

The Cost of Inequality: Home Production, Gender Roles, and Fertility Decisions *

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Abstract

Declining fertility is a common concern in high-income countries. One central cause is the gendered division of labor between spouses, in which women perform most domestic labor regardless of their education and career prospects, while men specialize in market work. This paper studies how this division shapes fertility through the non-pecuniary costs it imposes on women, including the disutility of a disproportionate childcare burden and lost career fulfillment, which vary with their gender role attitudes. Using data from the Japanese Panel Survey of Consumers, I estimate a life-cycle model in which spouses jointly decide on time allocation and fertility. The results show that gender role attitudes determine how women perceive the unequal division of labor and thereby shape their fertility decisions. Husbands' long working hours limit their involvement in childcare, and reducing these hours raises fertility, particularly among progressive women. Moreover, a more equal allocation of paid and unpaid work between spouses preserves or increases the fertility gains, suggesting that greater gender equality need not come at the expense of fertility.

Keywords: low fertility, domestic labor division, gender roles, work-life balance

JEL classification: D13, D79, J1.

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1 Introduction

Fertility has fallen below replacement level in nearly all high-income countries. A growing literature attributes much of this decline to a mismatch between women’s expanding economic autonomy and the persistence of traditional gender roles (Goldin, 2025a,b). This mismatch is most visible in the gendered division of labor between spouses, in which women perform most housework and childcare while men specialize in market work, an inequality that widens sharply after childbirth (Kleven et al., 2019, 2024; Aguilar-Gomez et al., 2026). As women’s education and career prospects rise, the unequal division imposes growing opportunity costs on them, both pecuniary and non-pecuniary, and many respond by having fewer children, or none.¹

The unequal division of labor carries several downsides. Women may perceive an imbalanced division as unfair, which lowers marital quality and life satisfaction (Lennon and Rosenfield, 1994; Hu and Yucel, 2018). The division also entails lower labor force participation and career ambitions among women, leading to forgone earnings (Kleven et al., 2019) and lost career fulfillment (Goldin, 2006). Beyond the financial losses, many of these costs are non-pecuniary and reflect women’s rising expectations of equality, especially among those with egalitarian gender role attitudes.² Overlooking these non-pecuniary costs understates the cost of children and the distortions that gender norms impose on fertility and family decisions (Boneva et al., 2026). The unequal division also matters beyond fertility, as it lowers the returns to investment in women’s education and reduces female labor supply, which worsens labor shortages in low-fertility countries with shrinking cohorts. These challenges persist even in relatively gender-egalitarian societies, where gender gaps in labor market and at home remain large (Angelov et al., 2016; Andresen and Nix, 2022). Understanding how, and for whom, the gendered division of labor raises the cost of children is therefore increasingly important.

Most pro-natal policies target women, yet the division of labor also depends on men, whose time at home may be limited by norms as well as the demands of their jobs. This constraint binds most tightly in East Asia, where fertility rates are among the lowest in the world and spouses roles among the most unequal (Myong et al., 2021). Labor markets in the region are characterized by a “rat race”, in which long and inflexible hours are expected. As primary breadwinners, men are most exposed to this demanding work culture, which limits their involvement in childcare and reinforces specialization at home (Goldin, 2014; Nagase and Brinton, 2017). Whether work-life balance policies can promote a more equal division of labor and, in turn, raise fertility is therefore a central

¹Part of this unequal division of labor reflects comparative advantage, since households gain from specialization when spouses differ in earning capacity (Becker, 1993). Yet comparative advantage alone cannot explain this division in advanced economies, where gender norms play a primary role (Siminski and Yetsenga, 2022). For example, even wives who out-earn their husbands still do more housework (Bertrand et al., 2015).

²Research on gender role attitudes and the division of labor is reviewed later in this section.

question.

