Female Labor Supply: Short-run and Long-run Trade-offs[+]
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1. Introduction

The Japan Revitalization Strategy that was approved by the Cabinet in June 2013 includes the following statement: "In the context of economic globalization and the declining birth rate and aging population, to place Japan's economy on a new growth trajectory in the future, it will be necessary to recognize that Japan's greatest resources are its human resources, and together with goals and deadlines, to realize a drastic policy that secures the required number of workers (quantity) and improves labor productivity (quality)." Furthermore, the Japan Revitalization Strategy (Revised in 2014) states the following: "Facing a population-declining society, whether Japan can sustain growth will depend on whether it can maintain its working population and raise its labor productivity before entering into a population-declining society by improving the working environment for women and elderly people and ambitious, capable youths who are hopeful about their future."

Based on the recognition described above, the Japanese government is currently taking action to promote the involvement of women and the elderly as important policy objectives, as well as conducting reforms to improve the working conditions and encourage the employment of foreigners. In this study we will discusses the significance of and problems related to the important policy of promoting the involvement of women.

Why was promoting the involvement of women and the elderly positioned as an important policy issue in the first place? We can identify two reasons for this. The first is that, as was planned in the Japan Revitalization Strategy, the labor force is becoming

smaller due to the declining birth rate and aging population. Currently, both of these demographic changes are proceeding at a fast pace in Japan. By 2007, the percentage of the population aged 65 and above increased to more than 21%, thus making Japan a "super-aging" society. The total population is now declining and the labor force, that is the population of employed and unemployed aged 15 and above, has entered a process of decline—a trend that will continue in the future.

Gross Domestic Product (GDP), which reflects the size of the economy of the nation as a whole, can be defined by multiplying the number of workers by the value of production per worker (labor productivity). The number of workers in 2010 was approximately 63 million people, whose value of production was approximately 8.1 million yen per capita. As a result, real GDP—excluding the impact of price fluctuations—was approximately 512.4 trillion yen (8.14 million yen × 62.98 million people) and GDP per capita was approximately 4 million yen.

Assuming the standard of living per capita is the same as in 2010 (4 million yen) and using the population projections of the National Institute of Population and Social Security Research (IPSS), I attempt to provisionally calculate GDP in 2050—35 years into the future (Table 1). As the total population in 2050 will be 97.1 million people (median projection), multiplying 97.1 million people by 4 million yen yields 388.4 trillion yen. In other words, if a real GDP of 388 trillion yen can be secured, the standard of living per capita will remain at 4 million yen.

At this time, if there are no changes to labor productivity and the value of production per capita stays at 8.13 million yen, how many workers will be required by 2050? By dividing 388 trillion yen by 8.1 million yen, we find that approximately 47.7 million workers will be required.

However, achieving this number will not be an easy task. This is because, by 2050, the population aged 15–64 years is projected to be approximately 50 million people. Assuming no other changes, approximately 95% of this age group would have to be working to reach the figure of 47.7 million, and that is unrealistic. It is worth noting that

the employment rate among the population aged 15–64 was 77.0% in 2010; thus, an estimate of 95% signifies that a much larger number of people will need to work by 2050 than at the present time. Therefore, if an employment rate of 95% is impossible, it is even more necessary to promote the involvement of women and the elderly in the labor market to the greatest possible extent. As of 2014, the female employment rate was 49.2%, whereas the labor force participation rates (totals for men and women) of the elderly aged 60–64 years and 65 years and above were 62.8% and 21.2%, respectively. Thus, it is necessary to establish and maintain a labor market to improve these percentages.

However, up to the present time, women and the elderly have not been considered part of the core labor force and have thus not been assigned importance in terms of the labor market policy. This is the second reason why promoting the involvement of women and the elderly has now become an important policy issue.

The Japanese employment practices that were established during the period of high economic growth (i.e., during the 1960s and the 1970s) had a major impact not only on company management but also on employment policies. Japanese employment practices, such as the lifetime employment system and the seniority wage system as well as the generous welfare system encouraged workers to remain within the same company and, simultaneously, promoted the accumulation of company-specific skills, which contributed to the improved productivity of Japanese companies. Furthermore, trade unions organized on a per company basis made it possible for labor and management to share information closely. In-company trade unions also facilitated the management of personnel and of work, which was tailored to the productivity of each individual company, and this is believed to have increased the competitiveness of Japanese companies. Many researchers have noted that Japanese employment practices became a source of competitiveness for Japan's companies at that time and contributed significantly to the growth of the Japanese economy.

Furthermore, Japanese employment practices increased the retention rate of workers

within companies, thereby significantly contributing to the low and stable unemployment rate. Therefore, rather than ex post facto unemployment measures, such as unemployment insurance, Japan's unemployment policy focused on measures to prevent unemployment that complemented Japanese employment practices. A typical example of such a policy is the Employment Adjustment Subsidies system, which subsidizes the practice of providing temporary leave and education and training during economic downturns. The policy aims to incentivize businesses to retain their labor force within the company during recessions and prevent unemployment before it occurs. Furthermore, a vocational training policy was also developed to complement companies' employment practices. In Japan, public vocational training is conducted for the unemployed and general job seekers. Furthermore, training is provided in an attempt to develop the abilities of workers via their employers—such as the Career Development Promotion Subsidies system, which subsidizes part of the costs and salary expenses of employers who develop the employees' abilities within the company.

