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Marriage, Fertility, and Female Labor Force Participation in an Aging Economy *

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Abstract

Japan faces a dual demographic challenge: persistently low fertility and underutilization of female labor. This paper develops a quantitative life-cycle model with heterogeneous agents to study how the spousal tax system and the social norm of unequal gender division of childcare jointly shape marriage, fertility, and women's labor supply decisions. The model incorporates endogenous marriage, fertility, and female labor participation choices, calibrated to Japanese data, and evaluates a series of counterfactual policy experiments. We find that the spousal tax treatment is a key disincentive to women's labor market participation. Eliminating tax benefits and deductions increases female labor supply but reduces marriage and fertility. Childcare subsidies partly offset these effects by raising household resources and encouraging women's market participation, though their effectiveness is limited in the presence of restrictive social norms. Once the childcare norm is relaxed, however, subsidies become more effective: they simultaneously raise fertility, stabilize marriage, and boost women's labor supply across all life stages. These findings suggest that achieving both higher fertility and higher female labor force participation in Japan requires a dual strategy: financial support for childrearing and broader institutional and cultural reforms.

Keywords: Marriage; Fertility; Female Labor Supply; Japan
JEL classification: F31, D84, D82

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1 Introduction

Japan's total fertility rate (TFR) has declined steadily over the past several decades, falling far below the replacement level. Combined with one of the world's highest life expectancies, this demographic shift has made Japan one of the most rapidly aging societies. The resulting population decline and labor shortage pose major macroeconomic and fiscal challenges.

Despite high educational attainment, among Japanese adults aged 25–34, 69% of women and 62% of men have completed tertiary education, compared with the OECD average of 54%, female labor supply remains low relative to potential. Previous studies, including Doepke et al. (2023), Yokoyama (2018), and Kitao and Mikoshiba (2022), have pointed to the combined influence of traditional gender norms and institutional features of the tax system on women's economic behavior. However, the relative importance and interaction of these factors in the Japanese context remain insufficiently quantified.

The unequal gender division of childcare is deeply rooted in Japan's cultural and institutional history, shaped by Confucian ideals and the traditional *ie* family system (Sugimoto, 2020). These norms assign men the role of primary breadwinners and women the responsibility for household and childcare duties. Consequently, Japanese women often face a strong trade-off between career advancement and family formation (Bertrand et al., 2016; Kim et al., 2024; Myong et al., 2021). The tax system further reinforces this imbalance: the spousal tax deduction grants households a tax advantage when the secondary earner's income falls below a fixed threshold, thereby discouraging full-time employment and sustaining the prevalence of part-time or marginal work among married women (Akabayashi, 2006; Yamada, 2011; Kitao and Mikoshiba, 2022).

In parallel with declining fertility, Japan has also experienced a substantial fall in marriage rates. The share of never-married individuals has risen across cohorts. Unlike many OECD countries, however, Japan maintains a strong institutional and social link between marriage and childbearing: the share of births occurring outside marriage remains extremely low. As a result, decisions about marriage and fertility are tightly coupled in Japan, and models of fertility behavior that abstract from family formation risk misrepresenting the relevant trade-offs. In particular, understanding female labor supply requires jointly considering the marriage margin, the very limited prevalence of non-marital fertility, and the interaction of childcare responsibilities and household income taxation within marriage.

This paper develops a structural life-cycle model to quantify how the social norm of unequal childcare division and the spousal tax deduction jointly shape marriage, fertility, and female labor supply decisions in Japan. The model features heterogeneous agents with endogenous family formation and policy-relevant aspects of the Japanese tax system. It is calibrated to match key moments of the cohort aged 49–60 in 2020 and is used to conduct counterfactual

experiments and policy simulations.

Our results show that the persistence of unequal childcare norms reduces marriage, fertility, and women's labor supply. The spousal tax deduction, while encouraging marriage and fertility, suppresses female full-time employment. Abolishing the deduction increases female labor supply but leads to lower marriage and fertility rates. Moreover, childcare subsidies are effective in simultaneously increasing fertility and women's labor supply only when the unfavorable childcare norm is weakened or eliminated.

While this study focuses on the social norm governing the gender division of childcare, other cultural norms may also shape family and labor outcomes. For example, expectations regarding the "ideal" number of children, attitudes toward working mothers, or norms about female full-time employment can all influence fertility and labor supply decisions (Myong et al., 2021; Kim et al., 2024). These aspects are not explicitly modeled here, and thus our quantitative results should be interpreted as capturing the dominant mechanism among several interrelated social norms. Nonetheless, focusing on the childcare norm is empirically well grounded. In Japan, the average desired number of children declined to about two by the 1960s and has since remained relatively stable, suggesting that fertility preferences are already low and less likely to explain the continuing decline in female labor supply. By contrast, survey and time-use evidence indicates that unequal childcare responsibilities remain one of the strongest constraints on married women's employment (Kitao and Mikoshiba, 2022). Another limitation of our analysis is that social norms are exogenously given in the model. In reality, social norms may evolve gradually through intergenerational transmission, peer effects, and policy interventions that alter the perceived costs of norm-conforming behavior (Bertrand et al., 2016). Policies that reduce the childcare burden on women, such as expanding paternal leave or promoting gender-neutral caregiving, may therefore play a role in both shifting social attitudes and improving labor market outcomes.

This study contributes to three strands of literature. First, it adds to the literature on social norms and family decisions (Doepke et al., 2023; Fernandez and Sevilla-Sanz, 2006; Bertrand et al., 2016; Myong et al., 2021; Kim et al., 2024; Hsu and Le, 2024) by quantifying how gender-based childcare norms interact with fiscal institutions to shape marriage, fertility, and labor outcomes. As a complement to this literature, this study provides a structural, policy-focused analysis centered on Japan—a uniquely aging society where traditional gender norms regarding childcare and household roles remain particularly strong.

Second, it extends the literature on taxation and female labor supply (Yokoyama, 2018; Abe and Oishi, 2009; Kitao and Mikoshiba, 2022; Akabayashi, 2006; Yamada, 2011) by jointly examining the role of tax incentives and social norms within a unified life-cycle framework. This study provides a quantitative assessment of how fiscal policies—such as the spousal deduction and childcare subsidies—affect marriage, fertility, and women's labor supply through

interrelated behavioral channels.

Finally, it contributes to the broader literature on the economics of fertility and marriage (Becker, 1960, 1973, 1974; Francesconi, 2002; Baudin et al., 2015; Gobbi, 2018; Kitao and Nakakuni, 2023) by embedding endogenous family formation, fertility, and female labor supply choices into a dynamic structural model. This framework enables systematic evaluation of how cultural and policy factors jointly influence family behavior and demographic outcomes over the life cycle.

The remainder of the paper proceeds as follows. Section 2 provides background on Japanese family policies and societal norms. Section 3 presents the model. Section 4 discusses calibration. Section 5 reports counterfactual and policy simulation results. Section 6 concludes.

2 Gender Norms, Demographic Change, and Family Policy in Japan

2.1 Gender Norms: Confucianism and the *ie* System

In East Asia, Confucianism has long elevated ideals of hierarchy, filial duty, and social order. Embedded within these doctrines was a gendered division of roles: men occupied the public sphere of work and governance, while women were expected to manage the household. Canonical precepts such as the "three obediences," and texts like *Onna Daigaku* ("Greater Learning for Women"), codified this arrangement and provided a normative template for gender relations (Lee, 2005; Sugano, 2007).

In Japan, Confucian gender ideology was reinforced institutionally through the patriarchal and patrilineal *ie* family system. The *ie* concentrated legal and economic authority in the male household head (typically the eldest son), while women were assigned primary responsibility for domestic labor and childrearing (Ueno, 1987). Although the post-war legal reforms abolished the formal *ie*, its social logic persisted: marriage and fertility were organized around the male breadwinner model, and women's primary identity continued to be defined through caregiving and household management.

These historical legacies help explain the resilience of gendered divisions of labor in contemporary Japan. Even as educational attainment increased and labor markets modernized, core expectations about childcare and domestic work remained highly gendered, shaping modern patterns of marriage, fertility, and female employment.

