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The Determinants of Low Marital Fertility in Korea: A comparison with Japan[1]

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Abstract

Using panel survey data with comparable variables, this study tests whether certain sets of hypotheses that are related to rational-choice and purposive-action theories of birth behavior hold in Korea as well as in Japan. In a previous study, Yamaguchi (2009) tested similar sets of hypotheses with Japanese panel data and they were largely supported. First, we clarify that although the rate of first marital birth is higher for Korea than for Japan despite the former's smaller total fertility rate (TFR), Korean women tend to delay the timing of second birth following the first birth compared with Japanese women, and the rate of third childbirth is lower for Korea than for Japan. The latter two tendencies contribute to the lower average marital birth rate in Korea than in Japan.

Despite these differences, there are many commonalities between the two countries regarding the determinants of marital childbirth. The magnitude of the effects of these determinants differs between the two countries, however. First, we found that the negative interaction effect between parity and income on fertility rate predicted by Gary Becker's theory regarding the quality-price of children exists for both Japan and Korea. The theory is supported more strongly for Korea than for Japan, however. This finding indicates that policies to reduce the costs of attaining "high-quality children," such as children's educational and medical expenses, will be effective in raising fertility, but more efficiently so in Korea than in Japan.

Second, we found that the availability of childcare leave increases the rate of marital fertility in both Japan and Korea. This tendency, however, holds more strongly in Japan than in Korea. Although this finding may be a result of the fact that the legally entitled term of childcare is much longer in Japan than in Korea, it nonetheless indicates that childcare leave policies in Japan were more successful than their Korean counterparts in raising fertility.

Keywords: family economics, opportunity costs of childrearing, work-life balance, birth intention, attitude-behavior consistency, hazard rate model

JEL classification: J13, D19

[1] The order of authors is alphabetical. Both authors equally contributed to the paper. This research is supported by the Research Institute of Economy, Trade and Industry, Japan.

1. INTRODUCTION

There are many commonalities and differences between Korea and Japan in social organizations. Such commonalities provide natural controls for unobserved parameters related to fertility rate, not possible when comparing Western societies with Japan or with Korea. This is one of the major reasons why a comparison of these two countries is useful.

Although there are many commonalities between Korea and Japan, those which are closely related to the present study include the following.

(1) Both Japan and Korea are among the few highly industrialized countries in Asia.

(2) Both countries have very low fertility rates of below replacement level. The total fertility rate (TFR) was 1.39 in Japan and 1.23 in Korea in 2010 (World Health Organizations, 2011).

(3) Unlike many Western countries, both countries have very low rates of extramarital childbirth, and therefore, there is a strong association between delay in marriage and the lowering of birth rate (Eun 2003, Yamaguchi 2009, Chapter 3). It follows that the analysis of marital fertility without considering extramarital childbirths is meaningful for both Korea and Japan.

(4) Among industrialized countries, both counties have relatively strong persistence of traditional gender roles characterized by large gender inequalities in the household division of labor (Cross-National Survey on Societies with Declining Birth Rate, Cabinet Office, Japanese Government, 2005), and firms' differential treatments of employees depending on their gender – despite the fact that gender discrimination in employment is illegal in both countries.

(5) Accordingly, both countries are among a few OECD countries with a large gender gap in wages and low proportions of women in managerial positions. (UNDP's GEM component statistics, 2009)

(6) Both countries have a relatively clear-cut distinction between "permanent employment" (*seiki koyo* in Japanese and *chong-kyu ko-yong* in Korean) without a term contract and "non-permanent employment" (*hiseiki koyo* in Japanese and *pi-jong-kyu ko-yong* in Korean) with a term contract, and consequent dual labor markets.

(7) Both countries have a large gap between the desired number of children (which is about 2.0) compared with the actual birth rate, and therefore, there are strong barriers to the realization of the desired number of children.[2]

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[2] A study based on the 2002 Survey of Birth Behavior (*Shussyo Doko Chousa)* conducted by The National Institute of Population and Social Security Research in Japan shows that the average ideal number of children for married women is 2.56 and the average planned number of childbirths (including those who they already had) is 2.13, while the total fertility rate in 2003 is 1.29. A Korean study showed that average ideal number of children among Korean married women changed from 2.2 in year 2000 to 2.3 in 2006. (Kim et al. 2009).

On the other hand, major differences are as follows.

(1) Fertility decline and delay in marriage timing has been much more rapid and recent in Korea than in Japan.

(2) The rate of expansion of college education is higher in Korea than in Japan, thereby having led to a much higher college attendance rate in Korea than in Japan (82.3% in Korea and 52.3% in Japan, in 2007) (Japan Institute of Labor, 2008).

(3) While Japan has been experiencing nearly no economic growth in the last two decades, Korea has been experiencing slow but steady economic growth during this time. The average economic growth rate was 1.2% in the 1990s and 0.7% in the 2000s in Japan, while it was 6.2% in the 1990s and 4.1% in the 2000s in Korea.

(4) There has been a great transformation in Korean society from the time of the IMF crisis of 1997, but there was no such major turning point in Japan since the economic recession that started in the early 1990s.

(5) There are more part-time workers in Japan than in Korea, and the gender difference in the proportion of part-time workers is greater in Japan than in Korea because more married women work part-time in Japan than in Korea. The proportion of part-time workers was 10% for men and 34% for women in Japan in 2010, and it was 7% for men and 16% for women in Korea in 2010 (OCED *Employment Outlook* 2011).

(6) While childcare leave is legally available for parents in both countries, the legally entitled maximum term and the extent of income compensation differ considerably between the two countries, as reviewed later.

Despite the fact that there are above-mentioned differences between Japan and Korea, we expect that the major determinants of marital fertility rate at the individual level may not differ significantly between the two, partly because differences identified above are macro-economic differences which may not affect individual-level and family-level decisions, and also because we test hypotheses that we expect to hold more universally over and beyond these two countries under a general hypothesis of rational decision making and purposive action for childbearing.

