

## Socio-economic Differentials in Fertility Transition

Samsik Lee<sup>1</sup>, Hyojin Choi<sup>2\*</sup>

<sup>1</sup> Korea Institute for Health and Social Affairs, Korea E-mail: [lss@kihasa.re.kr](mailto:lss@kihasa.re.kr)

<sup>2</sup> Korea Institute for Health and Social Affairs, Korea E-mail: [chj@kihasa.re.kr](mailto:chj@kihasa.re.kr)

### Abstract

The main purpose of this paper is to investigate determinants of continued lowest-low fertility syndrome in Republic of Korea. As for the demographic factors, the demographic decomposition revealed that both delay in marriage and decrease in marital fertility rate had led to the fertility decline but the delay in marriage played a crucial role to press a rebound of the fertility level in recent years. As for the socio-economic factors, the analysis on the parity progression ratio revealed that the traditionally high fertility population groups, with a relatively low prestige in their socio-economic statuses, made a significant contribution to further lowering the fertility rate in recent years. These findings imply that government should put a great emphasis on eliminating barriers for marriage or family formation and supporting for child-bearing and rearing of the traditionally high fertility population groups with relatively low socio-economic statuses.

**Keywords:** Lowest low fertility, Fertility transition, Differentials.

### Introduction

In Republic of Korea, the total fertility rate below the population replacement level (low fertility syndrome) has continued for more than 30 years and the total fertility rate below 1.3 (lowest low fertility syndrome) has continued for 13 years since 2001 (Korea National Statistical Office, 2014). The total fertility rate decreased even to 1.05 in 2005. The long continuation of the low fertility syndrome can accelerate population aging, which will bring about the shrinkage of labor force, aging of labor force and thereby decrease of labor productivity, increase in burden for social expenditure, shrinkage of domestic demand, slowdown of potential economic growth, etc. Accordingly, the government of Republic of Korea launched pronatal policies in response to the low fertility syndrome in 2006. Nevertheless, the total fertility rate has maintained below 1.3, prolonging the duration of the lowest low fertility phenomenon, which has never been experienced by any other countries in the world.

Why has not the fertility rate increased despite of a lot of prenatal policies? Have the policy measures been ineffective? Has the policy target been wrong? This study makes an attempt to answer these questions, which can help the policy-makers identify the causes of the continued lowest low fertility phenomenon. The analysis on causes of lowest low fertility needs to take into considerations demographic as well as socio-economic aspects. Thus, this study makes an attempt to identify the extent to which the marriage delay and the marital fertility change, as demographic factors, contribute to

change in the total fertility rate. Influence of the demographic factors, marriage delay and marital fertility change, might vary among population groups with different socio-economic characteristics. Therefore, this study also makes an attempt to identify the difference in fertility transition, as influenced by various socio-economic characteristics, among population groups. Identifying those demographic and socio-economic factors, which contributed to the continuation of lowest low fertility syndrome, will be an important basis for re-establishing the policies to recover the currently low fertility rate.

### Literature Review

According to Frejka and Ross (2001), in Western societies 60 percent of women married, decreasing the possibility of pregnancy in 1980s. It was also found out that in Asia, the fertility decline was attributable to the decrease in number of marriages as well as the delay of marriage for the past several decades; Retherford, Ogawa and Matsukura (2001) asserted that in Japan, the urbanization had a weak effect but the educational level played an important role in increasing female's age at first marriage and celibacy rate during the period between 1973 and 1975. Kim, et. al. (2006) found, based on the multivariate analysis on the population census data for 1980, 1990, and 2000, that the increase in age at marriage played a role in decreasing the number of births in Republic of Korea. Lee and Choi, et. al. (2009) proved the negative effect of the timing of first marriage on the number of births, by analyzing the 2009 Marriage and Fertility Dynamics Survey.

Orsal and Goldstein (2010) proved by analyzing the data for 22 countries of OECD that the increase in unemployment rate played a role in decreasing the fertility rate during the period between 1976 and 2008. Kravdal (2002) also proved through a simulation that in Norway, the rise in unemployment rate in 1993 contributed to the fertility decline. In Japan, the increase in young male's unemployment rate contributed to the decrease in the fertility rate during the period between 2000 and 2004 (Sobotka, et. al., 2011). According to Sobotka, et. al. (2011), the increase in the proportion of self-employed workers decreased the fertility rate during the economic recession. Many studies made a consensus that during the hard economy, the female's educational level tended to increase as a strategy for entering the labor market, which caused the delay in marriage and thereby the decline in fertility rate (Oppenheimer, Kalmijn, and Lim, 1997; Sobotka et. al., 2011).