However, the intended recipients of Japanese employment practices were the male heads of households. As a result, labor-market policies have also been primarily focused on men. From the 1990s onwards, the involvement of women in the labor force dramatically increased. However, it had been taken for granted in Japanese companies up to this time that women would leave the company when they got married, and it is no exaggeration to say that the personnel management of women was conducted based on practices reflecting this assumption. Efforts to reform these practices with regard to women have been conducted for many years. However, the question whether women's participation in the labor force was not recognized as an important problem in the way that it is today remains. This question will be considered in detail in the next section.

The structure of this paper is as follows. The next section is an overview of the environment surrounding female labor in Japan and the labor market during the post-war period. Further, section 3 will explore the advantages and disadvantages of promoting the employment of women as well as explain the trade-off relationship

between policies promoting the employment of women in the short and long run. Section 4 will emphasize that improving a work–life balance policy will promote the policy to employ women and will improve the sustainability of Japan's society and economy.

2. The employment of women in Japan's labor market

In the "Abenomics" growth strategy of the Abe administration, the goal of increasing the proportion of female managers to 30% by 2020 was set, and the legislation toward this is currently being discussed in the Diet. In reality, this was the first time a numerical target for the employment of women was set in Japan's labor market policy, and there are both pros and cons to it. For example, experts who are in favor of diversity state that increasing the proportion of female managers is important for companies to continuously achieve growth. In contrast, though some experts have noted that if companies simply introduce a quota system to increase the proportion of female managers, it will invite confusion within management and also cause companies to lose their competitiveness.

Recently, there has been growing interest within Japanese companies regarding how to increasing the proportion of female managers. The fact that they may, in future, be legally required to achieve a target ratio is a manifestation of the fact that Japanese companies have not been actively utilizing women. As of 2014, the percentages of women in management positions in private sector companies employing more than 100 full time workers was 16.2% of subsection chiefs, 9.2% of section chiefs, and 6.0% of department chiefs, all of which are well short of their targets (Ministry of Health, Labour and Welfare, "Basic Survey on Wage Structure").

Why have women not been employed in Japan's labor market?

Figure 1 indicates the trends in labor force participation rates by gender since the end of the Second World War. The female labor force participation rate peaked at 56.7% in 1955 before trending downward; however, in 1975 it changed direction and began

increasing again. Unlike the long-term downward trend for men, the female labor force participation rate has remained stable at approximately 50% in recent years. However, this remains a fairly low level compared with the male labor force participation rate, from which we can conclude that women are not being employed.

The downward trend in the female labor force participation rate until 1975 was caused by the decrease in the number of self-employed workers (particularly farmers) due to the high growth of the Japanese economy. The number of female workers in 1955 was 17 million, however, out of these, no more than 5.31 million or 31.2% were employees whereas there were 9.02 million family workers (53.1%) and 26.7 million self-employed workers (15.7%)[1]. Immediately prior to the period of high economic growth, both households and companies tended to prioritize the employment of men to stabilize household economies, and while the labor market policy pursued full employment, there was a tendency to postpone female employment. Therefore, the increase in female employees had to wait until the high-growth period. The labor market policy relating to the employment of women at that time was mainly intended for maternity protection but a general perspective of employing women did not exist.

However, the perspective of employing women was observed after the start of the high-growth period. At that time, the Japanese economy was growing at a rate in excess of 10% per annum, and there was a chronic shortage of labor. As a result, more women were employed. However, the practice was for women to leave the workplace after they got married, and since women served for a shorter tenure as compared with men, they were positioned merely as an auxiliary labor force. Japanese companies were keen to invest in human resources specific to their company, however, they did not invest in women as human resources because of their short tenure and they offered poor investment efficiency.

Subsequently, the Working Women Welfare Act was fundamentally revised in 1986

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[1] By 2014, of the 27.3 female workers, 89.3% (i.e., 24.4 million) were employees; 5.0% (i.e., 1.4 million) were family workers; and no more than 5.2% (i.e., 1.4 million) were self-employed workers.

and the Equal Employment Opportunity Act was enacted. In the Equal Opportunity Act, companies are forbidden from discriminating on the basis of gender in the fields of education, training, welfare, retirement age, and dismissal; however, they must also strive to grant equal opportunities to men and women and treat them equally in terms of recruitment, appointments, deployments, and promotions. The prohibition on gender discrimination in recruitment, appointment, deployment, and promotion did not exist until the 1997 Revised Equal Employment Opportunity Act, and it opened up a new frontier for female policy within the labor market policy. In 1992, the Child Care and Family Care Leave Act was enacted, which states the following:

"The purposes of this Act are to promote the welfare of workers, etc. who take care of children or other family members and to contribute to the development of the economy and society." (Article 1)

This is thought to be the first time that the perspective of employing women had been included in Japan's labor laws (Iki 2011).

