Declining Fertility: Theories and Japanese Experience

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February, 2007

Keywords: Fertility, Economic Theory, Japanese Society.

Abstract: Japan is one of the countries which suffer from a rapid decline in fertility. We set up a simple economic model to explain the declining fertility and to consider public policies to reduce inefficiency associated with declining fertility in Japan. We argue that it is caused by various market failure problems, government failure problems, and social constraints. Our policy proposal is to reduce inefficient decline in fertility by mitigating such problems and constraints.

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1 Introduction

Declining fertility is one of the most challenging problems in Japan. It is important in Japan especially because it is a serious challenge for the sustainability of social security system such as the pay-as-you-go (PAYG) pension system and the public health insurance in which intergenerational transfers from the working generation to the elderly generation are expected.

Figure 1 shows the actual movement of the total fertility rate and its past estimates in Japan. It shows that the estimates have been consistently above the actual movement.

![Figure 1: Declining Fertility in Japan: Estimates and Reality](Image)

One of the consequences of such over-estimates is the insufficient reform of the PAYG pension system. Even though a major pension reform to reduce the net benefit of the pension was made in 2004 based on the 2001 estimate, the necessity for further pension reform is now suggested because the estimate turned out to be still optimistic and the number of children is expected to be shrinking faster than previously thought.

In this paper, we present a simple economic model to understand human behavior of child-bearing and child-rearing (Section 2). The model is then used as a framework to identify reasons for declining fertility in Japan (Section 3) and to discuss public policies to mitigate the problem (Section 4).

We argue that some of the reasons for declining fertility in Japan can be attributable to market failure problems, government failure problems, and social constraints. Reducing inefficient decline in fertility caused by them should be one of the important policy goals in Japan.

In Section 3 and Section 4, we present several data which suggest factors affecting the declining fertility and policies to mitigate the problem. Note that we have not attempted careful analysis of the data in this paper but only tried to show the consistency between the data and
theories. Further analysis on the Japanese experience is left as a future research agenda\(^1\).

## 2 Framework: An Economic Model of Fertility

In this section, we first introduce a simple individual-decision model in which we can see the factors affecting the fertility rate\(^2\). Then, we discuss some interesting implications of the model.

### 2.1 Basic Model

We assume that the utility from children is separable and defined over the number of children \((n)\) and the average quality of the children \((q)\) as in \(x(n,q)\). The quality not only affects the utility but also will affect the children’s wage rate, which will affect the parents’ expected transfer from the children \(\sigma(n,q)\).

There are two periods Period-1 (young-period) and Period-2 (elderly-period). Each individual is born in the beginning of Period-1 and dies at the end of Period-2.

The utility function is defined by

\[
U(c_1, c_2, \ell, m, x(n,q))
\]

where \(c_t\) is consumption in each Period-\(t\), \(m\) is the time for raising children, and \(\ell\) is the time for leisure. The total time available is given by \(M\) and thus the time for working is simply \(M - m - \ell\).

Since having children is a productive action, we need to consider a production function. We consider a simplified production function \(f : \mathbb{R}^2 \to \mathbb{R}^2\) defined by

\[
(n, q) = f(m, h)
\]

where \(h\) is a child-care service which is sold at the price \(p\). Besides the basic goods and services to foster children, education is especially important to increase the quality \((q)\) of the children.

The budget constraint in Period-1 and Period-2 is given, respectively, by:

\[
c_1 + ph + s = w(M - m - \ell) + I \quad \quad (3)
\]

\[
c_2 + B = (1 + r)s + \sigma(n,q) \quad \quad (4)
\]

where \(s\) is a saving at the interest rate \(r\), \(w\) is a wage rate, \(I\) is the net transfer from parents, \(B\) is the bequest to children, and \(\sigma(n,q)\) is a transfer from the children.

The lifetime budget constraint is given by

\[
c_1 + ph + \rho(c_2 + B) = w(M - m - \ell) + I + \rho\sigma(n,q), \quad \text{where } \rho = \frac{1}{1+r}.
\]

\(^1\)An excellent discussion on the issues and policies concerning fertility and children in Japan is provided in, for example, Ogawa (2003), NIPSSR (2004), and Suzuki (2006).

\(^2\)The model in this section is based on the ideas of Becker (1993) and others. Similar models can be found, for example, in Cigno (1986, 1991, 1993) and Weiss (1997).
The maximization problem is given by
\[
\begin{align*}
\text{max} & \quad U(c_1, c_2, \ell, m, x(n, q)) \\
\text{s.t.} & \quad c_1 + ph + \rho(c_2 + B) = w(M - m - \ell) + I + \rho\sigma(n, q) \\
& \quad (n, q) = f(h, m)
\end{align*}
\]
(6)

Now, in order to simplify our exposition, we assume that the utility function is separable as
\[
U(c_1, c_2, \ell, m, x(n, q)) = u(c_1, c_2, \ell) + v(m, x(n, q))
\]
(9)