Kim, et. al. (2006) found, from the multivariate analysis on the population census data for 1980, 1990, and 2000, that higher educational level, engagement in professional and clerk

works, etc. had a negative effect on the number of children. Other studies (for example, Kim, 2007; Kim, 2008) also revealed a negative effect of education, employment status and occupation on the number of children. However, Choi and Song (2010) argued, based on a probit analysis on the 2008 Financial Panel that mothers' educational level had no significant influence in the second birth or higher. Kim and Kim (2012) proved, by applying the Cox's proportional hazard model and the discrete hazard model to Korea Labor Panel (1998~2008), that the employment status had no significant effect on the hazard of giving the first birth and the second birth.

### Methods and Data

The demographic factors, which have proven to significantly affect the fertility level in many studies, include age at first marriage and marital fertility. Thus, the change in period total fertility rate (TFR) can be decomposed by both demographic factors; the age at first marriage can be converted to the proportion of the married women to the total and the marital fertility can be calculated by the fertility rate of women who are currently married. The decomposition is carried out by the following formula;

$$FR_i = \frac{Bi}{Fpi} = \frac{Bi}{Fpi} \times \frac{MFPi}{MFPi} = \frac{Bi}{MFPi} \times \frac{MFPi}{Fpi} = MFR_i \times MR_i$$

(FR =period fertility rate, B= number of births in a specific year from females in age i, FP= number of females, MFP=number of married women, MFR=marital fertility rate, MR = proportion of married women to the total, i=age)

The fertility transition by a specific group of married women can be measured by the parity progression ratio (PPR). In this study, the parity progression ratio is to compare the fertility transition between educational levels, employment statuses, and occupations, respectively. The parity progression ratios are calculated by the following formula (Henry S. Shryock, Jacob S. Siegel and Associates, 1976);

$$P_{0 \rightarrow 1} = P_1 = \frac{W_1}{W_2}, P_{1 \rightarrow 2} = P_2 = \frac{W_2}{W_3}, P_{2 \rightarrow 3} = P_3 = \frac{W_3}{W_4}, P_{3 \rightarrow 4} = P_4 = \frac{W_4}{W_5}, \dots$$

For the demographic decomposition, the data from Population and Housing Census, Residential Registration System, and Vital Registration System are used. The data from Population and Housing Census for 2000, 2005 and 2010 are used to calculate the parity progression ratios.

### Main Findings

The total fertility rate dropped from 1.78 in 1992 to 1.52 in 1997, and then to 1.08 in 2005. Thereafter, the total fertility rate irregularly fluctuated to reach to 1.19 in 2013. The demographic decomposition shows that both the decrease in proportion of married women to the total women due to the delay in marriage and the decrease in fertility rate by the married women (marital fertility) led to the decline in total fertility rate between 1992 and 1997; the contribution to the decrease in the total fertility rate was bigger almost three-fold

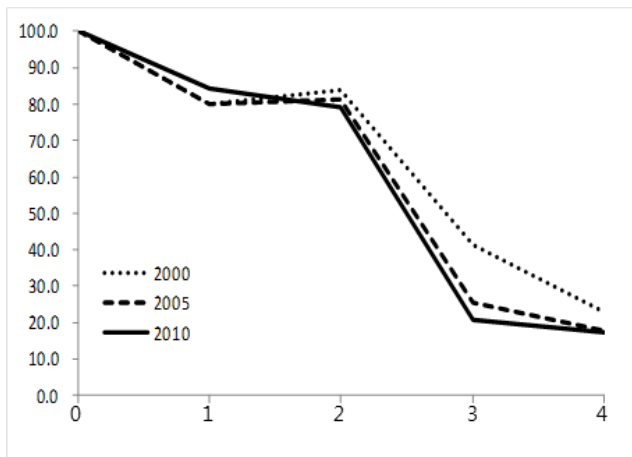
for the marriage delay than for the decrease in marital fertility. The marriage delay, even with a positive effect of the marital fertility, played a crucial role in decreasing the total fertility rate between 1997 and 2005; the total fertility rate decreased by 0.52 due to the marriage delay, offsetting the increase of 0.03 by the marital fertility. However, the total fertility rate increased by 0.11 between 2005 and 2013, thanks to the increase of the marital fertility, although the marriage delay still played a role to decrease the total fertility rate. For the whole duration between 1992 and 2013, the marriage delay contributed to the total fertility rate in a negative direction and the marital fertility did in appositive direction; the negative contribution by the marriage delay was bigger that that by the marital fertility, resulting in decrease of the total fertility rate.