This paper examines how the unequal division of labor between spouses affects fertility decisions by addressing two specific questions. The first is how women’s gender role attitudes shape their fertility response to an unequal division of labor. These attitudes determine how costly the division is for each woman, as progressive women perceive greater unfairness in an unequal division of housework and are more willing to work long hours for career fulfillment, while traditional women hold the opposite views. The same division may therefore discourage fertility more among progressive women, and this paper quantifies how much the specialization affects fertility among women with different gender role attitudes. The second question asks how workplace constraints exacerbate the unequal division of labor within households. I evaluate whether relaxing long working hours reduces this inequality and thereby raises fertility. The answer speaks to husbands’ incentives to provide childcare and informs labor market policies aimed at improving work life balance and increasing male employees’ involvement in childcare.

The main contribution of this study is to quantify how the gender gap in the labor division between spouses, covering both paid and unpaid work, affects fertility decisions. Existing studies show that a heavy and unequal childcare burden discourages fertility, and this paper extends the literature in two ways. First, it uses time-use data to measure how both spouses’ allocate their time, which allows the effects to be quantified within a structural model. Second, it extends the focus from childcare to market work. Although the two are sides of the same coin, spouses value time spent in each differently ([Briselli and González, 2025](#)). For women, a career loss goes beyond forgone earnings to include lost career fulfillment, a psychological cost largely absent from existing studies. Moreover, the paper examines workplace norms and the “rat race”, an institutional source of husbands’ long working hours, thereby linking the household division of labor to the labor market.

Another contribution is the integration of the psychology and sociology of identity into household decision-making. The study incorporates the non-pecuniary costs women incur when the division of labor conflicts with their gender role beliefs, which makes it possible to assess the role of gender identity in fertility decisions and the division of labor. The analysis further documents that gender role attitudes are not fully determined by education. Even among equally educated women, different gender role attitudes lead to distinct perceptions of an unequal division of labor and fertility choices. Accounting for this heterogeneity helps predict how different groups respond to policies that rebalance the division of labor.

Finally, the paper contributes to the literature on dynamic household models by developing a framework that jointly captures fertility, home production, and women’s perceived unfairness of unequal division of labor. With this framework, I decompose the factors behind family decisions and evaluate policy counterfactuals.

This paper uses Japan as its empirical setting. Japan’s total fertility rate has remained

below replacement level since the mid-1970s, and couples exhibit one of the largest gender gaps in paid and unpaid work among high-income countries (OECD, 2025). Successive family-friendly policies have barely raised fertility rates, as persistent gender norms and long, rigid working hours keep spouses' paid and unpaid work highly unequal (Boling, 2008; Nemoto, 2013). These features make Japan a compelling setting for this study.

I use data from the Japanese Panel Survey of Consumers (JPSC), which provides comprehensive information on household demographics, detailed expenditure categories, and the time use of both spouses. The survey also provides two important self-reported measures. The first is respondents' family values, reflecting their gender role attitudes toward labor division, which I use to classify women as progressive, moderate, or conservative. The second is respondents' intentions to have an additional child and, for those who do not, their specific reasons. Two empirical patterns emerge from the data. First, following Kleven et al. (2019, 2024), I use an event-study design to trace the effect of the first birth on spouses' time allocation for women with different gender role attitudes. Specialization intensifies after childbirth for all three groups, as husbands' working hours remain consistently long, while wives' market work declines and the housework gap between spouses widens. The degree of specialization, however, differs increasingly across women in different groups. Second, I show that labor inequality between spouses lowers birth intentions more among progressive women, even with equally shared childcare and comparable education and wages. This finding suggests that women's aversion to the gendered division of labor influences fertility decisions beyond these other factors.

To assess how women's gender role attitudes affect fertility and household welfare, I develop a dynamic structural model building on framework of Mazzocco (2007); Voena (2015); Foerster (2024). The model has three key features.

First, married couples cooperatively determine intra-household allocation and fertility choices. Spouses have heterogeneous preferences over private consumption, leisure and home-produced goods. The household maximizes the weighted sum of their utilities, with weights given by bargaining power. I adopt a full-commitment framework, under which the weights are fixed at household formation and spouses commit to all future allocations.