Then, the problem can be solved as follows. First, given the pair \((n, q)\), solve
\[
\begin{align*}
\min_{h,m} & \quad ph + wm \\
\text{s.t.} & \quad (n, q) = f(h, m)
\end{align*}
\]
(10)
(11)

Then, the optimal input can be expressed as \(\tilde{h}(n, q; \frac{w}{p})\) and \(\tilde{m}(n, q; \frac{w}{p})\), and we can solve the main problem as follows.

\[
\begin{align*}
\text{max}_{c_1, c_2, \ell, n, q} & \quad u(c_1, c_2, \ell) + v(\tilde{m}(n, q; \frac{w}{p}), x(n, q)) \\
\text{s.t.} & \quad c_1 + ph(n, q; \frac{w}{p}) + \rho(c_2 + B) = w(M - \tilde{m}(n, q; \frac{w}{p}) - \ell) + I + \rho\sigma(n, q)
\end{align*}
\]
(12)

Define the Lagrangean function by
\[
\mathcal{L} \equiv u(c_1, c_2, \ell) + v(\tilde{m}(n, q; \frac{w}{p}), x(n, q)) - \lambda[c_1 + ph(n, q; \frac{w}{p}) + \rho(c_2 + B) - w(M - \tilde{m}(n, q; \frac{w}{p}) - \ell) - I - \rho\sigma(n, q)].
\]
(14)

Then the maximization with respect to \(n\) and \(q\) implies
\[
\begin{align*}
\frac{\partial \mathcal{L}}{\partial n} = 0 : & \quad v_m\tilde{m}_n + v_x x_n - \lambda[p\tilde{h}_n + w\tilde{m}_n - \rho\sigma_n] = 0 \\
\frac{\partial \mathcal{L}}{\partial q} = 0 : & \quad v_m\tilde{m}_q + v_x x_q - \lambda[p\tilde{h}_q + w\tilde{m}_q - \rho\sigma_q] = 0
\end{align*}
\]
(16)
(17)

Now let
\[
\begin{align*}
\text{MB}^n(n, q; \lambda) & \equiv \frac{1}{\lambda}(v_m\tilde{m}_n + v_x x_n) + \rho\sigma_n \\
\text{MC}^n(n, q; \lambda) & \equiv \tilde{h}_n + w\tilde{m}_n.
\end{align*}
\]
(18)
(19)

Then, \(\text{MB}^n\) and \(\text{MC}^n\) represent the marginal benefit and the marginal cost from increasing the number of children. The optimality condition (18) requires \(\text{MB}^n = \text{MC}^n\) at optimum.

The marginal cost potentially comes from two factors:

(C1) Increase in spending for child-care services \((p\tilde{h}_n)\).

(C2) Increase in opportunity cost of raising children \((w\tilde{m}_n)\).
The marginal benefit potentially comes from three factors:

(B1) Increase in utility from spending time for children ($v_m \tilde{m}_n$).

(B2) Increase in utility from having more children ($v_x \tilde{x}_n$).

(B3) Increase in transfer from children ($\rho \sigma_n$).

Note that, for some individuals, spending time for children could be painful (just as labor), in which case the factor (B1) may constitute the marginal cost.

The optimality condition above suggests that, when the net marginal benefit $NMB_n \equiv MB_n - MC_n > 0$, having more children is better, and when $NMB_n < 0$, having less children is better; and thus at the optimal, the condition $NMB_n = 0$ is expected to hold.

The optimality conditions for other decision variables are given as follows:

\[
\frac{\partial L}{\partial c_1} = 0 : \quad u_1(c_1, c_2, \ell) - \lambda = 0 \tag{20}
\]

\[
\frac{\partial L}{\partial c_2} = 0 : \quad u_2(c_1, c_2, \ell) - \lambda \rho = 0 \tag{21}
\]

\[
\frac{\partial L}{\partial \ell} = 0 : \quad u_\ell(c_1, c_2, \ell) - \lambda w = 0 \tag{22}
\]

All the optimality conditions above can be summarized as follows:

\[
\frac{u_2(c_1, c_2, \ell)}{u_1(c_1, c_2, \ell)} = \rho \tag{23}
\]

\[
\frac{u_\ell(c_1, c_2, \ell)}{u_1(c_1, c_2, \ell)} = w \tag{24}
\]

\[
\frac{v_m \tilde{m}_n + v_x \tilde{x}_n}{h_n + w \tilde{m}_n - \rho \sigma_n} = \frac{v_m \tilde{m}_q + v_x \tilde{x}_q}{h_q + w \tilde{m}_q - \rho \sigma_q} = u_1(c_1, c_2, \ell) \tag{25}
\]

Together with the life-time budget constraint, we can solve them for five variables ($c_1^*, c_2^*, \ell^*, n^*, q^*$), and two decision variables ($h^*, m^*$) can be obtained by $h^* \equiv \tilde{h}(n^*, q^*; \frac{w}{\rho})$ and $m^* \equiv \tilde{m}(n^*, q^*; \frac{w}{\rho})$.