**Table 1. Result from Demographic Decomposition of Change in TFR**

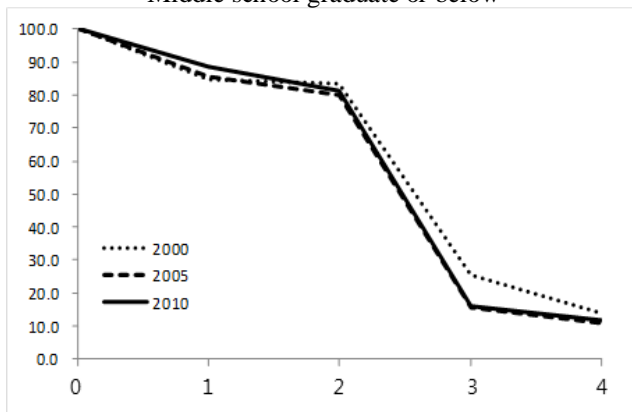
duration	change in TFR	contribution to change in TFR		
		due to change in proportion of married women to total	due to change in marital fertility rate	due to interaction
1992~1997	-0.24	-0.20	-0.07	0.03
1997~2005	-0.44	-0.52	0.03	0.05
2005~2013	0.11	-0.31	0.54	-0.13
1992~2013	-0.57	-1.10	0.73	-0.20

Source: Calculated using statistics from Population and Housing Census, Residential Registration System, and Vital Registration System.

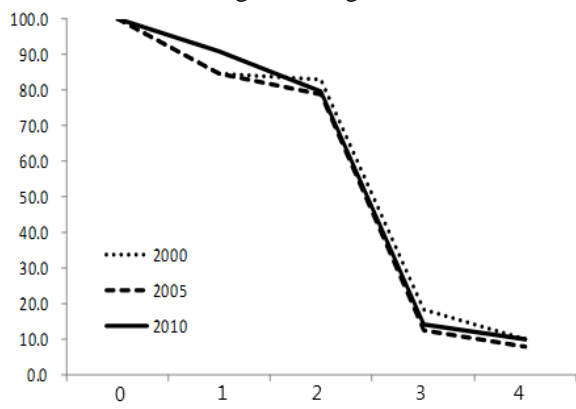
As influenced by both marriage delay and change in marital fertility, the parity progression ratios for the married women aged 45 to 49 appeared to decline as the parity increased, without exceptions, in all educational levels of married women aged 45 to 49. For the educational group with graduate from middle school or below, the change in the parity progression ratios between 2000 and 2010 appeared to be relatively big from the second birth to the third birth (P<sub>3</sub>), followed by from the third birth to the fourth birth (P<sub>4</sub>). The differences in P<sub>3</sub> and P<sub>4</sub> between 2000 and 2005 appeared to be higher than those between 2005 and 2010; for this group of women, the fertility decline was bigger in the past than in the recent years. However, such differences in P<sub>3</sub> and P<sub>4</sub> appeared to decrease as the educational level increased, implying that the fertility decline in 2000s was more attributable to the fertility transition of the low educational groups than that of the higher educational groups.



