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What are the factors of the gap between desired and actual fertility?

- A comparative study of four developed countries

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What are the factors of the gap between desired and actual fertility?
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Abstract

This study is an analysis of the gap between the desired and actual number of children for four developed countries. Although the direct costs of raising children is an indispensable element in decision-making regarding having children, it has hardly been treated in relevant studies. We estimate the achievement rate of having the desired number of children by many possible elements, including the direct costs of raising children. The results show significant negative impacts of these direct costs as well as delayed marriage as the main causes for low achievement of desired fertility (Japanese men and women, Korean men). Also, the sexual division of labor affects the wife's achievement rate in Japan, depending on the husband's employment situation. No noteworthy negative impact was found in the case of high achievement of desired fertility (French men and women, American men).Our results suggest that reducing the direct costs of raising children and stabilizing the employment situation should be given priority rather than other measures with regard to achieving desired fertility.

Keywords: Fertility, Costs of children, Work-life balance, Job security

JEL Classification: J13, J22, D10, Z13,

1 Introduction

Most of the developed countries have experienced a declining birth rate, but is this decline due to the decrease in the number of children people desire, or is it due to the increasing difficulties in accomplishing their desire? In the former case, the factors causing people to want fewer children should be discussed, and the factors that thwart people's accomplishment of desired fertility need to be discussed in the latter case. While there are some countries where the desired number of children has decreased, such as Germany[1], the desired number of children has been rather stable and the gap between desired and actual number of children is problematic for the four countries addressed in this study.

First, let us examine the trend in total fertility rate for the four countries examined in this study, that is, the U.S., France, Japan, and Korea (Figure 1). The countries are divided into two groups; the first group (the U.S. and France) has a relatively high birth rate, around 2.0, while the second group (Japan and South Korea) has a lower birth rate, below 1.5. In the mid-1990s, this distinction was not found, but thereafter the remarkable recovery of the birth rate in France and its drastic decline in South Korea made this noticeable difference between these two groups. As shown later in this study, though the birth rate doesn't always correspond with the achievement of desired fertility, the counties with a relatively high birth rate tend to have higher achievement of desired fertility. We examine what factors contribute to the difference between these two groups in this study.

The structure of the paper is as follows. The definition of terms used to express the number of children one wants is discussed in section 2. The relevant past studies are reviewed in Section 3. Our data are introduced in section 4, and the results of descriptive analysis and those of multivariate analysis on the gap between the desired and actual number of children are discussed in sections 5 and 6, respectively. Concluding remarks are provided in section 7.

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[1] Brachet, Letablier, and Salles (2010)

Figure1 Trend in total fertility rate
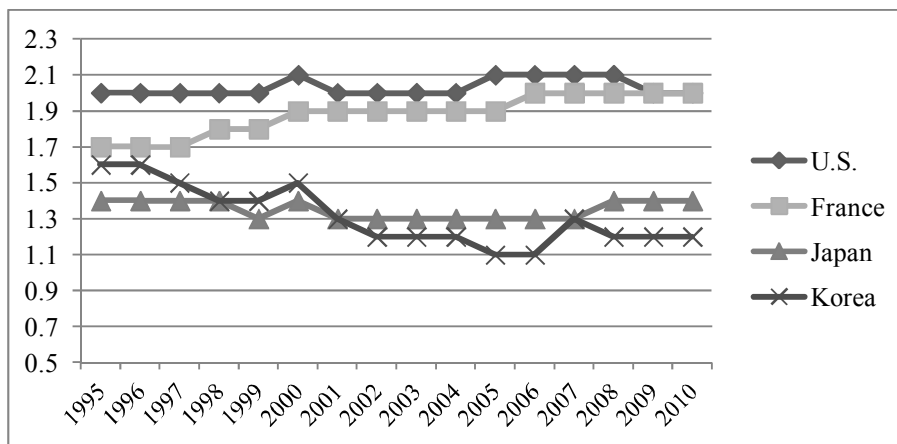
Source: Population Reference Bureau

2. Definition of terms

In previous relevant studies, several terms have been used to describe the number of children one wants, including ideal number, desired number, wanted number, intended number, expected number, and likelihood. There are conceptual differences among these terms that are worth discussing.

The phrase "ideal number of children" is less realistic than some of the other terms, because respondents give an answer on the basis of the supposition "if possible." In addition, there are two ways to ask about the ideal number of children, that is, in a general context or as a personal matter. In the former case, the ideal number can reflect the social norm more than in the latter case, in which the ideal number will be close to the number one wants (desires).

In comparison to the concept of the ideal number, the phrases "intended numbers" and "expected numbers" are more realistic, as respondents give an answer based on their actual situation. Noack and Østby (2002) distinguished intended number from expected number because the intended number doesn't include unwanted childbirth, but this distinction is not necessary since, as Morgan (2002) pointed out, one cannot actually predict one's contraceptive failure. Thus, intended and expected numbers are regarded as having the same meaning in the present study.

The desired number is different from the intended (or expected) number. Yokoyama (2009) distinguished clearly between these two terms. Using the Japanese Panel Survey of Consumers

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(JPSC)[2], Yokoyama defined the desired number of children as the sum of one's actual number of children and the number of children one would like to have, with and without conditions affecting the decision (economic condition, health condition, etc.). To determine the intended number of children, she excluded the additional number of children one wants "with conditions" from the desired number of children. That is, the intended number was considered to be more realistic than the desired one. It is not hard to anticipate that the intended number is smaller than the desired number for nearly all of the developed counties (Goldstein, Lutz, and Testa 2003, p.486).

Considering these definitions, the ideal number could be the farthest from the actual number, since it reflects one's ideal condition with regard to having children or the social norm, and the intended (or expected) number could be closest to the actual number. The desired number could be somewhere between the ideal and intended numbers, because it is given under the assumption that conditions are right but it is less sensitive to social norms.

It is worthwhile to note that the desired number may be closer to the intended number than to the ideal number, and the opposite is also true, that is, the desired number may be farther away from the intended number than from the ideal number. Which statement is true depends on how respondents are asked the question. Some questionnaires ask one's intended number following a question about the desired numbers, and others ask only the desired number. It is plausible that the respondents give a more realistic answer when they are asked only the desired number, whereas their answer is less realistic when they are asked the desired number together with the intended number. How respondents are asked about the desired number of children is an important consideration; however, this point has rarely been treated in studies.

Which term is the best choice as an indicator when discussing political issues, the ideal, desired or intended number? In mature and democratic nations, social policies aim at removing obstacles that hamper the free choice of individuals. Remember that people are influenced by the social norm when they are asked the ideal number of children. Using the ideal number as an indicator, the social policy will reinforce that particular social norm. Therefore, it would be better to avoid using the term "ideal"

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[2] JPSC asked respondents about their desire for having additional children by providing three options: "I would very much like to have more children", "I would like to have more children if conditions are right" and "I wouldn't like to have more children."

for political reasons. For the intended number, people tend to give a more realistic response assuming according to the situation they are facing, which is easily inferred by the fact that many studies have proven the consistency between intended and actual numbers of children over the short term (see the next section). For instance, a woman who wants three children may give "two" in response to the intended number, thinking "two" is more realistic than "three," considering the long waiting list for daycare centers in her town. Since the intended number can be regarded as the response of compromise in this way, no policy target will be found if it is taken as an indicator of social needs. Thus, the desired number is considered the best indicator of social needs when constructing childcare policy. The survey used in the present study asks the respondents about their desired number of children, as our goal is to discuss social policy concerning childcare and work-life reconciliation.