The optimal number of children $n^*$, in which we are interested to discuss the declining fertility, should be determined by the procedure above, and can be expressed as a function of various exogenously given variables and functions:

\[
n^* = \tilde{n}(p, w, r, I, B, \sigma, U, x, f) \tag{26}
\]

Given the model above, we would like to discuss some implications of the model to derive theoretical explanations for declining fertility.

### 2.2 Quantity v.s. Quality

The relationship between the quantity and the quality of children has got some attention of the economists\(^3\). It has been empirically observed that they are strongly substitutable compared with other goods and services.

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\(^3\)See for example, Willis (1973), Becker (1993), and Lundholm and Ohlsson (2002).
Namely, it has been pointed out that, when the demand for quality increases, the demand for quantity is likely to shrink (and vice versa). The reason can be explained as follows.

The optimality condition (25) can be rewritten, by assuming that \( m \) (time for rearing children) and \( \sigma \) (transfer from children) is fixed for simplicity, as

\[
\frac{v_x x_n}{h_n} = \frac{v_x x_q}{h_q} \iff \frac{x_n(n, q)}{x_q(n, q)} = \frac{h_n(n, q)}{h_q(n, q)}
\]

(27)

In the second expression above, the left-hand side is the marginal rate of substitution between \( n \) and \( q \). If \( n \) and \( q \) were the ordinary goods, then it must be equal to the fixed price ratio. But, they are not ordinary goods and the right-hand side is not fixed but is dependent on \( n \) and \( q \).

For illustration, suppose that the demand for child-care service is given by \( h(n, q) = nq \). Then, the optimality condition is given by

\[
\frac{x_n(n, q)}{x_q(n, q)} = \frac{q}{n}
\]

(28)

This condition suggests that, when there is an increase in demand for quality (e.g., by an increase in income) more than the demand for quantity, the marginal rate of substitution must be higher at the new optimum, which requires a decrease in \( n \) (cf. Figure 2).

![Figure 2: Demand for Quantity and Quality of Children](image)

In the figure, it is shown that an increase in income can reduce the number of children demanded even when the quantity and quality are “normal goods”. The result suggests that high price of education may not the “reason” for the low fertility, but may be a consequence of the higher demand for quality and the lower demand for the number of children.

### 2.3 Female Labor Participation

Given that the (formal or informal) marriage is the typical form of raising children, the division of labor within each household can be seen as an efficient way to increase the welfare of the
household\textsuperscript{45}. As the economic theory of international trade suggests, however, if the division of labor is an efficient way, using the service available in markets is likely to be a better way for many households than the division of labor within the household.

The choice between the own service and the market service to raise children can be seen in our model by the minimization problem:

$$\min_{h,m} \quad ph + wm$$

s.t. \quad \( (n,q) = f(m,h) \).

In Figure 3, the time for leisure is fixed at \( \ell_0 \), and the maximum time for child-care is given by \( M - \ell_0 \). Given some level of unearned income (e.g., partner’s income) to purchase the child-care service at \( h^a \), if the wage rate is low (\( w_a \)), then the optimal allocation of time between child-care and work may be at \( E_a \) where all the time available (\( m^a = M - \ell_0 \)) is devoted to the child-care.

![Figure 3: Effects of an Increase in the Wage](image)

If the wage becomes higher (say, \( w_b \)) then the optimal choice would be at \( E_b \) where participating in the labor market is optimal. Hence, when the child-care service is available in markets (at the price \( p \)), it is not necessarily optimal to make the division of labor within the household. How much each couple should work depends on the wages of the couple and the cost of child-care service.

It has been often pointed out that the women’s labor market participation is one of the reasons for declining fertility. From a theoretical point of view, however, such a claim is not so convincing. Figure 3 shows that as the wage of women increases (e.g., due to higher level of education), it is optimal for her to participate in the labor market to earn labor income. Such

\textsuperscript{4}See Becker (1985, 1993) and Cigno (1991)

\textsuperscript{5}Although the division of labor may be efficient if the marriage contract lasts long, it may not be so if the contract is short-term because the high skill (e.g., house-keeping) which is valuable in the marriage life may have little value in the single-parent life.
an income allows her to spend more money for children. If the increase in income has positive effects on both the number \( (n) \) and the quality \( (q) \) of children, the women’s labor participation itself can increase the number of children and thus need not be the reason for declining fertility.

It is empirically well known that, among developed countries, the fertility rate and the female labor participation now have a positive relationship\(^6\) as in Figure 4.

\[
y = 0.0132x + 0.7647 \\
R^2 = 0.257
\]

It can also be shown that, by using the cross-section data of 47 prefectures in Japan, the relationship between the female labor participation and the fertility rate is positive in Japan (c.f. Figure 5).

Needless to say, we can think of some cases in which female labor participation and the fertility rate have a negative relationship\(^7\).