Middle school graduate or below

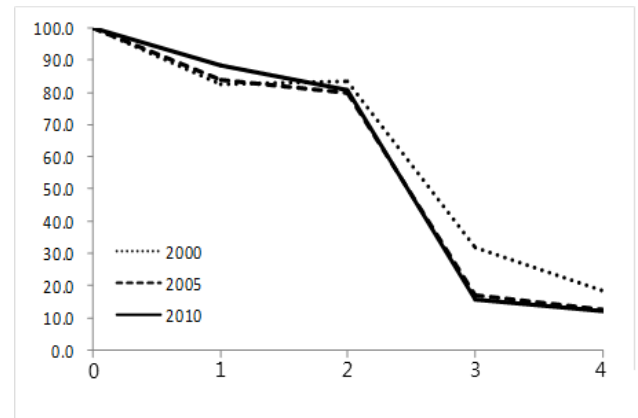


High school graduate

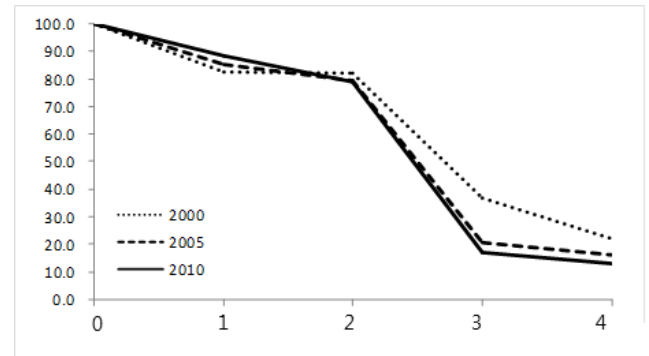


Junior college graduate or above

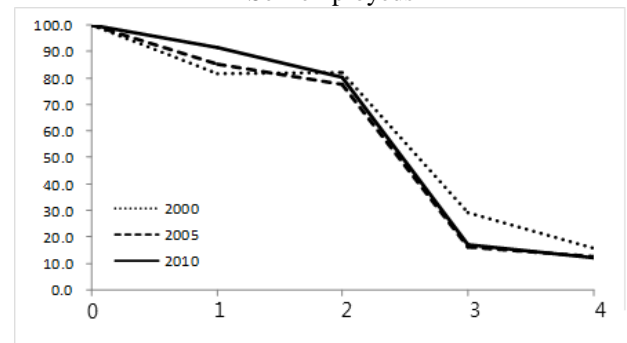
of married women aged 45 to 49 with different economic characteristics such as employment status and occupation. The parity progression ratios decreased as the parity increased in all employment statuses of the married women. For all groups of employment statuses, the change in the parity progression ratios between 2000 and 2010 appeared to be relatively big from the second birth to the third birth ( $P_3$ ), followed by from the third birth to the fourth birth ( $P_4$ ). The differences in  $P_3$  and  $P_4$  between 2000 and 2005 appeared to be higher than those between 2005 and 2010, indicating that the fertility decline was bigger in the early 2000s than in the late 2000s. Such differences in  $P_3$  and  $P_4$  appeared to be high for the unpaid family workers, followed by the self-employed workers, the paid workers, and the employers, in that order, implying that the fertility decline in 2000s was more attributable to the fertility transition of the unpaid family workers and the self-employed workers than that of the paid workers and the employers.



Paid Workers



Self-employed



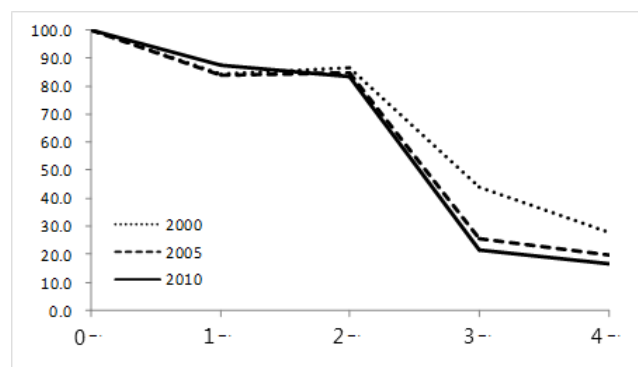
Employers

**Figure 1.** Parity Progression Ratios by Educational Level of Married Women Aged 45 to 49

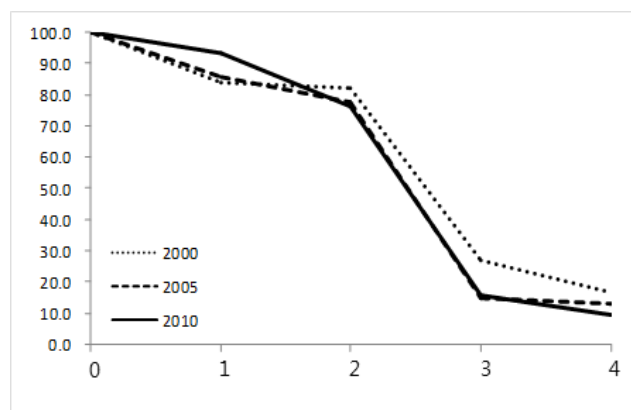
*Note: 1 denotes shift from childless to the first birth, 2 denotes shift from the first birth to the second birth, 3 denotes shift from the second birth to the third birth, 4 denotes shift from the third birth to the fourth birth.*

