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Overwork and Fertility Decline in Japan

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Abstract

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1. Introduction

Many experts in Japan are claiming the importance of promoting a balance between work and family/private life (work-life balance, hereafter) in the workplace (Osawa, 2006, for example). Although there are many reasons behind this, in the context of our paper, we are interested particularly in its effect on reversing the trend toward a decreasing fertility rate in this country.

Difficulties in having babies while holding a full-time job create a tradeoff relationship between child-bearing/child-rearing and continuing work.. Faced with this tradeoff, women tend to either choose family life and sacrifice their working life or choose their working life and sacrifice their family life. In particular, in a labor market like Japan's, where it is difficult to obtain a full-time job after spending several years out of the labor force, the opportunity cost of having a child becomes inevitably high, which weakens the incentive to have children. If it were to become easier to work full-time and have children at the same time, women would no longer have to quit full-time jobs to have a child. This would lower the opportunity cost of having children, and hence should lead to an increase in the fertility rate. The promotion of work-life-balance is expected to do just that.

The promotion of work-life balance through means such as provision of child-care leave is becoming more prevalent at the workplace in Japan. Figure 1, which shows how the female employment status changed before and after the birth of the first child, indicates an increasing trend in the percentage of female workers who took child-care leave and continued working following the birth of their first child (the percentage rose from 5.1 % of all females, or 8.4% out of those with jobs prior to childbirth, in the late 1980s to 13.8%, or 20.7%, by the beginning of the 2000s). However, we also see from Figure 1, that the percentage of female workers who quit their jobs when the first child was born remains high at about 40% (or 60 % out of those with jobs prior to childbirth). This suggests that the introduction of child-care leave alone was not enough to eradicate the obstacles that make it difficult to continue working after childbirth.

One such obstacle may be the recent trend toward long working hours among full-time workers. Figure 2 shows an international comparison of trends in the proportion of workers who work 50 hours or more (49 hours or more for Japan and

the US) per week. Although the figures for the UK and the US have been increasing recently, the figure for Japan far exceeds that of most other developed countries. Furthermore, despite the continued economic slowdown in the meantime, since the early 90s there has been a sharp increase in the proportion of full-time workers working long hours since the early 90s. This is particularly marked amongst young workers, as can be seen from Figure 3. According to Genda (2001), this is a result of firms cutting back on hiring during the recession and instead increasing the workload of the group with least seniority.

In a country like Japan where labor turnover cost is high, full-time workers often have no choice but to obey employers demanding long and excessive work hours. This tendency is stronger during a recessionary period when it is more difficult to find employment elsewhere. The recent trend of longer work hours, therefore, is likely to have strengthened the tradeoff relationship between having babies and holding a full-time job by directly influencing time constraint placed on wives and/or by shifting the burden of housework from husbands to wives.

The strengthened trade off relationship also weakens the incentive to marry. As in other developed countries, there is no doubt that more education on the one hand, and the introduction of high-technology household devices in addition to wider availability of market goods and services which are close substitutes to household production on the other, have contributed to a delay in the timing of marriage in this country. In Japan, however, this tendency is likely to have been exacerbated by the increased opportunity cost of child-bearing to the extent that marriage is a necessary precursor to childbearing. Excessive work, while holding wage income constant, is also likely to reduce the probability of finding a partner.

Given these factors, this paper examines the determinants of marriage and fertility, while paying particular attention to the role of hours worked by husbands and wives using the panel data, which is rich in information on individual's time-use.

In Japan, studies on fertility and marriage have traditionally been based on macro data. However, the recent development of panel data, the Japanese Panel Survey of Consumers (JPSC) conducted by the Institute of Household Economy in particular, has enhanced the opportunity to conduct micro-level analysis of these issues. Higuchi and Abe (1999) and Higuchi (2001) were the first studies to utilize

this panel data in analyzing the timing of birth and marriage. They found the wife's wage level to have a significant effect in delaying the timing of birth assuming a Weibull duration distribution. In addition, an increase in the unemployment rate at the time of graduation was found to speed up the timing of birth, while an increase in the unemployment rate at the time of observation was found to delay it.

More recently, Yamaguchi (2004), also using the same data, has shown that a significant positive income effect on fertility is observed only amongst families with no children, which is consistent with the quality-quantity model proposed by Becker (1960). He utilized a discrete-time logistic model and jointly estimated the probability of having the first, second, and third child while also controlling for unobservable heterogeneity by including a variable reflecting the intention toward childbirth. Sakamoto and Kitamura (2007), on the other hand, analyzed factors that determine timing of marriage using the JPSC data. They found that women who worked excessive hours were less likely to marry a year later and that such effect was greater amongst cohorts who were in their 20s and 30s during the recessionary period that started in the early 1990s.

Following these studies, this paper utilizes a Cox-proportional hazard model to estimate the impact of working hours, amongst other factors, on the subsequent probabilities of marriage and childbirth. For the timing of childbirth, to the extent that time allocation decisions are made jointly between husband and wife, the effect of both the husband's and wife's working hours as well as their housework hours are estimated by the hazard model, which jointly determines the timing of the first, second, and third childbirth using the model proposed by Prentice, et. al (1981). We hope to be able to ascertain whether an improvement in the work-life-balance through reduced working hours and/or increased housework hours has any effect on the decision to marry and on fertility.

The remainder of the paper is organized as follows. Section 2 outlines the data used. Section 3 gives an overview of the recent decline in the probability of marriage and childbirth on the one hand, and the increase in the employment rate on the other, in addition to some basic statistics on distribution of housework hours. Section 4 and Section 5 explain the estimation methodology and illustrate the results of the hazard model applied to the timing of marriage, and the timing of first, second, and third childbirth, respectively.

2. Data

In this paper, we have used data obtained from the 2nd through 14th JPSC conducted by the Institute for Household Economy. The JPSC randomly selected 3623 women aged 24-34 (born between 1959-69) in 1993. Out of these, 1500 women responded and were included in the sample for the 1st survey . This group is called Cohort A. Later, the JPSC added a sample of 500 women aged 24-27 (born between 1970-73) in 1997 (5th survey), which was called Cohort B, and a sample of 836 women aged 24-29 (born between 1974-79) in 2003 (11th survey) which was called Cohort C. As of 2007, the JPSC has been conducted 14 times and the data for these 14 surveys are available.

The JPSC surveys participants every year and asks them questions about their spouse's situation, the number and age of their children, and their own employment status at the time of the survey. The survey also includes questions about the annual income and number of hours worked by respondents and their spouses. Moreover, the JPSC asks how long the respondents and their spouses spend time on the following activities on usual weekdays and weekends: commuting, work, study, housework including child care, hobbies, and other categories including sleeping. Respondents are asked to report the time they spent for each of these activities such that their total adds up to 24 hours. In the estimation that follows, we compute weekly housework hours as five times the usual weekday housework hours plus twice the usual weekend hours. We do a similar computation for hours of work. Commuting, hobbies, and other hours spent including sleeping are categorized as leisure time.

In addition, participants are asked about their work history since graduation, and those who got married or had children in between the surveys (or before the first survey) are asked in what years they married and gave birth. However, there is no information on respondents' wages and annual income prior to the first survey so that only the data from 1993 can be used to assess the effect of these variables. Formulation of variables used in the estimation and the estimation strategies are laid out in a later section.

In the descriptive analysis in the following section, we use the entire usable sample of the 2nd through 14th JPSC. In the econometric analysis of Section 4 and Section 5, however, it was necessary to delete samples of women who were already married or had more than two children before the start of the survey, because they lack data on some of the explanatory variables needed to conduct the estimation. For example, samples used for analysis of the timing of marriage were those who were not married at the commencement of the survey, that is, the 2nd survey for Cohort A, the 5th survey for Cohort B, and the 11th survey for Cohort C[1]. This inevitably restricts samples to those who marry or have a child late within the given age range, which is likely to cause a sample selection problem. In order to mitigate this problem, we control for their unobservable differences by including appropriate birth cohort dummies in the econometric analysis in Section 4 and Section 5.

3. Casual Observations on Marriage, Childbirth, Employment and Time Allocation

Before examining the estimation models, it is useful at this point to give an overview of the pattern of delayed marriage, lower fertility and increasing female employment in this country demonstrated by the JPSC. Figure 4 shows the percentage of women who have never married at each age for the four different birth cohorts.