(1) An increase in the household income can result in more demand for quality \( (q) \) and less demand for the quantity \( (n) \) (c.f. Section 2.2).

(2) An increase in the wage of women can result in their longer work and fewer number of children when children do not bring positive utility.

The second case requires a little more explanation. To illustrate the case, assume that individuals do not gain any utility from children \( (U_x = 0 \text{ and } U_m < 0) \). Then, the demand for children purely comes from the expected return \( \sigma(n, q) \) from children.

\(^6\)The interpretation of this empirical relationship has been under serious discussion. For example, Kögel (2004) argues that the relationship is still negative if we exclude country-specific factors, although the negative relationship has been weaken after the mid 1980’s. Adserà (2004) studies, in some sense, country-specific factors and finds some institutional factors in labor markets which affect the fertility rates.

\(^7\)It has been shown that the relationship between the female labor participation and the fertility had been negative in the past.
Figure 5: Female Labor Participation and TFR in Japan

Suppose, for simplicity, that leisure and the child-care service are fixed at $\ell_0$ and $\bar{h}$, respectively. Then, depending on $m$, the life-time income can be calculated by $I(m) \equiv w(M - \ell_0 - m) + \rho \sigma(f(m, \bar{h})) + I$. Since both the time for labor and the child-care create disutility, if $\frac{dI(m)}{dm} \leq 0$ for all $m$, then $m = 0$. If $\frac{dI(m)}{dm} > 0$, then there will be optimal choice between labor and child-care to minimize the disutility. The situation is illustrated in Figure 6 for the case when $\sigma(f(m, \bar{h}))$ is linear in $m$. When there is an increase in the wage rate from $w_a$ to $w_b$, the intercept of the life-time income line goes up, resulting in the decline in the time for child-care service. This is due to the fact that spending more time for labor is more productive than spending time for child-care.

Figure 6: Effects of an Increase in the Wage

An important point here is to recognize that an increase in the female labor participation
need not reduce the number of children and that various factors should be considered to see the relationship between the female labor participation and the fertility\(^8\).

### 2.4 Transfers within Family

The argument just above suggests the importance of transfers within family. The transfer \(\sigma(n, q)\) from children to parents can take the form of income and/or in-kind services. For example, children’s living with parents and supporting them can be seen as a typical transfer in-kind. Such a transfer must be valuable especially when the markets for pension (insurance against the risk of living long) are not working well due to the asymmetric information about individual life-expectancy. Children have been providing a kind of pension to their parents\(^9\).

An interesting problem concerning the transfers from children is that children in principle will not want to transfer money and service to their parents. So, in general, there must be some mechanisms to make children support their elderly parents\(^10\). One of such mechanisms is the use of the bequest which is a transfer of money from parents to their children when they die.

If pension markets are not suffering from asymmetric information, the elderly can invest the money in pension to have some income as long as they live. When pension markets are not working well the parents use the children as a pension provider, and the bequest can be seen as the asset for the pension\(^11\).

What if the elderly parents do not have assets for bequests? Will children refuse to support their parents? Most societies have social and/or legal codes which require the children to support their parents\(^12\).

These mechanisms suggest that parents usually have some control over children to take care of them when they need. Living with elderly parents has been a very popular form of transfer from children in Japan. As Figure 7 shows, however, the ratio of elderly living with children has been rapidly decreasing in Japan.

The fact suggests that the expected transfer \(\sigma(n, q)\) from children has likely been declining. The lower expected return from children can be one of the reasons for declining fertility in Japan, as we have discussed in the last subsection. An important question is why the expectation has been declining in Japan.

We argue below that the better access to pensions and insurances provided by markets and the government now make the elderly less dependent on their children, and lowered the expectation for the return from the children. An interesting aspect of the children’s living with

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\(^8\)The increasing female labor participation and the declining fertility can be explained by the changes in the women’s preference. Since there is no strong reason to believe such changes have happened, we would like to explain the relationship by the changes in socio-economic variables rather than the changes in the human nature.

\(^9\)For example, see Kotlikoff and Spivak (1981) and Guiso and Jappelli (1991). Cigno and Rosati (1997), for example, argues that the saving rate movement in Japan is consistent with this view.

\(^10\)For example, see Cigno (1993) for interesting discussion on this issue.

\(^11\)For example, see Bernheim, et al. (1986) and Cremer and Pestieau (1996).

\(^12\)Japan has such a legal code, which are not strictly observed. There are many cases in which children do not take care of their elderly parents and the elderly is dependent on the public assistance.
their parents is that it is not only the in-kind transfer from the children to their parents but also has a function of the in-kind transfers from the elderly to their children (e.g., care services for their grandchildren). The gradual loss of such a mutual help seem to be also one of the reasons for declining fertility in Japan.

3 Analysis: Reasons for Declining Fertility

Based on the simple economic model and the discussion in the last section, we would like to analyze and summarize the reasons for declining fertility in children. We suggested various reasons in the last section. We would like to classify them into three categories, which we discuss in order.