*Source: Calculated using statistics from Population and Housing Census, 2000, 2005 and 2010.*

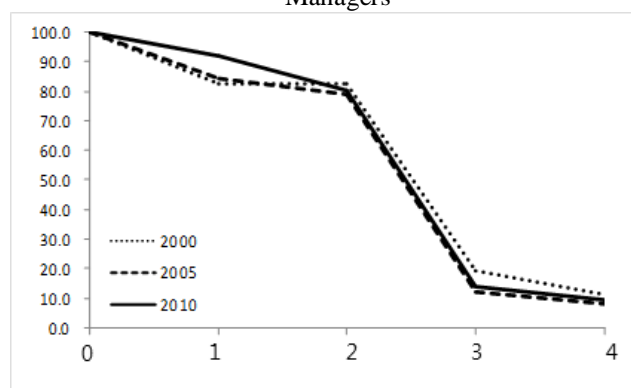
Such a pattern in parity progression ratios as appeared between the educational levels can also be seen for the groups



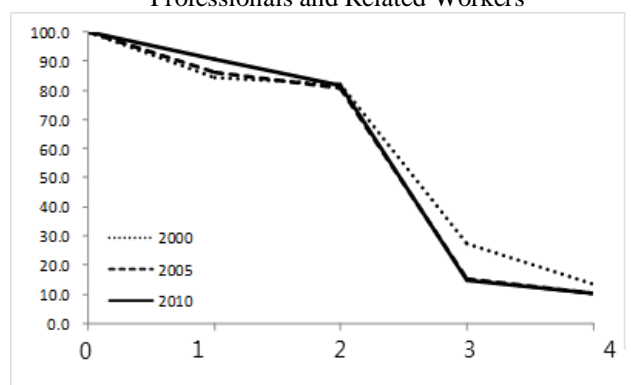
Unpaid Family Workers



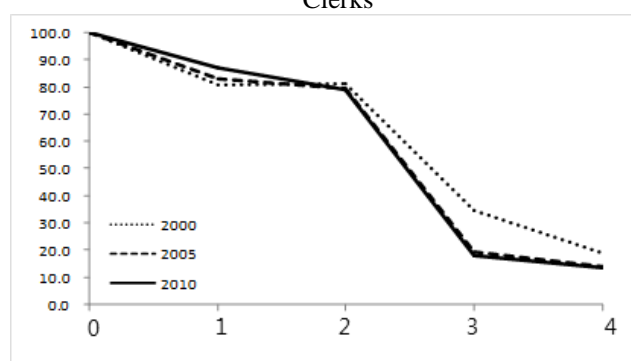
Managers



Professionals and Related Workers



Clerks



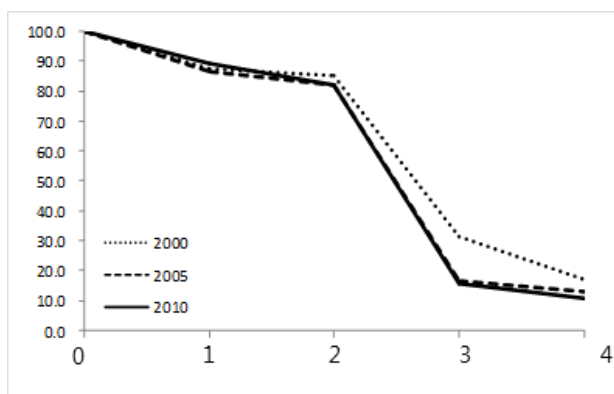
Service Workers

**Figure 2.** Parity Progression Ratios by Employment Status of Married Women Aged 45 to 49

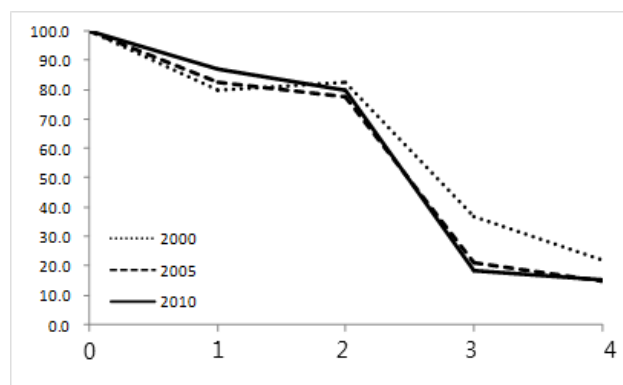
*Note: 1 denotes shift from childless to the first birth, 2 denotes shift from the first birth to the second birth, 3 denotes shift from the second birth to the third birth, 4 denotes shift from the third birth to the fourth birth.*

