	1,086	(53.82)	925	(60.82)	734	(66.49)
Buddhism	421	(26.92)	323	(18.92)	323	(16.01)	195	(12.82)	119	(10.78)
Christianity	332	(21.23)	377	(22.09)	466	(23.09)	305	(20.05)	179	(16.21)
Other religions	127	(8.12)	134	(7.85)	143	(7.09)	96	(6.31)	72	(6.52)
Attitudes on family formation (mean)	-0.11	(0.02)	0.05	(0.02)	0.13	(0.02)	0.15	(0.02)	0.23	(0.03)
Total	1,564	(100.0)	1,707	(100.0)	2,018	(100.0)	1,521	(100.0)	1,104	(100.0)

Note Table presents number of women with percentage in parenthesis. Mean value and standard deviation reported for number of siblings and attitudes.

Table 2 reports the results for the discrete-time models of the transition to first birth. Model 1 shows that women's birth cohort was negatively associated with the likelihood of having a first birth ($p < 0.05$). Compared to women in the 1960–1964 cohort, the odds of having a first birth are 12% lower for women in the 1965–1969 cohort, 21% lower for women in the 1970–1974 cohort, 35% lower for women in the 1975–1979 cohort, and 59% lower for women in the 1980–1984 cohort, holding all other predictors constant. As shown in

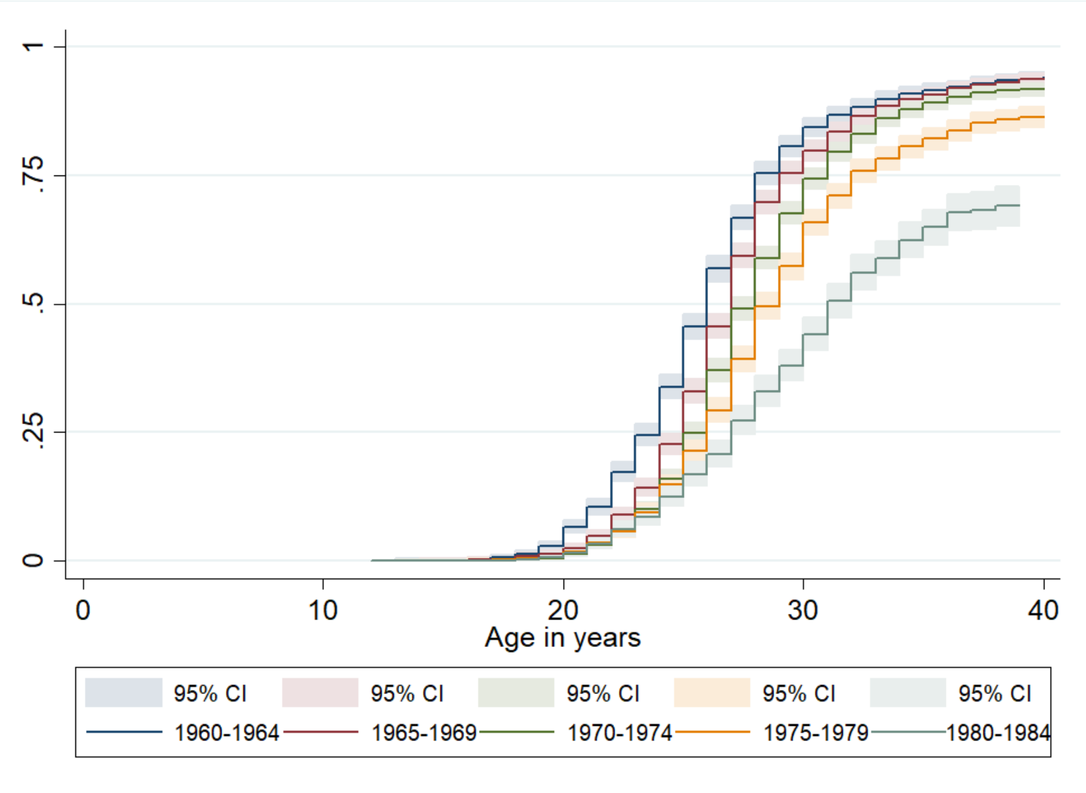
Figure 1, the cumulative probability of having a first birth is higher for women in older birth cohorts than women in younger birth cohorts. The proportion of women that experienced a first birth declined for younger birth cohorts, and women in younger birth cohorts took longer to have their first birth compared to those in older birth cohorts.