3.1 Market Failure Problems

Markets play very important role in explaining the declining fertility in Japan. One of the most serious challenges in the market system is the asymmetric information problem. In order for the market mechanism to work well, it is important that sellers and buyers share the same information about the products and services. In reality, however, sellers often have better information than buyers. This asymmetric information problem (also known as “incomplete information” problem) makes the market transaction inefficient and, in the worst case, makes the market fail to work at all\(^\text{13}\).

The market, however, tries to mitigate the problem by uninformed buyers’ collecting more information (screening) and the informed sellers’ trying to revealing the information (signaling).

\(^{13}\)See, for example, Akerlof (1970).
Hence, with accumulation of information in the process of transactions and the new information technologies, markets for various financial services have mitigated the problem and have been developed\textsuperscript{14}. There is, however, limitation in the resolution of the asymmetric information, and thus some markets are suffering from the asymmetric information and are underdeveloped.

Financial markets, for example, are still full of asymmetric information. The liquidity constraint that people can only borrow money at a higher interest rate than the fair rate (i.e., the rate under asymmetric information) is one of the examples of such market failure problems. It is especially a serious problem for young people who have or who are willing to have children.

The child-care service is also one of the services which suffer from the incomplete information, because the parents usually care the quality of the child-care service, whose information is not easy to get, in general. Hence, the markets for child-care service are usually underdeveloped.

The underdevelopment of markets for borrowing and childcare service in Japan, in the process of increasing pension and insurances for the elderly, can cause declining fertility. The elderly is now less dependent on children and more elderly decide not to live with their children, even though the children still want to live with their parents to get transfers from their parents in the form of money and services.

When the markets for borrowing and child-care services are underdeveloped because of the asymmetric information problem, such a change will tighten the budget constraint of the young generation. One of the consequences is likely to be the decline in child-bearing. Notice that the essential problem here is the market failure problem (asymmetric information problem) in the borrowing markets and the child-care service markets.

### 3.2 Government Failure Problems

As the public assistance towards the elderly increases, the elderly become less dependent on their children, and thus the children must be dependent on the markets for borrowing and child-care services. These markets, however, are often under serious asymmetric information problem and thus the young generation who want to have children face serious resource constraints, resulting in the declining fertility, as we have explained in the last subsection.

Now, given such a situation, there is a good reason for the government to intervene these markets. The Japanese government indeed made some intervention to these markets. The way the Japanese government intervened these markets, however, was not appropriate and have worsened the problem. Namely, the government failure to tackle the market failure problem can be seen as one of the sources of the declining fertility.

One of such problems is that the government supplied day-care services inefficiently at very low prices. The low price, which looks like a good policy for the people, actually discouraged the

\textsuperscript{14}Since having children has been a substitute for pension and insurance, the development of their markets should have reduced the benefit of having children, contributing to the declining fertility. Furthermore, the development of markets for services which has traditionally produced within households (e.g., foods, cleaning, entertainment) must have reduced the motivation for marriage and may have also contributed the decline in fertility.
development of the private markets for day-care service. Together with the inefficient supply of the service, the heavy fiscal burden due to the low price (and the low tax revenue) discouraged the government to increase the child-care services. Namely, the supply of day-care service has been seriously constrained in Japan.

Needless to say, the government’s intervention to the pension and the child-care service, for example, can be justified from the viewpoints of the market failure problems. It is, however, important to recognize that such intervention had negative side-effects on other variables such as fertility, especially when the public provision were inappropriate. Hence, it is important to design policies considering various side-effects of the policies.

For example, in many countries, the public intervention is first made in the services for elderly (e.g., pension and long-term care). They, however, have made the elderly less dependent on children, and thus have negative side-effects on fertility. Thus, public supports for raising children must be also introduced to offset such side-effects (see also the discussion in Section 4.2). Many developed countries seem to have introduced such policy measures to sustain the fertility as Figure 8 suggests.

The figure shows that countries which balances the supports for the elderly and the young can enjoy higher fertility. Inappropriate provision of public support and not taking such offsetting measures can be seen as one of the government failure problems, contributing to the declining fertility in Japan.

3.3 Social Norms and Customs

In making decisions, we are subject to various social norms and customs. They usually exist to discourage our selfish behavior which results in inefficiency (e.g., free-rider behavior). Let us
call the social norms “rational norms” or “rationalizable norms” if we can rationalize them as a mechanism to improve the efficiency and equity of the society.

When the society changes (e.g., development of market system), the social norms and customs which were rationalizable need not be so any more. Rather, they can be mechanisms to enhance inefficiency and inequality. Hence, the social norms and customs should be changed as the society changes.

They, however, have hysteresis, i.e., tendency of lasting for a long time. In the context of the declining fertility, we think that the following two social norms are important:

(1) Husband should work outside the house and wife should engage in house-keeping.
(2) A couple should get married to have children and the divorce is not good.

We discuss the problem of each norm in order.