This is the first comparative study of fertility rate between Korea and Japan based on the micro-level analysis of individuals' hazard rates of bearing a child. Although there were many macro-level comparisons of fertility rates between the two countries, those studies could not inform us whether there are behavioral commonalities or differences between the two countries regarding their common experiences of fertility decline, and whether the two countries require common or different government measures for work and family policies intending to mitigate low fertility rates.

2. HYPOTHESES

Our hypotheses are primarily concerned with testing whether some major sets of hypotheses that were tested and supported by Yamaguchi (2009, chapter 2)[3] for married women in Japan also hold for married women in Korea. There are three sets of theoretical considerations and hypotheses as described below.

2.1 Work-Life Balance and the Opportunity Costs of Childrearing

The negative correlation between number of children and women's employment status (employed versus not employed) is primarily due to the fact that fertility affects employment status but not the reverse. There is clear evidence that women tend not to leave employment if they do not bear a child, and women who bear fewer children tend to return to the labor force after a shorter period of time. On the other hand, it is unclear whether married women's employment reduces marital fertility. Reviewing the literature on the relationship between fertility and women's employment, Brewster and Rindfuss (2000) report that a cross-national comparative analysis of association between fertility and women's labor-force participation indicates that the extent of association between the two was negative during the 1970s but became positive during the 1990s, indicating that countries which have a higher rate of women's employment now have a higher, rather than lower, fertility rate. However, in a previous work, Yamaguchi (2009, chapter 3) tested and supported with the OECD data a hypothesis, by assuming country-specific fixed effects on fertility, that the effect of women's employment on fertility is not uniform but varies with the extent of work-life balance attainable in the society, and that while the effect is still negative on average, the negative effect becomes smaller and eventually disappears as the extent of work-life balance attainable in the society increases.

While the Brewster-and-Rindfuss study and the Yamaguchi study were both concerned with the effect of the rate of women's labor-force participation on fertility rate at a macro-societal level, we are concerned in this paper with a question of whether women's employment lowers fertility at the individual level, and whether this effect changes with women's workplace environment concerning work-life balance.

A theory posits that the employment of married women reduces marital fertility rate. When work and family roles are incompatible, women are expected to resolve this issue by either compromising the work role (that is, to become a part-time worker or a fulltime homemaker by leaving full-time employment) or by compromising the family role, which may include having fewer children than they desire (Glass and Estes 1997; Mennino and Brayfield 2002). However, the extent of incompatibility between work and family roles is variable, rather than constant.
In Japan, it is known that family-friendly work environments promote the continuation of employment among married women of childbearing age (Higuchi and Abe, 1999). Similarly, we can expect that that married employed women will have a lower fertility hazard rate than married

[3]See Yamaguchi (2010) for its translation and publication in Korean.

non-employed women, but this difference will be smaller or absent if the former women have family-friendly work environments. In fact, in a previous work, Yamaguchi (Yamaguchi 2009, chapter 2) showed that the hazard rate of marital fertility of employed women became significantly higher when childcare leave was available than when it was not available. Furthermore, he showed that the hazard rate of marital fertility of employed women with childcare leave became approximately the same or even higher in certain cases than that of non-employed women. For Korea, Kim (2009) found using panel data that the availability of childcare leave raised fertility rate of employed women while the availability of maternity leave did not.

In Japan, in principle, childcare leave should be available for regular employees since the Law on Childcare Leave was enacted in 1992, but some employers did not observe or implement the law properly, especially during the time periods of 1993-1999 for which birth occurrences are analyzed in this paper. The maximum legally entitled term of childcare leave was one year, with a possible extension for an additional half year depending on the condition of access to a daycare center, and the rate of income compensation was 40% during the time periods analyzed in this paper, though it was extended to 50% in 2007.

In Korea, the maximum term for legally entitled childcare leave is much shorter than Japan and is only 45 days (90 days including 45-days maternity leave) and maternity and childcare leaves include 60 days with 100% income compensation, by a revision of a law on women's employment in 2001. The problem of law observance by employers also exists in Korea as well. Thus, we also test this following hypothesis with Korean data.

H1. (1) Married employed women will have a higher fertility hazard rate when childcare leave is available rather than unavailable, and (2) the fertility rate for married employed women is lower than that of women without employment only if childcare leave is unavailable from their employer.

Another related hypothesis is concerned with the negative effect of the opportunity costs of childrearing on fertility. Although the opportunity costs of leaving a job for childrearing is higher for women with higher individual incomes, thereby suggesting a lowering of fertility rate for such women, an increase in income may also have an offsetting positive income effect because higher income makes it more affordable to "outsource" high-quality childcare. We will continue to discuss income effects on fertility in relationship to Becker's theory later. We do not present any hypothesis on the effect of women's individual incomes, however.

When a person expects incompatibility between work role and childrearing, one may either compromise the work role or may decide not to bear a child. The tendency to take the latter choice will be greater when the opportunity costs of compromising the work role by leaving or changing the job are higher. In Japan, getting a job with permanent employment status after a job leave due to childrearing is more difficult than in the U.S. and most other European countries (Tsuya 2004). The situation in Korea is similar to Japan, and therefore, the opportunity costs of leaving a job for

childrearing is expected to be very high for both countries. Generally, in both Korea and Japan, larger firms provide higher employment security and job opportunity to their regular employees, and therefore, losing or changing a job in larger firms is considered more costly than losing or changing a job in smaller firms. Thus we obtain the following hypothesis and compare the results between Korea and Japan.

H2. Married women employed in relatively large firms have lower fertility rate than women employed in relatively small firms.