3. Previous studies

Previous studies on the difference between desired and actual number of children are classified into two groups according to the purpose of the study. The first group analyzes the consistency between the intended (or desired) number of children and actual fertility to see whether the former can be useful as an indicator of fertility projection. The second group analyzes the determinants of the difference between desired and actual number of children to see what interferes with achieving the desired family size and discusses future family policy. Although the present study belongs to the second group, we introduce past studies of both groups, because the factors causing the gap between the intended (or desired) and actual number of children have been discussed in both types of study when the consistency between the intended number and actual fertility was not confirmed, and this provides us with some useful information.

3.1. Predictive validity of stated fertility intention (or desire)

Since Westoff and Ryder (1977) first discussed the vulnerability of the intended number of children as a predictor of future fertility[3], many researchers have studied the predictive validity of the fertility

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[3] They pointed out the inconsistency between intended and actual fertility at the aggregate level. At the individual

intention. Some studies analyzed the validity at the macro level using the aggregate data, while others made this analysis at the individual level using micro data (panel data in most cases)[4].

At the macro level, quantitative descriptive analysis has been applied using aggregate data. Some studies are based on Bongaarts' comprehensive model, which allows us to analyze many of the factors concerning the gap between the intended number of children and the total fertility rate[5]. The predictive validity of fertility intention has been confirmed by O'Connell and Rogers (1983) and Monnier (1989), and others. More recently, however, Hagewen and Morgan (2005) denied the predictive validity of fertility intention, as shown by the fact that the gap between intended and actual fertility varied across countries. Whereas postponed childbirths are recovered later in the fecundity period in some countries (for example, the U.S.), this is not the case in other countries (for example, Italy).

At the individual level, the gap between the intended and actual number of children has been analyzed by descriptive analysis, hazard analysis, multivariate analysis (and calculate odds ratios), and other methods. The principal explanatory variables expected to increase the gap are the age at first marriage, real number of children, birth spacing, women's income, women's educational attainment, and disagreement between spouses regarding the number of children. The principal explanatory variables expected to reduce the gap are the age of the parents, the duration of the marital relationship, and household income.

The predictive validity tends to be confirmed by those who analyzed less than ten years of panel data (for example, Coombs 1974, Schoen et al. 1999, and Matuura 2009). Conversely, those who analyzed more than ten years of panel data tend to argue an inconsistency between intended and actual fertility (for example, Symeonidou 2000, Noack and Østby 2002, and Quesnel-Vallée and Morgan 2003). These outcomes suggest the intended number of children could be useful for the short-term prediction, but the fertility intention can vary over time and is therefore not suitable for the long-term prediction. The intended number can change, for example, in response to a change in fecundity, a disagreement regarding the desired number of children between spouses (Thomson

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level, they argued its predictive power.
[4] Morgan (2001) conducted a detailed survey described in previous studies.
[5] For more information about the Bongaarts' model, see Bongaarts (2002) and Hagewen and Morgan (2005).

1997), divorce, or a change in social norms (Westoff and Rider 1977 and Freedman, Freedman, and Thornton 1980).

There are also studies examining the consistency between the desired (not intended) and the actual number of children. Though the desired number seems to be more stable than the intended number, because the former is less realistic than the latter, as discussed in the previous section, some studies deny the consistency between the two numbers. According to Heiland, Prskawetz, and Sanderson (2008), who analyzed West Germany panel data conducted in 1988 and 1994/1995, more than 50% of respondents had changed the number of children they wanted to have during the time span of the study. They noted that the desired number could be modified by a change in one's values regarding having children, which results from actually experiencing childbearing. Their findings were that the actual number of children increased the desired number by 0.14. Moriizumi (2004) also claimed that childrearing experiences change one's desire regarding the number of children, analyzing the pseudo cohort data made of Japanese aggregate data[6]. Goldstein, Lutz, and Testa (2003), using Eurobarometer 2001, showed that both the ideal and desired numbers of children dropped to the replacement level in the German-speaking counties, which indicates young people, who grew up in a society of low fertility for their entire lives, tended to decrease both their desired and intended number of children. Their study suggests that one's desire comes close to reality, while at the same time the reality moves toward one's desire. The study results show that one's desire can be sequentially updated.

As our data is unfortunately cross-sectional, we cannot observe the change in people's desire over time. Even so, we will give consideration to that change, at least controlling for the factors, such as childrearing experience, that can influence one's desire.

3.2. Analysis of the gap between desired and actual fertility

Van Peer (2002) estimated the relative risks of experiencing a gap between desired and actual fertility in logistic models for nine countries and found that the duration of current relationship

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[6] Childbearing experiences could also have a negative effect on one's preference for children; however, their positive effect has been confirmed by many past studies.

reduces the discrepancy between the desired and achieved number of children for all of the countries (except for Italy and Austria, where this factor is not statistically significant), disagreement with one's partner regarding the number of children enlarges the gap in Spain, Belgium, Italy, and Austria (no information was available for the other countries), later first birth increases the gap in five countries (Belgium, Italy, Austria, France, and Sweden; it was not statistically significant for the others), and the age of the respondent and the number of live births reduce the discrepancy. With regard to the employment situation, some differences across countries were found. For example, a gap was found for female part-time workers in Spain, Italy, and Poland, which means they are confronted with more difficulties in balancing work and life, while part-time work is considered as a good way to reconcile work and parental life in Austria and Sweden, where the gap is therefore smaller. Van Peer's political discussions in the macro context suggest that fertility behavior is sensitive to labor policy, family policy, and the other social policies and how they are mixed. Adsera (2006) analysed the gap between desired and actual fertility in the OLS model using Spanish Fertility Surveys, focusing on the relation between the long recession and fertility. She anticipated that the rapidly worsening employment situation and its subsequent deterioration in Spain had enlarged the gap between desired and actual fertility for the younger generation.   Withdrawal from the labor market in a time of long recession can cause a serious income loss, because it is more difficult to reenter the labor market during such a period. To avoid the income loss, women tend to delay childbearing for a certain time, which can lead to the reproductive restriction and therefore enlarge the gap between desired and actual fertility. The results showed that women facing a high unemployment rate in their mid-twenties tend to have a greater gap, and the gap is more significant for employed women (especially for temporary contracts workers) than inactive women. The other main findings are that later marriage decreases the achievement rate of one's desired number of children and that disagreement between spouses enlarges the gap.

   Putting the results from past studies all together, we conclude that there are several   key factors in the achievement of desired number of children: (1) life events concerning marriage (or cohabitation), childbirth, and divorce or separation by death and their timing[7], (2) disagreement between spouses

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[7] For example, in Sweden, although women's age at the first birth is not as young as in Japan and Korea, the

regarding the desired family size, (3) the economical situation and its predictability, (4) difficulties in balancing work and life, (5) one's health condition including infecundity, (6) additional children needed to satisfy strong gender preferences, and (7) unwanted fertility[8] Items (3) and (4) are related, because some peoples face difficulties in balancing work and life so as not to decrease their standard of living or to keep their secure job. In addition to these factors, there is an indispensable factor that has hardly been treated in past studies; (8) the cost of raising children.