Table 2 Discrete-time logit estimates for the transition to first birth

	Model 1			Model 2			Model 3		
Variables	OR	SE	p-value	OR	SE	p-value	OR	SE	p-value
Birth cohort (ref: 1960–1964)									
1965–1969	0.88	0.04	0.002	0.91	0.04	0.019	0.86	0.04	0.001
1970–1974	0.79	0.03	<0.0001	0.84	0.03	<0.0001	0.80	0.04	<0.0001
1975–1979	0.65	0.03	<0.0001	0.70	0.03	<0.0001	0.69	0.04	<0.0001
1980–1984	0.41	0.02	<0.0001	0.46	0.03	<0.0001	0.61	0.05	<0.0001
Educational attainment (ref: high school or lower)									
College	–			0.77	0.03	<0.0001	0.58	0.07	<0.0001
University or higher	–			0.65	0.02	<0.0001	0.66	0.05	<0.0001
Interaction									
1965–1969 x College	–			–			1.39	0.21	0.026
1965–1969 x University or higher	–			–			1.15	0.12	0.157
1970–1974 x College	–			–			1.36	0.19	0.027
1970–1974 x University or higher	–			–			1.06	0.10	0.569
1975–1979 x College	–			–			1.36	0.19	0.028
1975–1979 x University or higher	–			–			0.97	0.10	0.740
1980–1984 x College	–			–			1.07	0.17	0.676
1980–1984 x University or higher	–			–			0.56	0.07	<0.0001
Religion (ref: no religion)									
Buddhism	1.04	0.04	0.280	1.05	0.04	0.198	1.05	0.04	0.161
Christianity	0.94	0.03	0.057	0.97	0.02	0.370	0.97	0.03	0.386
Others	0.94	0.05	0.277	0.99	0.05	0.905	0.99	0.05	0.880
Residence at 15 (ref: large cities)									
Medium and small cities	1.12	0.04	0.002	1.12	0.04	0.001	1.12	0.04	0.001
Rural towns and villages	1.32	0.05	<0.0001	1.31	0.05	<0.0001	1.31	0.05	<0.0001
Abroad	0.80	0.15	0.225	0.75	0.14	0.114	0.74	0.14	0.099
Parental education (ref: elementary school or lower)									
Middle school	0.89	0.03	0.001	0.92	0.03	0.016	0.92	0.03	0.014
High school	0.80	0.03	<0.0001	0.88	0.03	0.001	0.87	0.03	0.001
College or higher	0.71	0.04	<0.0001	0.84	0.05	0.002	0.84	0.05	0.004
Father's occupation at 15 (ref: no job/no father)									
White collar	1.03	0.06	0.681	1.10	0.07	0.118	1.11	0.07	0.100
Pink collar	0.97	0.06	0.625	1.02	0.06	0.699	1.02	0.06	0.695
Blue collar	1.00	0.05	0.997	1.02	0.05	0.771	1.02	0.05	0.724
First born (ref: no)									
Yes	1.12	0.04	<0.0001	1.12	0.04	<0.0001	1.13	0.04	<0.0001
Siblings	1.06	0.01	<0.0001	1.05	0.01	<0.0001	1.06	0.01	<0.0001
Attitudes on family formation	0.88	0.01	<0.0001	0.88	0.01	<0.0001	0.88	0.01	<0.0001
Age at first birth (from age 12)	5.24	0.16	<0.0001	5.31	0.16	<0.0001	5.31	0.16	<0.0001
Age at first birth squared	0.97	0.00	<0.0001	0.97	0.00	<0.0001	0.97	0.00	<0.0001
Log-likelihood			11447.82			11605.11			11649.72
Pseudo R2			0.2148			0.2178			0.2186
Akaike information criterion			41889.65			41736.37			41707.76
Bayesian information criteria			42104.72			41970.99			42020.59