2.2 Becker's theory on the price effect of child quality

Wealthier societies have lower birth rates. This is a paradox in economics because children are regarded as assets. In economics, this is explained by considering the effects of the "price" of child quality, which increases with the number of children (Becker 1981; Becker and Lewis 1973). In Becker's theory, "child consumption" is expressed by πNQ, where N stands for number of children and Q stands for child quality, indicating the amount of time and expense that the family spends for the "quality" of each child, such as for education or health. Q is assumed to increase with household income. Letter π denotes the unit "quality price" per child, and partially depends on the opportunity costs of childrearing.

According to this model, the effects of income include not only the direct income effect but also the effect of the costs of child quality. Since the total cost of child quality πNQ (and the "price" of child quality $P_Q = \pi N$) increases with the number of children while the direct income effect does not, higher income will have a positive effect on the birth rate of the first child (because the income effect likely exceeds the price effect), but it will have a negative effect on the birth rate of third and later childbirths (because the price effect likely exceeds the income effect). Such negative interaction of income and existing number of children on fertility rate is empirically supported (e.g. Seiver 1978) for the U.S. Yamaguchi and Ferguson (1995) also found similar interaction effect of women's education and existing number of children on fertility rate with US data. Yamaguchi (2009, chapter 2) also tested this hypothesis with panel data of women in Japan and showed that the hypotheses largely holds. Hence, we will examine the following hypothesis regarding married women's hazard rate of fertility using Korean panel survey data, and compare the results with those of Japanese data. If this interaction effect exists, it will indicate that a policy to reduce costs of attaining high child quality, such as education and heath expenses for children, will become an effective method for increasing fertility rate.

H3. An interaction effect of parity and the household income on the hazard rate of marital fertility exists, and while a positive effect of household income on marital fertility exists for the birth of a first child, the effect is reduced or becomes negative as the number of children already born increases.

2.3. Attitude-Behavior Consistency of Childbearing

The third set of hypotheses is not related to a rational-choice consideration of fertility but is concerned with a broader conception of fertility behavior as purposive action. The issue concerned here is generally related to the understanding of attitude-behavior consistency. In a classical work on "unprejudiced discriminator" and "prejudiced non-discriminator," Merton (1968) argued that a major cause of attitude-behavior *inconsistency* is the normative environment sanctioning against the realization of behavior that agrees with attitude. More generally, we can expect that attitude-behavior inconsistency increases with the extent of social constraints on the realization of attitude through behavior, and these constraints include social norms against the behavior, a lack of social opportunity to realize the behavior, and a socially-caused lack of individual control over the behavior. For example, Yamaguchi (2009,chapter 5) has shown that since few part-time jobs with permanent employment are available in Japan, women who wish to retain their permanent-employment status but also need to change to a part-time job for the sake of compatibility with childrearing have to quit the firm whose job they wish to retain. Other examples of social constraints include a lack of work-life balance in the workplace that makes many employees compromise either their work roles or family roles even though they do not desire such a compromise. Married women's desire to have a child is more likely to be realized than the desire of unmarried women's because the latter have less opportunity for childbearing.

Conversely, we can expect that the weakening of social constraints on behavior increases attitude-behavior consistency. At the time when birth control is widely available for women, strong attitude-behavior consistency will exist for married women. In fact, strong association between birth intention and birth behavior was already found in 1970s in an early study by Westoff and Ryder (1977) for married American women, among whom birth control was already widely used.

Regarding marital fertility, we will test the following set of hypotheses with the data of married women in Korea and compare the results with those of Japan. Yamaguchi (2009, chapter 2) tested similar two hypotheses and confirmed that they were both supported empirically with the Japanese data.[4]

H5. Strong attitude-behavior consistency exists for married women's childbirth such that birth intention, or birth desire, becomes a strong predictor of the occurrence of an additional childbirth.

H6. Marital satisfaction positively and strongly affects the hazard rate of childbirth, but the effect is indirect and only through birth intention/desire.

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[4] Instead of marital satisfaction, Yamaguchi (2009, chapter) used in the test of hypothesis H6 the extent of sharing by communication between wife and husband regarding their worries and pleasures.

3. DATA AND STATISTICAL MODEL

3.1 **Data**

For the analysis of the determinants of marital fertility in Korea, we employ data from the Wave 1 (2007.10~2008.02), Wave 2 (2008.10~2009.06), and Wave 3 (2010.07~2011.05) of *Korean Longitudinal Survey of Women & Families* (hereafter KLOWF). The KLOWF data were collected by the Korean Women's Development Institute and officially approved by the Korea National Statistical Office. "The KLOWF was a longitudinal and nationally representative study that used a stratified multistage sampling design to survey 9084 households in all urban and rural areas of Korea, excluding Jeju and the other islands. A total of 10,013 adult women aged 19-64 participated in the survey (response rate=95.8%) (Park et al. 2008)."–*(Kim, Jeon, and Jang 2010, p.552).* Due to a high response rate, this survey is considered as one of the most reliable panel surveys in Korea. We restricted the maximum age of the sample to be analyzed, however, to be the highest age of childbirth, which was 41, observed in the data. In other words, all observations that correspond to age 42 or above are treated as censored. The sample was also restricted to those who were observed to be at risk for first, second, or third marital birth and had no missing values for defining the time of entry into risk. The sample thus retained is 4,662. A large reduction in sample size is mainly due the deletion of all sample persons aged 42 or above at Wave 1.

For comparison, we use the same data set that Yamaguchi (2009, Chapter 2) employed, the data from the 1993-1999 waves of the *Panel Survey of Consumers' Lives* (PSCL) collected by the Institute for Research on Household Economics for as nationally representative random sample of 1000 women aged 24~34 years in 1993 (Cohort A) and a supplementary sample of 201 women aged 24-34 years in 1997 (Cohort B). This panel survey is also considered highly successful because of the relatively low rate of attrition (less than 10% across sequential waves in most cases). We restrict the analysis to 964 sample women who were found to be at risk for either first, second, or third marital births during the observation and had no missing values for defining the time of entry into risk.