3.3. The cost of raising children

The mechanism of the fertility decision as explained by the Chicago School of Economics, which is well known as Becker's model, has been the basis for a large number of relevant studies. In this model, the marginal cost of raising children is compared with the marginal utility of children to determine whether one will have an additional child[9]. Aside from this model, there are few studies that treat the cost of raising children (especially the direct costs) in the estimation of the gap between desired and actual fertility. However, this cost is an indispensable factor in the decision of whether to have children. The international opinion survey conducted by the Cabinet Office of Japan in 2010 asked the respondents who haven't accomplished their fertility desire to list the reasons why they will not or cannot have as many children as they want. The top answer for people in their 30's was "Because it costs too much to raise and educate children" for most countries[10].

The cost of educational attainment is often used as a proxy variable of the indirect cost of raising children (*i.e.*, opportunity cost), but the impact of educational level is not always confirmed (Van Peer 2002). This is probably because education (*i.e.*, potential earning power) has two opposite effects on the fertility decision, that is, the income effect and the substitution effect. The former increases the number of children and the latter decreases it. For married women, the latter will be more significant than the former because, in general, they are engaged in housework and childbearing more than men are. The overall situation is, however, not so simple. The degree of

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achievement rate can be high because of shorter birth spacing (Van Peer 2002).

[8] Also, we find the factor "the replacement of children who have died" in Bongaarts' model, which explains the difference between intended and achieved fertility. This factor does not seem to be a general case in developed countries, because their infant mortality rate is very low.

[9] See Becker (1960), Becker and Lewis (1973), and Willis (1980).

[10] Cabinet Office of Japan (2011), pg. 135

difficulty in balancing work and life depends on how work-life supports are provided to parents and how spouses share housework and child rearing. Also, the relative importance of the wife's income to the family budget can affect the relation between income and substitution effects. Generally speaking, highly educated women tend to get married to highly educated men. When work-life support is not sufficient, housework and child rearing are not equally shared between spouses, and the mother's income isn't relatively important, the income effect of the husband's income (on the number of children) will be relatively important and the substitution effect of the wife's income will be less important. In such cases, the division of labor between spouses will be reinforced, and female education will have a positive effect on the number of children. However, that will not be the case when work-life support is sufficient and/or both spouses share equally in the housework and child rearing. In this case, the effect of female education level would have a positive effect on the fertility decision, though the effect is somewhat ambiguous (that is, the substitution effect can be greater than the income effect, depending on the stage of her career). Furthermore, in the case where the husband's income is not enough to feed all family members or is not stable and the wife is forced to work outside the home, the substitution effect will be greater than the income effect, and consequently the female education level will have a negative effect on the number of children. In any case, the variables that represent both income and substitution effects should be considered in equations used to estimate these factors, and the results should be carefully interpreted.

One of the advantages of the present study is that the costs of raising children are treated in our estimations. The household income is used for the income effect, and educational attainment and employment status are used for the substitution effect. Also, comparing four developed countries under almost the same conditions permits us to conduct an efficient discussion on policy effects. We go into the details of these issues in the following sections.

4. Data

The data used here is from the "International opinion survey on a low birthrate society," which was conducted by the Cabinet Office of Japan in 2010 across five developed countries: the United States, France, Sweden, South Korea, and Japan (hereinafter referred to as the "Cabinet Office

survey"). The aim of this survey was to investigate attitudes about marriage, childbirth, child rearing, social support, and life awareness, and to analyze the results comparatively. For each country, men and women between 20 and 49 years old were randomly selected. We do not include Sweden in our analysis because there were many data constraints for the Swedish data. This survey was a follow-up to a previous survey carried out in 2005 for those same countries, but the earlier respondents are not the same as those in 2010, so we cannot, unfortunately, treat the responses as panel data. For that reason, we used only the 2010 survey in this study to carry out estimations of the gap between desired and actual number of children.

The authors of several studies have criticized the use of cross-sectional analysis of the achievement of desired fertility for the reason that one's desire for family size can change with time (Heiland, Prskawetz, and Sanderson 2008, Van peer 2002). As they pointed out, if the desired number varies over time, cross-sectional analysis will have biases because of ignoring the time-variant effect. Also, cross-sectional analysis can be biased if the unobservable individual effect is significant. Nonetheless, we feel it is interesting to analyse our cross-sectional data, because it allows us to compare four different countries with different labor systems, welfare regimes, and birth rates. As with the total fertility rate (TFR), which is a commonly used indicator for the international comparison of birth rate[11], we can consider the cross-sectional analysis as a useful tool to grasp the representative features of a given age group in a given country. Such a consideration will help us to observe which factors make differences between the case with high achievement and that with low achievement of desired number of children.

In South Korea and Japan, childbirth is strongly associated with marriage; in other words, the percentage of out-of-wedlock child is low. Therefore, we excluded single people from our sample so that we can discuss the childbirth issue separately from the marriage issue. The respondents who did not have a partner (divorced and separated by death) at the moment of investigation were also removed. It remains possible that our sample includes those who have divorced but remarried, which could influence both wanted and actual number of children; however we cannot control for this fact

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[11] TFR means the average number of children born to a woman over her lifetime. It does not indicate the average completed birthrate for real women but rather is for an imaginary woman. It is found by summing the weighted age-specific fertility rates for ages 15–49 that were recorded for a given population in a given year.

due to the lack of information. After data-cleaning   for each group (divided by country and sex) in our study, the data we considered included between 221 and 368 observations. A statistical description is shown in Appendix 1.

5. Descriptive results

Table 1 shows the average number of children, desired and achieved, by cohort. Since this table was made after data cleaning, these figures show the average value for married people. The questions asked to respondents were the following: for the desired number of children, "How many children do you want, in total? If you already have children, include them in your answer" and for the actual number of children. "How many children (including adopted children) do you actually have?" The desired number of children (Total) is anywhere between 2.3 and 2.7. Looking at desired number by cohort, we notice that it tends to increase by cohort in the U.S. and France. For Japanese and Korean men, their initial desired number is relatively large, but it decreases from their 20's to their 30's. The actual number of children for the 40's, which is the nearest to the completed fertility rate, varies more across counties, running from 1.8 to 2.5. It is below 2.0 in Japan and Korea. The average number of live births is in their 20's in France, but the steady growth in the subsequent two decades boosts the final number of live births. On the other hand, in Japan and Korea, it is not as low in their 20's, but the slower growth over the following 20 years lowers the final number of live births.

   Let's define the achievement rate of fertility desire by dividing the actual number of children by the desired number of children. The figure runs from 0 through 1[12]. When one's desire comes true, the figure equals 1. In the case where both desired and actual numbers of children are 0, the achievement rate cannot be calculated. In this case, we assign 1 because their desire is consist with their reality.