Second, couples engage in a home production process and make endogenous fertility choices. Both spouses devote time to daily chores and childcare to produce a household public good, which represents children's welfare and a good living environment. In each period, couples decide whether to conceive a child, and each child raises the spouses' home production time. Husbands' working hours are fixed at 60 hours per week, reflecting rigid workplace norms, which allows the counterfactual analysis to evaluate the effects of shortening these hours.

Third, the model introduces a gender-view channel through which an unequal division of labor imposes a subjective cost on women. This cost has two components, one at home and one in the labor market. At home, women's disutility increases with the housework

gap between spouses.³ This effect is stronger for progressive women, whose beliefs conflict with an unequal burden, and weaker for conservative women, for whom such a burden is consistent with traditional roles. In the labor market, women’s attitudes shape how they value long working hours. Conservative women incur disutility from long hours, as social norms assign their primary responsibilities to the household, whereas progressive women may value them as a source of career fulfillment. Through these two components, the same division of labor can affect women differently, which in turn shapes their fertility decisions.

The model also incorporates learning-by-doing human capital accumulation for both spouses, which generates a wage penalty from childbearing. Working longer hours builds human capital and raises future wages, while career interruptions and childrearing slow this accumulation and lower subsequent earnings. The fertility decision thus reflects a trade-off between the utility from children and several costs, including lower consumption and leisure, slower human capital accumulation for women, and the disutility women experience from an unequal division of labor that conflicts with their gender role attitudes.

The analysis yields several main findings. First, the non-pecuniary costs associated with women’s gender role attitudes are an important determinant of fertility. Women who hold progressive gender role attitudes devote more time to market work and less to domestic labor, since an unequal division of labor imposes greater disutility on them, and consequently have fewer children. To quantify this channel, I simulate a scenario in which conservative and moderate women hold progressive gender role attitudes while all their other characteristics remain unchanged. Gender role attitudes account for 60.2% of the fertility gap between moderate and progressive women but only 33.7% of the gap between conservative and progressive women. The remaining difference largely reflects other economic factors, in particular earning potential. I measure earning potential by women’s human capital stock at age 24, which captures both educational attainment and early work experience. Among conservative women, the fertility response to adopting progressive views varies with earning potential. Those with the lowest earning potential reduce their fertility the least, since their low opportunity cost of childbearing keeps children affordable even when the non-pecuniary costs rise. The higher a woman’s earning potential, the more she reduces her fertility. For moderate women, gender attitudes play a more dominant role, such that their fertility falls substantially even among women with similar initial earning prospects.

Second, husbands’ long working hours act as a binding constraint on fertility, and shorter working hours for husbands raise completed fertility in all three groups. To show this, I simulate reductions in husbands’ weekly market hours and let both spouses re-optimize their time allocation. A modest reduction from 60 to 54 hours per week increases

³The gap can be positive or negative, with a negative value indicating that the husband performs more housework.

completed fertility by 4.4% among progressive women, 3.7% among conservative women, and 1.3% among moderate women. Husbands devote only 10–14% of their freed-up time to domestic labor and the remaining 86–90% to private leisure. Even this modest reallocation eases women’s childcare burden and allows them to increase their market work hours by 6–20%, which lowers the non-pecuniary costs of an unequal division of labor and raises fertility. Progressive women respond most strongly since they devote the most time to market work and bear the highest non-pecuniary costs of an unequal division of household labor. Additional paternal involvement at home therefore relieves them the most and gives them the strongest incentive to have more children.