Thus, the age range of the population somewhat differs between the Korean and the Japanese data. However, we restrict the analysis to married women with 0~2 children during the time of observation for both cases, and this selection makes the two samples become quite comparable. We include in the analysis, the observation of risk for one event, which is the first event at risk during the periods of observation, and can be either first, second, or third marital childbirth, in order not to make the same sample person contribute twice or more for event occurrences. The average age at entry into risk was 28.5 for Korean data and 27.3 for Japanese data, which do not differ significantly despite differences in the age range of population. However, since women in the Korean data at risk for the event are older (with the average age of 34.3 at Wave 1 of KLOWF) on average, than women at risk in the Japanese data (with the average age of 29.5 at Wave 1 of PSCL), it is possible that the former's exposure to risk may contain risk periods with longer duration at risk. Indeed, while the longest duration at risk observed for Japanese data is the 17th year, it was the 24th year for the

Korean data. Hence, in the hazard rate analysis of fertility conducted below, we have decided to impose on the Korean data the end of the 17th year at risk as an additional censoring time so that we should not cover for Korean women, risk periods not covered for Japanese women. The major benefit of using these two data sets is that variables collected by these two surveys are largely comparable, and therefore, if we employ the same analytical model, the results are largely comparable as well.

3.2 Statistical Models

We employ discrete-time logit model for hazard rate (Yamaguchi, 1990). We apply the conditional survival analysis starting from the time of observation (Guo 1993), but setting the initial duration time of observation, such as age at marriage or age at previous birth, from the information of the entry into risk collected retrospectively from the first wave of each survey. When respondents have not yet entered the risk before the first wave, but entered the risk during the time of observation, their duration time starts from 0. We model first, second, and third marital childbirths simultaneously mainly because we need to test a hypothesis (H3) about the interaction effect of parity and income on the hazard rate of fertility. However, the pattern of duration dependence of the hazard rate differs between the first marital childbirth whose risk starts at marriage, and the second and third marital births, whose risk starts at the previous marital childbirth. Hence, two sets of time-varying dummy variables reflecting distinct duration dependence are employed in the model, one for the first birth and the other for the set of second and third births. Except for the two sets of dummy variables for duration dependence, the independent variables are time-lagged so that the realizations of independent variables' values precede the event occurrence in time.

4. ANALYSIS

4.1 Commonalities and Differences in Parity-specific Fertility Rate Between Korea and Japan

Model 1 in Tables 1 and 2, respectively for Korean and Japanese data, provide the estimates of regression coefficients for the discrete-time hazard rate model of marital fertility with only the parity effects and the two sets of duration effects, one set for first birth and the other set for second and third births. Although the analysis in Table 2 substantively overlaps with the analysis presented by Yamaguchi (2009, chapter 2), the models presented here were tested anew in order to make comparability with the analysis of the Korean panel data as high as possible.

(Tables 1 and 2 About Here)

Figure 1 presents the conditional probability of having the first marital childbirth in one year, that is, the equivalent of the rate of first marital birth in the discrete-time expression, among women at risk for Korea and Japan, based on the results from Model 1, given the condition that a birth did not yet occur up to the previous year. Duration value of 0 indicates that the risk period is the same as the age at marriage.

Results in Figure 1 show that the rate is higher for Korea in the first three years after

marriage. In particular, a high rate during the period of age at marriage (0 duration) is considered to reflect a pregnancy-caused "shotgun wedding", known as *dekichatta kekkon* in Japanese and *sokto weeban kyoron* in Korea. Although Japan is known for a high proportion of such births, it seems that the proportion is even higher for Korea. In neither Korea nor in Japan, premarital pregnancy does not seem to be an unintended threat to couples as it was in the traditional "shotgun wedding". It functions more as a prelude to marriage, thereby making many couples move up the wedding once they find out pregnancy.

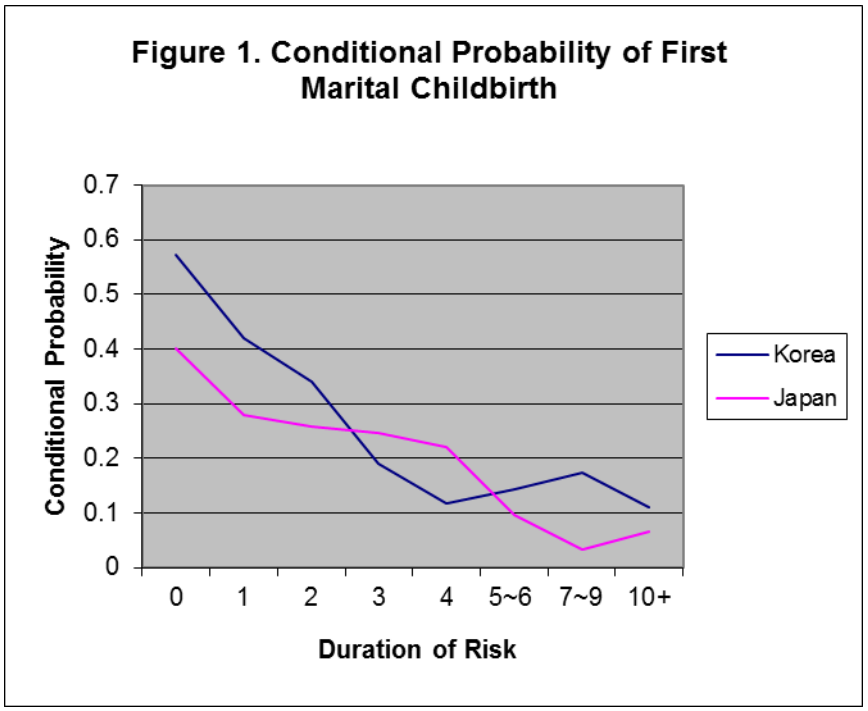
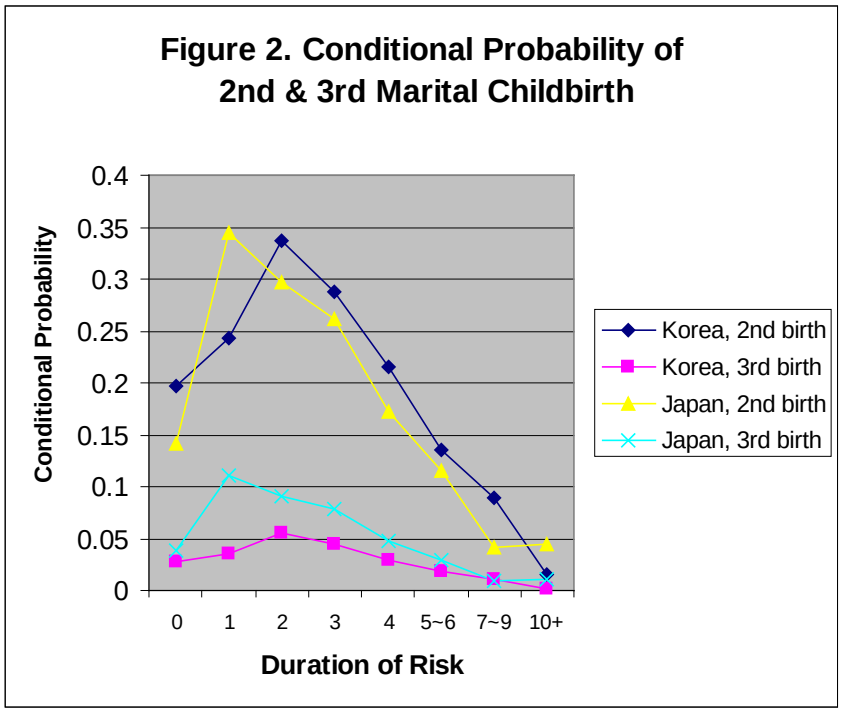