In this manner, whether in households or in companies, the employment of women was not considered important in the past and required thirty years to reach the point today where it has become a target of labor policy. Moreover, even after the perspective of employing women was introduced into the labor market policy, progress has been made only in some areas. Abe (2011) provided an overview of the effects that the enforcement of the Equal Employment Opportunity Act has had on the female labor market, noting that while the full-time employment rate has increased in the group of women aged less than 40 years and with a higher education, the full-time employment rate of married women has not increased, and there has been no change in the labor force participation rate of women other than those with a higher education. Abe (2011) cites the rise in the unmarried rate as the reason for the increase in full time employment in the group aged less than 40 years.

Furthermore, the current female labor force participation rate according to age describes an M-shaped curve as many women are outside the labor force due to

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marriage and child-rearing; thus, it cannot be considered that women are being sufficiently utilized.

3. Short-run and long-run trade-offs

Population trends in the future will have a major effect on the sustainability of Japan's society and economy. Japan's total population is set to decline in the future and is projected to fall to 97.1 million by 2050—31.0 million lower than the level in 2010. A decline in the birth rate will occur simultaneously, and the working-age population aged 15–64 years is also projected to significantly decline to 50.0 million in 2050—which is 31.7 million lower than in 2010. Therefore, the decline in the working-age population will be faster than the decline in the total population; thus, in terms of sustaining Japan's society and economy, the labor participation rates of women and the elderly have become extremely important.

However, from a different perspective, female labor participation might have a particularly negative effect on the sustainability of Japan's society and economy. This is because female labor participation may further accelerate the declining birthrate.

3.1 Female labor participation and birthrate

The possibility that female labor participation will accelerate the declining birthrate has been theoretically and empirically shown in research up to the present time.

First, if gaps between male and female labor participation and income decreases, the opportunity cost of having and raising children will increase, which will likely cause the birthrate to decline. People make decisions on various actions by considering the relationship between the relative sizes of the benefits and costs that occur from these actions. If the benefits from an action are greater than the costs of obtaining those benefits, people are likely to decide to take that action. Conversely, if the costs are higher than the benefits, people are unlikely to take that action. Leibenstein

(1974) and Becker (1960) theoretically analyzed the birth-selection problem of couples from this perspective[2].

Leibenstein and Becker assumed that the benefits of raising a child were the inherent happiness and sense of satisfaction from having that child and also the potential the child has to earn income that he/she will have in later life. In contrast, they considered the costs of raising a child to be the direct costs incurred during childbirth and while raising a child; further, they also considered the sacrifices that must be made to raise a child. In other words, there is an opportunity cost to raising a child. A specific example of the opportunity cost of raising a child is if the person leaves their job during the period when they are raising their child, the income they would have earned in that period represents an opportunity cost; namely, the income that they sacrificed to raise the child. Thinking in this manner, reducing the salary gap between men and women by promoting the employment of women increases the opportunity cost of raising a child, which is likely to have a negative effect on the birthrate.

In actuality, female labor participation does have a negative effect on the birthrate. Figures 2 and 3 outline, with Japan's prefectures as the unit, the relationship

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[2]The motive of Leibenstein and Becker was to clarify why it is that children are considered "inferior goods." When per capita income increases in a country following its economic development, people become capable of paying more than the costs required to have children; thus, it was assumed that they would have more children. However, looking at the birthrates of the various countries in the world, we see a tendency for the birthrates to be lower in developed countries—where people have high income levels—than in developing countries—where people have low income levels.

With regards to this, Leibenstein and Becker considered that the benefits obtained from children in addition to the satisfaction gained from raising children itself (which they called consumption utility), there is the benefit obtained from the income earned by children as workers (labor utility) and the benefit of the care the children provide to the parents in their old age (security utility). Among these utilities, in developed countries, labor utility is weakened as the need for children to work is lessened when income per capita (for adults) increases, and therefore in developed countries this utility does not act as an incentive to have children. Furthermore, developed countries with high capita income have developed social security systems where it is possible for people to be independent even in their old age; thus, this utility also does not act as an incentive to have children.

Conversely, Becker focused on the distinction between "the number of children" and "the quality of children." In developed countries, it can be said that there is a tendency is for people to have fewer children, but to spend a large amount on child-raising per child. Prioritizing the satisfaction obtained from each and every child rather than the utility from the number of children results in a reduction in the number of children.

between the female labor force participation rate (aged 30–44 years) and total fertility rate[3]. The data on the labor force participation rates were obtained from the National Census conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications, while the data on birthrates were obtained from Demographic Statistics (statistics according to prefecture) by the IPSS.

First, Figure 2 indicates the relationship between the labor force participation rate and birthrate, by year. A positive correlation is observed between the two, and the birthrate in prefectures with a high female labor force participation rate is low. In this case, the employment of women would, at first glance, seem to increase the birthrate.