The study also addresses the concern that a transition toward more egalitarian gender roles may lower fertility. Shorter working hours for husbands and greater labor market involvement of women may reduce household earnings and raise women’s career costs of childbearing, both of which could depress fertility. To examine this concern, I consider a counterfactual in which husbands devote half of the time freed from market work to home production, and women re-optimize their time allocation accordingly. This scenario imposes a move away from traditional household specialization toward a more egalitarian division of labor, with husbands taking on more domestic work and women more market work. Imposing this more egalitarian division of labor further raises completed fertility for all women, relative to the scenario where spouses freely re-optimize their time allocation after husbands’ work hours are reduced. Taken together, the results suggest that combining shorter working hours for husbands with a more equal division of labor between spouses can expand female labor supply while raising fertility, and also give men a better work-life balance.

Related Literature. This paper relates to three strands of literature. The first concerns low fertility in high-income countries. An important factor behind it is women’s greater autonomy and a mismatch between men’s and women’s preferences over the traditional division of labor, including both home production and market work (Goldin, 2025a,b). While a heavy childcare burden on women lowers fertility intentions (Cardia and Gomme, 2018), the way spouses share this burden plays a distinct role.⁴ Doepke and Kindermann (2019) find that an unequal division of childcare makes women more opposed than their husbands to having more children. When husbands contribute more to home production, women are more willing to have additional children and to participate in the labor market (Feyrer et al., 2008; De Laat and Sevilla-Sanz, 2011).

Unequal division of labor lowers fertility through two main mechanisms. The first

⁴The division of labor between spouses also matters for household welfare beyond fertility. Spouses’ housework time is substitutable, so households can absorb income shocks by reallocating it between partners, which serves as a consumption-smoothing channel (Blundell et al., 2018; Ma and Shi, 2020). Studies that focus solely on the size of the childcare burden therefore miss an important dimension of household welfare.

is the child penalty, the effect of children on women’s labor market outcomes (Eckstein et al., 2019; Kleven et al., 2019; Andresen and Nix, 2022; Kleven et al., 2024). As women’s education rises, the time spent on childcare carries a higher opportunity cost, and the anticipated penalty shapes both fertility and career choices (Adda et al., 2017). The second is the non-pecuniary cost of unequal division of labor within the household. Women often perceive the paid and unpaid labor imbalance as unfair (Greenstein, 1996; Coltrane, 2000; Goldin, 2006), and such unfairness perceptions are associated with lower marital and family satisfaction (Lennon and Rosenfield, 1994; Hu and Yucel, 2018). Recent economic evidence points in the same direction. Sun et al. (2025) shows that childbirth temporarily reduces women’s paid work but persistently increases unpaid domestic work, raising their total workload and harming mental and physical well-being. These costs are well documented in sociology and psychology but rarely examined in economic studies of household decision-making. This paper incorporates this mechanism and uses time-use data to quantify its effect on fertility decisions.

The second strand of related literature concerns gender identity and economic outcomes. Following Akerlof and Kranton (2000, 2016), gender identity reflects the prescriptions individuals hold about how each gender should behave. The prescriptions that prevail in a society form gender norms and shape individuals’ family decisions such as marriage, labor supply, home production, and fertility (Fernández and Fogli, 2006, 2009; Bertrand et al., 2015, 2021; Bursztyn et al., 2017). A central example is the gendered division of labor, which assigns most housework and childcare to women and most market work to men (Siminski and Yetsenga, 2022; Sakamoto and Kohara, 2025). This unequal division can be inefficient and impose social costs, such as lower fertility. In East Asian countries, Myong et al. (2021) show that traditional norms reduce fertility rates because women bear a disproportionate share of childcare. In South Korea, which has one of the lowest fertility rates in the world, Kim et al. (2024) find that social norms substantially depress fertility, even though education costs also play a major role.