   Figure 2 represents the achievement rates of fertility desire by country and sex. Each bar is made by stacking the achievement rate by cohort to show the speed of achievement (starting at their 20's at the bottom). The overall height of the bars shows the almost final achievement rate of desired

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[12] There was only 1 respondent (out of 10,269, before data cleaning) whose figure exceeded 1, that is, his/her actual number exceeded the desired number. This sample was excluded during data cleaning.

fertility. Japan has the lowest achievement rate, below 80% (both men and women), followed by Korean men (these together comprise the lowest group). The final achievement rate is 90% or more for French men and women and American men (which together comprise the highest group). American women and Korean women are between the highest and lowest groups (88%). It should be noted that the degree of achievement rate doesn't always correspond with the level of birthrate; the Korean birth rate is lower than the Japanese birth rate, but the achievement rate is lower in Japan than in Korea.

Looking at the data by cohort bracket, we see that the U.S. (both men and women), Japan (women), and Korea (women) achieve around 50% in their 20's. Afterward, the speed of achievement weakens for Japanese women, and, as a result, their final achievement rate doesn't reach the level of 80%. The achievement rate is relatively low for French men and women and Japanese men; however, it grows at a higher pace in their 30's for French people. Japanese men don't make up for their delay, and their final achievement rate remains below 80%.

Overall, the achievement rate is constantly high in the U.S. In France, the rate is relatively low at the beginning, but people catch up later in their 30's and/or 40's. The speed of growth becomes slow in their 30's and/or 40's in Japan and Korea (especially for men). We examine which factors contribute to these differences in the following sections

Table 1 Average desired and actual number of children

	U.S.		France		Japan		Korea	
	Men	Women	Men	Women	Men	Women	Men	Women
Desired number of children								
20's	2.4	2.3	2.5	2.4	2.7	2.3	3.0	2.2
30's	2.5	2.5	2.7	2.5	2.3	2.4	2.3	2.3
40's	2.8	2.5	2.7	2.6	2.4	2.3	2.5	2.3
Total	2.6	2.5	2.7	2.5	2.4	2.6	2.5	2.3
Actual number of children								
20's	1.1	1.1	0.9	0.9	1.2	1.1	1.0	1.1
30's	1.6	1.9	1.9	1.9	1.4	1.6	1.5	1.7
40's	2.5	2.2	2.4	2.2	1.9	1.8	1.9	1.9
Total	1.9	1.8	2.1	1.7	1.6	1.7	1.7	1.7

Figure 2 Achievement rate of fertility desire　　　　　(M): Men, (W): Women

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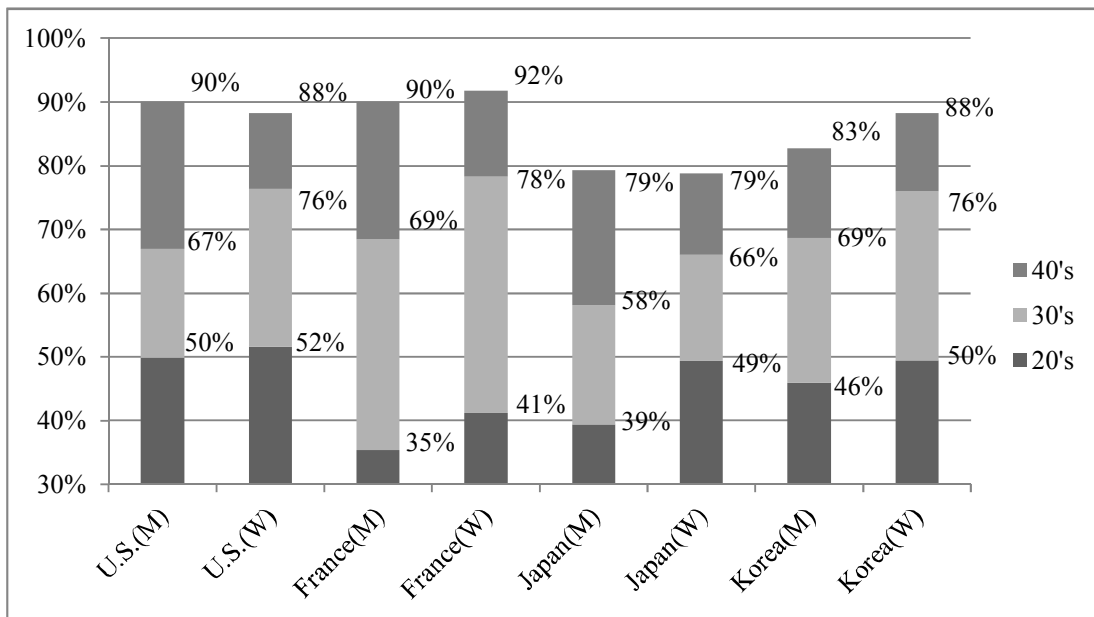
6 Analysis of the difference between desired and actual number of children

6.1. Methodology

We estimated the achievement rate of desired fertility (P) in an ordered logistic model. The achievement rate (AR) was calculated for all respondents following the definition shown in the previous section, and AR was classified into three categories, as follows: if $AR=0$, then $P=1$, if $0<AR<1$, then $P=2$, and if $AR=1$, then $P=3$. The estimations were done by country and sex, so there were 8 estimations in total. Independent variables were age of respondent, age at first marriage (only for Japan and Korea[13]), the cost of childcare and children's education (as direct child costs), university degree for both spouses (dummy variable, as the substitution effect and indirect child costs), household income (income effect), working hours for both spouses (as a barometer of work-life balance), precarious labor market situation[14] for both spouses (dummy variable, as a barometer of economical instability), living in a big metropolitan area (dummy variable), and the views about child rearing of the respondent.

Some previous studies include the number of live births in their independent variables, as the experience of child rearing can raise one's fertility desire. However, because our dependent variable (achievement rate = real number of children/desired number of children) includes the actual number of children in its numerator, the effect of child rearing experiences will be overestimated, and thus we needed a proxy variable. The Cabinet Office survey asked all respondents with and without children about the positive and negative aspects of child rearing. Therefore we created a proxy variable based on the answers to these questions (see Appendix 2 for details), supposing that the positive values of child rearing are fostered by real experiences of child rearing, which can result in the increase in fertility desire. Certainly we can expect the opposite effect of child rearing experiences to also be present. For example, relatively high opportunity costs of child rearing or lonely child rearing because of lack of support for the parents can give parents a negative impression of child rearing.

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[13] This variable cannot be used for the other countries, because there were too many "no response" answers. Since being married is a very important component of having children in Japan and Korea, we leave this variable for these countries.

[14] This includes non-regular workers such as part-timer and dispatched workers, home workers, and the unemployed (in search of a job).

The independent variables that were not included in our estimation were the age of one's spouse, the fertility desire of one's spouse, and gender preference, because of lack of information. The lack of information about the age of the spouse could have had a negative effect in our estimation for men, because we could not control for the fecundity of the spouse.

We did not consider unwanted pregnancy in this study, because there was only one case in which the actual number of children exceeded the desired number of children in our datasets.

According to Becker's quality-quantity fertility model, the quality per child is decided simultaneously with the number of children. Therefore, the direct cost of raising children can be considered an endogenous variable. To cope with this endogeneity problem, we estimated the direct cost of children with an instrumental variable, followed by the achievement rate of desired fertility. We used the approximate average age of children[15] as the instrumental variable. As our datasets contain respondents without children, the estimation of child cost was conducted via Heckman two-stage estimation as well as in general OLS estimation. If the inverse Mills ratio was statistically significant, we used the results of Heckman's estimation for the estimation of achievement rate. If that was not the case, we used the results of general OLS estimation. All estimation was done with robust standard errors[16].