Figure 2 describes the rate of second and third births for Korea and Japan. There are three important findings in Figure 2, including one commonality and two differences between Korea and Japan.

First, both Korea and Japan, the rate of birth is significantly reduced from the 2nd to the 3rd birth. Second, Korean women tend to postpone the timing of the second marital childbirth compared to Japanese women. Third, while the rate of third childbirth is low for both countries, it is considerably lower for Korea than for Japan.

Hence, although the average rate of first marital childbirth is higher for Korea than for Japan, there is a greater negative effect of parity on fertility in Korea than in Japan. The average TFR was somewhat lower for Korea than for Japan during the time period analyzed for the data of each country (about 1.2 for Korea in 2009-2010 and about 1.4 for Japan during 1994-1999). The tendency for Korean women to postpone the timing of second childbirth, and to have a lower ultimate probability of having the third child than Japanese women also contributed to this cross-national difference in fertility. A higher rate of first marital child birth for Korea than for Japan may be a

result not only of a higher rate of "shotgun weddings", but also of a higher prevalence of social norm that "married people should bear a child" in Korea than in Japan (Kojima 2006).



4.2 **Results of the Test of Hypotheses H1 and H2.**

Now, we will analyze data regarding the hypotheses we presented before. Model 2 in Tables 1 and 2 adds key variables that are related to the effects of work-life balance and the effects of opportunity costs of childrearing. These are self-reported availability of childcare leave from the employer, firm size, and respondents' income. Since some missing cases exist for respondents' income, a dummy variable for missing state is added, while giving a constant 0 value for the income value for those missing cases. This method yields a consistent estimate for the effect of the income variable with missing values while the coefficient for the missing dummy variable depends on the value of a constant assigned to missing cases. As control variables, we also included in Model 2, respondents' education, respondents' and husbands' employment status, and age at entry into risk.

First, the results from Model 2 in Tables 1 and 2 consistently show that respondents' individual income does not affect fertility rate. Second, the results of Model 2 in Tables 1 and 2 consistently show that the availability of childcare leave increases the hazard rate of childbirth. In particular, the effect is very strong in Japan with the 0.1% level of significance despite its smaller sample size than Korea. While the availability of childcare makes the odds of having another child 1.92 [=exp(0.654)] times as much in Korea, it makes the odds 2.60 [=exp(0.954)] times as much in Japan,

Third, being employed for relatively large firms reduces the hazard rate of having another

childbirth both in Korea and Japan. The threshold of firm size that makes a difference differs between Korea and Japan, however. It is the distinction of medium-sized and large firms with 100 or more employees from small firms with less than 100 employees that makes a difference in Korea. Korean women employed in firms with 100 or more employees are 0.345 [=exp(-1.065)] times as likely, in terms of odds, to have another childbirth as women employed in firms with less than 100 employees. On the other hand, it is the distinction of large firms with more than 1000 employees from medium-sized and small firms with less than 1000 employees that makes a difference in Japan. Japanese women employed in firms with 1000 or more employees are 0.572 [=exp(-0.558)] times as likely to have another childbirth as women employed in firms with less than 1000 employees.

By combining the main effects of respondents' employment status, the availability of childcare leave, and firm size, we can also obtain the following conclusions for Korea based on the significance test of combined effects[5].

(K1) If they are employed by firms with less than 100 employees, regularly employed women without childcare leave do not differ significantly in birth rate from non-employed women.

(K2) If they are employed by firms with 100 or more employees, regularly employed women without childcare leave have a smaller birth rate than non-employed women.

(K3) Regularly employed women with childcare leave do not differ significantly in birth rate from non-employed women regardless of whether they are employed by firms with less than 100 employees.

Hence, only when women are employed by firms with more than 100 employees and the firm does not make childcare leave available to them, their birth rate becomes smaller than that of non-employed women.

For Japanese women, the following conclusions are obtained.