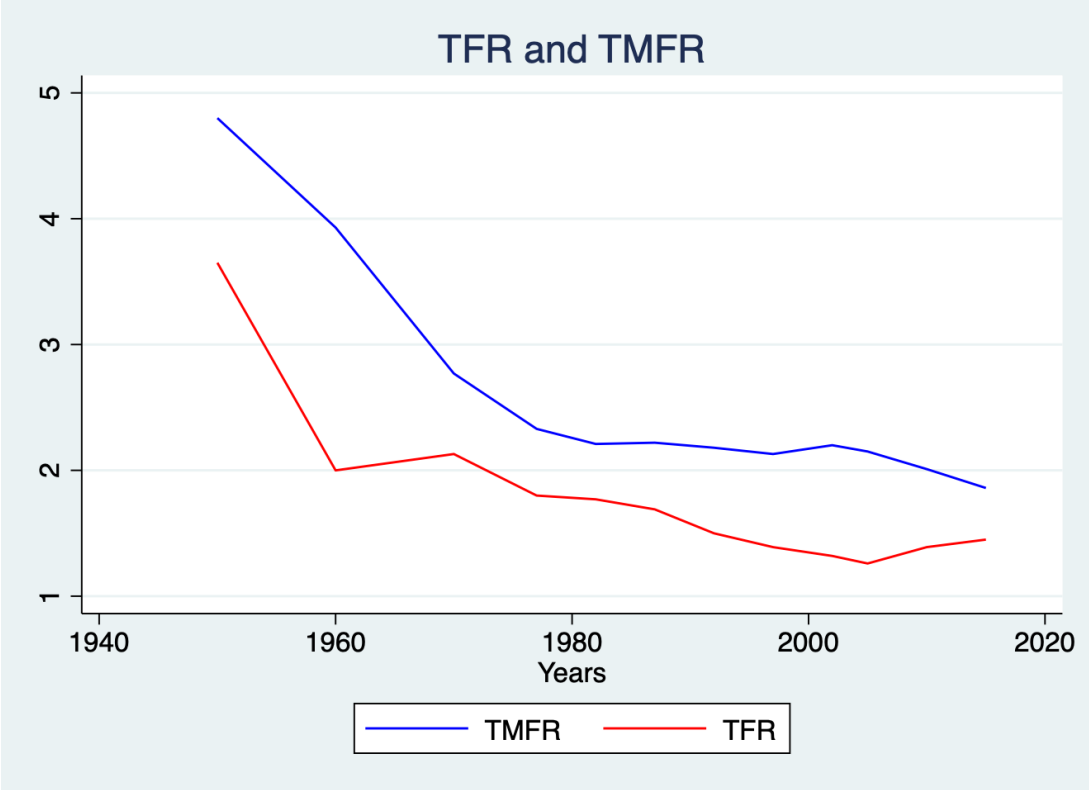

Figure 1: Total Fertility Rate (TFR) and Total Marital Fertility Rate (TMFR) in Japan

2.2 Demographic Changes and Modern Views on Women's Roles

Japan's total fertility rate (TFR) has been declining for several decades and has fallen far below the replacement level. The TFR was 2.37 in 1955 and 2.00 in 1960. In 1989 it fell to 1.57, triggering the so-called "1.57 shock," and continued to decrease thereafter, reaching 1.36 in 2000 and 1.26 in 2005—the lowest level in modern history. Although the TFR rose modestly to 1.39 in 2010 and 1.45 in 2015, it remained below the government's target of 1.8 set under Abenomics, and fell further to 1.33 in 2020.

A related pattern can be seen in the total marital fertility rate (TMFR). Figure 1 plots both TFR and TMFR over time. While TFR declined continuously between 1980 and 2000, TMFR remained relatively stable during this period, implying that falling marriage rates were the primary driver of declining fertility. Figure 2 illustrates this trend: the share of married individuals aged 40–44 and 45–49 decreased sharply from above 90% in 1980 to under 65% in 2020.

These demographic shifts have important implications for the labor market. In the context of population decline and tightening labor supply, women's labor force participation has become essential to sustaining economic activity. Yet Japanese women continue to face difficulties balancing paid work and domestic responsibilities. Female labor force participation follows an

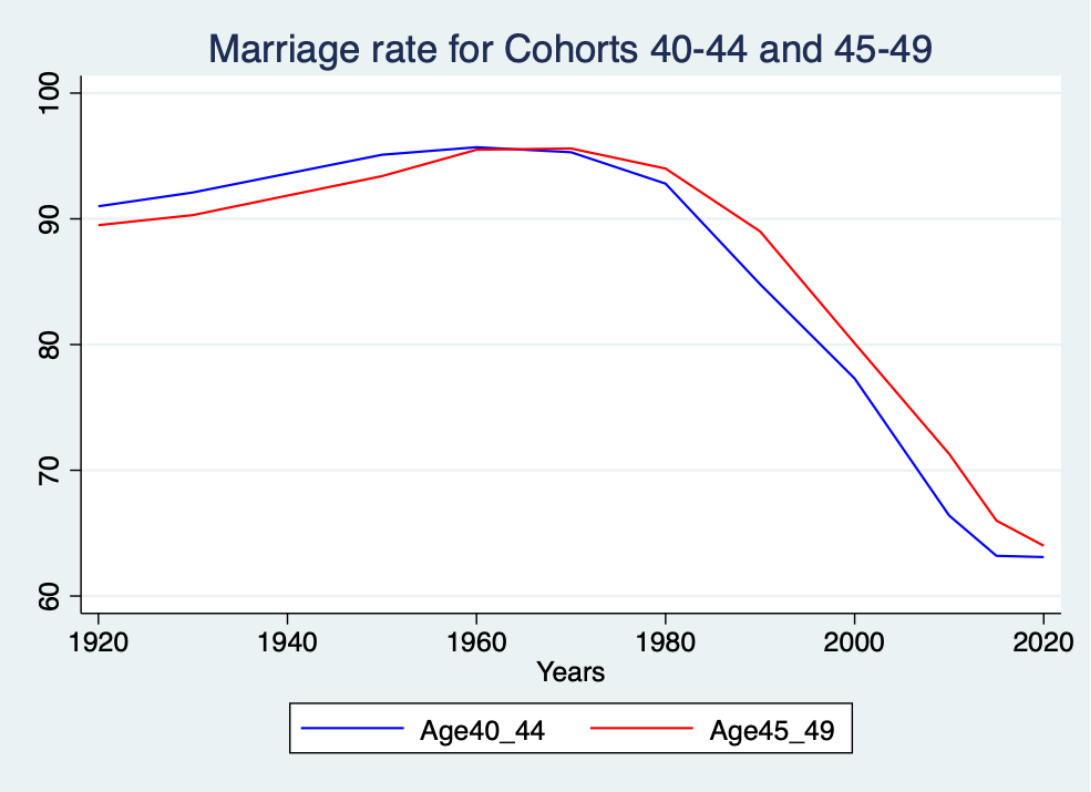

Figure 2: Marriage Rates of Cohorts 40–44 and 45–49 in Japan

"M-shaped" pattern: it is relatively high in the mid-twenties, drops sharply during the childrearing years in the early thirties, and rises again in the late forties before declining later in life. This contrasts with the inverted U-shape observed in most other advanced economies (Sugimoto (2020)).

Since the 1980s, the Japanese government has implemented a series of legal and policy reforms aimed at reducing barriers to women's participation in the labor market. The 1986 Equal Employment Opportunity Law (EEOL) mandated equal treatment of men and women in recruitment, placement, and promotion. The Childcare Leave Law of 1992 granted either parent the right to one year of unpaid childcare leave with job protection, with the goal of facilitating continued employment for mothers and encouraging fathers to share childcare responsibilities. In practice, however, uptake by fathers remains extremely low (only 0.33% in 2002[1]) and mothers continue to bear most childcare duties.

Further initiatives sought to expand childcare availability. The 2001 "Plan for Zero Waitlisted Children" introduced extended-hours childcare, weekend and overnight care, care for sick children, and after-school programs. In 2008, the "New Zero Waitlisted Children Plan" aimed to increase nursery capacity by more than one million places by 2017, and under the Abe

[1]Gender Equality Bureau, Cabinet Office Japan (2004), *White Paper on Gender Equality 2004*, Tokyo.