However, by looking at the nature of relationship that exists between the respective changes in the labor force participation rate and the birthrate presented in Figure 3, we can observe a negative correlation between the two variables. Additionally, over 10 years, we find that the birthrate has further decreased in prefectures where the labor force participation rate has increased. These figures are for regions that originally had high labor force participation rates and birthrates due to their regional characteristics; however, they signify that, regardless the region, when the labor force participation rate increases, the birthrate decreases.

To confirm this, after controlling for regional characteristics, I investigated the nature of the relationship that exists between the labor force participation rate and birthrate using the Fixed Effect Model[4]. In this analysis, the focus was placed solely on the correlation between the labor force participation rate and the birthrate, and the causal relationship was not considered. This implies that even if there is a causal relationship in which the labor force participation rate is low because the birthrate is high, it is not possible to simultaneously achieve an increase in the labor force participation rate and the birthrate. Therefore, even if the opposite causal relationship

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[3] The results are not shown, but the conclusion was the same for the relationship between the birthrate and the female labor force participation rate of 20–29 year olds.
[4] Estimates were also made with the Random Effect Model; however, the Fixed Effect Model was adopted from the results of the Hausman Test.

exists, in terms of policy, the result will remain the same. The results of the estimates were as follows.

Birthrate = 3.031 − 0.0219 × labor force participation rate (30–44 years)

(0.1050)   (0.0016)

Overall R-sq = 0.0061; Within R-sq = 0.5725; Between R-sq = 0.2725.

Number of obs =188, Number of groups =47.

Therefore, after controlling for regional characteristics, we find that a negative relationship exists between the labor force participation rate and the birthrate[5]. This result is not observed solely in Japan; the same result was obtained by Kogel (2004), Engelhardt et. al (2004), and Yamaguchi (2005) in their analyses of the relationships between the female labor force participation rates and birthrates in various OECD countries.

3.2 Human Capital Investment in women, and marriages and births

Second, if we assume that women aim to be active at high levels in the society, this might affect the age at which they get married have their first child because there is a greater possibility that the period of investment in human capital will be prolonged. Consequentially, as female fecundity has not biologically developed in recent years, a continued decline in the birthrate might result[6].

The analysis below is tentative, however, we will consider the types of effects that investment in women as human capital can have on their child-birth behavior. The data used in this section is from the Japanese Panel Survey of Consumers—one of

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[5]When the data were grouped and estimated using the ordinary least squares method, the following results were obtained.

Birthrate = 1.3301 + 0.0084 × labor force participation rate −0.2535 × 1990 dummy

(0.0697)   (0.0011)   (0.0245)

− 0.4078 × 2000 dummy − 0.4705 × 2010 dummy

(0.0248)   (0.0284)

Adj R-squared = 0.6513. Number of obs = 188.

[6]The Japan Society for Reproductive Medicine and other organizations have stated that "If considered purely biologically, the optimum age for pregnancy and childbirth is 20 years until at the latest 35 years."

Japan's leading panel surveys—by the Institute for Research on Household Economics. In 1993, this survey extracted—from a nationwide scale—the data on young women aged 24–34 years (cohort 1) and this group has been surveyed ever since. Furthermore, from 1997, a group aged 24–27 years (cohort 2); from 2003, a group aged 24–29 years (cohort 3); from 2008, a group aged 24–28 years (cohort 4); and from 2013, a group aged 24–28 years (cohort 5) were newly added as the subjects of the survey.

We used this survey to analyze the effects that educational background and the first job after graduating subsequently have on marriage and childbirth.

Figure 4 presents the results of the Kaplan–Meier estimates on the age at which women get married and have their first child for each cohort. We see that the more recent the cohort, the older the age at which women get married and have their first child.

A reason that has been given for why members of more recent cohorts tend to get married and have children later is an increase in the number of people with a higher education in the more recent cohorts. Table 2 indicates the percentages of final academic achievement for each cohort. While the percentage of university graduates and above in cohort1 is 12.8%, in cohort5 it is 41.2%, and from this, we can infer the popularization of higher education. When we analyze whether the age at which women get married and have their first child are different depending on educational background, we find that, as shown in Figure 4, there is a trend among those with a higher education of getting married and having children later.

Furthermore, the increase within the more recent cohorts of women who are actively attempting to pursue careers in the labor market has an effect. Table3 shows, for each respective cohort, the proportion of women attending self-development classes, the reasons for attendance, and the costs of attending. Here, "self-development classes" refers to classes at various types of schools, vocational colleges, universities, and via online education, but not on-the-job training (OJT). Furthermore, the figures in Table 3 are the totals for the entire survey period and were counted as one, even if the same

person attended a class multiple times. We observe that the more recent cohorts have a higher percentage of class attendance. Additionally, the reasons for attending given by respondents in these cohorts were not only "to acquire knowledge and qualifications that may be useful for work in the future," but also "to increase knowledge and qualifications that may be useful in developing my work up to the present time." The costs of attending have also increased.