6.2 Estimation of direct cost per child

We considered the costs of childcare service and a child's education as direct costs of raising children. The Cabinet Office survey asked the following question: "Of your household's annual budget in the past year, about what percentage was spent for your children? Please include expenditures for childcare and education, such as school, university, private tutoring, and after-school lessons." Respondents were given 9 options of percentage bracket, cut off every 5% between 0% and 30% and every 10% between 30% and 50%, with a final option of "more than 50%." Each respondent with children chose one option, and we took the median of these percentage

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[15] To be precise, the average age of the eldest child and youngest child is used, since the ages for all children are not available.

[16] The product from Stata (Stata/SE 11) did not enable us to estimate the Heckman model with robust standard errors. Since the heteroskedasticity test (Breusch-Pegan) didn't reject the null hypothesis, we conducted a Heckman estimation by hand to estimate inverse Mills ratios, and we then estimated the OLS model, inserting the inverse Mills ratio, with robust standard errors.

brackets to obtain the cost of children on a value basis. For the last option, "more than 50%," we allocated 55%. Multiplying the median of child's expenditure share by the median of annual household income bracket[17], we obtained the total cost of children on a value basis. Finally, we divided the total cost of children by the number of children to get the cost per child, supposing there is no merit of scale on childcare service and child's education.

The variables used for Heckman estimation were the following: for the first stage, the presence or absence of children is estimated in a binary probit model. The independent variables were those related to the respondent's profile, such as age, educational attainment, and household income. In addition, two variables concerning the value of children were introduced; one was the dummy variable for respondents who agree with the idea "one ought to have a child of his/her own after marriage," and the other was the respondent's views about having children. The Cabinet Office survey inquired about how respondents felt about having their own child and asked them to choose 3 out of 16 proposed options. Giving 1 point to 10 options with a positive view and -1 point to 3 options with a negative view, the total score was calculated for each respondent (the other 3 options were neither positive nor negative and received a score of 0). This variable could have any value between -3 and 3. For the second stage, the cost of children (per child, logarithm) was estimated in the OLS estimation with robust standard errors. Independent variables were those related to the respondent's profile, the average age of children (IV), and the inverse Mills ratio.

6.3 Results

Table 2 shows the estimation results of direct cost per child conducted using the Heckman model for French women and Japanese men, where inverse Mills ratios are statistically significant at the 15% level, and using the general OLS model for the other cases. For all of the cases, household income had a significantly positive effect on the cost of children. In Japan, men's precarious labor market situation shows an opposite impact on men and women; it is positive in the estimation for men and

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[17] The annual household income is pretax and includes social security benefits and any financial support by family other than earned income and interest dividends. Respondents were asked to choose from one of 10 brackets for their annual household income. We excluded the respondents who fell into the maximum bracket (families whose members earn more than 250,000 dollars).

negative for women. We expected a negative impact for this variable, but the positive impact was also seen for American men. This may be due to the disruption by the global depression, which resulted in the deterioration of the labor market. It will take some time before the negative effect of this labor market's deterioration reaches the typical household budget. Unfortunately, our cross-sectional data don't allow us to perceive such a time-lag effect. The average age of children, introduced as the instrumental variable, shows a different impact by country; whereas the direct cost per child increases as children grow older in Japan and Korea and decreases with the age of children in the U.S. and France, although the difference is not statistically significant for some cases. Is this result plausible?

Figure 3 shows the share of private expenditure on educational institutions in 2006, reported by the OECD. The share stays at slightly more than 20% for the primary and secondary education, even in Korea, whose share is the most significant among the four study counties. Tertiary education varies among countries; the share is small, between 10% and 20% in France, while it exceeds 60% in Korea, Japan, and the U.S. However, in the U.S., almost all undergraduate students pay a discounted tuition, receiving some assistance such as federal student financial aid, institutional aids, and grant aid. Also, there is a large student loan system and tax credit system in the U.S. Therefore, American parents could shoulder less of the burden in child's tertiary education compared to Japanese and Korean parents, and consequently the average age of children might have had a negative impact on the direct cost per child for the U.S. in our estimation.

Table 3 represents the estimation results of the achievement rate of desired fertility. The age of the respondent has a statistically significant positive effect in all cases. Looking at the cases of the three lowest rates of achievement (Japanese men and women, Korean men), we notice some common points; the age at first marriage and the direct cost of raising children have a statistically significant negative impact on the achievement rate. The later one gets married, the lower the achievement rate s/he has, and an increase in the direct cost of raising children reduces one's achievement rate. The negative effect of the age at first marriage is also found for Korean women.

In terms of university degree of the respondent (proxy variable of opportunity cost), the negative impact wasn't confirmed in any case. University degree of one's spouse has a negative effect with

regard to French women's achievement.

Household income has a positive effect for both men and women in Japan. This is a plausible result, because the direct cost per child paid by the family is significant in Japan. The other countries have different propensity by sex. In the U.S. and France, the higher the household income is, the higher the achievement rate is for women, while there is no correlation between these two variables for men. This suggests that conjugal decisions about family size reflect more the woman's intention as household income increases. On the contrary, the positive effect is found only for men in Korea, which may mean that the conjugal decision clearly reflects the man's intention as household income increases, but additional validation of this point is necessary.

Spouse's working hours has a positive impact on the achievement rate for American women and Japanese women. In those cases, men's working hours seem to relate to their higher income, because both countries are well known as requiring long hours of white-collar employees. It also relates to the sexual division of labor in Japan, where there is still a strong belief in the man's role as a breadwinner. This result is consistent with our other result that men's precarious labor market situation has a negative impact on Japanese women's achievement rate.

The views about child rearing were expected to have a negative impact, because real experiences in child rearing can increase the desired number of children. In spite of our expectation, we had only one case in which this was true, Korean men.

The negative effects of direct costs of raising children and delaying marriage were found in the case in which both the birth rate and the achievement rate of desired fertility were low (Japanese men and women and Korean men). As the marginal effect of the direct cost of raising children is much more significant than that of delaying marriage[18], reducing the direct cost of raising children (costs of child care and children's education) is the most efficient way to improve the achievement rate of desired fertility. In Japan, the sexual division of labor can increase or decrease the achievement rate, depending on whether the husband has a secure and well-paid job. In the case in which both birth rate and achievement rate are high (American men and French men and women), no noteworthy negative effects were found. American women and Korean women have a similar

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[18] The marginal effects are not shown in this paper but are available upon request.

achievement rate (88% in their 40's) between the highest group and the lowest group, but their estimation results are different. For American women, direct child cost shows a negative impact (the marginal effect is smaller than that of the lowest group), and the achievement rate decreases when respondents are in a precarious situation in the labor market. Wealthier American women tend to meet their desire. For Korean women, only the age at marriage has a negative impact on the achievement rate.

7. Discussion

We analyzed the achievement rate of desired fertility using the data of men and women for four countries. Those corresponding to the low achievement case (around 80%) are Japanese men and women and Korean men. Those corresponding to the high achievement case (90% or more) are French men and women and American men. American women and Korean women are placed between the high and low cases (88%).