Table 1: Weekly Hours Spent on Domestic Work and Childcare (Ages 15+)

	2011				2016			
	Japan		United States		Japan		United States	
	Male	Female	Male	Female	Male	Female	Male	Female
Housework and related work	0.43	3.45	2.19	3.39	0.45	3.38	2.21	3.49
Childcare	0.05	0.24	0.14	0.32	0.06	0.26	0.16	0.32

Source: Survey on Time Use and Leisure Activities (Japan); American Time Use Survey (U.S.).

administration additional measures were introduced under the banner of "Childcare Support which Nurtures Dreams" (Yamaura (2020)). These efforts reflect ongoing attempts to reconcile traditional gender roles with rising demand for women's labor.

Notable progress has been made: female labor force participation has increased and childcare availability has expanded. However, traditional gender norms continue to exert strong influence within households and society at large. The persistence of these norms is central to understanding contemporary patterns in fertility, marriage, and women's labor supply, and will be examined in the following subsection.

2.3 Gendered Time Allocation in the Household

A central legacy of the traditional gender division of labor in Japan is the unequal allocation of childcare and domestic work within households. Despite substantial socioeconomic change, childcare responsibilities remain overwhelmingly concentrated on women. International comparisons highlight this imbalance. In 2011, Japanese women spent more than seven times as many weekly hours on domestic work as men. By 2016, this ratio had declined only slightly to six-to-one. In contrast, in the United States female domestic work time was 1.7 times that of men in 2011 and 1.8 times in 2016.

A similar pattern appears in childcare. In Japan in 2011, married women spent 8.3 times as many weekly hours on childcare as their husbands, and in 2016 they still spent seven times as many. In the United States, the corresponding female-to-male ratios were 1.93 in 2011 and 1.82 in 2016. Table **??** summarizes these comparisons.

Although Japanese women devote substantially more time to housework and childcare than women in other advanced economies, their average educational attainment is high. This implies that the opportunity cost of reducing labor market participation to meet childcare demands is correspondingly high, making the time cost of childrearing economically costly for households.

Further evidence from East Asia and OECD economies confirms that Japan's gender division of housework remains unusually pronounced. Myong et al. (2021) report that in Japan

Table 2: Weekly Hours Spent on Housework by Gender and Female Share of Total

	China		Japan		South Korea		Hong Kong		Taiwan		Developing Avg.	
Year	1991	2012	2001	2011	2004	2014	2002	2013	2004	2017	2000	2010
Women (hours)	26.2	25.4	25.6	25.6	24.6	24.3	23.1	18.9	16.7	17.2	33.0	32.5
Men (hours)	5.3	5.0	5.7	5.4	5.1	5.5	7.7	5.6	3.7	4.0	10.1	11.2
Female share	0.83	0.84	0.82	0.83	0.83	0.82	0.75	0.76	0.82	0.81	0.75	0.76
	United Kingdom		United States		Canada		Finland		Spain		Italy	
Year	2001	2015	2003	2015	2005	2016	2000	2010	2003	2010	2003	2014
Women (hours)	24.9	21.3	27.8	26.7	27.3	24.5	26.6	25.5	34.4	31.8	36.8	34.3
Men (hours)	13.7	11.7	16.6	16.5	16.8	16.1	16.8	17.6	11.3	14.5	12.3	14.1
Female share	0.65	0.64	0.63	0.62	0.62	0.60	0.61	0.59	0.75	0.69	0.75	0.71

Source: Myong et al. (2021).

in 2001 and 2011, women accounted for 82% and 83% of total household housework hours, respectively—substantially higher than the levels observed in the United States (63% in 2003 and 62% in 2015) and even higher than the developing-country average (75% in 2000 and 76% in 2010). Table 2 presents cross-country data on weekly hours spent on housework by gender and the female share of total household housework time.

2.4 Tax System for Family

In Japan, the tax system is built to subsidize the transitional type of family with the household head working and the spouse mainly taking care of the family. The special spousal tax treatment includes the spousal deduction and non-taxable spousal income, also know as the "Wall of 1.03 million yen" is the main distorting power of the tax system. In fact, the "Wall of 1.03 million yen" refers to an income ceiling that qualifies a household for an income tax deduction. The married taxpayer whose spouse earns less than 1.03 million yen gets 380,000 yen deducted from their taxable income. The spouse, usually the wife, does not need to pay income tax but is also eligible for medical insurance and pension. Many scholars argue that the Japanese tax system encourages women to stay at home or work part-time. Although giving incentives to women for childbearing is important, the tax system may play a significant role in guiding the choices of women in terms of labor force participation. Specifically, the 1.03 wall incentivizes women to stay at home or not work long hours, so as to keep their income below the threshold. It was estimated that 14 million women keep their income below the ceiling, which costs the government 600 billion yen[2]. This system also encourages employers to hire

[2]Bloomberg Business, Japan Working Women Face Tax Blow as their Numbers swell, April 4, 2014

women for low-paid jobs or pay them capped wages.

Based on these observations of the prevailing social norm and government tax policies, we develop a comprehensive life-cycle model starting from household formation: it uses random matching and incorporates endogenous marriage, fertility, female labor force participation decisions so as to evaluate the impact of the above social norm and tax system.

3 Model

The aim of the model is to capture the life-cycle features between age 25 and 60. Each model period represents 12 years and there are 3 periods. Agents are singles upon entry into the economy. They enter with heterogeneous characteristics: gender $\in \{m, f\}$ and education $\in \{s_l, s_h\}$, where m stands for male and f stands for female, while s_l stands for low education and s_h stands for high education. At the beginning of the first period, there is a round of matching where some agents are randomly matched with agents of the opposite gender. They either get married with the matched partner and form a household in period 1, or remain singles. However, at the beginning of the second period, there is another round of random matching, which is the last one. Agents who do not get married in period 2 remain singles until the end of their lives in the model. Therefore, the proportion of married individuals with a given education attainment in the economy is calculated at the end of period 2. The probability of being matched is κ_1, if both individuals are in low education, and is κ_2, if one of the individuals is highly-educated.

We assume that agents with a low education attainment have a higher probability of being matched than agents with a high education attainment. This assumption is based on the fact that highly educated individuals spend a longer time in school, so they are not ready for marriage at the same time with those who stopped their education earlier. If an agent is matched, they observe the characteristics of the potential partner as well as the value of randomly drawn match quality x and then, decide whether to marry by comparing the value of being married V and the value of being single V_{SG}. If both parties (male and female) agree to marry, they do so and sustain the marriage throughout their lives. Once agents get married, there is no possibility of getting divorced in the model. After the household formation, married agents make decisions jointly as a couple. The couple makes a joint decision about fertility and the wife's participation in the labor market. All the agents regardless of gender are endowed with one unit of time.

3.1 Household Problem

3.1.1 Benefits and Costs of marriage

A married couple gets benefits from marriage, but also incurs costs. The benefits consist of consumption sharing k and utility from children $v(N)$. Consumption sharing within the household refers to economies of scales generated by sharing the expenses of the couple. For example, a household does not have to buy two refrigerators like two singles living separately. A couple with a number of children N derives utility $v(N)$ from them. Regarding costs, married couples incur, childcare time costs, childcare monetary costs, education costs and a disutility for outsourcing childcare. The latter represent the social norm. In this model, h_c is the time cost per child and W_a education cost per child. Thus, the total time cost for N children is Nh_c and NW_a is the total education cost. The wife's unit of time can be used either for market work l_s or for childcare $1-l_s$; while the husband's unit of time if fully used for market work. The household can outsource childcare by paying w_c, the monetary cost of childcare. In this case, the household will incur another cost ω, which captures a disutility for not taking care of one's children by oneself. This disutility ω represents the social norm in our model.
There is an inverse relationship between age of the children a_c and the time required to take care of them h_c. Thus, the time cost of raising children decreases as children grow up (i.e when children's age a_c increases, h_c decreases). In the model, childhood lasts for two periods: a_c can take values 1 or 2.