The effects of having a higher education and self-development have on marriage and the first childbirth were estimated using Cox's Proportional Hazard Model (Cox1972,1975) (Table 4). The reasons for using the Hazard Model as the estimation method is that there are women who are unmarried or have not had children; thus, it was necessary to conduct a duration analysis that corresponds to this sort of censored sample. Another reason for using Cox's Proportional Hazard Model was that only minimal assumptions are needed for the distribution of errors.

Observing at the results of Table 4, we see that having a higher education and undertaking self-development have the effects of delaying the timing of marriage and the first childbirth. Even if the effects of educational background and self-development are added to the set of explanatory variables, the timing of the marriage and first childbirth of the more recent cohorts is delayed, and apart from this, they are also considered to be factors accelerating the declining birthrate.

4. Conclusion

As discussed above, the employment of women in the labor market may cause a dilemma, as it counterproductively promotes the declining birthrate. If a solution cannot be found, Japan's society and economy will become less sustainable.

To resolve this dilemma, it will be necessary to make work and daily life more compatible and establish and maintain an environment where it is possible to raise children while continuing to work. To this end, the provision of childcare facilities and school nurseries—as social capital—is required, and it will also be necessary to assign

greater importance to employees' work–life balance in human resource management within companies.

The research of Shigeno et al. (1999)—who analyzed the relationship between childcare centers and female employment—clarified that increasing the childcare center capacity ratio, which is the ratio of the population of infants aged 0–6 years relative to the capacities of childcare centers, promotes female employment: increasing the childcare center capacity ratio by 1% has the effect of raising the female employment rate by 0.7%.

In recent years, measures to establish childcare centers have progressed, such as the government's Zero Waiting List for Day Nurseries Strategy. Despite such efforts, the M-shaped curve of the female labor force participation rate according to age is deeply rooted and can still be observed. With regards to this, Unayama (2011) defined the potential capacity rate as the rate of the female population aged 20–44 years relative to the prescribed capacities of childcare centers, and calculated its correlation with leaving work (turnover) due to marriage. The correlation coefficient obtained was −0.74, from which we also understand that the potential capacity rate strongly prescribes female turnover behavior. In other words, while we can observe progress in establishing childcare centers based on the their capacity rate and the number of children on waiting lists, when we look at the potential capacity rate, we find that progress in establishing childcare centers is not being made. A reason for this may be the gap between turnover rates due to marriages in prefectures is being preserved over the long term, which can be said to indicate that the social capital for growing children is still insufficient.

Childcare facilities for infants less than a year old are said to be particularly insufficient; however, childcare leave has the role of supplementing this. In recent years, the percentage of men and women taking childcare leave has been increasing. The percentage for women is particularly high, with more than 80% of eligible women having taken childcare leave. The percentage of men taking leave is low but is trending upwards.

A body of excellent research has been accumulated on the effects that childcare leave has on female employment and childbirth. The majority of this research has concluded that childcare leave has a positive effect on female employment and childbirth. For example, the research of Waldfogel et.al (1999) and Kawaguchi (2008) found that a company's childcare support system significantly increased the percentage of its female employees who had children. Therefore, it can be said that a system of childcare leave is necessary for women to both work and raise children.

However, the current situation is that only approximately 40% of women continue working after giving birth. While progress is being made in establishing a system of childcare leave, many women decide not to continue working. With regards to this, Abe found that the low wage levels of women, the availability of places in childcare centers, and the possibility of grandparents taking care of the children strongly affects women' decision to take childcare leave. If the wage level is increased, the opportunity cost of quitting work becomes sufficiently high such that women decide to take childcare leave and not quit; however, if there are no childcare resources after the childcare leave is ended (such as childcare centers and childcare by grandparents), it becomes difficult for them to continue working, which hints at the reason why they decide not to take childcare leave in the first place. In this sense, the establishment of childcare centers must be implemented because it also facilitates the use of the support provided by companies.

On one hand, responding to the rapidly declining birthrate by promoting the employment of women in the labor market is an important policy. On the other hand, addressing the declining birthrate by facilitating a work–life balance and establishing an environment in which it is easier to raise children while continuing to work is also an important policy.

References

Abe, Masahiro (2005). "Who will take childcare leave? The popularization of and

problems with the childcare leave system," National Institute of Population and Social Security Research, ed., "Social security for households raising children," University of Tokyo Press (Japanese).

Abe, Yukiko (2011). "Long-Term Impacts of the Equal Employment Opportunity Act in Japan," The Japanese Journal of Labor Studies No.615, pp.12-22, The Japan Institute for Labour Policy and Training.) (Japanese).

Becker, G.S. (1960) "An Economic Analysis of Fertility," in Coale, A. ed. Demographic and Economic Change in Developed Countries, Princeton: Princeton University Press.

Engelhardt, H., T. Kögel, A. Prskawetz (2004) "Fertility and women's employment reconsidered: a macro-level time-series analysis for developed countries, 1960–2000," *Population Studies* 58 (1), pp.109–20.