In the low achievement case, we found a significant negative impact of the direct cost of raising a child, a slight negative impact of delaying marriage, and a positive impact of household income. Thus, one's achievement of family formation depends strongly on his/her household income level, because of the very high direct cost of raising children. In Japan, the social norm with regard to having a child has weakened compared to that in Korea[19]. That is why some Japanese couples receiving a meager salary or having a precarious job give up having as many children as they want. The Japanese government has taken many measures against the declining birth rate, such as reforms of the childcare leave law, the expansion of daycare services, and promotion of the firm policy on work-life balance. If anything, these measures target white-collar employees. However, the results we obtained in this study suggest that reducing the direct costs of raising children and the stabilization of employment should be given priority rather than the other measures. Also, in Japan, the husband's precarious situation in the labor market decreases the wife's achievement rate, whereas the husband's high income and long working hours, which provide additional income to the family, raise the wife's achievement rate. These findings suggest that the wife's achievement of desired

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[19] Cabinet Office of Japan (2011), pg.114.

fertility is greatly affected by the husband's employment situation, because Japanese families maintain the sexual division of labor. When the overall income level becomes diminished and the share of precarious jobs in the labor market is high, the sexual division of labor tends to fall out of step with the times. To change this, the Japanese government would need to break away from the policies based on the male breadwinner model[20].

The factors affecting the declining birthrate in Korea are thought to be the high cost of children's education and the destabilization of employment. Also, the male breadwinner model persists in Korean society, which might make it difficult for Korean men to achieve their desired fertility. Before anything else, it would be important for Korea to alleviate the economic burden of parents with regard to children's education and to establish a system that enables young people to form a family even if they don't have much money. This is also true for Japan. Incidentally, the Korean government announced a new strategy to lower the starting age of compulsory education from the current 6 to 5 years old in 2012. The birthrate is very low in Korea, but the achievement rate is not so low for Korean women. Even so, it is somewhat doubtful that any significant effect of either the direct cost of raising children or household income was found for them. It is possible that some necessary variable for Korean women such as a social norm was missed in our estimation. It will be an issue to explore in the future.

Our estimations have some problems due to data constraints; the impact of household income could be overestimated for the higher-income individuals, because household income includes income tax, the direct cost of raising children is narrowly defined, the direct cost of raising children is not totally accurate because it was not asked in terms of monetary amounts in the questionnaire, the change in the desired number of children over time is not considered because cross-sectional data was used for our estimations, and the desired number of children is that given at the moment of taking the survey not that given at the beginning of marital life. The estimation should be improved by using panel data that would allow us to overcome these problems in our next study.

While some challenges remain in the estimation, this study was an attempt at a comprehensive analysis of child bearing on the micro-level, estimating the achievement of one's desired fertility as

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[20] There is still a tax deduction for one's spouse in Japan.

affected by many relevant variables. The direct cost of raising children, which is an indispensable element of the decision about child bearing that has barely been treated in past studies, was also integrated in our estimation. More elaboration of the estimation will enable us to make more effective policy proposals.

Table 2 Estimation results of direct cost per child (logarithm)

	U.S.		France		Japan		Korea	
	Men	Women	Men	Women	Men	Women	Men	Women
Age of respondent	0.008	0.004	-0.002	0.050	-0.031	-0.050*	0.000	-0.023
Age at first marriage	-	-	-	-	0.010	0.060**	0.012	0.033*
Household Income (*ref.* Lowest income)								
Second lowest income	0.654**	0.954**	0.745**	1.112**	1.093**	0.465**	0.933**	1.030**
Medium	1.140**	1.304**	1.212**	1.064**	1.444**	0.731**	1.492**	1.457**
Second highest income	1.249**	1.692**	1.156**	2.105**	1.447**	1.066**	1.712**	1.632**
Highest income	1.612**	2.073**	1.718**	2.361**	2.238**	1.427**	1.788**	2.215**
University degree of respondent	-0.042	-0.075	-0.332	0.277	0.233	0.119	-0.047	0.111
University degree of spouse	-0.019	-0.127	0.063	-0.411	0.043	0.082	0.019	-0.110
Working hours of respondent	0.010*	0.002	-0.003	0.003	-0.002	0.001	-0.001	-0.002
Working hours of spouse	0.005	0.001	0.009	0.001	-0.001	-0.000	-0.001	-0.001
Precarious situation in labor market (respondent)	0.830*	0.016	0.325	-0.359	1.458*	0.101	0.245	0.062
Precarious situation in labor market (spouse)	-0.023	0.173	0.129	-0.323	0.050	-1.071**	-0.376**	0.038
Dwell in big metropolitan area	-0.140	0.022	0.376	-0.239	0.054	-0.015	-0.087	-0.286**
Views about child rearing	0.025	-0.013	-0.002	0.059	-0.030	-0.052**	-0.026	-0.028
Average age of children	-0.055**	-0.048**	-0.006	-0.022	0.064**	0.060**	0.023	0.041**
Inverse Mills ratio	-	-	-	2.114*	0.452	-	-	-
Constant	7.454**	7.948**	6.507**	4.032**	11.967**	12.154**	13.787**	13.870**
R-squared	0.419	0.404	0.249	0.371	0.363	0.292	0.348	0.392
Number of obs	180	182	179	223	184	317	240	310

Note: **Significant at 1%, *Significant at 5%

Household income for each country was classified into one of 5 categories, referring to the purchasing power parities in 2010 published by the OECD (http://stats.oecd.org/). The details of the amount of money are as follows; the U.S.: less than 30,000USD | 30,000-50,000USD | 50,000-80,000USD | 80,000-100,000USD | 100,000-200,000USD, France: less than 22,500EUR | 22,500-37,500EUR | 37,500-52,500EUR | 52,500-75,000EUR | 75,000-125,000EUR, Japan: less than 3 million JPY | 3-5 million JPY | 5-7 million JPY | 7-10 million JPY | 10-15 million JPY, South Korea: less than 20 million KRW | 20-40 million KRW | 40-50 million KRW | 50-70 million KRW | 70-150 million KRW.

Figure 3 Share of private expenditure on educational institution (2006)
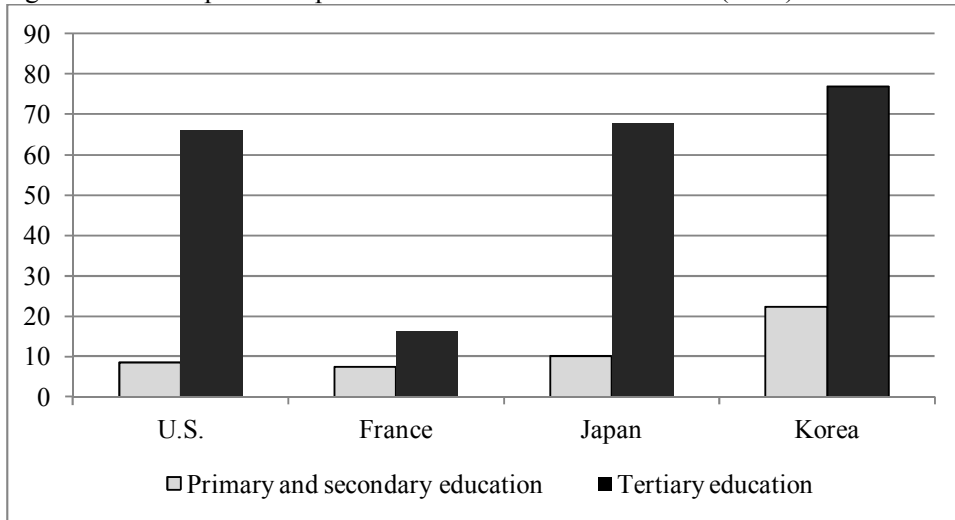
Source: OECD, *Education at a Glance 2009*