3.1.2 Fertility and Female labor Supply Decision

In our model, the household is a decision unit. In other words, spouses do not make decisions individually. The couple makes a joint decision about fertility and the wife's participation in the labor market.
The planned number of children is denoted by $\hat{N} \in \{0,1,2,3\}$. Let $P_{f,a}$ denote the probability of a woman in age a successfully giving birth to a baby. This probability captures the decline in the probability of giving birth as a woman ages.
It is worth noting that fertility is stochastic. In other words, the planned number of children $\hat{N}$ may be different from the realized number. In fact, the realized number of children depends on the probability $P_{f,a}$. The realized number of children N follows the a binomial distribution with parameters ($\hat{N}$, $P_{f,a}$). The probability function is as follows: $P(N) = C_N^{\hat{N}}(P_{f,a})^N(1-P_{f,a})^{\hat{N}-N}$.
The married couple chooses simultaneously the number of children and the wife's labor force participation. Fertility decision is made at once, in the period when they get married.
Agents enter the economy with no experience, so their labor market experience in period 1

equals zero for both males and females ($E_1^m = E_1^f = 0$). Since men always work full-time, E_1^m is automatically incremented by 1 in the next period. Based on this law of motion, $E_1^m = 0$, $E_2^m = 1$ and $E_3^m = 2$. In contrast, women's labor force participation is endogenously determined in the model. Although they start with $E_1^f = 0$ in the first period, the value of E_a^f in the following periods is determined by the couples' choice regarding the wife's labor supply. So, in the second period E_2^f can be 0, 0.5 or 1, depending on the couple's labor choice for the wife in period 1. If she did not participate in the labor market in period 1, E_2^f is 0, if she worked part-time E_2^f is 0.5, and 1 in case she worked full-time. Finally, in the last period, a married woman's labor market experience is in the range $\{0, 0.5, 1, 1.5, 2\}$, which is the sum of her past labor market history.

In the model, wage is a function of age, education attainment and labor market experience. We estimate two wage functions for each education group of males, that is low education and high education. The functional form of the model is:

$$ln(w_m(a, s_i, E_a^m)) = \gamma_i + \eta_i E_a^m \tag{1}$$

In this equation, we use the subscript i for education level, which can be low or high. Specifically, l refers to the agents with a low education attainment, while h refers to the highly-educated group of agents. We then normalize by the first period wage of a low education male agent, which serves a reference for all the periods. A woman with a given education level and experience gets a proportion of the wage a man with similar characteristics would get. This proportion is determined by the woman to man wage ratio, labeled δ in our model. For a woman with characteristics (a, s_i, E_a^f), the wage function is as follows:

$$ln(w_f(a, s_i, E_a^f)) = \delta(\gamma_i + \eta_i E_a^f) \tag{2}$$

At the beginning of period 1, the problem is as follows:

$$\begin{aligned} V(a, s_m, E_a^m, s_f, E_a^f, x, a_c) = \max_{\hat{N}, ls} \sum_{N=0}^{\hat{N}} P(N) \Big[& U(\frac{c_h}{k}) + \\ & x + \nu(N) - \omega \max\{N h_c(a_c) - (1 - l_s), 0\} \\ & + \beta V(a+1, s_m, E_{a+1}^m, s_f, E_{a+1}^f, x, a_c + 1, N) \Big] \end{aligned} \tag{3}$$

s.t

$$c_h = \begin{cases} (1-\tau)\Big(w_m(a,s_m,E_a^m)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{if ls=1} \\ \Big(w_m(a,s_m,E_a^m)-\tau(w_m(a,s_m,E_a^m)-\lambda)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{Otherwise} \end{cases} \tag{4}$$

Where V denotes the value of marriage, which is the same for the man with (a,s_m,E_a^m) and the woman with (a,s_f,E_a^f) who are matched in age a with a match quality of x, with N children aged a_c. The husband uses his time endowment for market work since the model does not include leisure. As a result, the husband's labor supply is not part of the choice variables. In the model, it means the husband always works full-time. The couple's choice for the wife's labor supply l_s is discrete, that is no work, part-time work and full-time work which correspond to 0, 0.5 and 1 respectively. Thus, $1-l_s$ is allocated to childcare. If she works full-time, the couple must outsource childcare. Here, k is the household's consumption sharing factor and $\nu(N)$ is the utility from children. Married couples incur a disutility ω when they outsource childcare. This disutility represents the social norm in our model.

The husband's income and the wife's income are taxed at the rate τ if the wife works full-time. However, if she works part-time or does not work, the wife's income is not taxed and the husband's income is subjected to a deduction λ before the tax rate is applied. This captures the spousal deduction in the Japanese tax system. The household chooses simultaneously the planned number of children $\hat{N}$ and the wife's labor supply.

The law of motion of labor market experience is as follows:

$$E_{a+1}^m = E_a^m + 1; \;\; E_1^m = 0 \tag{5}$$

$$E_{a+1}^f = E_a^f + l_s; \;\; E_1^f = 0 \tag{6}$$

Married male and female agents start with the same experience since they entered the economy with no labor market experience.

Period 2

In the second period, there are two types of married couples: old married couples and newly married couples. The old married couples are those who got married in period 1 whereas newly married couples are couples that got married in period 2. These two types of couples have different maximization problems. In fact, the old married couples only make labor market participation decision for the wife while newly married couples make decision both about the wife's labor force participation and fertility.

Old married couples

Old married couples made their fertility decisions in the previous period. Thus, in period 2, they decide on the wife's labor supply to maximize the value function. The problem is reduced to:

$$V(a,s_m,E_a^m,s_f,E_a^f,x,a_c,N) = \max_{l_s}\Big[U(\frac{c_h}{k})+x+\nu(N)+ \beta V(a+1,s_m,E_{a+1}^m,s_f,E_{a+1}^f,x,a_c+1,N)\Big] \quad (7)$$

s.t

$$c_h = \begin{cases} (1-\tau)\Big(w_m(a,s_m,E_a^m)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{if ls=1} \\ \Big(w_m(a,s_m,E_a^m)-\tau(w_m(a,s_m,E_a^m)-\lambda)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{Otherwise} \end{cases} \quad (8)$$

$$E_2^m = E_0^m+1 = 0+1 = 1 \quad (9)$$

$$E_2^f = E_0^f+ls_1 = 0+ls_1 \quad with \quad ls=\{0,0.5,1\} \quad (10)$$

In period 2, for all men, $E_2^m = 1$, since men worked full-time in period 1. But for women, their E_2^f depends on the labor decisions their households made in the previous period. Consequently, E_2^f can take values $\{0,0.5,1\}$. If the woman did not work in period 1, $E_2^f = 0$, if she worked part-time, $E_2^f = 0.5$, and if she worked full-time $E_2^f = 1$. There is no social norm disutility in period 2. It applies only in the period when the couple gets married and the children are aged $a_c = 1$.

Newly married couples

Newly married couples choose simultaneously the number of children and the labor supply of the wife. The problem is similar to that of the married couple in period 1.
The maximization problem is:

$$V(a,s_m,E_a^m,s_f,E_a^f,x,a_c) = \max_{\hat{N},l_s}\sum_{N=0}^{\hat{N}} P(N)\Big[U\Big(\frac{c_h}{k}\Big)+x+\nu(N)-\omega\max\{Nh_c(a_c)-(1-l_s),0\} + \beta V\Big(a+1,s_m,E_{a+1}^m,s_f,E_{a+1}^f,x,a_c+1,N\Big)\Big] \quad (11)$$

s.t

$$c_h = \begin{cases} (1-\tau)\Big(w_m(a,s_m,E_a^m)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{if ls=1} \\ \Big(w_m(a,s_m,E_a^m)-\tau(w_m(a,s_m,E_a^m)-\lambda)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{Otherwise} \end{cases} \tag{12}$$

The law of motion of labor market experience is similar to the one used for old married couples. However, newly married couples are subjected to social norm in period 2 because it is the period when they get married and have children. In period 2, their children are aged $a_c = 1$ while children from old married couples are aged $a_c = 2$. Both husband and wife are taxed if the wife works full-time, but the wife is not taxed if she works part-time or does not work. In the latter case, the husband's income is taxed after subtracting a deduction λ.