From this figure, it is readily apparent that more females in Japan are getting married later in life. Even amongst the cohorts less than 10 years apart, the difference is marked: the percentage of women remaining single is clearly higher for younger cohorts. Among the oldest cohort (those born between 1959-64), we see a sharp decline in the percentage of unmarried women starting in their early 20s, but this pattern is not observed for younger cohorts. The age at which half of the cohort is married is 28 for the cohort born between 1965-69, 30 for those born between 1970-73, and 31 for those born between 1974-79, respectively. Furthermore, the percentage of single women at age 31 in the cohort born between 1974-79 is double

[1] We do not use the 1st JPSC because the variable required in the hazard model cannot be obtained from this initial survey.

that for the cohort born between 1959-64. As can be seen, the data reveal a dramatic change in the marriage behavior of women during the short time span of this survey.

Let us now turn to trends in the age of childbirth. Figure 5 shows the percentage of women with no children at each age for the four birth cohorts. Hardly any change is observed for women in their early 20s. Amongst women in their mid-20s and onward, however, there is a clear tendency showing that the younger the cohort, the lower is the proportion of women without children, although this tendency is slowing.

As we saw in Figure 4, the tendency for delayed marriage and increased proportion of women who never marry certainly contributes to a delay in childbirth, since the percentage of children born outside of marriage is exceedingly small in Japan. The tendency for delayed childbirth, however, may also be observed among those who are already married. In order to confirm this, Figure 6 plots the percentage of married women without children against years after marriage for the four birth cohorts.

Interestingly, there is a tendency to delay the timing of the first birth after marriage for the older three cohorts, although this tendency seems to have stopped for the youngest cohort born in the late 70s. Nevertheless, we see that the younger the cohort, the higher the proportion of women who continue to work well into their late 20s (Figure 7). To the extent that delaying childbearing, unlike marriage, does have a biological limit, the effect of increased economic opportunity may be starting to have a smaller effect on the timing of birth conditional on marriage.

More importantly, when the sample is confined to women with small children, the tendency found in Figure 7 is not observed, indicating that continuing work after marriage and childbirth does not seem to be getting any easier. This, in addition to the delaying of marriage and childbirth, suggests a growing tendency in Japan for women to prioritize work and delay starting a family life..

Is childrearing still fairly much the responsibility of the wife even when she works full-time? Table 1(a) shows how the housework is shared between wives and husbands depending on the number of children and the working status of the wives[2].

[2] In this paper, we use the term "full-time" for working as a full-time regular worker, and "part-time" for working as an employee in any status other than a full-time regular worker. Hence, our definition of "part-time" worker includes part-time workers, as well as workers on temporary contracts.

Here, we are restricting the samples to households with husbands working on a full-time basis. As seen, hours of housework done by non-working wives is high compared to working wives (although hardly any difference is observed depending on whether the wives work full or part-time) and is about twice as long for wives with children. Hours of housework done by husbands, on the other hand, are also 4 to 8 hours longer in households with children although they are surprisingly similar irrespective of the wives working status. In fact, when the average hours of housework in households with two children are compared, husbands with full-time working wives actually do a little less housework (8.3 hours) than husbands with stay-at-home wives (9.04 hours).

When we make the same tabulation for households with husbands who work 60 hours or longer on a regular basis (Table 1(b)), we see that those with full-time working wives and children are less likely to have husbands working excessive hours than households with stay-at-home wives (21 ~23% vs. 28~29%). Nevertheless, hours of housework done by husbands who work long hours are shorter, and this reduction is particularly marked for husbands with full-time working wives. Husbands working excessive hours do not seem to shift the burden of housework onto working wives. However, the intensity of their housework may be affected[3].

These figures indicate that husbands and wives do seem to share housework responsibilities to a certain extent, by husbands refraining from excessive work when the wife also works full-time, for example. However, housework, and childrearing in particular, is still very much a responsibility of the wife irrespective of the wife's working status. The wife's participation in the market work does not affect the husband's share of housework at all, and even though excessive working hours by the husband does not seem to increase the wife's housework hours, the husband's contribution to the housework is reduced.

4. Analysis of The Timing of Marriage

A Theoretical background

[3] There is also a possibility that these households tend to contract out their household work, although this possibility cannot be confirmed by the JPSC.

The theoretical foundation of marriage behavior we adopt in this paper is given by the matching models of marriage in economics (Becker 1981, Oppenheimer 1988). There, individuals decide to marry if the benefit they expect to receive from marriage is greater than what they would receive if they remained single. Among the benefits of marriage most often emphasized is the gain from specialization and exchange within marriage, which is large if there is a large difference in comparative advantage in home and market production between the two partners. Hence, more education for women, as well as cohabitation with parents prior to marriage, for instance, are expected to make gains from marriage smaller so as to reduce the likelihood of marriage. Other benefits derived from marriage include economies of scale and benefits obtained from the marriage specific investment such as children. Moreover, when the timing of marriage is an issue, it is also influenced by the cost of finding a suitable mate (Keeley (1979)). Hence, factors influencing the state of the marriage market, such as the size of the population to which potential partners belong or the ratio of females to males in the cohort of marriageable age, for example, affect both gains to marriage and difficulty in searching for a partner.

Of particular interest in the Japanese context, and also the focus of this paper, is the relationship between labor participation by women and marriage. Greater economic opportunities for women are likely to reduce the gain from specialization and increase single "income", so that labor participation by women would be expected to lead to marriage delay and a higher incidence of non-marriage. Moreover, even if it is easy or socially acceptable for women to combine married life with work, increasing difficulties in combining childcare and a career, induced by long work hours imposed by employers, for instance, are likely to decrease gains to marriage in a country like Japan where marriage necessarily precedes childbearing. Excessive work, with wage income held constant, may also reduce the probability of finding a partner.

B Estimation

Here, we employ a Cox proportional hazard model with time-varying covariates to analyze the determinants of the decision to marry by young women who were not married when the survey began. Our particular concern lies in the effect of long hours worked on the timing of marriage.

Let t be the duration until marriage from age 20, and τ be a calendar time at which such a spell starts (i.e., when a woman's age is 20). The hazard rate for the ith woman, $h_i(t)$, measures the probability of marrying at calendar time τ_i+t, conditional on the fact that she has stayed unmarried for at least as long as t since age 20. Adopting a proportional hazard formulation, the hazard can be written as:

$$h_i(t,x_i,z_i;\ \beta,\ \gamma) = \exp(\beta' x_i(\tau_i) + \gamma' z_i(\tau_i+t))\ h_0(t) \qquad (1)$$

where $h_0(t)$, the baseline hazard, depends only on the elapsed duration t, $x(\tau)$ is a vector of explanatory variables observed at the start of the spell, and $z(\tau+t)$ is a vector of explanatory variables that vary after the commencement of the spell. The advantage of utilizing a proportional hazard formulation is that it is possible to draw an inference about the effects of covariates without any knowledge of the functional form of the baseline hazard. In our estimation, x includes dummy variables for a woman's education and birth cohort.

As for the time-varying variables $z(\tau+t)$, with the exception of unemployment rate, we utilize variables that are measured at calendar time $\tau+t-1$, which is one year prior to the year in which the hazard rate in equation (1) is defined. This is done in order to mitigate the possible simultaneity problem between the decision to work, how long to work, and marry, as well as the decision to cohabit with parents and to marry. They include dummies for the population size and the area block of the residing city at $\tau+t-1$ in order to represent the ease of finding a potential partner. Whether the woman is cohabiting with her own parents at $\tau+t-1$ is also included. The woman's employment status, the overwork dummy, and some employer characteristics at year $\tau+t-1$ are included to examine the effect of excessive work on the subsequent decision to get married. We also include the unemployment rate at $\tau+t$ in order to capture the effect of future uncertainty and/or the opportunity cost of marriage as considered in Higuchi and Abe (1998) and Higuchi (2001). For a detailed explanation of the variables used for the estimation, see Appendix Table A-1.

Table 2 shows the estimated results using the Cox proportional hazard model of marriage. As an indicator for long hours of work, model 1 uses a dummy for working

longer than 45 hours per week on average, while model 2 uses a dummy for having more than 1 hour of overtime work on a regular basis[4].