Figure 4 Distribution of public and private expenditure on educational institutions (2006)
a. Pre-primary education
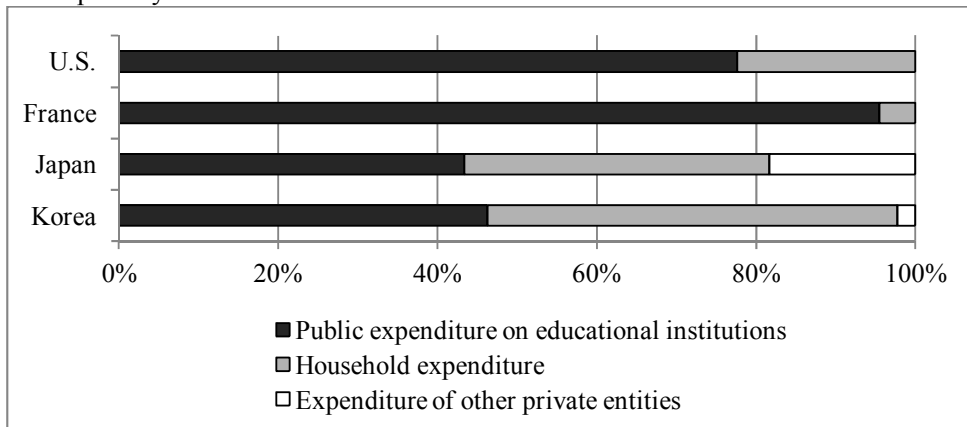
b. Tertiary education

Source: OECD, *Education at a Glance 2009*

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Table 3 Estimation results of achievement rate of desired fertility
Dep. variable: *P*=1 if *AR*=0, *P*=2 if 0<*AR*<1, and *P*=3 if *AR*=1

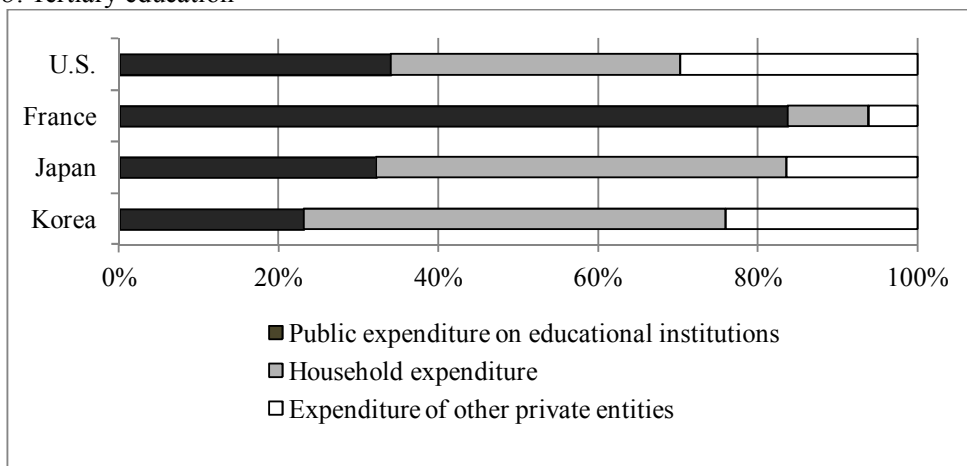|	U.S.		France		Japan		Korea	
	Men	Women	Men	Women	Men	Women	Men	Women
Age of respondent	0.147**	0.061*	0.148**	0.152**	0.209**	0.150**	0.259**	0.141**
Age at first marriage	-	-	-	-	-0.226**	-0.169**	-0.157**	-0.151**
Ln Child cost	0.616	-1.984*	-0.300	-1.516	-2.131**	-2.496**	-5.684*	0.488
University degree of respondent	0.188	-0.607	-	-0.264	0.728	-0.028	-0.735	0.467
University degree of spouse	-0.708	-0.113	-0.249	-0.671*	-0.073	0.512	0.390	-0.143
Household income (*ref.* Lowest income)								
Second lowest income	-0.050	2.078*	-0.256	1.575*	1.956*	0.239	6.542**	0.056
Medium	0.379	2.094	0.446	1.667*	2.612*	1.389	9.545**	0.097
Second highest income	0.196	3.468**	-0.125	3.795**	2.989**	1.726	11.349**	-0.246
Highest income	0.455	4.076*	-0.185	3.717*	3.909*	2.589*	10.966*	-0.473
Working hours of respondent	0.003	-0.009	0.017	0.010	-0.019	-0.003	-0.011	-0.000
Working hours of spouse	-0.011	0.027**	-0.006	0.005	-0.013	0.021*	-0.009	-0.004
Precarious situation in labor market (respondent)	-1.027	-0.689*	-0.561	-0.633	0.382	-0.071	0.253	-0.148
Precarious situation in labor market (spouse)	-0.506	0.923	-0.271	-0.488	0.024	-3.000**	-1.889	0.620
Dwell in big metropolitan area	-0.166	-0.541	0.280	-0.521	0.163	-0.471	-0.694	0.145
Views about child rearing	-0.133	0.032	-0.005	0.125	0.054	-0.047	-0.286**	-0.099
/cut1	3.424	-14.732	1.794	-6.679	-26.354	-31.758	-78.730	5.627
/cut2	4.927	-13.025	3.457	-4.604	-23.984	-29.217	-75.739	8.156
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R2	0.164	0.153	0.145	0.208	0.191	0.166	0.150	0.136
Log likelihood	-174.367	-184.581	-208.909	-206.345	-181.392	-292.743	-188.296	-236.666
Number of obs	226	229	235	269	221	368	257	331

Note: **Significant at 1%, *Significant at 5%. For French men, the variable "university degree of respondent" is removed because of its strong correlation with child cost (*R*=0.834).

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Appendix 1 Statistical description of respondents by country
U.S.