Period 3

In the last period, the married couple makes decision about the wife's labor supply, which means that there is no longer fertility decision. The problem is as follows:

$$V(a_T,s_m,E_a^m,s_f,E_a^f,x,a_c,N) = \max_{l_s}\Big[U(\frac{c_h}{k})+x+\nu(N)-\Psi\Big] \tag{13}$$

s.t

$$c_h = \begin{cases} (1-\tau)\Big(w_m(a,s_m,E_a^m)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{if ls=1} \\ \Big(w_m(a,s_m,E_a^m)-\tau(w_m(a,s_m,E_a^m)-\lambda)+w_f(a,s_f,E_a^f)l_s\Big) & \\ -w_c max\{Nh_c(a_c)-(1-l_s),0\}-W_a(a_c)N & \text{Otherwise} \end{cases} \tag{14}$$

$$E_3^m = E_1^m + 1 = 1+1 = 2 \tag{15}$$

$$E_3^f = E_1^f + ls_2 = \{0, 0.5, 1, 1.5, 2\} \tag{16}$$

In period 3, for all men, $E_3^m = 2$, since men worked full-time in the past two periods. But for women, labor market experience depends on the labor decisions their household made in

periods 1 and 2. Consequently, E_3^f can take values $\{0, 0.5, 1, 1.5, 2\}$. Couples that had children in period 1 are not subject to education cost W_a in the last period since childhood lasts for 2 periods in the model. However, couples that delayed marriage and had children in period 2 are subject to education cost in period 3 because children are aged 2 ($a_c = 2$). The parameter Ψ is a disutility for working in period 3. This disutility helps keep period 3 labor force participation at reasonable levels in the model. In period 3, agents are approaching retirement and are at the stage of their lives where physical strength and productivity decline. They are less eager to make efforts than younger workers, Ψ captures this reality in the model.

Budget Constraint in case of "No Tax Benefits"

The process described above is used for the benchmark model and some experiments. One of the experiments we refer to as " No tax benefit ", will consist in taxing all women, whether they work part-time or full time. In this case, the part-time working wife's income will also be subjected to tax, leading to a different budget constraint. It can be combined with deduction, meaning that if the wife works part-time, her income is subjected to tax, but the household gets a deduction applied to the husband's income. When there is no deduction, the part-time working wife's income is subjected to tax, but the household does not get a deduction, meaning that $\lambda = 0$. In sum, the budget constraint in the case where all workers are subject to tax is given the following expression:

$$c_h = \begin{cases} (1-\tau)\Big(w_m(a, s_m, E_a^m) + w_f(a, s_f, E_a^f) l_s\Big) & \\ -w_c max\{N h_c(a_c) - (1-l_s), 0\} - W_a N & \text{if ls=1} \\ \Big(w_m(a, s_m, E_a^m) - \tau(w_m(a, s_m, E_a^m) - \lambda) + (1-\tau) w_f(a, s_f, E_a^f) l_s\Big) & \\ -w_c max\{N h_c(a_c) - (1-l_s), 0\} - W_a N & \text{Otherwise} \end{cases} \tag{17}$$

3.2 Single Agent Problem

Single agents work full-time and derive utility only from consumption. In the model, it means that singles use up the unit of time they are endowed with. As mentioned in the introduction, the share of births occurring outside marriage is extremely low in Japan. In our model, we simply assumes that singles cannot have children.

Period 1

For a single woman in age a with education level s_f and labor market experience E_a^f, the expected lifetime value is $V_{SF}(a, s_f, E_a^f)$. The subscript SF stands for single female and C_{SF}

denotes consumption. The first term $U(C_{SF})$ is utility from consumption and β is the discount factor. Here, P^M_{a+1} is the probability of being matched at age $a+1$, which is the same for all singles. Let $sh^{sm}_{a+1}(s_m)$ be the population share of s_m type single men among the total single males with age $a+1$. The parameter $\psi(x)$ is the distribution of the match quality x, and V is the value function of the married couple. The threshold for match quality from which an agent accepts marriage is denoted by $x^*(a, s_m, E^m_a, s_f, E^f_a)$

$$
\begin{aligned}
V_{SF}(a, s_f, E^f_a) &= U(C_{SF}) \\
&+ \beta \Bigg[P^M_{a+1} \sum_{s_m} sh^m_{a+1}(s_m) \int_{x^*(a+1, s_m, E^m_{a+1}, s_f, E^f_{a+1})}^{1} \psi(x) V\left(a+1, s_m, E^m_{a+1}, s_f, E^f_{a+1}, x, a_c+1\right) dx \\
&\quad + \left(1 - P^M_{a+1} + P^M_{a+1} \sum_{s_m} sh^m_{a+1}(s_m) \int_0^{x^*(a+1, s_m, E^m_{a+1}, s_f, E^f_{a+1})} \psi(x)\, dx\right) V_{SF}(a+1, s_f, E^f_{a+1}) \Bigg]
\end{aligned}
\tag{18}
$$

s.t.

$$
C_{SF} = (1-\tau)\, w_{SF}(a, s_f, E^f_a). \tag{19}
$$

Given the matched partner is an s_m male type, the woman will agree on marriage if the match quality is higher than $x^*(a+1, s_m, s_f, E^m_{a+1}, E^f_{a+1})$. Therefore, in this case, the probability of being a successful match is

$$
\int_{x*(a+1, s_m, s_f, E^m_{a+1}, E^f_{a+1})}^{1} \psi(x)\, dx
$$

where $\psi(x)$ is the distribution of x. In addition, $P^M_{a+1} sh^{sm}_{a+1}(s_m)(\int_{x*(a+1, s_m, s_f, E^m_{a+1}, E^f_{a+1})}^{1} \psi(x)\, dx)$ is the probability of being married with an s_m-type man in the next period. In this problem,

$$
1 - P^M_{a+1} + P^M_{a+1} \sum_{S_m} (sh^{sm}_{a+1}(s_m) \int_0^{x*(a+1, s_m, s_f, E^m_{a+1}, E^f_{a+1})} \psi(x)\, dx)
$$

is the probability of remaining single in the next period and the last item represents the probability of an unsuccessful match. Likewise, for a single man in age a with education attainment s_m and labor market experience E_m , the expected lifetime value given by:

$$V_{SM}(a,s_m,E_a^m) = U(C_{SM}) +$$
$$\beta \left[P_{a+1}^M \sum_{s_f} \left(sh_{a+1}^{s_f}(s_f) \left(\int_{x*(a+1,s_m,s_f,E_{a+1}^m,E_{a+1}^f)}^{1} \psi(x) V(a+1,s_m,E_{a+1}^m,s_f,E_{a+1}^f,x,a_c+1,N) \right) dx \right) + \right.$$
$$\left. \left(1 - P_{a+1}^M + P_{a+1}^M \sum_{s_f} \left(sh_{a+1}^{sf}(s_f) \int_0^{x^*(a+1,s_m,E_{a+1}^m,s_f,E_{a+1}^f)} \psi(x)\, dx \right) \right) V_{SM}(a+1,s_f,E_{a+1}^f) \right] \tag{20}$$

s.t

$$C_{SM} = (1-\tau)(w_{SM}(a,s_m,E_a^m)) \tag{21}$$

Period 2

The maximization problem is similar for both genders. We use the subscript g to denote gender. For an agent with gender g, the problem is as follows:

$$V_{SG}(a,s_g,E_a^g) = U(C_{SG}) + \beta V_{SG}(a+1,s_g,E_{a+1}^g) \tag{22}$$

s.t

$$C_{SG} = (1-\tau) w_{sg}(a,s_g,E_a^g) \tag{23}$$

In period 2, a single agent works full-time and derives utility from consumption. The discounted term $\beta V_{SG}(a+1,s_g,E_{a+1}^g)$ does not include the value of being married next period because there is no matching in the last period.