Firstly, unlike the tendencies shown in Figure 3, estimated coefficients for the three birth cohort dummies indicate that the hazard rate is higher the older the birth cohort, except for the oldest. This is due to the fact that the oldest cohort (born between 1959 - 63) is the only cohort which was older than 29 years of age when the survey began. As stated in Section 2, this means that the oldest cohort is more likely to include women with unobserved characteristics that delay their marriage and this cohort dummy should help control for such heterogeneity[5].

Secondly, none of the factors such as area of residence, employer characteristics (i.e., working for a company larger than 500 regular employees, working in the public sector), and the unemployment rate seem to exert any significant effect. There is, however, a tendency for earlier marriage amongst those living in smaller municipalities. Even though direct search costs are presumably lower in highly populated areas, urbanization may also be associated with reduced gains from marriage because of the higher costs of children[6]. In addition, there may be less pressure for women to marry early in urban areas, and those who do not wish to be under such social pressure may move to or do not return from urban areas, making women in urban areas even less likely to get married[7].

Lastly, working as a full-time or part-time employee, as opposed to not working, does not seem to affect the subsequent decision to get married. However, working for more than 45 hours per week on average makes it significantly less likely for a

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[4] In our estimating sample, the percentage of full-time female workers working longer than 45 hours per week on average is 49.6% and 36.2% for single and married women, respectively, The same percentages for part-time female workers are 20.6% and 5.0%, respectively. On the other hand, the percentages for the overwork dummy defined in model 2 is 70.1% and 59.2% for full-time single and full-time married women, and 40.5% and 20.6% for part-time single and part-time married workers.

[5] We also tried to control for heterogeneity by excluding women aged 30 or above when the survey began. Although this did not affect our estimates of the marriage equation, doing so wastes important information regarding the third birth in the fertility equation. Thus, we decided to keep them in our analysis for both marriage and fertility equations.

[6] The effect of the municipality size dummies may also be reflecting the effect of better market opportunities for women not captured by employment status and education dummies. Ideally, women's estimated wage offer should be included as an explanatory variable in order to control for market opportunities for women. We have tried including such a variable, but the coefficient of estimated wage offer was never significant, which may be due to lack of identifying variables, and the result of other variables did not change.

[7] This has been cited by Tokuno (1998) as a major reason why the female marriage rate in Japan is found to decrease with the degree of urbanization.

woman to get married in the following year[8]. This suggests that long working hours, either by decreasing the gains to marriage or by making it difficult to search for a partner, lead to a reduced likelihood to marry.

4. Analysis of The Timing of Childbirth

A Theoretical background

According to the economic model of fertility called the "quality-quantity" model of children (Becker (1961, 1981), Becker and Lewis (1973)), demand for children depends not only on the benefits they expect to receive but also on the costs of raising them, which include opportunity cost of time and family income.

Higher income enables a family to afford to finance more children. However, as parents tend to spend more income on child "quality" as their income increases, the net effect of income on the number of children is ambiguous under this model. Nevertheless, while the pure income effect itself is not affected by how many children one already has, the price of the quality of children increases with the number of children, so that we expect the income effect on additional fertility to decrease in size with the existing number of children. This interacting effect of income and number of children on the fertility rate has been found in Japan in Yamaguchi (2004), and will also be tested here in this paper.

One way of raising the quality of children is to purchase market goods and services that enhance their health and human capital. However, a large part of parents' contribution is the time they devote to childrearing. The benefits that parents could have received for the time and energy devoted to child-rearing, such as more income from working longer hours or more utility from enjoying longer hours of leisure, all constitute the opportunity cost of child-rearing. In a country like Japan where it is not only very difficult to combine full-time employment and having a family, but it is also difficult to obtain a full-time job after spending several years out of the labor force, the opportunity cost of having a child for women with full-time jobs becomes particularly high. In such an environment, women are often

[8] Since working for an employer with a maternity leave provision is likely to increase gains to marriage to the extent that such a provision makes it easier for a woman to combine childcare and a career, we have also included this variable in the marriage hazard but its effect was found insignificant.

forced to choose between full-time employment on the one hand and childrearing on the other.

Such a trade-off relationship, however, should weaken if the difficulty in combining child-rearing and a career is eased by factors such as formal childcare leave provisions and other family friendly workplace practices. In the analysis below, we specifically investigate the effect of the availability of paid child-care leave at the workplace and wives' working hours on the hazard probability of having children[9,10].

Moreover, to the extent that time allocation decisions amongst the family are made jointly between husbands and wives, husbands' working hours may have some effect on the ease with which working wives can combine family and a career. Specifically, if the husband cuts back on his working hours and spends more time on housework, the trade-off situation faced by the working wife would be expected to ease. In the analysis below, we examine the effect of the husband's housework hours, in addition to working hours, on the fertility hazard.

B Estimation

In this section, we employ an extended proportional hazard model with time-varying covariates to examine factors that determine the timing of the first, second, and third childbirth using the samples of married women. We restrict the samples to married women with living spouses who work as full-time employees. We focus on the duration from the age of marriage to the birth of the first child, from the age of the birth of the first child to that of the second, and from the age of the birth of the second child to that of the third. We treat them as ordered multiple

[9] In Japan, the formal childcare leave policy of up to one year was mandated for firms with more than 31 regular employees in 1992. The scope and provisions of the law have since been expanded several times. However, workers are not necessarily aware of such rights, and in the analysis, we utilize the information on the workers' knowledge of the existence of such a provision applicable to them at their workplace. For instance, the percentage of full-time female workers who are aware of such a provision was about 61.2% in 1995 and 66.8% in 2000. None of our part-time samples were eligible for this policy.

[10] The JPSC asks about the availability of child- care leave at the workplace in the 2nd survey and every survey after the 5th survey. In order to compensate for the information gap with regard to child care leave in the 3rd and 4th surveys, we take the following strategy. Firstly, when the answers to the child-care leave question is the same in the 2nd and 5th survey and the respondents have not changed their job in between, we assume that information on child care leave has remained unchanged between the 2nd and 5th survey. Secondly, if the respondent has quit her job either at the stage of the 3rd or 4th survey, we use the information on the previous job. Thirdly, if the answers to the child-care leave question are different between the 2nd and 5th surveys and the respondents have not changed their job in between, we use the information from the 5th survey.

failure data to which a Cox proportional hazard model is applied which takes into account the correlation among the error terms in estimating the covariance matrix of the estimators as proposed by Prentice, et. al. (1981).

Let t be the duration until jth birth since the last birth (or since marriage for the first birth, j=1), and τ_j be a calendar time at which such a spell starts. The hazard rate for the ith woman's jth birth, $h_{ij}(t)$, measures the probability of having the jth child at calendar time $\tau_{ij}+t$, conditional on the fact that she has not had the jth child for at least as long as t since the last birth (or since marriage for the first birth). Adopting the proportional hazard formulation, the hazard can be written as:

$$h_{ij}(t,x_i,z_i;\beta,\gamma) = Y_{ij}(t)\exp(\beta_j'x_i(\tau_{ij})+\gamma_j'z_i(\tau_{ij}+t))\,h_{0j}(t) \quad \text{for } j=1,2,3 \qquad (2)$$

where $h_{0j}(t)$, the baseline hazard, depends only on the elapsed duration t, $x(\tau)$ is a vector of explanatory variables observed at the start of the spell, and $z(\tau+t)$ is a vector of explanatory variables that vary after the commencement of the spell, as before. But in this model, each failure type j is allowed to have a separate baseline hazard $h_{0j}(t)$, and the effect of the covariates are allowed to differ across j[11]. This feature is convenient since one of our interests lies in examining whether the size of the income effect differs depending on the number of children one already has. Also unique in this model is the at-risk indicator for the jth event, $Y_{ij}(t)$, which is zero until the j-1st event and then becomes one until the jth event or censoring occurs, reflecting the sequential nature of events.

When constructing the likelihood, this model does not take into account the dependencies between failure times due, for instance, to individual unobservable heterogeneities that are common across failure times of the same person. It does, however, adjust for the correlation in estimating the covariance matrix of the estimators so as to make them appropriate for testing purposes. In our paper, we control for unobservable heterogeneity by including the wife's intention toward childbirth as answered at the start of the survey as was also done in Yamaguchi (2004), in addition to the cohort dummies as discussed in the marriage hazard model. Joint estimation of the first, second, and third birth this way also provides us

[11] While the risk for the first birth starts at marriage, the risks for the second and the third birth start at the prior birth. Therefore, the baseline hazard is likely to take a very different shape between the first and the second onwards. Even though a baseline hazard function is allowed to differ by failure type, the proportional hazard formulation enables us to estimate the effects of covariates without specifying the functional forms of h_{0j}.

with larger degrees of freedom, which is an additional plus for our analysis, since the sample is not so large..