*Source: Calculated using statistics from Population and Housing Census, 2000, 2005 and 2010.*

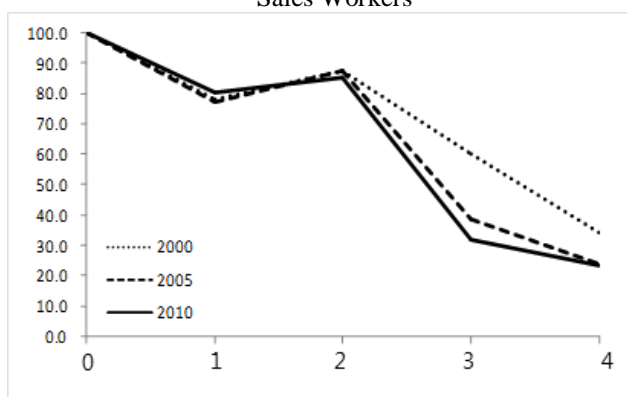
The parity progression ratios appeared to decline as the parity increased for all groups of occupations. The change in the parity progression ratios between 2000 and 2010 appeared to be relatively big from the second birth to the third birth ( $P_3$ ), followed by from the third birth to the fourth birth ( $P_4$ ). The differences in  $P_3$  and  $P_4$  between 2000 and 2005 appeared to be relatively high but the differences between 2005 and 2010 appeared to be very small, indicating that the fertility decline was bigger in the early 2000s than in the late 2000s for all groups of occupations. For the professionals and related workers,  $P_3$  and  $P_4$  in 2005 appeared to be lower than those in 2010. The differences in  $P_3$  and  $P_4$  between 2000 and 2010 appeared to be relatively high for the skilled agricultural, forestry and fishery workers, the craft and related trades workers, the equipment, machine operating and assembling workers, the elementary workers, the service workers, and the sales workers but relatively low for the managers, the clerks, and the professionals and related workers; it implied that the fertility decline in 2000s was more attributable to the fertility transition of the married women working in those occupations with the relatively low prestige than the fertility transition of those workers engaged in the occupations with the relatively high prestige.



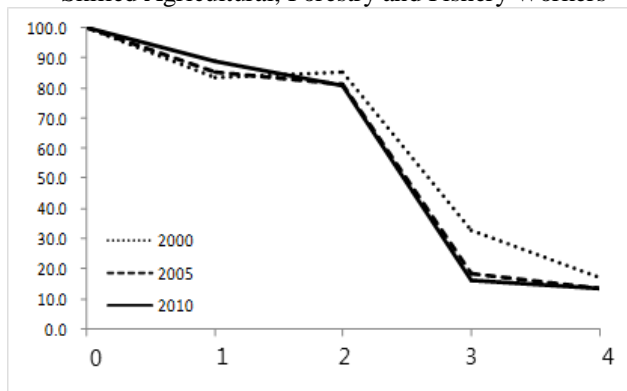
Sales Workers



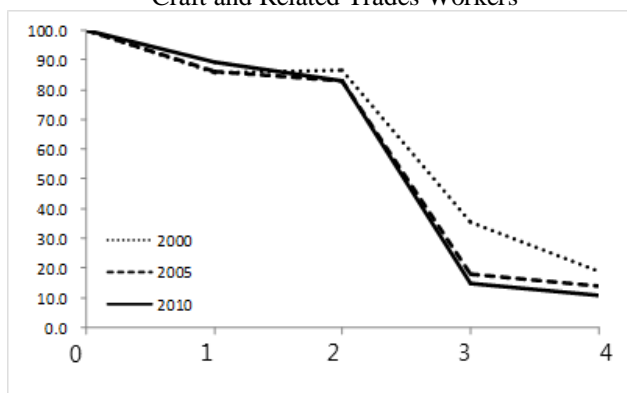
Elementary Workers



Skilled Agricultural, Forestry and Fishery Workers



Craft and Related Trades Workers



Equipment, Machine Operating and Assembling Workers

**Figure 3.** Parity Progression Ratio by Occupation of Married Women Aged 45 to 49

*Note: 1 denotes shift from childless to the first birth, 2 denotes shift from the first birth to the second birth, 3 denotes shift from the second birth to the third birth, 4 denotes shift from the third birth to the fourth birth.*

*Source: Calculated using statistics from Population and Housing Census, 2000, 2005 and 2010.*

### Conclusions

It is found for this study that among the demographic determinants of fertility, the delay in marriage played more pivotal roles than the change in the marital fertility rate in lowering the total fertility rate and continuing the lowest low fertility syndrome more in Republic of Korea. The negative influence of the marriage delay on the fertility rate became bigger and bigger with time. Thus, a recommendation should be raised from the findings of this study that policy designed to recover from the lowest low fertility put a great emphasis on changing the current marriage behaviors, postponement in timing of first marriage.