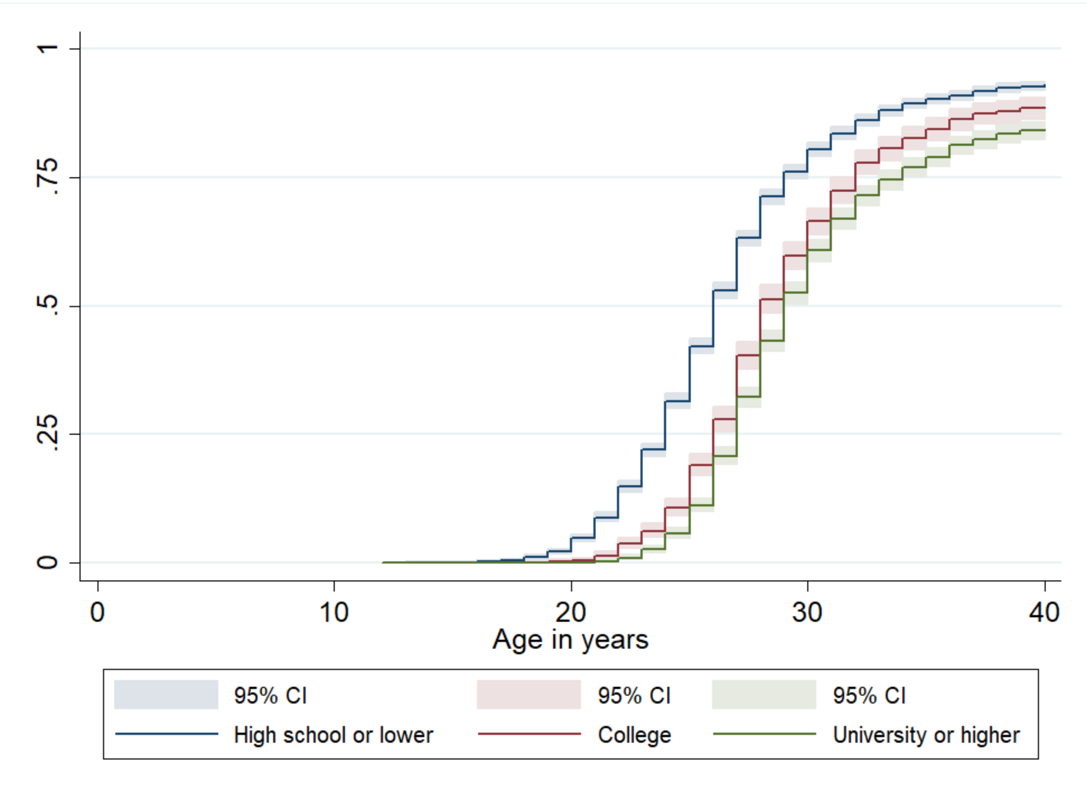
Note For each model, odds ratio is reported in the first column, standard error in the second, and p-value in the third.

Figure 1 Cumulative probability of the transition to first birth, by birth cohort



Model 2 reveals that women who were more educated are less likely to have a first birth compared to women who were less educated ($p < 0.05$). The odds of having a first birth for women with college education is 23% lower than women with high school or lower education. Similarly, the odds of having a first birth for women with university or higher education is 35% lower than women with high school or lower education. Figure 2 shows that women with high school or lower education have a higher probability of having a first birth compared to women with college education and women with university or higher education. Furthermore, less educated women appear to have earlier first births compared to better educated women.

Figure 2 Cumulative probability of the transition to first birth, by education



Model 3 presents the results of the two-way interaction between birth cohort and educational attainment. There were significant birth cohort trends which differ substantially by educational attainment. To aid in the interpretation of model 3, the change in odds of having a first birth between and within cohorts were compared. The results show a negative association between women's educational attainment and the transition to first birth within cohorts, and an overall decline in the odds of having a first birth for each successively younger cohort (see Table 3). There appears to be a narrowing followed by a widening of education–fertility differentials across birth cohorts. Figure 3 shows a convergence in the predicted probabilities of having a first birth for different education groups for the 1965–1969, 1970–1974 and 1975–1979 cohorts. However, the gaps in fertility between education groups subsequently widened for the younger birth cohort. The fertility gaps among women with high school or lower education, college education, and university or higher education are significantly different for the 1980–1984 cohort.