(1) Social Norm on Sexual Division of Labor
This norm is likely to be a good mechanism when the markets for child-care service (and other household services) were not well developed so that the division of labor within household were efficient. The division of labor between men and women is likely to be coming from the difference in their human bodies.

As more child-care services are provided at lower prices by the government and to some extent by the markets, the division of labor within the household is no more efficient for many households. And the norm has become less rationalizable and has been disappearing gradually in many developed countries.

Figure 9, however, shows that the norm is still alive in Japan in comparison with many other developed countries.

The social consequences of such a norm are (i) work-life imbalance, and (ii) underdevelopment of markets for child-care services, as we will discuss below.

First, under the division of labor, the bread-winners have to work really hard; and most firms provided the labor contract in which workers work long and earn the wage income enough to support their family. There were little consideration for the work-life balance in workplaces. Such a contract must have been profitable for firms because it minimizes the fixed costs associated with each worker.

When most wives provide child-care services, there is little demand for child-care services, which contributed to the underdevelopment of service markets in Japan. As more child-care services are provided at affordable prices, however, it became more efficient for many women to work outside their house.

The custom to provide the labor contract with work-life imbalance has not been changed so quickly. A consequence is the inefficient labor market. For example, in Figure 3, suppose that the choice is either to work for \( M - l_0 \) (Point \( G \)) or zero. Then, an increase in the wage rate will
not change the labor supply at all since the indifference curve which goes through the point \( G \) locates lower than the one which touches the point \( E_a \). The result explains a behavior that many highly educated women does not work at all for labor income and engage in the housework. From the viewpoints of declining fertility, such a constraint probably works to sustain the fertility rate.

The result, however, can be drastically changed by a small change in the preference. For example, if the indifference curve labeled as \((n^a, q^a)\) went through a point slightly below \( G \) on the vertical axis, then it is optimal to choose the point \( G \) and the individual starts working suddenly for long hours and spends no time for child care. Figure 3 is drawn assuming that we can ignore the consumption choice (for simplicity) and the increase in the wage income is only spent on purchasing the child-care service to “increase” the pair \((n, q)\).

When we consider the consumption choice explicitly, at least some of the increase in the wage income are likely to be spent for the increase in the consumption. And it is likely that the overall effects of the wife’s starting to work for full-time at the higher wage would be the reduction in the fertility rate.

The analysis here suggests that the social custom of requiring regular workers to work for long hours may have contributed to sustaining the social norm on the sexual division of labor and the fertility rate. Such an “equilibrium”, however, is not stable. A small changes in preferences and/or wages, for example, can create drastic changes in the individual behavior, and would create a rapid change in the society (e.g., declining fertility rate).

Notice that when there is little constraints on the working hours, i.e., when the work-life balance is possible, then people will choose an optimal point (e.g., \( E_b \) in Figure 3), and many individuals can choose to have children. Note also that when the women’s working for wage income need not reduce the number of children. As long as the life-work balance is attainable,
an increase in the wage income allows the household to purchase the child-care service and thus to have more children. Such result can be seen in the relationship between the female labor participation and the fertility in Figure 4 and Figure 5. Figure 10 also suggests that fertility rate seems to be relatively higher in countries where flexible work is allowed to many workers.

\[y = 0.0124x + 1.245\]
\[R^2 = 0.21141\]

![Figure 10: Flexible Work and TFR in OECD countries](image)

Eliminating the constraint, and thus the social custom, not only enhances efficiency but also stability of the society against small changes in, for example, preferences and wages.

(2) Social Norm on Marriage and Divorce
It has been pointed out in Japan that one of the factors of declining fertility is the declining marriage rate (c.f. Figure 11).

![Figure 11: Declining Marriage Rate and Increasing Divorce Rate in Japan](image)
From the viewpoints of biology, however, the child-bearing is nothing to do with the marriage. What we need is the pair of an ovum and a sperm. Men and women need not get married to have a baby. With the improvement of the bio-technology, in order to give births to babies, they even need not meet.

One of the deep questions about the human society is why most societies have required the “marriage” as a precondition for having babies. Most societies try to identify mother and father of each child and put responsibilities of raising the child on them. A justification for such a government intervention (institutionalization of marriage and parents’ responsibility) is the externalities created by each child (c.f. Cigno (1991; Chapter 5)).

Our existence has external effects on the society. It can have positive and negative effects; and thus, it is important for the society to protect lives of good citizens. Since children of human being is so vulnerable, the human society must have a good mechanism to protect lives of the infants.

Requiring parents to take care of their children is an efficient mechanism with a good risk hedge. It, however, requires heavy costs (e.g., $ph + um$ in our model) that parents want to avoid to pay; and thus the society must carefully monitor the behavior of the parents and, if necessary, punish parents who take irresponsible actions. The formal marriage contract is a way to facilitate the monitoring and the punishment by the society.

Such a cost, however, discourages people to have children, and the society, especially the extended families and the local communities, often provide supports for the parents. The formal marriage was also the way to get the reward from the society.