As for the socio-economic determinants of fertility rate, which are presumably affecting the demographic factors, the analysis on parity progression ratios shows that the married women with relatively low prestige of socio-economic statuses were more likely to shift from the high fertility practice to the low fertility practice that their counterparts. The probability rate of transition to higher order of birth, specifically to the third birth and the fourth birth, decreased rather rapidly for those women with lower levels of education, the unpaid family workers and the self-employed workers, and the skilled agricultural, forestry and fishery workers, the craft and related trades workers, the equipment, machine operating and assembling workers, the elementary workers, the service workers, and the sales workers. Thus, entering and continuing of the lowest low fertility syndrome in Republic of Korea was attributable to the decrease in fertility rate among those population groups, who had traditionally high propensity for high fertility. Form such findings, it is worthwhile to recommend that the government put a great emphasis on facilitating child- caring and rearing of the population groups, who are in relatively low prestige of socio-economic statuses.

## References

1. Bongaarts, J. & Feeney, G. (1998), On the quantum and tempo of fertility, *Population and Development Review*, 24(2), 271~291.
2. Choi, J. O. and Song, H. J. (2010), *Analysis on Effectiveness and Impact of Pronatal policy Measures*, Korea Institute for Finance.
3. Frejka, T., Ross, J. (2001), Paths to sub replacement fertility: the empirical evidence, *Population and Development Review*, Vol. 27, Supplement; Global Fertility Transition(2001), 213~254.
4. Henry S. Shryock, Jacob S. Siegel and Associates (1976), *Methods and Materials of Demography*, Academic Press.
5. Kim, D. S. (2008), The recent change in the fertility level and its socio-economic differentials, *Multi-discipline Study for Development of Policy Measures in Response to Low Fertility*, Ministry of Health and Welfare and Korea Institute for Health and Social Affairs, 5~30.
6. Kim, H. S (2007), Count model analysis on determinants of number of children in Korean households and its economic implications, *Korea Journal of Population Studies*, 30(3), 107~135.
7. Kim, H. S. and Kim, J. Y. (2012), *Differentials of Fertility according to Females' Labor Conditions and Policy Options*, Korea Institute for Health and Social Affairs.
8. Kim, T. H., Lee, S. S. and Kim, D. H. (2006), Demographic and socio-economic differentials of fertility, *Korea Journal of Population Studies*, 29(1), 1~23.
9. Korea National Statistical Office, KOSIS (2014).
10. Kravdal, Ø. (2002). The impact of individual and aggregate unemployment on fertility in Norway. *Demographic Research*, 6(10), 263~294.
11. Lee, S. S., Choi, H. J., Seo, M. H., et. al. (2009), *2009 National Marriage and Fertility Dynamics Survey (In-depth Analysis)*, Ministry of Health and Welfare and Korea Institute for Health and Social Affairs.
12. Lee, S. S., Choi, H. J., (2015). Transition of Fertility Practice: Measurement Using Demographic Technique of Parity Progression Ratio. Current Research on Art, Culture, Game, Graphics, Broadcasting and Digital Contents II. ASTL Volume 101, 2015.
13. Oppenheimer, V. K., Kalmijn, M., & Lim, N. (1997), Men's career development and marriage timing during a period of rising inequality, *Demography*, 34(3), 311~330.
14. Orsal, D. D., & Goldstein, J. R. (2010), The increasing importance of economic conditions on fertility, In *Annual Meeting of the Population Association of America, Dallas, Texas*.
15. Retherford, R. D., Ogawa, N., Matsukura, R. (2001), Late marriage and less marriage in Japan, *Population and Development Review*, 27(1), 65~102.
16. Sobotka, T., Skirbekk, V., Philipov, D. (2011), Economic recession and fertility in the developed world, *Population and Development Review*, 37(2), 267-306.