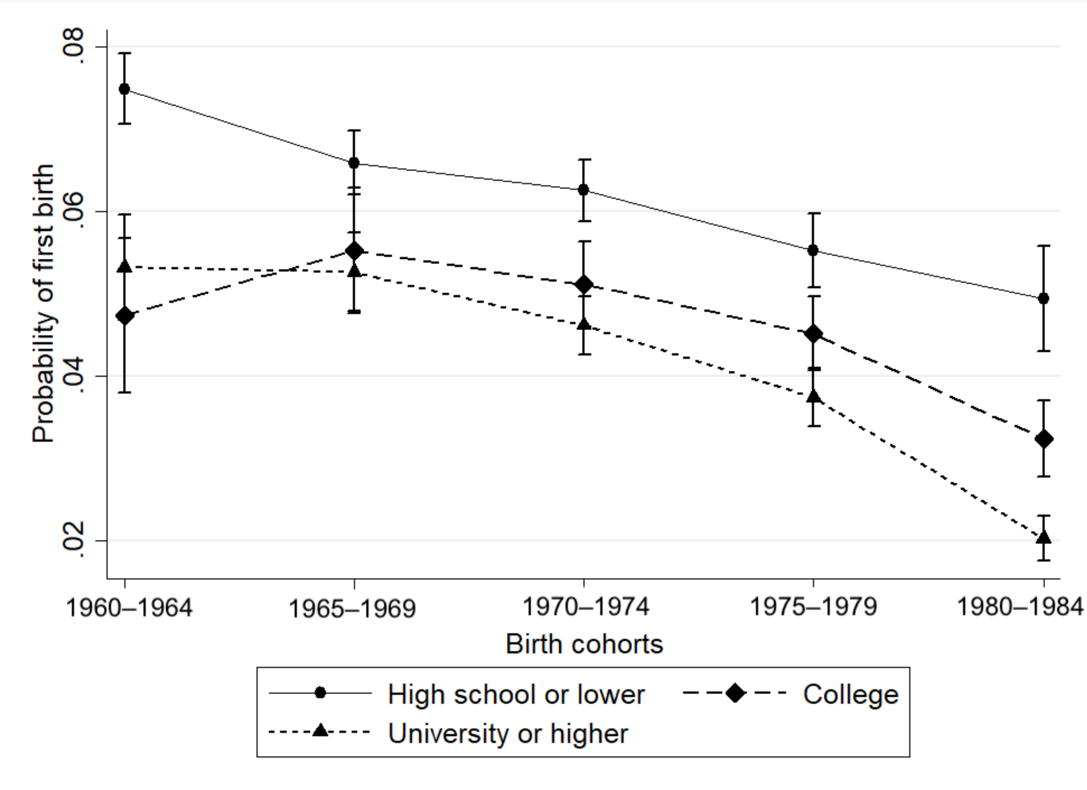
Table 3 Comparing the effects of education on the transition to first birth

	Birth cohort														
	1960–1964			1965–1969			1970–1974			1975–1979			1980–1984		
Differences within cohorts	OR	SE	p-value	OR	SE	p-value	OR	SE	p-value	OR	SE	p-value	OR	SE	p-value
College vs High school or lower	0.58	0.07	<0.0001	0.81	0.07	0.019	0.79	0.06	0.001	0.79	0.06	0.002	0.62	0.07	<0.0001
University or higher vs High school or lower	0.66	0.05	<0.0001	0.77	0.05	<0.0001	0.70	0.04	<0.0001	0.64	0.05	<0.0001	0.38	0.04	<0.0001
University or higher vs College	1.14	0.16	<0.0001	0.95	0.09	0.566	0.89	0.07	0.117	0.81	0.06	0.007	0.60	0.06	<0.0001

	Education attainment								
	High school or lower			College			University or higher		
Differences between cohorts	OR	SE	p-value	OR	SE	p-value	OR	SE	p-value
1965–1969 vs 1960–1964	0.86	0.04	0.001	1.19	0.17	0.213	0.99	0.09	0.881
1970–1974 vs 1960–1964	0.80	0.04	<0.0001	1.09	0.14	0.502	0.85	0.07	0.052
1975–1979 vs 1960–1964	0.69	0.04	<0.0001	0.95	0.12	0.670	0.67	0.06	<0.0001
1980–1984 vs 1960–1964	0.61	0.05	<0.0001	0.65	0.09	0.003	0.34	0.04	<0.0001
1970–1974 vs 1965–1969	0.94	0.05	0.207	0.92	0.09	0.383	0.86	0.06	0.030
1975–1979 vs 1965–1969	0.81	0.05	0.001	0.79	0.08	0.022	0.68	0.05	<0.0001
1980–1984 vs 1965–1969	0.71	0.06	<0.0001	0.55	0.06	<0.0001	0.35	0.03	<0.0001
1975–1979 vs 1970–1974	0.86	0.05	0.015	0.87	0.07	0.087	0.79	0.05	0.001
1980–1984 vs 1970–1974	0.76	0.06	0.001	0.60	0.06	<0.0001	0.41	0.03	<0.0001
1980–1984 vs 1975–1979	0.88	0.08	0.145	0.70	0.07	<0.0001	0.51	0.05	<0.0001

Note Odds ratios remain the same regardless of where the covariates are held constant.