With the weakening ties of communities and extended families, the couple under formal marriage can get less rewards (and punishment) from the communities. The net cost of formal marriage, therefore, has been increased as the decreasing marriage rate and the increasing divorce rate suggest. Even if people want to get married, they will not get married unless the expected benefit from the marriage is sufficiently high. When the marriage is still the precondition for having children, the high cost of marriage means high fixed cost of having children.

Now, it is interesting to observe that many developed countries are more tolerant towards non-marital births. It can be seen as a way to reduce the fixed cost of having children. A consequence of such a change in the social norm can be seen in Figure 12. Namely, societies which put less weight on the traditional social norm of the marriage are enjoying higher fertility.

The Japanese society is not yet so tolerant towards the non-marital births, which is considered to be one of the factors of declining fertility. The society, however, is changing. Now, it has been estimated that one third of the marriage in Japan is a result of knowing the pregnancy. Namely, in Japan, we may be able to say that having a baby now becomes a precondition for marriage.

Being tolerant towards non-marital births itself does not require monetary cost but has positive effects on fertility. The argument above, however, suggests that such a change will
increase the risk of children and of the parent (usually mother) who takes care of the children, because the formal marriage contract was a way to reduce the risks. This is the cost of being tolerant towards the non-marital births. The cost can be seriously high if there is no social mechanism to reduce the risks; but it need not be so high if the markets or the governments provide the services which reduce the risks.

From the viewpoints of cost of marriage and the risk of children, reducing the cost of divorce has a similar effect to the tolerance towards the non-marital births. It will reduce the entry cost of marriage but will increase the risk of children and the parents who take care of the children.

Hence, from a theoretical point of view, not only the marriage but also the divorce is an important factor to consider in the analysis of the declining fertility and the public policies to mitigate it. The divorce rate, especially the rate of divorce to marriage, has been gradually increasing in Japan (c.f. Figure 11). One of the important questions is whether those who got divorced are treated well by law and by the society. If they are, the cost of marriage and thus of having children is considered to be lowered. Despite the increasing number of the divorce in Japan, the cost of divorce does not seem to be lowered in Japan. Hence, the cost of marriage and having children is still high in Japan, resulting in the declining marriage and fertility.

4 Solution: Fertility and Public Policy

Given the analysis in the previous section, we would like to have a brief discussion on possible solutions to the problem of the declining fertility. From the viewpoints of economics, increasing the fertility rate should not be the ultimate goal of public policy. The question should be what kind of policies are effective to improve efficiency and equity of our society in the process of
the declining fertility. Increasing the fertility rate to some level can be an “answer” to such an question.

Although it is very important to ask whether or not increasing the fertility rate is good for the society under declining fertility, answering it requires lots of information about the society. So, here we just assume that it is better to increase the fertility rate and set the following two policy goals: (i) To reduce inefficient decline in fertility, and (ii) to encourage fertility efficiently.

4.1 Subsidies

In Section 3.2, it was identified that one of the important reasons for declining fertility is the existence of the public pension system. Existence of such a pension system itself can be justified by some market failure problems in the pension market. It is, however, important to recognize that it has a negative side-effects on the fertility, i.e., inefficient decline in fertility.

The problem become more serious when the pension system is the pay-as-you-go (PAYG) type, because under the PAYG system one can free-ride on the contributions of the children of others, i.e., it works as commons for the society and people would have inefficiently small number of children.

As Groesen et al. (2003) clearly shows\textsuperscript{15}, in order to reduce the infancy created by the PAYG pension system, some policies should be supplementary introduced. The subsidy to rearing each children (i.e., child allowances) is considered to be one of the effective policies\textsuperscript{16}.

The subsidy for children can be categorized into two types. One is the income transfer and the other is the subsidy for child-care service. Both reduce the cost of each child (assuming that everyone is using some child-care services). The effects, however, are slightly different between the two.

Apps and Rees (2004), for example, argued that the subsidy for child-care services is likely to a better policy to increase the fertility. The subsidy for child-care services, in addition to its positive income effects on the number of children, would reduce the time \((m)\) for child-care, and encourage people to work more, which generates extra revenue for the subsidy for the child-care services (especially if the subsidy were conditioned on working). On the other hand, income transfer per child reduces the marginal cost of increasing the number of children \(n\) but it is likely to increase the demand for leisure and the time with children, and reduces the labor supply. This, in turn, reduces the tax revenue and thus reduces the ultimate size of the subsidy. The difference in their effects on the tax revenue is one of the reasons for why the subsidy for child-care services is likely to have higher effects on fertility.

\textsuperscript{15}For related works, see fro example, Abio, Mathiew and Patxot (2003) and Fenge and Meier (2005).