(J1) If they are employed by firms with less than 1000 employees, regularly employed women without childcare leave do not differ significantly in birth rate from non-employed women.

(J2) If they are employed by firms with 1000 or more employees, regularly employed women without childcare leave, have a smaller birth rate than non-employed women.

(J3) If they are employed by firms with less than 1000 employees, regularly employed women with childcare have a larger birth rate than non-employed women.

(J4) If they are employed by firms with 1000 or more employees, regularly employed women with childcare leave do not differ significantly in birth rate from non-employed women.

Except for the fact that the threshold of firm size differs, conclusions (J1), (J2), and (J4) for Japan are basically the same respectively as conclusions (K1), (K2), and (K3) for Korea. Only

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[5] It is the significance test for the following sum of [coefficient×dummy variable]:

$b_1 D_1$(employment status: regular)+$b_2 D_2$(childcare leave: available)+$b_3 D_3$(firm size:N or more),

where N=100 for Korea, and N=1,000 for Japan. Note that for non-employed women, all three dummy variables take a value of zero because dummy variables D_2 and D_3 reflect distinctions only among employed women and they are set at zero for non-employed women.

conclusion (J3) differs, however, by reflecting a stronger impact of childcare leave in Japan than in Korea. These results are summarized in Table 3.

Model 2 of Table 1 and 2 also indicates that compared with non-employed women, temporary workers have somewhat smaller hazard rate of childbirth in Korea and Japan -- though their difference in fertility rate from regular workers is not significant. This finding does not fit very well with our theoretical scheme and we still do not know how to interpret this common finding. Although the fact that husbands of temporary workers have lower incomes explains in part, as shown by a slight reduction of the effect in the results of Model 3 compared with those of Model 2, this fact does not explain the effect fully.

4.3. **Results for the test of hypothesis H3.**

Model 3 adds to Model 2 key variables related to hypothesis H3 based on Becker's theory on the price effect of the quality of children, that is, the effects of the husband's income and the interaction effect of parity and the husband's income. Although the interaction effect between parity and income can be tested using the household income, we found in our preliminary analysis that it is the husband's income rather than the household income that reveals such an interaction effect.

First, the results from Model 3 in both Tables 1 and 2 consistently show that the effect of the husband's income varies significantly, at the 5% level for Korea in Table 1 and at the 10% level for Japan in Table 2, with the existing number of children. The results show that the husband's income has a positive effect on marital fertility when the couple has no children, but has no effect when the couple has one or two children.

While the significance level of 10% is marginal for Japan, this is the result of a two-sided test; the significance level for a one-sided test is 5%, and it is what we expect from hypothesis H3 theoretically. Hence, the results here are consistent in both data sets with a theoretical hypothesis stating that there exists a negative interaction effect between income and the existing number of children because the price effect of child quality increases with the number of children. We tested but did not find a significant reduction in the effects of husband's income on fertility when parity increases from 1 to 2, however.

There is a notable difference between Korea and Japan, however. Although the coefficients for the interaction effect are not directly comparable because currency in measuring income differs between Korea and Japan, we can calculate the relative size of the coefficient to the standard error of husband's income for each country's data and compare the value between the two countries. Based on samples where husband's income is not missing, the estimate for the mean and the standard error of husband's monthly income (in 1 million won) are respectively 2.55 and 1.46 for the Korean data during the period at risk, and the mean and the standard error of husband's annual income (in 1 million yen) are respectively 4.86 and 2.08 for the Japanese data during the period at risk. Hence, the ratio of the interaction effect to the standard error of husband's income is 0.166 [=0.243/1.46] for

Korea while it is 0.076 [=0.158/2.08], and thereby indicates that the impact is more than twice as much for Korea than for Japan.

4.4 **Results for the test of Hypothesis H4, and H5.**

Models 4 and 5 in Tables 1 and 2 present results for the test of Hypotheses H4 and H5. Model 4 adds to Model 2 a variable for marital satisfaction, and Model 5 further adds a variable for birth intention for Korea and the variable for birth desire for Japan. We did not retain the husband's income and its interaction with parity in these models because we wished to see how the parity effects change by a control of birth desire/intention, and the changes become unnecessarily complicated when we include the interaction effect of parity and husband's income in Models 4 and 5.

The birth-intention variable for Korea is trichotomous ("yes", "no, and "missing"). The missing data here occurs due to the following known mechanism. At Wave 1 of KLOWF, the survey asked only married women with at least one child whether they intended to bear another child. At Wave 2, however, birth intention was asked for all married women. Hence, when the missing state is categorized as the third state of the birth intention variable, the effect of this category compared to the state of "no" category in Model 5 reflects the difference in the logit of hazard probability between married women with no children at Wave 1 and married women with two children and without an intention to bear another child. Although this effect could be very large, we include this state only for obtaining unbiased estimates for the effect of "yes" versus "no" for birth intention and the parity effects, under the assumption that no interaction effects of time (Wave 2 versus Wave 1) and the response of birth intention on hazard rate of childbirth exists among women without a child. With this assumption we can regard missing cases as missing at random among married women with no child.

The birth desire variable for Japanese data is also trichotomous ("strongly desire," "may desire depending on conditions," "do not desire").

Results from Model 4 consistently show for both Korea and Japan that higher marital satisfaction increases the hazard rate of childbirth, with a strong 1% level of significance. However, when birth intention/desire is further added in Model 5, the effect of marital satisfaction becomes insignificant, thereby supporting hypothesis H6, such that marital satisfaction affects the rate of childbirth only indirectly through birth desire/intention, under the assumption that marital satisfaction affects birth intention/desire rather than the reverse. The effect of birth intention for Korean results is very strong with 0.1% level of significance and the odds of bearing another childbirth becoming 10.44 [=exp(2.346)] times greater when the respondent intended to have another child rather than not. Similarly, the effect of birth desire in Japan is also very strong with 0.1% level of significance for the two coefficients and the odds of bearing another child becoming 6.79 [=exp(1.915)] times greater when the respondents "strongly desire" to have another childbirth rather than when they do not desire to do so.