Period 3

Period 3 is the last period in the model. The maximization problem is as follows:

$$V_{SG}(a,s_g,E_a^g) = U(C_{SG}) \tag{24}$$

s.t

$$C_{SG} = (1-\tau)w_{sg}(a, s_g, E_a^g) \tag{25}$$

The single's problem in period 3 is straightforward. A single agent works full-time and derives utility from consumption.

3.3 Marriage Decision

Let ρ be an indicator function which equals 1 if the matched agent agrees to marry and zero otherwise. Then,

$$\rho = \begin{cases} 1 & if \quad V(a, s_m, E_a^m, s_f, E_a^f, x, a_c, N) \geq V_{SM}(a, s_m, E_a^m) \\ & and \quad V(a, s_m, E_a^m, s_f, E_a^f, x, a_c, N) \geq V_{SF}(a, s_f, E_a^f) \\ 0 & otherwise \end{cases} \tag{26}$$

This equation means that the matched male and female agents agree to marry only if the utility from marriage is higher than the one they would enjoy being singles. Based on this condition, we can infer that it exists a threshold for match quality, $x^*(a, s_m, E_a^m, s_f, E_a^f)$, such that $\rho(a, s_m, E_a^m, s_f, E_a^f, x) = 1$ if and only if $x \geq x^*(a, s_m, s_f, E_a^m, E_a^f)$.

4 Parameterization

We use a two-step strategy to determine the parameters in the model. In the first step, a group of parameters are obtained out of the model: some are estimated based on data and the others are borrowed from the literature. In the second step, the rest of parameters are calibrated to match the targeted moments by minimizing the average distance between model and data moments.

4.1 Parameters Determined Outside the Model

The labor income tax rate τ (including social security contributions) is set to 33%, corresponding to the average marginal tax rate over 2000–2007 reported by Gunji and Miyazaki (2011). This period aligns with the cohort entering adulthood around 2000 and captures the relevant tax burden for labor supply decisions.

Female–male wage ratios (δ) are taken from OECD statistics. Because the gender wage gap has narrowed over time, we assign period-specific ratios: 0.661 (2000), 0.713 (2010), and 0.775

(2020) for periods 1–3. Wage function parameters are estimated using the statistics from *Basic Survey on Wage Structure* in Japan, conducted by the Ministry of Health, Labour and Welfare (MHLW). We construct six empirical wage points across the life cycle (two per model period) and regress wages on potential labor market experience (see Appendix).

Utility over consumption and children follows CRRA forms:

$$U(c) = \frac{c^{1-\mu}}{1-\mu}, \qquad v(n) = \alpha\left(\frac{n^{1-\mu}}{1-\mu}\right),$$

with $\mu = 0.5$ following Seshadri and Roys (2014). The consumption sharing parameter k is set to 1.5 based on the OECD equivalence scale. Time discount factor β is computed from the formula $1/(1+r)$, where r is the average real interest rate from 2000 to 2020.

The externally calibrated parameters are summarized in Table 3.

Matching quality x is assumed to be uniformly distributed between an upper bound $\bar{x}_1$ and a lower bound $\bar{x}_2$, where $\bar{x}_1$ is normalized to 1 and $\bar{x}_2$ will be calibrated in the second step.

Table 3: Parameters determined outside of the model

Parameters	Description	Value	Source
μ	Risk aversion	0.5	Seshadri and Roys (2014)
k	Consumption sharing	1.5	OECD Equivalence Scale
β	Discount factor	$(0.95)^{12}$	Computed
γ_1	Constant for Low Education	7.3172	Estimated
η_1	Coefficient of Exp Low	0.18	Estimated
γ_2	Constant for High Education	7.4244	Estimated
η_2	Coefficient of Exp High	0.336	Estimated
$\delta(a)$	Female to male wage ratio	[0.661 0.713 0.775]	OECD Statistics
τ	Labor tax rate	0.33	Gunji and Miyazaki (2011)
$\lambda(a)$	Deduction	[0.1593 0.1655 0.1566]	Computed
κ_1	Probability of matching (low-edu)	0.99	Normalization

4.2 Parameters Calibrated Inside the Model

The remaining parameters in the model govern preferences, matching frictions, childcare demands, fertility success, and late-career work disutility. These parameters are determined

Table 4: Education Distribution by Gender, Ages 49–60 (2020)

	Male		Female	
Education	Low	High	Low	High
2020	52.21%	47.79%	53.28%	46.72%

Table 5: Marriage Rates by Gender and Education, Ages 49–60 (2020)

	Male		Female	
Education	Low	High	Low	High
2020	74.59%	82.62%	87.83%	85.88%

within the model to ensure that simulated outcomes reproduce the nine empirical moments for the cohort aged 49–60 in 2020. These moments capture marriage outcomes by male education, completed fertility by female education, and female labor force participation over the life cycle. By ages 49–60, both marriage and fertility decisions are effectively completed, while labor force participation can be reconstructed using earlier census years.

To compute education distributions and marriage outcomes, we use the 2020 Population Census for individuals aged 49–60. Education attainment is grouped into low and high categories, yielding shares of 52.21% and 47.79% for low- and high-education men, and 53.28% and 46.72% for women, respectively (Table 4).

The census distinguishes married, widowed, divorced, and never married. Since the model abstracts from divorce and widowhood, we treat all non–never-married individuals as married. Marriage rates are constructed as

$$MR_{g,s} = \frac{Married_{g,s} + Widowed_{g,s} + Divorced_{g,s}}{NeverMarried_{g,s} + Married_{g,s} + Widowed_{g,s} + Divorced_{g,s}},$$

where g indexes gender and s indexes education. Table 5 reports marriage rates by gender and education. The calibration targets male marriage rates in periods 1 and 2.

Completed fertility is taken from Ghaznavi et al. (2022), who report average children ever born by cohort, gender, and education. Because births occur only within marriage in the model, we adjust the reported fertility by dividing through the marriage rate of the corresponding female education group. We use the cohort born 1966–1970 to represent ages 49–60 in 2020. The resulting completed fertility targets are shown in Table 6.

Female labor force participation is disciplined using census data from 2000, 2010, and 2020, corresponding to ages 25–36 (period 1), 37–48 (period 2), and 49–60 (period 3) for this cohort.

Table 6: Completed Fertility by Female Education, Ages 49–60 (2020)

	Low Education	High Education
2020	1.7534	1.4788

Table 7: Female Labor Force Participation by Model Period

Age 25–36 (2000)	Age 37–48 (2010)	Age 49–60 (2020)
64.19%	71.36%	76.86%

Table 7 reports the resulting participation rates.

The nine parameters are selected to minimize the average distance between the model moments and the empirical targets. Table 8 summarizes the calibrated parameter values.

Table 9 compares the targeted empirical moments with the corresponding model-generated moments. The calibrated model reproduces the key cross-sectional patterns observed in the data, including higher marriage rates among high-education men, higher fertility among low-education women, and rising female labor force participation over the life cycle.

5 Quantitative Analysis

Based on the benchmark model, this paper aims at evaluating the impact of the social norm of unequal gender division of childcare and the spousal tax treatment on marriage, fertility and female labor supply.

5.1 Social Norm on Childcare

To understand the role of social norm on childcare in shaping the trends observed recently in marriage, fertility and female labor force participation in Japan, we conduct a counterfactual experiment by eliminating the social norm (ω is set to zero). All the other parameters of the economy are unchanged from the benchmark. The result is reported in table 10. We observe an increase in early marriage as well as an increase in the proportion of married individuals from both education categories. There is also a slight increase of aggregate fertility. Regarding female labor supply, women significantly increase their participation in the labor market at each stage of the life.