\textsuperscript{16}The child allowance need not be the unique solution to the problem. For example, the PAYG pension system with contribution or benefit dependent on the number of children can be effective to reduce the inefficient decline in fertility. See, for example, see Fenge and Meier (2004).
4.2 Market Reforms

Markets for child-care services are under asymmetric information problems. Parents are usually concerned with the quality of the services for their children, but the information about it is not usually fully known. As a result, the markets for child-care services are underdeveloped. There is a good justification for the government intervention into the markets. The government intervention, however, can further discourage the development of the markets if it is inappropriate.

In Japan, the public day-care services were provided for only limited number of children at very low prices. Such intervention discouraged the development of the private day-care services and there were so much unsatisfied demand for the child-care services (c.f. Section 3.2)\textsuperscript{17}.

The markets for the child-care should be drastically changed. The government should reduce its public day-care services and should encourage the development of the private day-care services, for example, by appropriate regulations and monitoring. If there is a need to increase the fertility, giving subsidies for the use of the day-care service would be effective.

4.3 Changing Social Norms and Customs

The long working hours required for the regular employees probably was not a bad custom when the division of labor within household was a rationalizable norm because of the lack of the markets for child-care services. As more child-care services become available, the division of labor is no more efficient. In such a circumstance, the long-work custom (work-life imbalance) has become a seriously inefficient constraint especially for highly educated women.

It discouraged many women to work, restraining them to earn wage income which allows them to have more children. It also discouraged many women, who decided to work, to have children because of the shortage in time for child-care. They are now contributing to the declining fertility.

The standard economic theory does not suggest that such a custom of working long is the profit-maximizing employment strategy. Rather, it basically suggests that as long as the employer pays the wage equal to the workers’ marginal productivity, the flexibility of working hours should be better.

Needless to say, too much flexibility probably requires high cost of managing workers, and thus some limitation should be considered to maximize the profit; but, it is not likely that the long work should be the unique work-style for regular workers. For example, if there is a short-work style for regular workers, and if regular workers can choose between the “full-time” and the “part-time” with appropriate wage payment then efficiency will be improved without deteriorating the firms’ profits\textsuperscript{18}.

\textsuperscript{17}As for the problems of the day-care services in Japan, see, for example, NIPSSR (2004; Chapter 4).
\textsuperscript{18}Nielsen et al. (2004) discussed the implications of considering women’s self-selection behavior between the family-friendly sector and the non-family-friendly sector. Such behavior should be considered by firms in designing their labor policies.
Hence, if the custom of having only one type of contract (with work-life imbalance) is provided by firms, then it is either because firms make wrong decisions or because there are institutional constraints which make following the custom more profitable. For instance, in Japan, we can think of the following factors.

- Bargaining with labor unions which represent the preference of the current workers.
- Policies which makes it unprofitable to employ regular workers for short hours.

Since labor unions usually do not consider those who are not employed, they usually bargain to maintain the custom. An interesting example of the government’s intervention can be found in the Dutch government which intervened the labor union bargaining with the employers to increase the flexibility of working style.

As for the example of the second factor, we can point out the social security payment for regular workers, which requires some fixed cost for each worker and makes the longer work more profitable. Namely, policies which had been good under the custom of long work need not work well any more.

As for the social norm on the marriage and divorce, we are not sure if it is good for the government to encourage the change in the norm. Although the tolerances towards the non-marital births and the divorce have an effect on reducing the cost of having children, it may increase the risk of having children in which case we cannot expect the increase in fertility.

Hence, in order to have higher fertility rate under such a change in social norms, it is important to consider ways to reduce risks of children and the parent. The development of markets, empowering women to be independent, changing laws and policies to provide more support for single parents, for example, can be good ways, but they may not fully cover the risks of children and single parents, especially when society is under the traditional norm on the division of labor. The government expenditure may have to be increased after all. Hence, the traditional norm may still be a rationalizable in Japan. A better policy may be to provide more supports for raising children under the formal and informal marriage.

Although the government’s tool to change the norms and customs is limited, it should be able to affect them by, for example, changes in the regulations and subsidies\textsuperscript{19}.

5 Concluding Remarks

In this paper, based on a simple economic model, we tried to identify reasons for the declining fertility in Japan, and considered public policies to mitigate the problem.

One of our findings is that a part of the declining fertility in Japan has been caused by market failure problems, government failure problems, and some other social constraints. Our

\textsuperscript{19}Needless to say, the change in one custom can have various effects on effectiveness of other social norms and customs. It is important to consider them and policies in making reforms in the system of social norms and customs.
basic policy proposal is to reduce the inefficient decline in fertility by mitigating these problems and constraints. For example, we suggested the following policies:

(P1) Increase in subsidy for children (e.g., child allowances and subsidy for child-care services).

(P2) Improving the efficiency of the child-care service markets (e.g., day-care services).

(P3) Reformulation of some social codes (norms and customs) by changing legal codes (e.g., work-life balance).

Although they require major reforms of the fiscal system, market system, and social system, it is time, I believe, that Japan should make such reforms to mitigate various serious problems (e.g., sustainability of the social security system) caused by the declining fertility. The future of Japan is crucially dependent on her choice.

References