Individuals hold different gender identities even within the same gender, with some more egalitarian and others more traditional. These identities, often measured as gender role attitudes, influence assortative mating and the intra-household allocation of resources (Goussé et al., 2017), especially maternal labor supply around childbirth (Mensinger and Pugnaghi Zimpelmann, 2025; Boneva et al., 2026). They matter increasingly as women’s attitudes become more egalitarian while traditional norms persist. Hwang (2016) shows that this conflict helps explain falling marriage rates among educated women in East Asia, who prefer staying single to marrying traditional men.⁵ Gender identities also shape how

⁵Other studies examine where gender norms and identities come from. Alesina et al. (2013) trace them to historical agricultural practices. Identities can also change over time. Fernández (2013) shows that married women’s labor force participation and gender identities evolved endogenously over the twentieth century. This paper focuses on decisions within an individual’s lifetime, so it treats gender identities as individual characteristics independent of long-run changes in the external environment. The

women view the spousal labor division. Progressive women tend to perceive greater unfairness in an unequal labor division, while traditional women are more accustomed to it (Greenstein, 1996; Coltrane, 2000). Despite these links, how gender role attitudes affect fertility decisions remains less explored. This paper fills this gap by showing that women with different gender ideology hold different expectations about the gendered division of labor and therefore make different fertility choices.

Methodologically, this paper builds on the literature on life-cycle models of household decision-making. Existing models primarily examine marriage dissolution and intra-household allocation while treating fertility as exogenous (Voena, 2015; Fernández and Wong, 2017; Reynoso, 2024; Foerster, 2024). Some examine how parental investment responds to an exogenous fertility process, offering indirect evidence on fertility decisions (Del Boca et al., 2014). Only a few studies model fertility as an endogenous discrete choice over the life cycle, notably Adda et al. (2017) and Doepke and Kindermann (2019). The former emphasizes the trade-off between labor supply and fertility but abstracts from domestic labor, whereas the latter captures spouses’ disagreement over having children without explicitly modeling home production process.⁶ Building on Voena (2015), Lise and Yamada (2019), and Foerster (2024), this paper develops a dynamic household model that integrates home production with endogenous fertility decisions.

The remainder of the paper is organized as follows. The next section describes the institutional background in Japan. Sections 3 and 4 present the data and empirical evidence from event-study and interaction analyses. Section 5 develops the theoretical model, and Section 6 presents the estimation results and model fit. Section 7 conducts counterfactual analyses evaluating the effects of the gender-view channel and husbands’ long working hours on fertility outcomes. Finally, Section 8 concludes.

2 Institutional Background

This paper uses Japan as an example to examine how the unequal labor division within households contributes to low fertility, drawing on the country’s cultural and institutional background. Japan has experienced total fertility rates below the replacement level since the 1970s. Although the government has introduced numerous pro-natal policies, their impact has been limited, partly because the spousal imbalanced labor division remains unresolved (Jones, 2019). For instance, despite generous parental and childcare leave provisions, men’s participation in childcare and paternal leave uptake together remained

origins and evolution of these identities are beyond the scope of this paper.

⁶Another strand of literature models endogenous fertility and child investment in a non-cooperative framework, such as Caucutt et al. (2002); Tartari (2015); Brown et al. (2025). This paper instead follows the cooperative approach of Chiappori (1988, 1992) and Chiappori et al. (2002), treating intra-household allocation as the outcome of coordinated decisions between spouses. This approach assumes Pareto-efficient allocations, a standard assumption in recent household models.

below 4% until the mid-2010s (Kawamura and Totake, 2024), and maternal leave policies did not significantly increase women’s labor participation after childbirth.

Japanese couples exhibit a large gender gap in the division of paid and unpaid labor. In 2023, Japanese women still performed on average 82% of total unpaid domestic work between spouses. Although labor force participation rates are relatively close (87% for men and 75% for women aged 15 to 64), about 34% of employed women work part-time (OECD, 2025). As a result, women’s average total working hours are roughly half those of men, with the disparity particularly pronounced among households with children (Lise and Yamada, 2019; Sakamoto and Kohara, 2025). Two main factors explain why the spousal labor gap remains exceptionally large in Japan. First, strong social norms reinforce traditional gender roles, as reflected in Japan’s persistently low scores on the Gender Gap Index (World Economic Forum, 2025). Second, poor work-life balance, driven by long working hours and rigid corporate hierarchies. This limits men’s time investment for childcare responsibilities and other housework.⁷