In our estimation, x includes dummy variables for a woman's education, birth cohort, a dummy indicating her intention towards childbirth, and the age at which each risk started. As was also the case in the marriage analysis, it is inappropriate to use the contemporaneous dependent and explanatory variables because of endogeneity[12]. In the case of fertility, we also need to take into account the fact that there must be at least nine months lag between when the decision to have a baby is made and when the baby is actually born. The JPSC asks whether a child was born during the past one year but no information can be obtained with regard to the month of the birth. It is thus possible for some people who answered yes to the question of childbirth in one survey to have already been pregnant at the time of the previous survey. In order to prevent having the reversed cause-and-effect relationship, we have resorted to using the information during year $\tau+t-2$, two years prior to the year the dependent variable is measured, as time-varying explanatory variables, $z(\tau+t)$[13].

This means we use information between the 2nd and 12th surveys for the explanatory variables and the 4th and 14th surveys for the dependent variable[14]. We must note, however, that this method inevitably deletes those who married during year t and had the first baby during year t+1, since the information on the husband, such as his income and working and housework hours, becomes available only after marriage. In the JPSC, about 40% of women of each survey on average have their first baby within the first year of marriage[15].

Table 3 reports the estimated results of the ordered hazard model. As was the case in Table 2, model 1 uses a dummy for working longer than 45 hours per week

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[12] This was also mentioned in Yamaguchi (2004), who utilized the information on work status and employer characteristics at the start of the spell in order to avoid the problem.

[13] Treating the employment status two years in advance as exogenous in the sense that it is pre-determined may be too strict an assumption. If many women decide to leave jobs many years prior to actually having children because they plan to have children, our estimation strategy will be plagued with simultaneity bias. A similar problem applies to cohabitation with parents.

[14] The reason we do not use the 1st JPSC is that some of the explanatory variables in the model cannot be obtained.

[15] In order to prevent losing samples who had a baby within the first year of marriage, we tried to estimate using information on husbands that lagged by one year instead of two but the estimated results hardly changed. Using variables that lag by two years also fails to capture those who were pregnant when married. The JPSC, however, cannot identify them precisely, although their percentage is probably not large since the percentage of respondents who answered that they got married and gave birth during the same year was about 8 percent.

on average, while model 2 uses a dummy for having more than 1 hour of overtime work on a regular basis as an indicator of the wife's overwork status. In this table, we have pooled the duration data for all three types of failure (i.e., zero to first, first to second, and second to third birth) and not allowed the effect of covariates to differ across failure types except for the intercepts which are allowed to differ depending on the existing number of children. Here, the long working hours and work status of wives, employer characteristics (including the availability of child-care leave), a dummy representing whether the husband's weekly average working hours are longer than 60 hours, the husband's income, the region and size of the municipality where the sample resides, dummies indicating whether living with or close to the husband's or wife's parents, and the unemployment rate are included, all of which are measured at $\tau+t-2$[16]. In addition, age at the start of risk, education dummies, birth cohort dummies, and intention towards childbirth are included. On the basis of these models, models estimated in Table 4 allow other covariates, namely, the wife's overwork dummy, the husband's overwork dummy, and his income to differ across failure types. And finally, models in Table 5 also allow the effect of the husband's housework hours to differ depending on the wife's work status.

The base models shown in Table 3 indicate some interesting findings. Firstly, households with a part-time working wife are significantly less likely to have a child in the second year from the time their working status is measured, even compared to households with a full-time or non-working wife. Secondly, when the wife works for smaller firms, is a university graduate, or is living with parents, her subsequent probability of having a child is significantly higher. The positive coefficient on university graduates contradicts the notion that higher education provides potential for a higher wage, so that those with a higher education tend to continue working instead of giving up jobs to have a baby. One explanation for this contradiction may be the nature of our data. Women in the JPSC samples are all above 24 years old at the time of the first survey, thus our sample does not include women who had a baby before they reached their mid-20s.

[16] We have not included the wife's housework hours since the wife's housework hours are largely determined by her working hours so that inclusion of both housework hours and working hours together with work status would create a multi-collinearity problem. For husbands, on the other hand, their housework hours are hardly affected by their excessive work status as observed from Table 1.

Thirdly, being aware of the availability of a child-care leave policy does tend to increase subsequent fertility, although this effect is not robust since it loses its significance in other specifications. Fourthly, having two children already reduces the hazard of having another child compared to having zero or one existing child, and the older the wife at the onset of risk, the lower the subsequent fertility likelihood. Lastly, those living in less urbanized areas have a higher fertility likelihood, other factors being constant, and in particular the northern region of Japan has the highest subsequent fertility probability.

The results in Table 3 do not indicate any significant effect of the wife's working hours nor the husband's working or housework hours. Once we allow their effect to differ depending on the existing number of children, however, some of these effects become significant. Turning to the results in Table 4, we see that a wife working overtime on a regular basis, rather than working in excess of 45 hours per week on average, has an effect in reducing the subsequent fertility probability, especially for the first birth. Interestingly, for the third birth, the wife's regular overtime status tends to raise the subsequent fertility probability compared to households with a wife not working overtime. The fact that wives are able to work overtime regularly while caring for two children may suggest tendencies for such households to have devised a way to facilitate juggling a career and child-rearing not controlled in our analysis, by obtaining help from outside the household, for example.

The results also reveal that the husband's overtime status (i.e., whether his weekly average hours of work are longer than 60 hours) matters. Interestingly, the husband's excessive working hours do not affect the probability of having the first or the third child, but they significantly reduce the probability of having the second child. Moreover, the income effect in the decision to have the third child is estimated to be significantly negative, as can be seen from the coefficient of husbands' incomes. This tendency is consistent with the findings in Yamaguchi (2004).

The husband's housework hours are not significant in the specifications in Table 4, but when we allow this effect to differ depending on the wife's work status, its effect becomes significantly positive for households with wives working on a full-time basis (Model 1, Table 5). For households with full-time working wives, the husbands' help with housework has a significant impact on increasing fertility. This

finding is consistent with the finding of Matsuda (2005), which showed that the husband's share of housework is important in increasing childbirth probability.

5. Conclusion

This study examined whether long working hours would delay the decision by women to get married or to delay the household's decision to have children. The Japanese Panel (JPSC) data revealed the following results. Firstly, women who work longer hours not only delay the timing of marriage, but also delay the timing of the first childbirth even after getting married. In particular, it is the long working hours (longer than 45 hours) that affect the timing of marriage, while it is having have to do some regular overtime work that delays the timing of the first birth. Secondly, persistently long hours worked by husbands (longer than 60 hours) also delay the timing of having a child, in particular, the timing of the second child. At the same time, the husband's help with housework has a significant impact on increasing the subsequent fertility probability amongst households with full-time working wives. Thirdly, we find a negative effect of the husband's income on the probability of having the third child, which is consistent with the quality-quantity model of children.

These results imply that promoting the work-life balance in terms of reduced work hours for both wives and husbands is effective in ameliorating the fertility decline. In a country where housework, in particular childrearing , is still very much the responsibility of the wife and where the wife's participation on market work doesn't affect the husband's share of housework at all, being able to work without overtime on a regular basis does seem to encourage the decision to have the very first child. Our results also indicate that it is not only the wife, but also the way the husband is working that affects fertility decisions by households. The detrimental effect of excessive work by husbands is particularly strong in the decision to have the second child. Moreover, when husbands use reduced work hours to help with the housework, this has a significant effect on increasing subsequent fertility probability, particularly amongst households with full-time working wives.

However, the estimated results of this study may not be fully robust concerning the endogeneity of some of the covariates used, in particular, the lagged working hours status and the lagged cohabitation status. In addition, our attempt to control for individual heterogeneities in terms of birth cohort dummies and the individual's intention to have a child measured at the start of the survey may not have been adequate. Further research on this issue is required to obtain insightful policy implications for alleviating the trade-off between working life and family life faced by women in this country.