Table 8: Calibrated Parameters

Parameter	Description	Value
α	Utility weight on children	2.55
$\bar{x}_2$	Lower bound of matching quality	-9.75
κ_2	Matching probability (high education)	0.80
$h_{c,1}$	Childcare time cost, period 1	0.35
$h_{c,2}$	Childcare time cost, period 2	0.042
W_a	Cost of children's education	0.30
$P_{fa,2}$	Probability of successful birth , period 2	0.77
Ψ	Disutility of work, period 3	0.13
ω	Disutility of outsourced childcare	2.00

Table 9: Targeted Moments: Data vs. Model

Moment	Data	Model
Marriage rate (Low Education, Age 1)	50.64%	54.90%
Marriage rate (High Education, Age 1)	47.84%	45.94%
Marriage rate (Low Education, Age 2)	74.59%	79.91%
Marriage rate (High Education, Age 2)	82.62%	82.33%
Fertility (Low Education)	1.7534	1.6307
Fertility (High Education)	1.4788	1.5758
Female labor (Age 1)	64.19%	55.57%
Female labor (Age 2)	71.36%	71.84%
Female labor (Age 3)	76.86%	84.94%

Social norm is a disutility that affects households' time allocation and eventually their utility. A weaker social norm means more freedom in allocating the wife's time. People anticipate a higher income in the presence of a weaker social norm. Therefore, they are less reluctant to get married and have children. Since they have more freedom in allocating the wife's time, they outsource childcare and let women participate in the labor market, which explains the higher female labor supply.

To sum up, in the absence of social norm, all marriage, fertility and female labor force participation are higher. The persistence of the social norm of unequal gender division of childcare has negative effects on marriage, fertility and female labor supply. Weakening or eliminating it may be a response to the current marriage, fertility and labor crisis in Japan.

Table 10: Social Norm

Variables	Data	Benchmark Model	Counterfactual No Social Norm
Marriage rate-low (Age 1)	50.64%	54.90%	55.64%
Marriage rate-high (Age 1)	47.84%	45.94%	47.52%
Marriage rate-low (Age 2)	74.59%	79.91%	80.67%
Marriage rate-high (Age 2)	82.62%	82.33%	83.37%
Fertility-low	1.7534	1.6307	1.6354
Fertility-high	1.4788	1.5758	1.6065
Female Labor Supply (Age 1)	64.19%	55.57%	74.12%
Female Labor Supply (Age 2)	71.36%	71.84%	83.42%
Female Labor Supply (Age 3)	76.86%	84.94%	90.81%

5.2 Tax System

In Japan, the spousal tax treatment has two main components: a *spousal deduction* and a *tax benefit* available when the secondary earner's income falls below a prescribed threshold. These provisions influence marriage, fertility, and female labor supply by lowering the tax burden on households with a non-working or part-time-working wife. To evaluate their impact, we conduct four counterfactual policy experiments:

Experiment 1: No Spousal Tax Benefit

When the tax benefit is removed but the spousal deduction is preserved, household behavior changes only modestly. Marriage rates for both low-educated and high-educated groups remain almost unchanged. Fertility also shows only minor adjustment, with average births per low-educated woman declining slightly from 1.63 to 1.62, and remaining constant at 1.58 for highly educated women. The most notable effect appears in women's labor supply. Female participation declines at age 1 (from 55.6% to 49.9%) but rises thereafter, from 71.8% to 74.1% at age 2, reaching 100% by age 3. This pattern suggests that in the first period, when childcare needs are highest, the tax effect lowers the effective wage and women allocate more time to childcare rather than market work. In later periods, the income effect dominates: women compensate by increasing their labor force participation, particularly at older ages. Overall, eliminating the tax benefit has relatively weak effects on marriage and fertility, but significantly alters women's labor supply decisions later in the life cycle.

Experiment 2: No Spousal Tax Deduction

Removing the spousal tax deduction has more pronounced effects on female labor supply. Marriage and fertility both decline slightly across groups—for example, the marriage rate of low-educated women at age 2 falls from 79.9% to 79.0%, while their fertility declines from 1.63 to 1.60. Female labor supply rises across all life stages, increasing from 55.6% to 56.1% at age 1, from 71.8% to 77.8% at age 2, and reaching 94.4% at age 3. These results highlight the deduction's role as a significant disincentive for wives' labor market participation, particularly once childcare responsibilities become less binding.

Experiment 3: No Tax Benefit and No Deduction

When both provisions are eliminated, the effects on marriage and fertility remain moderate. Female labor supply combines the patterns from the previous two experiments: it falls at age 1 (from 55.6% to 50.4%), increases modestly at age 2 (from 71.8% to 74.3%), and rises sharply to 100% at age 3. These results indicate that when disposable income contracts due to the simultaneous loss of the tax benefit and deduction, households reduce marriage and fertility slightly. At the same time, women compensate by participating more in the labor force, particularly in later stages of life.

Experiment 4: No Tax Benefit, No Deduction, and No Social Norm

Finally, when the social norm of unequal gender division of childcare is also removed, the labor supply response becomes striking. Female participation increases across all ages, rising

from 55.6% to 74.5% at age 1, from 71.8% to 83.2% at age 2, and reaching 100% at age 3. Marriage and fertility, however, are less affected. The key difference is that without the social norm, women can respond directly to financial incentives and expand their labor market participation, avoiding the initial setback observed in other experiments.

Taken together, these results show that while tax reforms and the erosion of social norms can encourage female labor supply, they do little to mitigate fertility decline. Addressing this tension will require complementary measures, such as childcare subsidies or broader family support policies, to sustain fertility while fostering greater female employment.

Table 11: Tax Benefit, Deduction and Social Norm

Variables	Benchmark	Counterfactual Experiments			
	Model	(1)	(2)	(3)	(4)
Marriage rate-low (Age 1)	54.90%	54.90%	53.85%	53.85%	55.64%
Marriage rate-high (Age 1)	45.94%	45.94%	45.94%	45.94%	45.94%
Marriage rate-low (Age 2)	79.91%	79.91%	78.98%	78.98%	80.24%
Marriage rate-high (Age 2)	82.33%	81.80%	81.79%	81.26%	81.80%
Fertility-low	1.6307	1.6197	1.6029	1.6029	1.6210
Fertility-high	1.5758	1.5758	1.5736	1.5610	1.5836
Female Labor Supply (Age 1)	55.57%	49.89%	56.11%	50.43%	74.50%
Female Labor Supply (Age 2)	71.84%	74.07%	77.76%	74.25%	83.21%
Female Labor Supply (Age 3)	84.94%	100.00%	94.36%	100.00%	100.00%

Notes: (1) No Tax Benefit; (2) No Deduction; (3) No Tax Benefit and No Deduction; (4) No Tax Benefit, No Deduction, and No Social Norm.

5.3 Childcare Subsidy

The previous experiments have shown that eliminating the spousal tax benefit and deduction increases female labor force participation but depresses fertility, and that removing the social norm further amplifies the labor supply response. Because the tax reforms reduce household income and increase the government revenue, we now explore whether government transfers the additional revenue from the tax reforms in the form of childcare subsidies can mitigate these trade-offs. If the elimination of tax provisions reduces disposable income, childcare subsidies should work in the opposite direction by easing household budget constraints. In these experiments, additional government resources are returned to households by lowering ϕ by 30%. We consider two additional counterfactuals: (5) tax reform (no tax benefit and no deduction) with

childcare subsidy; and (6) ttax reform (no tax benefit and no deduction) with childcare subsidy and no social norm. The results are reported in Table 12.

Experiment 5: Full Tax Reform (no tax benefit and no deduction) with Childcare Subsidy

Relative to Experiment 3 (no tax benefit and no deduction without subsidy), the introduction of a childcare subsidy moderates the negative effects on marriage and fertility. Marriage rates fall slightly for both education groups—for example, the highly-educated marriage rate at age 2 declines from 82.3% to 81.8%—but the reduction is smaller than in the absence of the subsidy (81.3%). Fertility also decreases modestly, from 1.63 to 1.60 for the low-educated and from 1.58 to 1.57 for the highly educated, but again, the decline is less pronounced than in Experiment 3. Importantly, female labor supply is consistently higher than in the benchmark. Although participation in age 1 still falls somewhat (from 55.6% to 50.4%) due to the binding social norm, it rises strongly thereafter: 76.0% at age 2 and 100% at age 3. In short, childcare subsidies offset part of the income loss from tax reform, cushioning marriage and fertility outcomes while further supporting female labor supply.