Figure 3 Predicted probabilities of the transition to first birth, by birth cohort and education



Discussion and Conclusion

The transition to first birth among women in different education groups followed a relatively homogenous pattern, albeit at a different rate. The initial negative gradient was steeper for the group with high school or lower education. For the group with college education, there was a slight increase in the probability of having a first birth between the 1960–1964 and the 1965–1969 cohorts, followed by a gradual decrease across the younger birth cohorts. The group with university or higher education consistently had the lowest probability of having a first birth among the different education groups. These findings suggest that the low fertility patterns may have spread from women with more education to women with less education for the 1965–1969, 1970–1974 and 1975–1979 cohorts. However, the decline in births for women with college and university or higher education occurred rapidly for the 1980–1984 cohort, giving rise to persistent differences in fertility between education groups.

Although fertility levels of the more- and less-educated groups appear to have narrowed at the end of the fertility transition, the results suggest that the gaps in fertility rates are re-emerging for the younger post-transition birth cohort. The transitions to first birth among women in different education groups had not become more similar with time. Therefore, the findings are more consistent with the permanent-difference model as opposed to the leader-follower model, considering that women with higher education seem to be pushing the fertility rates even lower for the 1980–1984 cohort. This has important implications given South Korea's declining fertility and rising education levels. The number of births may continue to decline as education levels continue to improve for South Korean women. Consequently, the delay and decline in first births may impact overall fertility by further driving down fertility rates.

There are some potential limitations of this study. First, as mentioned in the methods section, the younger birth cohorts born in 1975–1979 and 1980–1984 might not have fully completed their childbearing (i.e., transition to first birth). While it is expected that the majority of women in these cohorts would have had their first births between ages 25 and 34 years, censored observations may contribute less information than uncensored observations. In examining whether there is adequate information for model estimation, the number of first births for the 1975–1979 (1,247 births) and 1980–1984 (596 births) cohorts suggests that there is sufficient information for each parameter in the model to generate relatively robust estimates (Allison 2010). Second, sample attrition might be a potential issue for longitudinal studies as women who attrite may have different fertility behaviours than those who remain in the sample. To keep the data representative and comparable over time, the KLoWF recruits refreshment samples in each wave to replace respondents lost to attrition and these were included in the analyses. Another limitation relates to the definition of educational categories in this study. Given the rapid expansion of higher education in the early 1990s, the educational categories may not carry the same meaning for the 1980–1984 cohort as they did for the 1960–1964 cohort. For instance, the meaning of 'university education' might be interpreted differently for the older cohorts than for younger cohorts, as university education used to be relatively uncommon in the past, but a much larger proportion of women attends university now. Although it is important to consider how the meaning of education has changed in understanding fertility differentials, the study notes that presently available data in most countries, including South Korea, remain limited in addressing the shifting meaning of education. Therefore, in this study, the interaction term composed by educational attainment and birth cohort was included to allow the effect of education on fertility to vary by cohort.

Despite these limitations, the study extends previous research on the effect of educational differentials on fertility in a low fertility setting. It points to the permanent-difference model as the more appropriate model for explaining South Korea's educational gradients in fertility. The study used microdata to show that there was indeed an initial convergence of fertility between education groups, but the gaps have since widened for the post-transitional cohort. Thus, women's education remains a crucial factor in influencing fertility rates. The study highlights the importance of recognising the impact of education–fertility gaps beyond the fertility transition. It remains vital for countries that have undergone or are undergoing the fertility transition to take into account the changing education composition of the population when developing population policies. Given South Korea's low fertility and high education levels, policymakers may wish to consider taking a more targeted approach to encourage childbearing among women in different education groups. Specific policies and messages could be tailored to address concerns relating to childbearing for women with differing needs for time, services, or financial support.

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