Although the effects of most determinants of hazard rate of childbirth are only weakly affected by the inclusion of birth intention/desire in the model, thereby indicating that these effects are largely independent of the effect of birth intention /desire, the effects of parity as well as that of marital satisfaction are greatly affected.

In Table 1 and Table 2 respectively for Korean and Japanese results, the parity effects are greatly reduced in Model 5 compared to Model 4, indicating that a decrease in hazard rate of childbirth with parity is partly explained as a result of reduction in birth intention/desire. The change in birth attitude has greater effect on the reduction in hazard rate of childbirth in transition from the second to third childbirth than from the first to second childbirth in Japan. On the other hand, the change in birth attitude has greater effect on the reduction in hazard rate of childbirth in transition from the first to second childbirth than from the second to third childbirth in Korea.

5. CONCLUSION AND DISCUSSION

Using micro-level individual data of fertility hazard rate, this study analyzed commonalities and differences in fertility behavior between Korea and Japan, based on rational-choice and purposive-action theories of birth behavior. Qualitatively, there are striking commonalities in the mechanism of determining fertility rate between the two countries. All hypotheses are supported consistently for both countries. Differences are only quantitative, rather than qualitative, in that certain effects are greater for one country than for the other. For example, we have found that the availability of childcare leave increases the rate of marital fertility in both Japan and Korea, but more strongly so in Japan than in Korea. Although this finding may reflect a result of the fact that the legally entitled term of childcare is much longer in Japan than in Korea, it nonetheless indicates that childcare leave policies in Japan were more successful than the Korean counterparts in raising fertility.

We have also found that Gary Becker's theory about the quality-price of children, tested by the interaction effect of parity and husband's income, is supported for both for Korea and Japan, but more strongly so in Korea than in Japan.

The fact that Becker's theory holds, generally implies that government policies to reduce the "price" of child quality (reducing educational and childrearing expenses) will be more effective in raising fertility than raising the income of people of reproductive age. While government child allowance for each child reduces the quality expense of having children, this policy will give more incentive to couples who intend to spend less on their children than those who intend to spend more, because the reduction by child allowance (A) in the unit quality price of children is greater for couples with smaller Q, as shown in the following equation, where I, p_z, and Z, respectively indicate income, unit price of other goods, and quality of other goods, and the equation for the budget constraint on consumption before child allowance is given is specified as $I = \pi NQ + p_z Z$.

. $$I + NA = \pi NQ + p_z Z \Rightarrow I = (\pi - A/Q)NQ + p_z Z$$

In contrast, government's financial aid programs for college education will give more incentive to

have subsequent children to couples who intend to spend more on children's education.

Kye (2008) reported that recent educational expansion in Korea contributes greatly to the delay of first marriage and first birth. Since the proportion of people with higher education is much greater in Korea than in Japan, and Korean families' concerns with the costs of children's college education are very high, we can imagine that the impact of the expected costs of higher education for children will be greater in Korea than in Japan, and our results seem to be consistent with this expectation. It follows that that policies to reduce the costs of attaining "high-quality children," such as children's educational and medical expenses, will be effective in raising fertility, but more efficiently so in Korea than in Japan.

Although we found strong commonality between Korea and Japan regarding strong attitude-behavior consistency of childbirth, whether the determinants of birth intention/desire are similar or not between the two countries largely remains to be seen. Existing studies show some commonalities and differences on this point. Yamaguchi (2009, Chapter 4) found for Japan that husbands' greater share in childcare at home increased wives' marital satisfaction and subsequently birth desire, and that this effect of husbands' share in childcare was especially critical in increasing the rate of second marital childbirth. However, he also found that husbands' share in household work did not have a significant effect on birth rate. For Korea, Park (2008) found that among married employed women, the number of hours that husbands spent on housework positively influenced the wives' tendency to bear a second child. Chung and Chin (2008) also found that married employed women's intention to bear a second child increased with the number of hours that husbands spent on housework, but the number of hours that husbands spent on housework had no impact on the intention of second birth among non-employed women. It seems to be clear, since it is found commonly between Korea and Japan, that the husbands' behavior at home is a critical determinant of the intention and occurrence of second marital child birth.

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Table 1. Results from Five Models for Korean Data