Iki, Noriko (2011), "Development of a female labor policy−from the perspectives of 'justice, 'employment,' and 'welfare'," Labor Policy Report Vol.9, The Japan Institute for Labour Policy and Training (Japanese).

T Kogel (2004) "Did the association between fertility and female employment within OECD countries really change its sign?" *Journal of Population Economy* 17 (1), pp.45−65.

Kawaguchi, Akira (2008) "Gender economic disparity," Keiso Shobo (Japanese).

Leibenstein, H. (1974) "An Interpretation of the Economic Theory of Fertility: Promising Path or Blind Alley?" Journal of Economic Literature 12 (2) pp.457−79.

Shigeno, Yukiko & Okusa Yasushi (1999), "The impact of childcare policy on decisions on childbirth and employment," Quarterly Journal of Social Security Research, 35 (2), pp.192–207.

Unayama, Taku (2011), "The possibility of achieving marriage / childbirth and work and establishing childcare centers," JCER Economic Journal, No. 65, pp.7–22, Japan Center for Economic Research (Japanese).

Yamaguchi, Kazuo (2005), "The true relationship between female labor participation and the birthrate: an analysis of various OECD countries," RIETI Discussion Paper Series 05-J-036, the Research Institute of Economy, Trade and Industry (Japanese).

Waldfogel, Jane, Yoshio Higuchi and Masahiro Abe (1999), "Family Leave Policies and Women's Retention after Childbirth: Evidence from the United States, Britain, and Japan," Journal of Population Economics, Vol.12, pp.523–545.

Table.1 Population and GDP

Year	(1) real GDP (trillion Yen)	(2) Total Population (thousand)	(3) per Capita GDP (million Yen)	(4) Labor Productivity (million Yen)	(5) Num of Working Persons(thousand)	(6) % of WP
2010	512.4	128,057	400	814	62,980	77.1%
2030	466.6	116,618	400	814	57,354	84.7%
2050	388.4	97,076	400	814	47,743	95.5%
2050	388.4	97,076	400	1	38,537	77.1%

(1)　　　　2005 price.　For Year2030 and 2050, real GDP = per Capita GDP(3) ＊ Total Population(2)

Table.2 the percentages of final academic achievement for each cohort

	Junior Highschool	Highschool	Junior Colledge	University	Graduated School
Cohort1	17.9%	44.0%	41.0%	12.6%	0.3%
Cohort2	5.7%	38.4%	41.5%	14.0%	0.0%
Cohort3	3.2%	31.3%	43.6%	19.7%	1.9%
Cohort4	5.1%	30.3%	34.1%	28.5%	1.8%
Cohort5	4.9%	22.7%	30.2%	38.4%	2.8%

Table.3 Proportion of Women Attending Self-development Classes

	Proportion of Attending Various Types of Schools(Vocational Colleges, Universities,Online Education)	Reason for Attendance		Cost of Attendance (ten thousands yen / year)
		to increase knowledge and qualifications that may be useful in developing my work up to the present time	to acquire knowledge and qualifications that may be useful for work in the future	
Cohort1	5.12	28.1	53	15.2
Cohort2	7	35.9	61.5	14.7
Cohort3	9.42	36.7	57.9	18.6
Cohort4	7.74	42.1	64.4	27.3
Cohort5	10.65	24.6	65.2	25.8

The figures in this table are the totals for the entire survey period and were counted as one, even if the same person attended a class multiple times.

Table.4 Estimators of Proportional Hazard Model

	Mariage			First Childbirth		
No. of subjects	1,985			2,512		
No. of failures	996			1,357		
	（1）	（2）	（3）	（4）	（5）	（6）
	Haz. Ratio	Haz. Ratio	Haz. Ratio	Haz. Ratio	Haz. Ratio	Haz. Ratio
Cohort2	0.999	1.002	1.003	0.957	0.986	0.964
	(0.118)	(0.118)	(0.118)	(0.085)	(0.088)	(0.086)
Cohort3	0.833	0.873	0.873	0.937	1.007	0.988
	(0.073) **	(0.076) *	(0.076) *	(0.067)	(0.073)	(0.071)
Cohort4	0.510	0.500	0.516	0.767	0.746	0.768
	(0.050) ***	(0.049) ***	(0.051) ***	(0.064) ***	(0.063) ***	(0.064) ***
Cohort5	0.374	0.322	0.338	0.744	0.649	0.683
	(0.037) ***	(0.033) ***	(0.034) ***	(0.074) ***	(0.065) ***	(0.068) ***
High School	0.930	0.998	0.971	0.850	0.892	0.874
	(0.153)	(0.164)	(0.160)	(0.122)	(0.128)	(0.125)
Junior Coledge	0.713	0.782	0.748	0.687	0.741	0.710
	(0.117) **	(0.129) *	(0.123) **	(0.098) ***	(0.106) ***	(0.102) ***
University	0.471	0.544	0.521	0.425	0.484	0.462
	(0.084) ***	(0.097) ***	(0.093) ***	(0.065) ***	(0.075) ***	(0.071) ***
Graduate School	0.184	0.208	0.205	0.257	0.310	0.294
	***	(0.125) ***	(0.123) ***	(0.098) ***	(0.118) ***	(0.112) ***
Attending Self-development Classes		0.584			0.599	
		(0.049) ***			(0.040) ***	
Attending Self-development Classes for the job			0.572			0.610
			(0.056) ***			(0.048) ***
LR chi2	270.51	316.05	307.55	126.46	188.16	170.63
Log Likelihood	−7000.2485	−6977.4785	−6981.7269	−9775.31	−9744.46	−9753.23