Experiment 6: Full Tax Reform with Childcare Subsidy and No Social Norm

When the social norm is also removed, the interaction with childcare subsidies becomes more significant. Marriage rates rise slightly above the benchmark, reaching 80.7% for low-educated women at age 2 and 83.1% for the highly educated. Fertility improves as well: from 1.6307 to 1.6309 for the low-educated and from 1.58 to 1.61 for the highly educated, reversing the fertility decline observed in earlier experiments. At the same time, female labor supply reaches very high levels across all periods: 74.8% at age 1, 92.4% at age 2, and 100% at age 3. This combination of higher marriage, higher fertility, and higher female labor supply shows that the subsidy is more effective when restrictive social norms are absent.

Experiments 5 and 6 demonstrate that childcare subsidies can play a crucial role in balancing policy objectives. On their own, subsidies mitigate the negative fertility effects of tax reform while reinforcing female labor supply, though the social norm continues to constrain women's early labor market participation. Once the social norm is eliminated, however, childcare subsidies become a highly effective tool: they simultaneously encourage marriage, raise fertility, and boost women's labor force participation. These findings suggest that while fiscal policies can shift household behavior, their success depends critically on the broader cultural environment. Achieving both higher fertility and higher female employment requires not only financial support such as childcare subsidies but also social change toward more egalitarian gender roles.

Table 12: Tax Benefit, Deduction, Social Norm and Childcare Subsidy

Variables	Benchmark	Counterfactual Experiments	
	Model	(5)	(6)
Marriage rate-low (Age 1)	54.90%	53.85%	55.64%
Marriage rate-high (Age 1)	45.94%	45.94%	46.68%
Marriage rate-low (Age 2)	79.91%	78.98%	80.67%
Marriage rate-high (Age 2)	82.33%	81.79%	83.10%
Fertility-low	1.6307	1.6029	1.6309
Fertility-high	1.5758	1.5736	1.6079
Female Labor Supply (Age 1)	55.57%	50.43%	74.83%
Female Labor Supply (Age 2)	71.84%	75.99%	92.37%
Female Labor Supply (Age 3)	84.94%	100.00%	100.00%

Notes: (5) No Tax Benefit and No Deduction with Childcare Subsidy; (6) No Tax Benefit, No Deduction, and No Social Norm with Childcare Subsidy.

6 Conclusion

Japan faces a dual demographic challenge: fertility has remained below replacement level for decades, while women's labor force participation continues to lag behind rising labor demand. Our analysis suggests that these two problems are not independent. They are jointly shaped by the interaction of cultural norms and fiscal institutions, particularly the spousal tax treatment.

Using a quantitative life-cycle model with endogenous marriage, fertility, and labor supply, we demonstrate how the spousal tax treatment and the prevailing childcare norm reinforce one another. The spousal deduction creates a powerful disincentive for women's market work, while the childcare norm amplifies the costs of early labor market participation. Eliminating the spousal tax deduction or the spousal tax benefit leads to higher female labor supply but reduces marriage and fertility, as households adjust to lower disposable income. These results highlight a central tension: fiscal reforms that promote female employment often undermine fertility, thereby exacerbating one dimension of Japan's demographic crisis even as they alleviate another.

Our policy experiments also reveal conditions under which this trade-off can be eased. Childcare subsidies, when introduced in the absence of tax benefits and deductions, partly cushion the negative effects on marriage and fertility while further supporting female labor supply. Yet their impact is muted as long as traditional childcare norms persist. Only when social norms evolve toward more egalitarian gender roles do subsidies become transformative: fer-

tility rises, marriage stabilizes, and women's labor force participation increases sharply across all life stages. In other words, financial transfers alone cannot realign demographic and labor outcomes; they must be accompanied by social change.

The broader implication is that Japan's demographic and labor market challenges cannot be solved by tax reform or subsidies in isolation. A coherent policy package must combine fiscal instruments that lower the cost of childrearing, such as childcare subsidies, with a deliberate effort to weaken the cultural and institutional barriers that restrict women's work. Without such a dual strategy, attempts to raise fertility will continue to clash with the imperative of mobilizing female labor.

Future research can build on this framework by incorporating richer forms of heterogeneity, such as productivity differences and preferences for leisure, to better capture the diversity of household responses. But the central message is clear: the sustainability of Japan's demographic and economic future depends on addressing both financial and social constraints simultaneously.

References

Yukiko Abe and Akiko Sato Oishi. The 1.03 million yen ceiling and earnings inequality among married women in japan. *Economics Bulletin*, 29(2):1510–1519, 2009.

Hideo Akabayashi. The labor supply of married women and spousal tax deductions in japan—a structural estimation. *Review of Economics of the Household*, 4:349–378, 2006.

Thomas Baudin, David De La Croix, and Paula E Gobbi. Fertility and childlessness in the united states. *American Economic Review*, 105(6):1852–1882, 2015.

G Becker. An economic analysis of fertility, 1960.

Gary S Becker. A theory of marriage: Part i. *Journal of Political economy*, 81(4):813–846, 1973.

Gary S Becker. A theory of marriage: Part ii. *Journal of political Economy*, 82(2, Part 2): S11–S26, 1974.

Marianne Bertrand, Patricia Cortés, Claudia Olivetti, and Jessica Pan. Social norms, labor market opportunities, and the marriage gap for skilled women. Technical report, National Bureau of Economic Research, 2016.

Matthias Doepke, Anne Hannusch, Fabian Kindermann, and Michèle Tertilt. The economics of fertility: A new era. In *Handbook of the Economics of the Family*, volume 1, pages 151–254. Elsevier, 2023.

Cristina Fernandez and Almudena Sevilla-Sanz. Social norms and household time allocation. Technical report, ISER Working Paper Series, 2006.

Marco Francesconi. A joint dynamic model of fertility and work of married women. *Journal of labor Economics*, 20(2):336–380, 2002.

Cyrus Ghaznavi, Haruka Sakamoto, Lisa Yamasaki, Shuhei Nomura, Daisuke Yoneoka, Kenji Shibuya, and Peter Ueda. Salaries, degrees, and babies: trends in fertility by income and education among japanese men and women born 1943–1975—analysis of national surveys. *PloS one*, 17(4):e0266835, 2022.

Paula E Gobbi. Childcare and commitment within households. *Journal of Economic Theory*, 176:503–551, 2018.

Hiroshi Gunji and Kenji Miyazaki. Estimates of average marginal tax rates on factor incomes in japan. *Journal of the Japanese and International Economies*, 25(2):81–106, 2011.

Minchung Hsu and Thu Trang Le. Fertility decisions and the norm of intergenerational support to aging parents. *International Studies of Economics*, 19(1):151–165, 2024.

Seongeun Kim, Michele Tertilt, and Minchul Yum. Status externalities in education and low birth rates in korea. *American Economic Review*, 114(6):1576–1611, 2024.

Sagiri Kitao and Minamo Mikoshiba. Why women work the way they do in japan: Roles of fiscal policies. *Available at SSRN 4054049*, 2022.

Sagiri Kitao and Kanato Nakakuni. On the trends of technology, family formation, and women's time allocation. *Family Formation, and Women's Time Allocation*, 2023.

Sang Wha Lee. Patriarchy and confucianism: Feminist critique and reconstruction of confucianism in korea. 2005.

Sunha Myong, JungJae Park, and Junjian Yi. Social norms and fertility. *Journal of the European Economic Association*, 19(5):2429–2466, 2021.

Ananth Seshadri and Nicolas Roys. On the origin and causes of economic growth. In *2014 Meeting Papers*, number 310. Society for Economic Dynamics, 2014.

Noriko Sugano. Gender, modern japan and the reception of confucianism. , (22), 2007.

Yoshio Sugimoto. *An introduction to Japanese society*. Cambridge University Press, 2020.

Chizuko Ueno. The position of japanese women reconsidered. *Current Anthropology*, 28(S4): S75–S84, 1987.

Ken Yamada. Labor supply responses to the 1990s japanese tax reforms. *Labour Economics*, 18(4):539–546, 2011.

Chigusa Yamaura. The cultural politics of childcare provision in the era of a shrinking japan. *Critical Asian Studies*, 52(2):248–269, 2020.

Izumi Yokoyama. How the tax reform on the special exemption for spouse affected the work-hour distribution. *Journal of the Japanese and International Economies*, 49:69–84, 2018.