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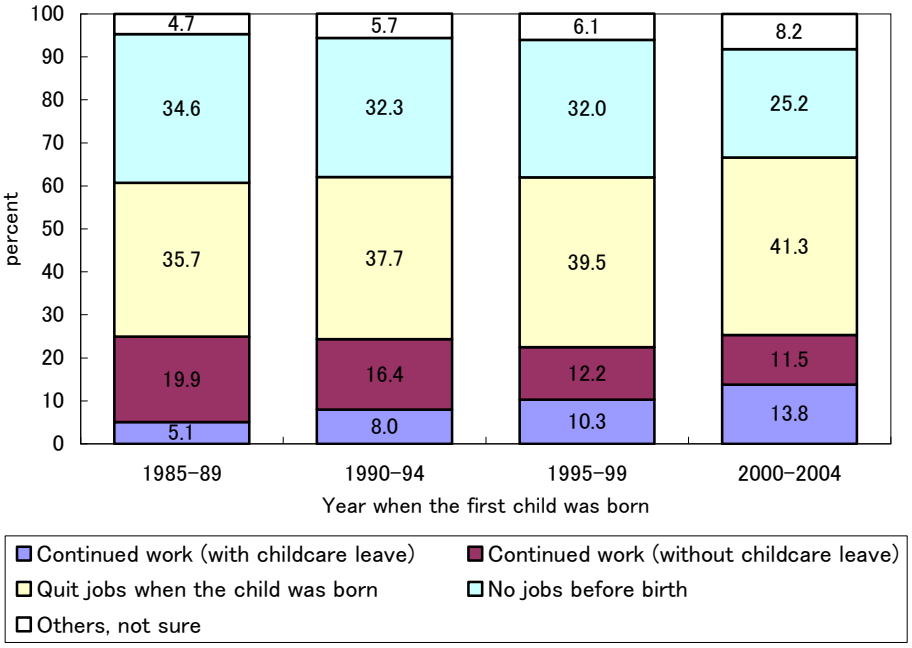
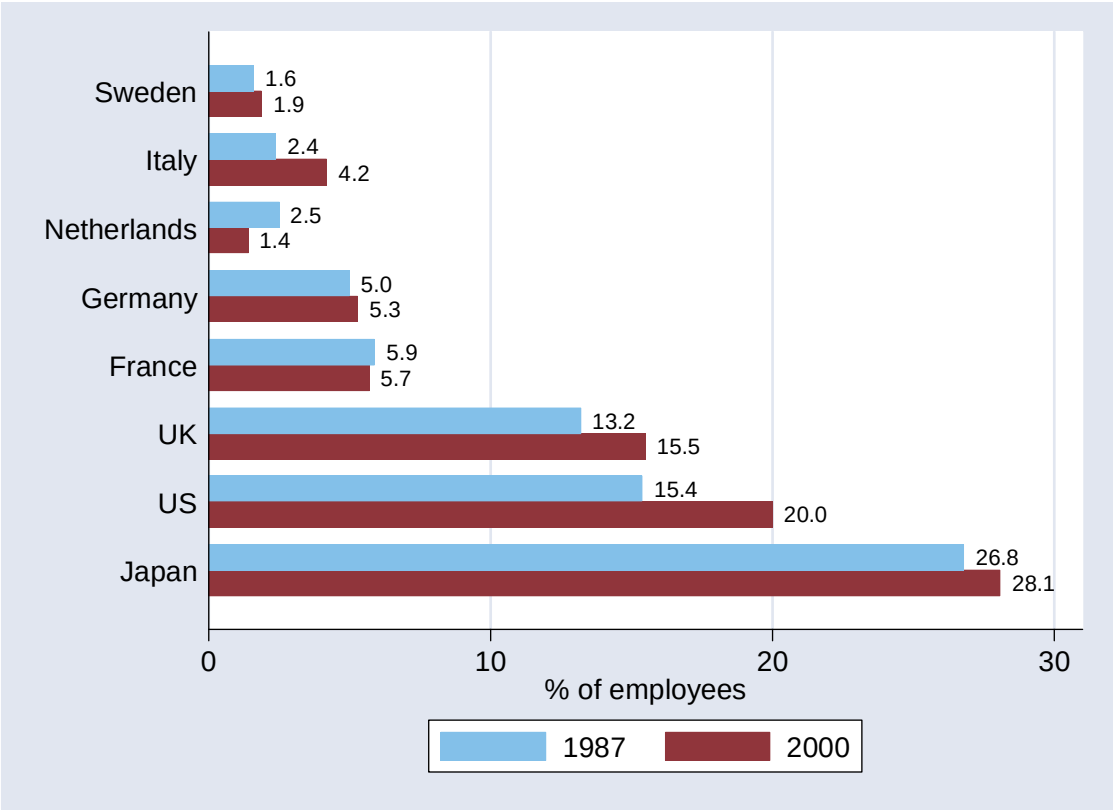
Figure 1: Changes in the Female Employment Status before and after Birth of First Child



Source: Report on the Thirteenth Japanese National Fertility Survey, National Institute of Population and Social Security Research

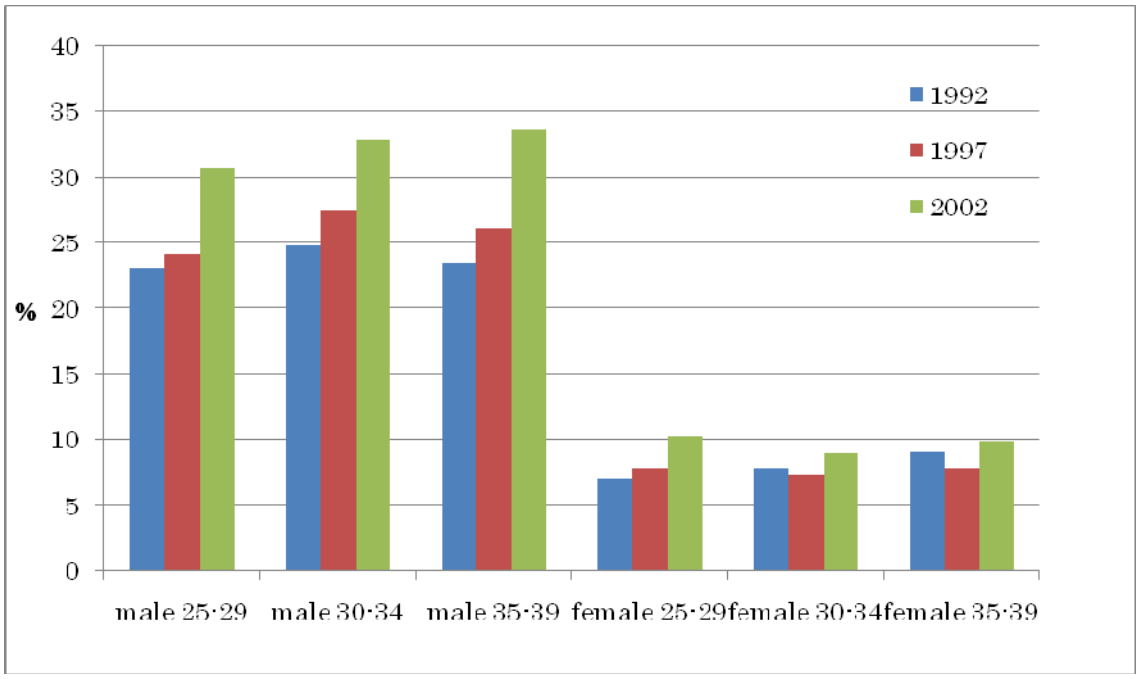
Figure 2: Excessive Working Hours Trends: International Comparison



Note: Department employees in non-agricultural sectors. Excessive hours defined as 50 hours and more per week, except the US and Japan (49 hours or more). For the US, 1979 and 1998 data are used. For Japan, 1993 data is used instead of 1987 data. US data are not strictly comparable due to changes in survey methods.