In Japan, gender norms remain extremely strong even in the 21st century, reflecting the influence of Confucian culture common across East Asian societies. Meanwhile, women’s increasing education and employment opportunities, alongside broader demographic and institutional change, are well documented (Jones, 2024). Because of these changes, women have become increasingly progressive despite persistently strong gender norms.⁸ As a result, the tension between a traditional labor division pattern shaped by long-standing social norms and women’s more egalitarian expectations has become increasingly evident. This evolution provides a clear setting to study the interaction between gender views, traditional household structures, and fertility outcomes.

Excessively long work hours arise from organizational mechanisms such as lifetime employment, seniority-based wages, and intense competition (Ono, 2018). Although intended for all employees, this system exacerbates gender inequality (Nemoto, 2013). The Labor Standards Act of 1998 formally limited work to 8 hours per day and 40 hours per week, yet firms could easily bypass these limits through Article 36 Agreements. Once such agreements were signed by employees or their representatives, companies could legally require overtime with no binding cap or penalty. In the absence of binding penalties and under a long-standing overwork culture, employees in Japan typically worked very long hours. For instance, married men averaged about 10 hours per day including commuting time.

⁷See Brinton and Oh (2019) for a comparative study of postindustrial Japan and South Korea. Drawing on in-depth interviews with highly educated women and men, the study shows that market structures and workplace norms reinforce a highly gendered household division of labor, leading many married women either to withdraw from employment or to limit childbearing to one child. Related demographic studies include Boling (2008), Brinton and Lee (2016), and Nagase and Brinton (2017).

⁸Hara and Rodriguez-Planas (2025) shows that education reform in Japan positively influenced women’s attitudes toward traditional gender roles, suggesting that shifts in gender views are possible even in a persistently conservative society.

To improve work-life balance and encourage female labor participation, the government introduced the Work Style Reform law in 2018, which for the first time imposed legally binding caps on overtime that could not be circumvented through Article 36 Agreements.⁹ In addition to the 40-hour weekly limit, overtime is capped at 45 hours in any given month and 360 hours in a year. Firms that violate these limits face fines of up to JPY 300,000 (approximately USD 2,660) per worker. In special circumstances, such as a peak season, employers and employees may conclude a special clause permitting up to 100 hours of overtime in a single month, subject to an annual cap of 720 hours. This monthly exception may be used in no more than 6 months per year. Certain occupations, such as drivers, doctors, and research and development (R&D) professionals, are exempt from the overtime cap. Empirical studies show that the reform reduced average monthly overtime by around 25% and total earnings by roughly 2% due to lower overtime pay, while hourly wages remained unchanged (Burdin et al., 2024). This policy offers a context to examine whether changes in husbands’ time allocation can reshape household labor division and influence fertility outcomes.

3 Data

This study uses data from the Japanese Panel Survey of Consumers (JPSC), a longitudinal survey covering 1993–2021. The JPSC tracks female respondents aged 24 and above, including both single and married women, and married respondents also report information on their spouses. As same-sex marriage is not legally recognized in Japan, all marriages in the dataset are heterosexual. The survey provides comprehensive demographic information, as well as respondents’ gender role attitudes and fertility intentions.

The sample retains married women and their husbands for whom the following are observed: (1) demographic characteristics, such as age, education, and work experience; (2) non-missing expenditure and time-use variables for at least one year; (3) at least one wage earner in the household; (4) if the household has children, the youngest child is below age 18; and (5) at least one wave of gender role attitudes is observed. The resulting sample includes 1,753 households, with 17,381 household-year observations.