Fig. 1　Rate of Labor Force Participation

Fig. 2　Labor Force Patripation Rate（Aged30〜44）and Total Fertility Rate (by Prefecture)
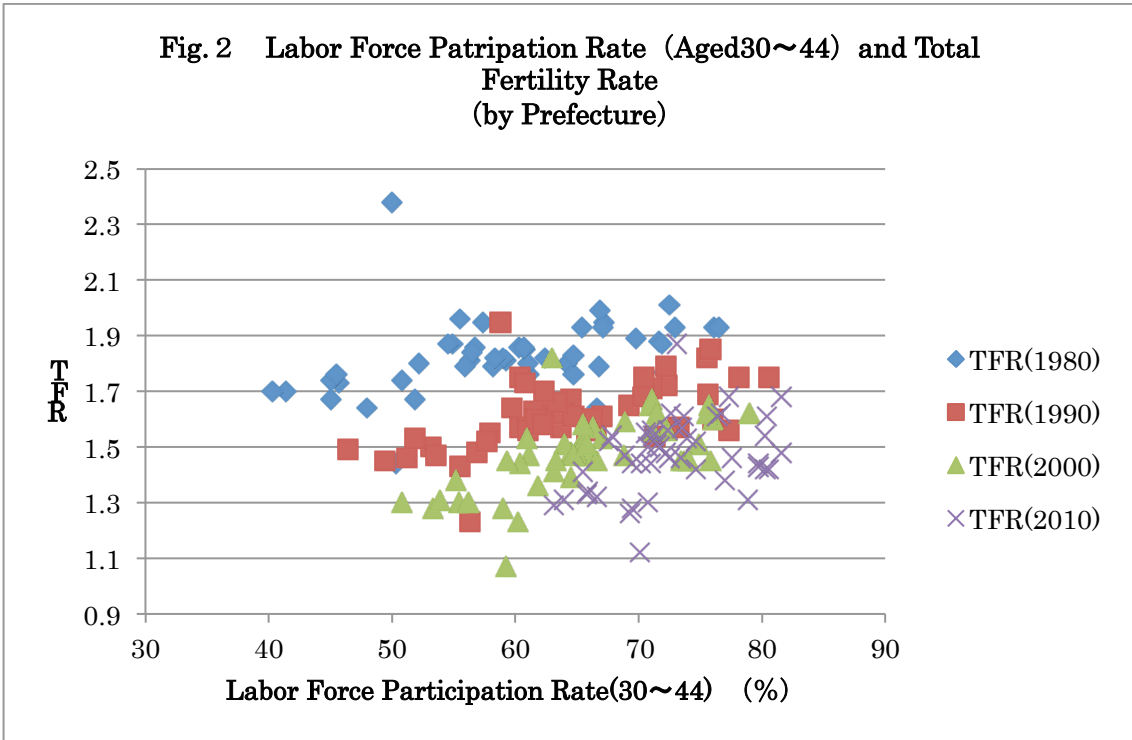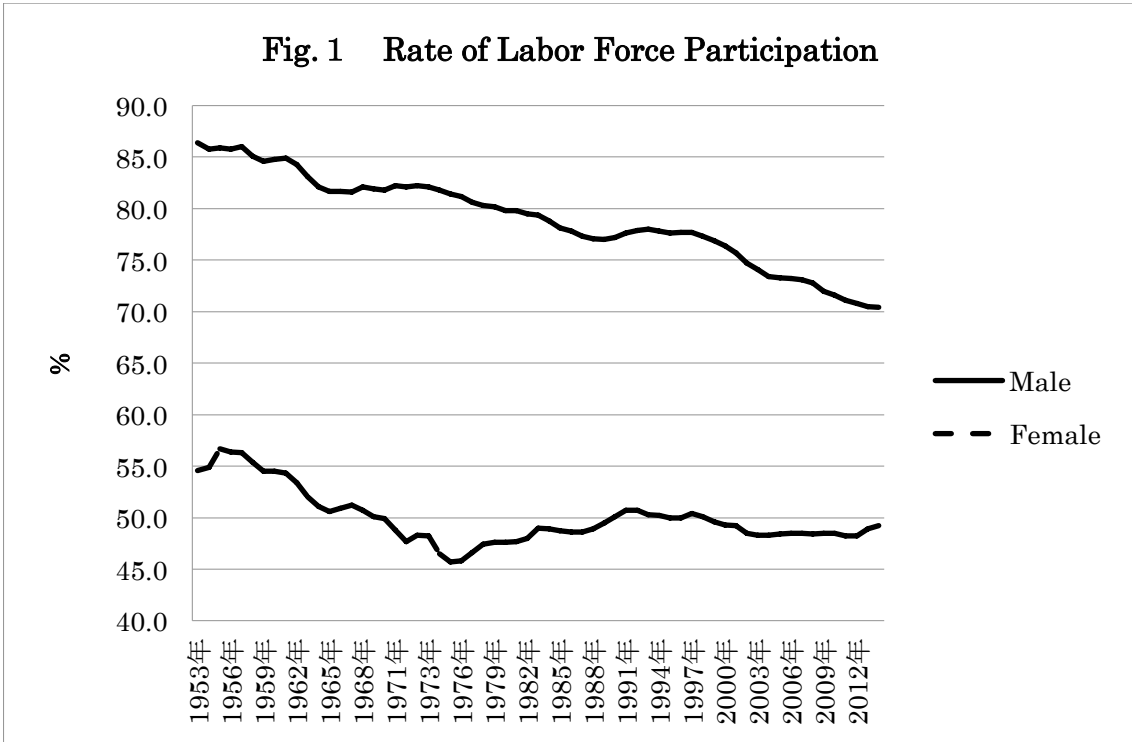
Fig.3 Change of LFPR and TFR