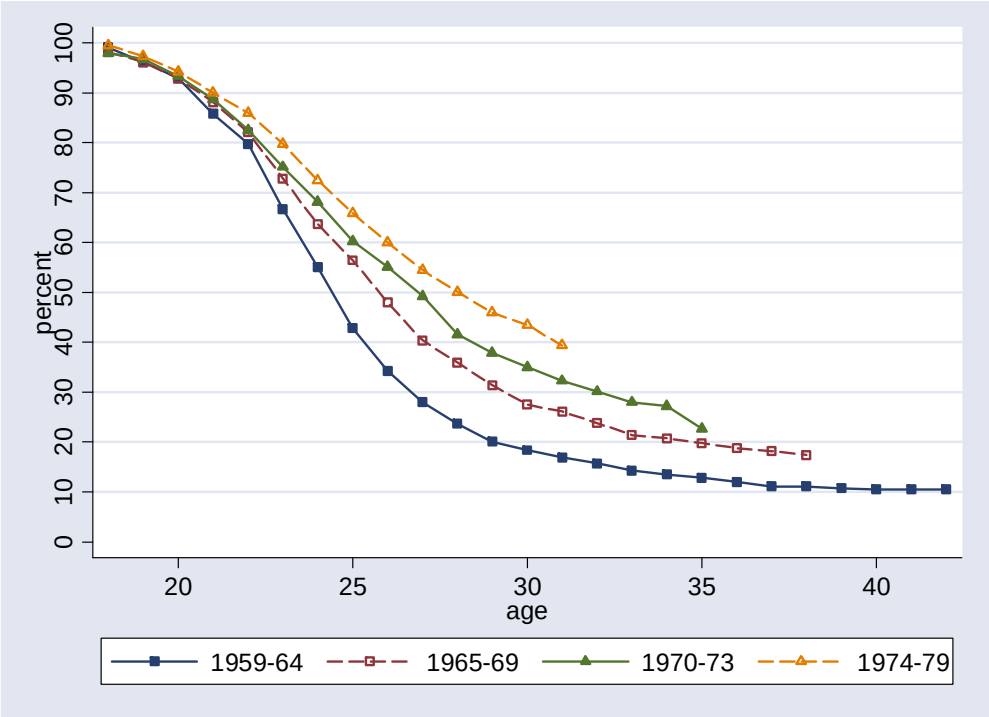
Source: Jon C. Messenger: *Working Time and Worker's Preferences in Industrialized Countries,* except for Japan (Labour Force Survey data).

Figure 3: Percentage of Full-Time Workers Working Longer than 60 Hours per Week



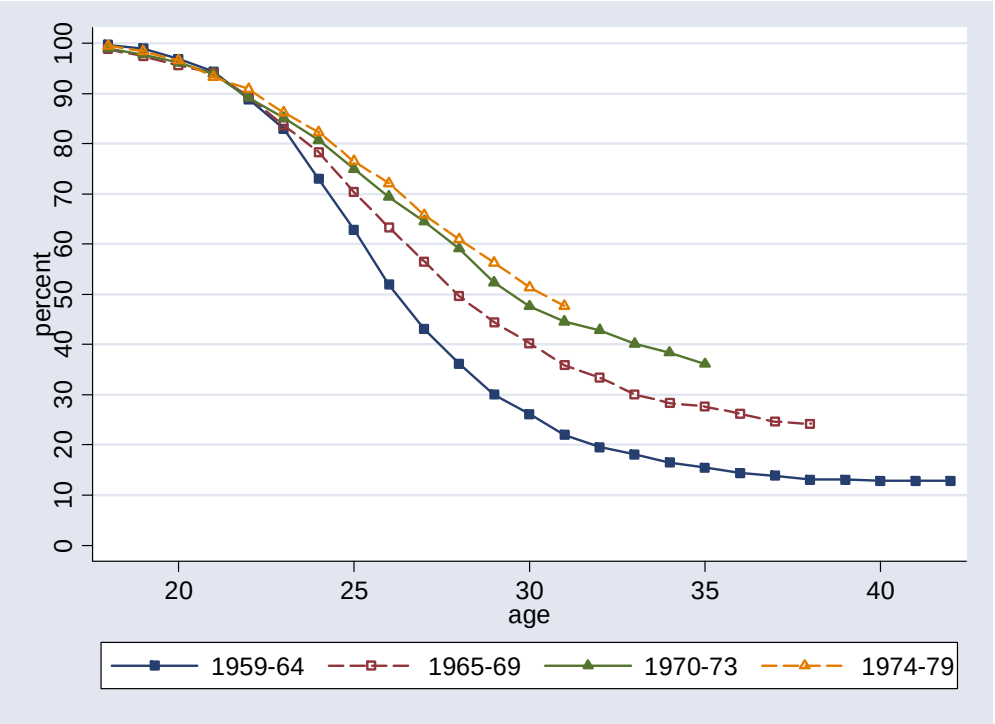
Notes: Shares are out of workers working more than 250 days per year.
Source: Employment Status Survey, Management Coordination Agency.

Figure 4: Percentage of Women Who Have Never Married for Four Birth Cohorts



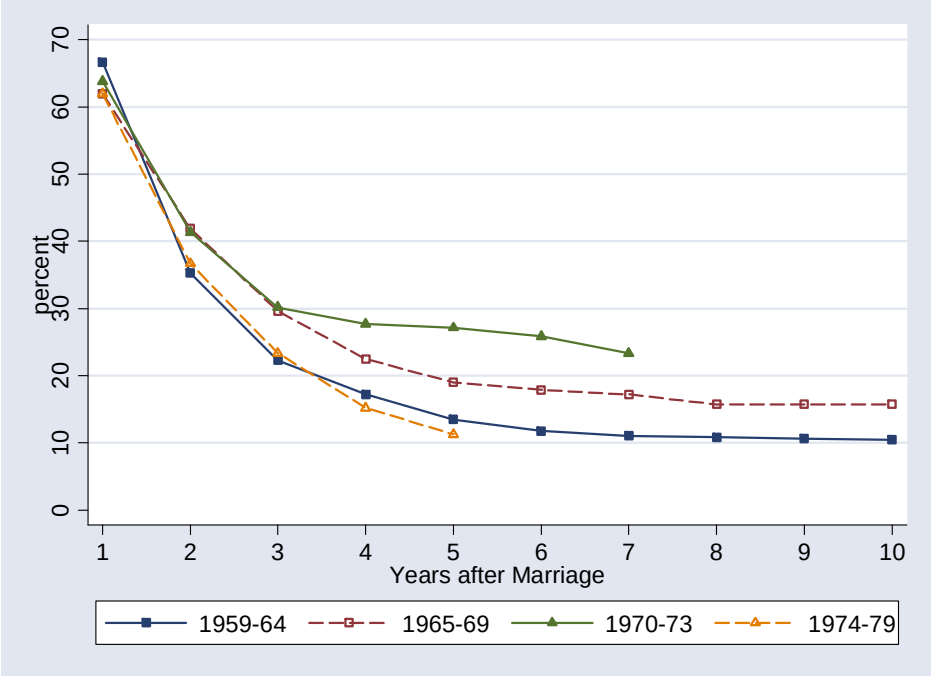
Source: Japanese Panel Survey of Consumers, Cohorts A-C.

Figure 5: Percentage of Women Who Never Had a Child for Four Birth Cohorts



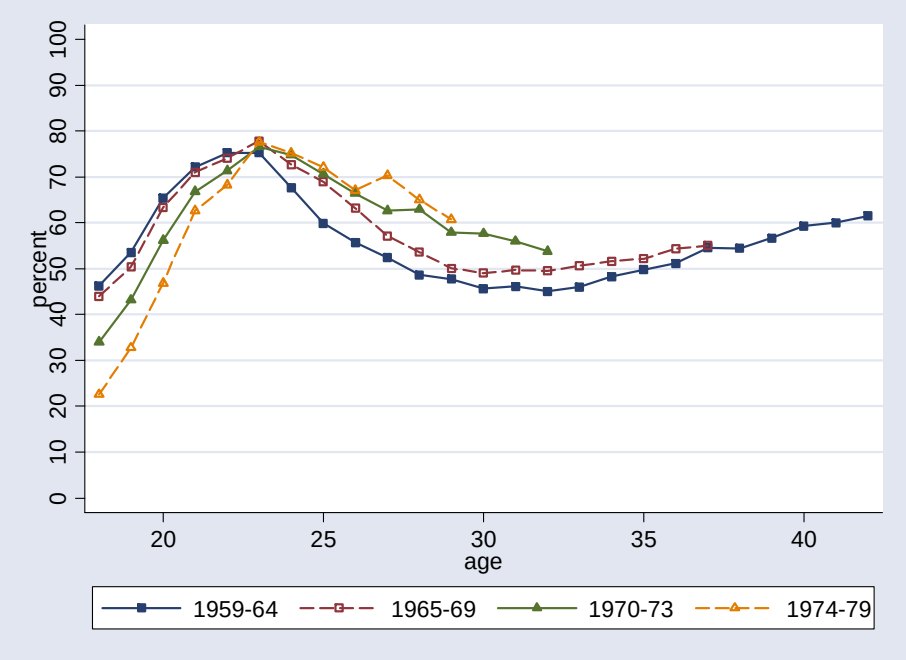
Source: Japanese Panel Survey of Consumers, Cohorts A-C.