	Men					Women				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Achievement rate of fertility desire	226	2.460	0.755	1	3	229	2.432	0.744	1	3
ln Child cost	226	8.836	0.631	6.796	10.848	229	8.790	0.669	6.860	10.013
Age of respondent	226	37.031	7.553	20	49	229	35.712	8.370	20	49
Household income										
Lowest income	226	0.128	0.335	0	1	229	0.157	0.365	0	1
Second lowest income	226	0.119	0.400	0	1	229	0.249	0.433	0	1
Medium	226	0.358	0.481	0	1	229	0.362	0.482	0	1
Second highest income	226	0.150	0.358	0	1	229	0.100	0.301	0	1
Highest income	226	0.164	0.371	0	1	229	0.131	0.338	0	1
University degree of respondent	226	0.332	0.472	0	1	229	0.336	0.473	0	1
University degree of spouse	226	0.371	0.484	0	1	229	0.301	0.460	0	1
Working hours of respondent	226	40.323	16.883	0	100	229	22.594	19.317	0	88
Working hours of spouse	226	25.854	25.854	0	80	229	41.611	17.592	0	90
Precarious situation in labor market (respondent)	226	0.097	0.297	0	1	229	0.262	0.441	0	1
Precarious situation in labor market (spouse)	226	0.155	0.363	0	1	229	0.109	0.313	0	1
Dwell in big metropolitan area	226	0.097	0.297	0	1	229	0.087	0.283	0	1
Views about child rearing	226	0.721	2.254	-7	7	229	0.747	2.519	-8	8
Average age of children	182	10.140	7.261	1	29	184	11.130	7.595	1	30

Appendix1- continued
France

	Men					Women				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Achievement rate of fertility desire	235	2.272	0.802	1	3	269	2.409	0.741	1	3
ln Child cost	235	7.434	0.915	5.919	9.583	269	7.086	0.703	5.492	9.143
Age of respondent	235	36.634	7.259	21	49	269	34.688	7.651	20	49
Household income										
Lowest income	235	0.238	0.427	0	1	269	0.286	0.453	0	1
Second lowest income	235	0.417	0.494	0	1	269	0.409	0.493	0	1
Medium	235	0.162	0.399	0	1	269	0.190	0.393	0	1
Second highest income	235	0.128	0.334	0	1	269	0.078	0.269	0	1
Highest income	235	0.055	0.229	0	1	269	0.037	0.190	0	1
University degree of respondent	-	-	-	-	-	269	0.405	0.492	0	1
University degree of spouse	235	0.370	0.484	0	1	269	0.349	0.478	0	1
Working hours of respondent	235	36.115	14.198	0	72	269	22.758	18.557	0	98
Working hours of spouse	235	26.230	16.622	0	70	269	38.409	14.257	0	98
Precarious situation in labor market (respondent)	235	0.145	0.353	0	1	269	0.253	0.435	0	1
Precarious situation in labor market (spouse)	235	0.196	0.398	0	1	269	0.119	0.324	0	1
Dwell in big metropolitan area	235	0.157	0.365	0	1	269	0.186	0.390	0	1
Views about child rearing	235	0.987	1.512	-3	6	269	0.550	1.544	-5	6
Average age of children	179	8.391	5.918	0	22	223	7.776	6.353	0	30

Appendix1- continued

Japan

	Men					Women				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Achievement rate of fertility desire	223	2.309	0.746	1	3	368	2.410	0.687	1	3
ln Child cost	223	12.855	0.743	11.040	14.685	368	13.058	0.492	11.339	14.484
Age of respondent	223	38.789	5.709	24	49	368	38.853	6.144	22	49
Age at first marriage	223	28.175	4.335	19	42	368	26.348	3.979	16	41
Household income										
Lowest income	223	0.045	0.207	0	1	368	0.087	0.282	0	1
Second lowest income	223	0.139	0.347	0	1	368	0.323	0.468	0	1
Medium	223	0.300	0.459	0	1	368	0.272	0.445	0	1
Second highest income	223	0.256	0.437	0	1	368	0.217	0.413	0	1
Highest income	223	0.117	0.322	0	1	368	0.101	0.301	0	1
University degree of respondent	223	0.417	0.494	0	1	368	0.231	0.422	0	1
University degree of spouse	223	0.224	0.418	0	1	368	0.438	0.497	0	1
Working hours of respondent	223	50.574	11.963	0	90	368	19.685	18.416	0	70
Working hours of spouse	223	19.188	18.892	0	70	368	51.005	12.175	0	105
Precarious situation in labor market (respondent)	223	0.009	0.094	0	1	368	0.342	0.475	0	1
Precarious situation in labor market (spouse)	223	0.309	0.463	0	1	368	0.016	0.127	0	1
Dwell in big metropolitan area	223	0.296	0.458	0	1	368	0.299	0.458	0	1
Views about child rearing	223	1.350	1.880	-3	7	368	1.549	2.093	-5	7
Average age of children	184	8.027	5.165	0	24.5	317	9.636	6.086	0	27.5

Appendix1- continued
Korea

	Men					Women				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Achievement rate of fertility desire	257	2.506	0.613	1	3	331	2.568	0.611	1	3
ln Child cost	257	15.444	0.485	13.839	16.325	331	15.318	0.546	13.715	16.550
Age of respondent	257	40.630	6.138	22	49	331	39.121	6.533	22	49
Age at first marriage	257	29.342	3.653	19	41	331	26.444	3.419	19	40
Household income										
Lowest income	257	0.054	0.227	0	1	331	0.076	0.265	0	1
Second lowest income	257	0.510	0.501	0	1	331	0.480	0.500	0	1
Medium	257	0.136	0.344	0	1	331	0.199	0.400	0	1
Second highest income	257	0.214	0.411	0	1	331	0.139	0.346	0	1
Highest income	257	0.086	0.280	0	1	331	0.106	0.308	0	1
University degree of respondent	257	0.428	0.496	0	1	331	0.263	0.441	0	1
University degree of spouse	257	0.327	0.470	0	1	331	0.462	0.499	0	1
Working hours of respondent	257	55.148	18.769	0	119	331	30.589	28.712	0	100
Working hours of spouse	257	21.467	25.815	0	94	331	50.211	17.721	0	112
Precarious situation in labor market (respondent)	257	0.097	0.297	0	1	331	0.139	0.346	0	1
Precarious situation in labor market (spouse)	257	0.089	0.286	0	1	331	0.048	0.215	0	1
Dwell in big metropolitan area	257	0.471	0.500	0	1	331	0.444	0.498	0	1
Views about child rearing	257	0.506	1.700	-7	7	331	0.462	1.799	-7	6
Average age of children	240	10.565	6.184	0	24	310	11.792	6.771	0	26

Appendix 2 The creation of a proxy variable for the effects of child rearing experiences
The questions used to create the proxy variable are the following:
A. Question about the positive aspects of child rearing.
Which of the following are good aspects of child rearing? Choose as many answers as you want.
(Persons without children should answer imagining that they have children.)
1. It makes our home lively
2. We are pleased that our friends and family are happy with our children
3. It gives me something to live for
4. I have more friends through child rearing
5. My world is wider through child rearing
6. I have grown emotionally through child rearing
7. It makes my relationship with my spouse deeper
8. Other (please specify)
9. Nothing especially good has happened
10. Don't know

B. Question about the negative aspects of child rearing
  What difficulties have you faced in child rearing? Choose as many answers as you want.
(Persons without children should answer imagining that they have children.)
1. I have physical fatigue from child rearing
2. I have emotional difficulty from child rearing
3. Expenses have grown due to child rearing
4. I am unable to have free time of my own
5. We don't have time to enjoy ourselves as a couple
6. I can't do as much work as I want
7. Friends and family do not always appreciate how difficult child rearing is
8. It is difficult when children are sick
9. Other (please specify)
10. Nothing has been burdensome
11. Don't know

The scoring was done by adding one point for any answer from the first item to the eighth item of question A and subtracting one point for any answer from the first item to the ninth item of question B. For example, when a respondent selected 3 items from question A (say, 1, 2 and 5) and 2 items from question B (say, 2 and 5), his/her score was 1.