1980-90

y = -0.0074x - 0.1958
R² = 0.1044

1990-2000

y = -0.0015x - 0.1361
R² = 0.00346

2000-10

BR_change

y = 0.0204x - 0.0396
R² = 0.1748

LFPR_change
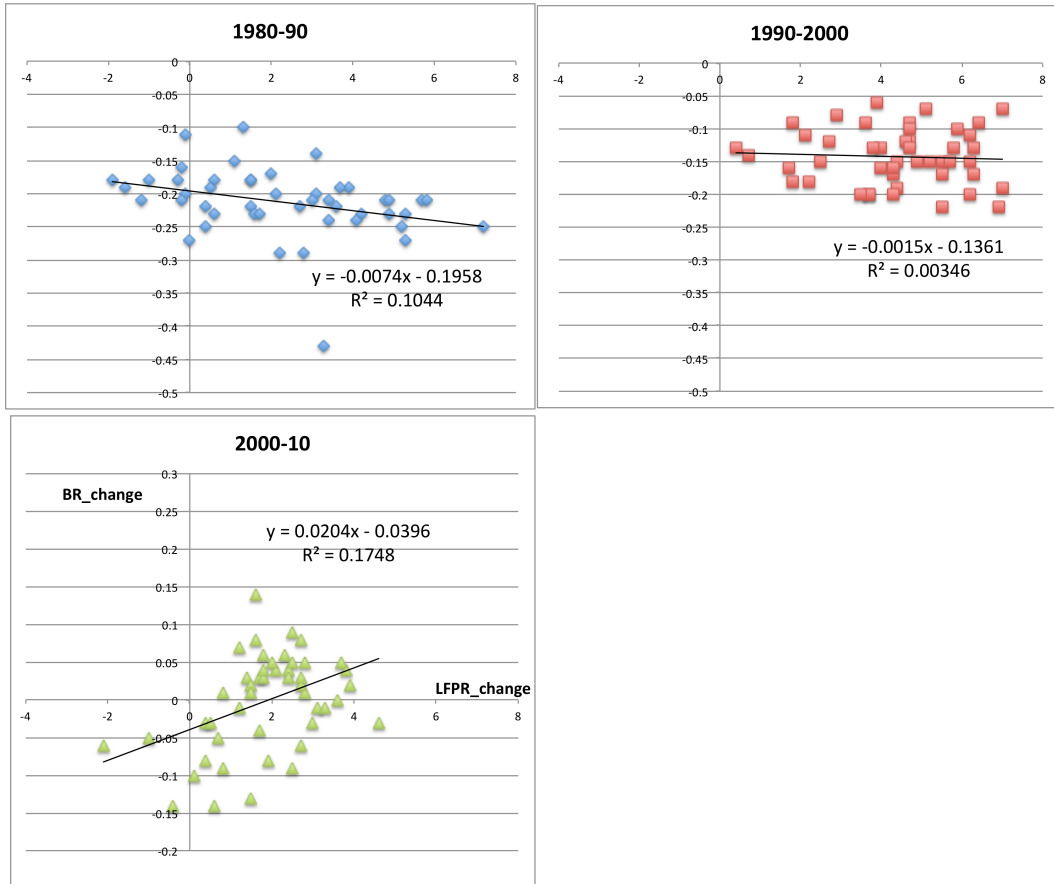
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Fig.4 **Kaplan–Meier cumulative hazard estimates**

Age of First Marriage (Kaplan-Meier failure estimates)

cohort = 1   cohort = 2
cohort = 3   cohort = 4
cohort = 5

Age of First Child Birth (Kaplan-Meier failure estimates)

cohort = 1   cohort = 2
cohort = 3   cohort = 4
cohort = 5