Figure 6: Percentage of Women Who Never Had a Child by Years After Marriage for Four Birth Cohorts



Source: Japanese Panel Survey of Consumers, Cohorts A-C.

Figure 7: Percentage of Employed Women for Four Birth Cohorts



Source: Japanese Panel Survey of Consumers, Cohorts A-C.

Table 1: Average Weekly Housework Time for wifes and husbands

(a) Whole sample

# of children		Total		Wife is a Full-Time worker		Wife is a Part-Time worker		Wife has no Job	
		Wife	Husband	Wife	Husband	Wife	Husband	Wife	Husband
0	Mean	25.27	2.74	18.19	3.34	21.94	1.96	35.94	2.96
	Std.Dev.	16.28	5.13	8.85	5.19	12.30	4.12	19.98	5.87
	N	1,156	1,167	378	376	402	401	376	390
1	Mean	56.63	9.42	39.39	11.39	37.90	7.25	67.48	9.73
	Std.Dev.	27.22	9.58	22.80	12.03	17.41	7.97	25.19	9.33
	N	2,532	2,560	378	375	561	561	1,587	1,619
2	Mean	52.09	8.17	33.66	8.33	39.76	6.65	66.18	9.04
	Std.Dev.	26.00	9.74	16.72	10.24	17.01	9.13	25.37	9.82
	N	5,047	5,054	885	870	1,593	1,573	2,562	2,603

(b) Those whose husband works 60 hours and longer in a week only

# of children		Total		Wife is a Full-Time worker		Wife is a Part-Time worker		Wife has no Job	
		Wife	Husband	Wife	Husband	Wife	Husband	Wife	Husband
0	Mean	23.58	1.97	18.00	2.43	21.98	1.61	32.73	1.75
	Std.Dev.	14.39	3.98	8.93	4.65	11.85	2.91	32.73	4.02
	N	292	291	112	111	95	93	85	87
1	Mean	59.61	7.73	38.75	6.29	39.19	6.51	70.21	8.37
	Std.Dev.	28.59	8.22	23.74	7.74	19.13	7.32	26.12	8.51
	N	684	692	88	86	143	142	452	464
2	Mean	54.60	7.10	31.35	5.61	39.43	5.96	68.44	8.06
	Std.Dev.	27.82	8.69	16.67	7.92	16.78	8.11	26.60	9.05
	N	1,291	1,289	189	186	372	364	728	737

Table 2: Parameter Estimates of the Hazard Model on The Timing of Marriage

	Case (1)			Case (2)		
	Coef.	Robust SE		Coef.	Robust SE	
wife weekly longer than 45hr	−0.2465	0.1035	**			
wife overtime				0.0304	0.1207	
wife full-time	0.0499	0.1643		−0.0488	0.1761	
wife part-time	−0.0354	0.1827		−0.0656	0.1868	
largefirm	−0.1077	0.1306		−0.1129	0.1317	
public	0.1534	0.1854		0.1573	0.1859	
childcare	0.1249	0.1174		0.1185	0.1197	
junior	0.0089	0.1185		−0.0015	0.1192	
univ	−0.1489	0.1306		−0.1759	0.1301	
living with parents	0.0914	0.1210		0.1047	0.1206	
HokkaidoTohoku	0.0786	0.1745		0.0760	0.1744	
Chubu	0.0674	0.1720		0.0659	0.1735	
Kinki	−0.0477	0.1608		−0.0479	0.1612	
Chugoku	0.3125	0.2167		0.3299	0.2138	
Shikoku	0.0539	0.2449		0.0651	0.2453	
Kyushu	−0.2600	0.1917		−0.2681	0.1909	
living in small-medium cities	0.2000	0.1162	*	0.2008	0.1160	*
living in villages	0.2943	0.1640	*	0.2809	0.1643	*
unemploment rate	0.0869	0.0969		0.0897	0.0971	
Birth 1965-69	0.8280	0.1836	***	0.8246	0.1834	***
Birth 1970-73	0.5387	0.2213	**	0.5282	0.2218	**
Birth 1974-79	−0.1276	0.3193		−0.1445	0.3202	
Number of Observations	5947			5947		
Number of Subjects	1302			1302		
Wald chi2	69.31			63.96		
Log Likelihood	−2839.3			−2842.5		

Note:

*,**,*** shows statistically significant at the 10% level, the 5% level and the 1% level respectively. Cox's proportional hazard model is employed. The sample is restricted to women without spouse. Number of subjects refer to the number of females in the sample. Number of observations refer to the total number of duration samples when each person's duration data is split into yearly data. Hence, for instance, when one's duration observation lasts for three years, it is counted as three "observations". Table A-1 shows the details for the definition of each explanatory variables.

Table 3: Parameter Estimates of the Hazard Model on The Timing of Birth

	Model 1			Model 2		
	Coef.	Robust SE		Coef.	Robust SE	
wife weekly longer than 45hr	0.0801	0.1716				
wife overtime				−0.1087	0.1523	
husband overtime	−0.0858	0.1009		−0.0821	0.1009	
husband's housework hrs	0.0005	0.0048		0.0004	0.0048	
wife full-time	−0.0270	0.1687		0.0412	0.1714	
wife part-time	−0.3971	0.1396	***	−0.3801	0.1416	***
childcare	0.2412	0.1617		0.2668	0.1605	*
largefirm	−0.4494	0.2041	**	−0.4347	0.2039	**
public	−0.0595	0.1992		−0.0474	0.1988	
junior	0.0473	0.1053		0.0439	0.1054	
univ	0.2720	0.1247	**	0.2716	0.1245	*
intent of birth	0.1153	0.0902		0.1126	0.0899	
husband's income	−0.0129	0.0227		−0.0127	0.0227	
living with parents	0.1997	0.1199	*	0.1986	0.1199	*
living near parents	−0.1024	0.1038		−0.1014	0.1038	
has one child	−0.0384	0.4925		−0.0394	0.4921	
has two child	−3.6636	0.4686	***	−3.6582	0.4686	***
age at the start of risk	−0.1015	0.0238	***	−0.1015	0.0237	***
HokkaidoTohoku	0.2476	0.1456	*	0.2456	0.1458	*
Chubu	0.0748	0.1362		0.0745	0.1365	
Kinki	0.1135	0.1379		0.1086	0.1384	
Chugoku	−0.0933	0.2319		−0.0885	0.2312	
Shikoku	0.3478	0.2578		0.3612	0.2569	
Kyushu	0.0220	0.1532		0.0177	0.1534	
living in small-medium cities	0.0241	0.1030		0.0247	0.1033	
living in villages	0.2505	0.1385	*	0.2559	0.1382	*
unemploment rate	−0.0175	0.0713		−0.0157	0.0713	
Birth 1965-69	−0.0398	0.1653		−0.0432	0.1653	
Birth 1970-73	−0.0513	0.2380		−0.0481	0.2375	
Birth 1974-79	−0.0688	0.3007		−0.0666	0.3001	
Number of Observations	7104			7104		
Number of Subjects	1386			1386		
Wald chi2	784.33			784.83		
Log Likelihood	−2955.1			−2955		

Note:

*,**,*** shows statistically significant at the 10% level, the 5% level and the 1% level respectively. Cox's proportional hazard model is employed. Number of subjects refer to the number of households in the sample. Number of observations refer to the