	Model 1	Model 2	Model 3	Model 4	Model 5
Parity (Ref : Parity =2)					
Parity = 0	3.858***	3.804***	3.223*	3.789***	1.615*
Parity = 1	2.165***	2.024***	2.007***	2.031***	1.071***
Risk duration (no child)(Ref : risk duration = 0)					
(child=0) risk duration = 1	-0.609	-0.680	-0.659	-0.711	-0.695
(child=0) risk duration = 2	-0.947+	-1.064*	-1.022+	-0.987+	-0.370
(child=0) risk duration = 3	-1.746**	-1.761**	-1.785**	-1.711**	-1.001
(child=0) risk duration = 4	-2.303**	-2.533**	-2.586**	-2.428**	-1.683+
(child=0) risk duration = 5/6	-2.079**	-2.379**	-2.401**	-2.330**	-1.712*
(child=0) risk duration = 7/9	-1.846**	-2.161**	-2.285**	-2.034**	-1.416+
(child=0) risk duration = 10~	-2.367***	-2.839***	-3.083***	-2.751***	-2.098**
Risk duration (child=1or2) (Ref : risk duration = 0)					
(child=1/2) risk duration = 1	0.271	0.246	0.241	0.283	0.354
(child=1/2) risk duration = 2	0.730*	0.687+	0.692+	0.783*	1.014*
(child=1/2) risk duration = 3	0.496	0.478	0.472	0.582	1.155**
(child=1/2) risk duration = 4	0.109	0.059	0.054	0.160	0.778+
(child=1/2) risk duration = 5/6	-0.441	-0.545	-0.557	-0.442	0.243
(child=1/2) risk duration = 7/9	-0.917*	-1.111*	-1.107*	-0.998*	-0.165
(child=1/2) risk duration = 10~	-2.753***	-3.059***	-3.045***	-2.946***	-1.705**
Respondent's education (Ref=High school or less)					
Vocational college		0.228	0.230	0.220	0.297+
University		0.074	0.101	0.042	-0.002
Respondent 's age at entry into risk		-0.117***	-0.120***	-0.112***	-0.090***
Respondent's employment status (Ref = Not-employed)					
Regular		-0.373	-0.435	-0.382	-0.481
Self-employed		-0.385	-0.418	-0.404	-0.322
Temporary/Etc		-0.767*	-0.727*	-0.772*	-0.915**
Spouse's employment status (Ref= Employee)					
Non-employed		-0.184	-0.202	-0.155	0.010
Self-employed		0.133	0.099	0.158	0.012
Respondent's monthly income (in 1 million won)					
Income		0.022	0.018	0.033	0.039
Income missing dummy		0.929*	0.850+	0.909*	0.783
Childcare leave (Ref=Not available)					
Available		0.654*	0.696*	0.610*	0.604+
Firm size (Ref=less than 100 employees)					
100 or more employees		-1.065**	-1.083**	-1.025**	-1.031**
Spouse's monthly income (in 1 million won)					
Income			-0.058		
Income missing dummy			0.482		
Parity and spousal income interaction					
(income) *(Parity=0)			0.244*		
(income missing) *(Parity=0)			1.195		
Respondent's psychological states					
Marital satisfaction				0.150**	0.042
New Birth Plan: Yes vs. No					2.346***
New Birth Plan: Missing vs.No					3.175***
Constant	-3.571***	-0.109	0.093	-1.158	-2.067*

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 Results from Five Models for Japanese Data

	Model 1	Model 2	Model 3	Model 4	Model 5
Parity (Ref : Parity =2)					
Parity = 0	2.843***	2.640***	1.885***	2.557***	1.821***
Parity = 1	1.434***	1.278***	1.288***	1.290***	0.679***
Risk duration (no child)(Ref : risk duration = 0)					
(child=0) risk duration = 1	-0.550	-0.631	-0.643	-0.616	-0.528
(child=0) risk duration = 2	-0.657	-0.690+	-0.710+	-0.660	-0.521
(child=0) risk duration = 3	-0.717+	-0.656	-0.727+	-0.589	-0.426
(child=0) risk duration = 4	-0.860+	-0.860+	-1.019*	-0.776	-0.689+
(child=0) risk duration = 5/6	-1.846***	-1.788***	-1.930***	-1.672**	-1.572**
(child=0) risk duration = 7/9	-2.996***	-2.939***	-3.082***	-2.794***	-2.595***
(child=0) risk duration = 10~	-2.257***	-2.246***	-2.463***	-2.128**	-2.037**
Risk duration (child=1or2) (Ref : risk duration = 0)					
(child=1/2) risk duration = 1	1.166***	1.233***	1.161***	1.240***	1.255***
(child=1/2) risk duration = 2	0.946**	1.008***	0.958**	1.028***	1.102***
(child=1/2) risk duration = 3	0.773*	0.848**	0.784*	0.880**	0.994**
(child=1/2) risk duration = 4	0.242	0.325	0.261	0.367	0.501
(child=1/2) risk duration = 5/6	-0.231	-0.204	-0.267	-0.159	0.046
(child=1/2) risk duration = 7/9	-1.321**	-1.369**	-1.431***	-1.324**	-0.952*
(child=1/2 risk duration = 10~	-1.268*	-1.482**	-1.549***	-1.438**	-0.892+
Respondent's education (Ref=High school or less)					
Junior college		-0.124	-0.140	-0.159	-0.156
University		0.231	0.186	0.212	0.183
Respondent's age at entry into risk		-0.103***	-0.104***	-0.099***	-0.095**
Respondent's employment status (Ref = not-employed)					
Regular		-0.453+	-0.449+	-0.439+	-0.358
Self-employed		-0.295	-0.285	-0.280	-0.203
Temporary/Etc		-0.429*	-0.421*	-0.411*	-0.343+
Spouse's employment status (Ref= Employee)					
Non-employed		0.105	-0.010	0.200	0.447
Self-employed		-0.056	-0.068	-0.096	-0.165
Respondent's annual income (in 1 million yen)					
Income		0.003	0.016	0.006	0.022
income missing dummy		0.098	0.055	0.098	0.128
Childcare leave (Ref=Not available)					
Available		0.954***	0.960***	0.935***	0.778**
Firm size (Ref=less than 1000 employees					
1000 or more employees		-0.558*	-0.523*	-0.537*	-0.477+
Spouse's annual income (in 1 million yen)					
Income			-0.013		
income missing dummy			0.025		
Parity and spousal income interaction					
(income) *(Parity=0)			0.158+		
(income missing) *(Parity=0)			0.843*		
Respondent's psychological states					
Marital satisfaction				0.178**	0.108
New birth plan: Yes (vs. No)					1.915***
New birth plan: Depends (vs. No)					1.247***
Constant	-3.248***	-0.301	-0.178	-0.936	-1.906*

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3. A Comparison of Regularly Employed Women vs. Non-employed Women in Fertility: A Summary of the Combined Effects of Employment Status, Childcare Leave, and Firm size for Korea and Japan

		Korea	Japan
Childcare leave	**Firm size**		
available	N or more	No difference	No difference
	less than N	No difference	Larger
unavailable	N or more	Smaller	Smaller
	less than N	No difference	No difference

N=100 for Korea, N=1000 for Japan. Significance is at the 5% level for all significant cases.

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