Table 4: Parameter Estimates of the Hazard Model on The Timing of Birth

	Model 1			Model 2		
	Coef.	Robust SE		Coef.	Robust SE	
wife weekly longer than 45hr	0.0015	0.2178				
＊one child	0.4923	0.3139				
＊two child	−0.5601	0.5139				
wife overtime				−0.4444	0.2016	**
＊one child				0.5079	0.2703	*
＊two child				0.7639	0.3081	**
husband overtime	0.2160	0.1855		0.2464	0.1846	
＊one child	−0.5927	0.2414	**	−0.6204	0.2412	**
＊two child	−0.0630	0.2711		−0.0848	0.2712	
husband's housework hrs	−0.0049	0.0148		−0.0036	0.0151	
＊one child	0.0071	0.0161		0.0055	0.0164	
＊two child	0.0008	0.0173		−0.0016	0.0176	
wife full-time	−0.0277	0.1685		0.0389	0.1707	
wife part-time	−0.4189	0.1409	***	−0.4369	0.1451	***
childcare	0.2249	0.1636		0.2589	0.1605	
largefirm	−0.4496	0.2071	**	−0.4091	0.2033	**
public	−0.0007	0.1981		−0.0520	0.1975	
junior	0.0685	0.1053		0.0639	0.1056	
univ	0.2929	0.1253	**	0.2802	0.1247	**
intent of birth	0.1035	0.0910		0.1001	0.0903	
husband's income	0.0086	0.0203		0.0054	0.0224	
＊one child	−0.0198	0.0367		−0.0173	0.0378	
＊two child	−0.1148	0.0542	**	−0.1055	0.0544	*
living with parents	0.1997	0.1199	*	0.1813	0.1206	
living near parents	−0.1005	0.1042		−0.1031	0.1041	
has one child	0.0027	0.5355		0.0711	0.5572	
has two child	−3.1594	0.5464	***	−3.2297	0.5645	***
age at the start of risk	−0.0976	0.0240	***	−0.0974	0.0239	***
HokkaidoTohoku	0.2095	0.1470		0.2090	0.1466	
Chubu	0.0650	0.1359		0.0652	0.1364	
Kinki	0.0888	0.1396		0.0828	0.1392	
Chugoku	−0.1150	0.2308		−0.1107	0.2310	
Shikoku	0.2464	0.2711		0.2690	0.2633	
Kyushu	−0.0153	0.1535		−0.0300	0.1546	
living in small-medium cities	0.0128	0.1035		0.0220	0.1041	
living in villages	0.2222	0.1395		0.2329	0.1383	*
unemploment rate	−0.0098	0.0717		−0.0085	0.0720	
Birth 1965-69	−0.0352	0.1657		−0.0224	0.1661	
Birth 1970-73	−0.0428	0.2385		−0.0327	0.2385	
Birth 1974-79	−0.0866	0.3021		−0.0546	0.3025	
Number of Observations	7104			7104		
Number of Subjects	1386			1386		
Wald chi2	770.64			792.62		
Log Likelihood	−2946.5			−2945.4		

Note:
The same note applies as in Table 3.

Table 5: Parameter Estimates of the Hazard Model on The Timing of Birth

	Model 1			Model 2		
	Coef.	Robust SE		Coef.	Robust SE	
wife weekly longer than 45hr	0.0862	0.2235				
* one child	0.4102	0.3120				
* two child	−0.6527	0.5169				
wife overtime				−0.3808	0.2060	*
* one child				0.4440	0.2712	
* two child				0.6947	0.3152	**
husband overtime	0.2082	0.1849		0.2383	0.1849	
* one child	−0.5798	0.2409	**	−0.6096	0.2414	**
* two child	−0.0508	0.2710		−0.0741	0.2716	
husband's housework hrs	−0.0111	0.0150		−0.0063	0.0151	
* one child	0.0091	0.0158		0.0060	0.0161	
* two child	0.0045	0.0169		−0.0004	0.0172	
husband's housework hrs*wife full time	0.0186	0.0094	**	0.0119	0.0095	
husband's housework hrs*wife part time	−0.0070	0.0158		−0.0089	0.0160	
wife full-time	−0.1971	0.1944		−0.0684	0.1916	
wife part-time	−0.3859	0.1797	**	−0.3844	0.1841	**
childcare	0.2166	0.1651		0.2482	0.1625	
largefirm	−0.4412	0.2061	**	−0.4051	0.2025	**
public	−0.0267	0.1988		−0.0728	0.1993	
junior	0.0725	0.1050		0.0667	0.1055	
univ	0.3024	0.1250	**	0.2870	0.1246	**
intent of birth	0.1037	0.0908		0.0985	0.0902	
husband's income	0.0069	0.0208		0.0043	0.0227	
* one child	−0.0185	0.0370		−0.0163	0.0380	
* two child	−0.1157	0.0547	**	−0.1066	0.0547	*
living with parents	0.1931	0.1200		0.1769	0.1206	
living near parents	−0.0990	0.1039		−0.1028	0.1040	
has one child	−0.0088	0.5473		0.0777	0.5618	
has two child	−3.1981	0.5587	***	−3.2375	0.5692	***
age at the start of risk	−0.0994	0.0240	***	−0.0988	0.0239	***
HokkaidoTohoku	0.2130	0.1464		0.2129	0.1466	
Chubu	0.0801	0.1360		0.0757	0.1366	
Kinki	0.0987	0.1400		0.0886	0.1402	
Chugoku	−0.0860	0.2302		−0.0895	0.2309	
Shikoku	0.2242	0.2764		0.2602	0.2660	
Kyushu	−0.0031	0.1541		−0.0207	0.1549	
living in small-medium cities	0.0082	0.1037		0.0158	0.1043	
living in villages	0.2222	0.1396		0.2314	0.1384	*
unemploment rate	−0.0095	0.0716		−0.0076	0.0719	
Birth 1965-69	−0.0313	0.1661		−0.0213	0.1664	
Birth 1970-73	−0.0434	0.2382		−0.0354	0.2383	
Birth 1974-79	−0.0915	0.3022		−0.0618	0.3028	
Number of Observations	7104			7104		
Number of Subjects	1386			1386		
Wald chi2	762.25			781.64		
Log Likelihood	−2944.4			−2944.3		

Note:
The same note applies as in Table 3.

Table A-1: Definition of Variables and Sample Statistics

		Analysis on Marriage		Analysis on Birth	
Explanatory variables		Mean	Std. Dev	Mean	Std. Dev.
wife weekly longer than 45 hr		0.385	0.487	0.0845	0.2782
wife overtime	=1 if a woman/wife works overtime at least one hour on average	0.554	0.497	0.1886	0.3913
husband overtime	=1 if husband's weekly average hours of work is 60 hours or longer			0.2556	0.4362
husband's housework hrs				7.6298	9.1306
wife full-tme	=1 if a woman/wife is a regular worker	0.644	0.479	0.1837	0.3873
wife part-time	=1 if a woman/wife is a non regular worker	0.216	0.411	0.2602	0.4388
childcare	=1 if a wife works at a firm with child care leave provision	0.366	0.482	0.1711	0.3766
largefirm	=1 if a firm woman/wife works employs more than 500 people	0.230	0.421	0.0782	0.2685
public	=1 if a woman/wife works public agency.	0.081	0.272	0.0641	0.245
junior	=1 if female educational attainment is junior college	0.247	0.431	0.2253	0.4178
univ	=1 if female educational attainment is university	0.241	0.428	0.1271	0.3331
intent of birth	=1 if a wife has a strong intention of child bearing			0.2823	0.4502
husband's income	Husband's annual income (million yen)			5.3332	2.5392
living with parents	=1 if living with their parents.	0.728	0.445	0.2041	0.4031
living near parents	=1 if living near the place parents live			0.2863	0.4521
age at the start of risk				28.392	3.3785
HokkaidoTohoku	=1 if residential area is Hokkaido or Tohoku	0.106	0.307	0.1039	0.3051
Chubu	=1 if residential area is Chubu	0.170	0.376	0.2009	0.4007
Kinki	=1 if residential area is Kinki	0.174	0.379	0.1592	0.3659
Chugoku	=1 if residential area is Chugoku	0.045	0.208	0.065	0.2466
Shikoku	=1 if residential area is Shikoku	0.033	0.179	0.0279	0.1646
Kyushu	=1 if residential area is Kyushu	0.109	0.312	0.0959	0.2944
living in small-medium cities		0.558	0.497	0.6014	0.4896
living in villages		0.128	0.334	0.1652	0.3714
unemployment rate	Unemployment Rate of each region	4.100	1.258	4.1196	1.1579
Birth 1965-69	=1 if woman/wife born at 1965-69	0.337	0.473	0.3601	0.4801
Birth 1970-73	=1 if woman/wife born at 1970-73	0.236	0.424	0.1441	0.3512
Birth 1974-79	=1 if woman/wife born at 1974-79	0.244	0.430	0.0601	0.2377
Number of Observations		5947		7107	

Note:
One-year-lagged explanatory variables are used in the analysis of marriage, and two-year-lagged explantory variables are used in the analysis of birth.