3.1 Intrahousehold allocation and demographics

One feature of the dataset is that it records detailed expenditure categories and time-use activities for each spouse and the entire household. Household expenditures are reported across five categories: spending on the entire household, the female respondent’s expenses, the husband’s expenses (if the female respondent is married), child-related

⁹The full name is “Act on the Arrangement of Related Acts to Promote Work Style Reform.” The law was enacted on July 6, 2018, and the main provisions took effect on April 1, 2019.

expenses, and other expenses. I treat household spending as family public consumption, spouse-specific expenditures as private consumption for each spouse, and child-related items as expenditure on children.

Time use is recorded for commuting, work, schoolwork, housekeeping and childcare, leisure, and other activities including sleep, meals and bathing. Commuting and schoolwork are combined with work to form a generalized measure of market work hours. Housekeeping and childcare are combined to form home production hours, while leisure is retained as a measure of private leisure. Since the survey collects daily schedules separately for weekdays and weekends, I sum each activity across weekdays and weekends to construct weekly hours for each category.

Table 1 presents summary statistics for married females in the JPSC, characterizing key features of Japanese households. The bottom panel reports basic demographic characteristics. On average, wives in the sample are 36.5 years old, while husbands are 38.7 years old. Educational attainment is high among Japanese households, with the majority of household members holding a tertiary degree, and attainment levels are comparable across genders. Around 4.5% of wives have a middle school education, 38% have a high school education, and 57.5% have attained tertiary education, including college, university, or graduate school. Among husbands, 8.7% have a middle school education, 39% have a high school education, and a slightly lower 52.8% have attained higher education, compared to 57.5% among wives.¹⁰ At the household level, couples have 1.69 children on average, and the average age of children under eighteen is 7.94 years. The average age at first childbirth for wives is 27 years.

The top panel of Table 1 reports average expenditures and expenditure shares for spouses' private consumption and child-related consumption. On average, 6.3% of household expenditure is reported as the wife's private consumption and 14.1% as the husband's, indicating a notable difference between spouses. Around 13.6% of expenditure falls under the child-related category, with the remaining 66% attributable to household public consumption.

There are also substantial differences in time allocation between wives and husbands across market work, home production, and leisure. Wives spend around 23 hours per week on market work and 47 hours on home production, accounting for 13.7% and 28.0% of their total time, respectively. The corresponding figures for husbands are 62.3 hours and 8.4 hours per week, accounting for 37.1% and 5.0% of their time. Time spent on leisure shows little difference between spouses, with both allocating around 22% of their time to private leisure. Since this study focuses on time allocated to market work, domestic labor, and private leisure, other activities—including sleep, meals, and bathing—are excluded

¹⁰Compulsory education in Japan consists of nine years, comprising six years of elementary school and three years of junior high school. Students are not required to pass a graduation or qualification exam to receive a junior high school diploma.

from the analysis. These activities account for approximately 76 hours per week for wives and 75 hours for husbands, or roughly 45% of total time for both.

Table 1: Summary statistics of married couples

	Mean [standard deviation]		
	Wife	Husband	Household
Expenditure, 1000 yen per month			
Private consumption (% of household total)	15.52 [22.23] (6.31%)	33.40 [29.55] (14.06%)	
Expenses on children (% of household total)			36.31 [58.80] (13.60%)
Time use, hours per week			
Market work (% of own time)	22.99 [22.35] (13.68%)	62.33 [15.00] (37.10%)	
Home production (% of own time)	47.02 [27.24] (27.99%)	8.38 [9.64] (4.99%)	
Leisure (% of own time)	21.62 [17.05] (12.87%)	22.36 [14.12] (13.31%)	
Demographics			
Age	36.47 [6.41]	38.66 [7.23]	
Middle school (%)	4.48 [20.69]	8.73 [28.23]	
High school (%)	38.07 [48.56]	38.52 [48.67]	
Tertiary education (%)	57.45 [49.44]	52.74 [49.93]	
Age of first birth	27.37 [4.32]		
Number of children			1.69 [1.03]
Average age of children below 18			7.94 [5.15]
Age of the youngest child			6.57 [5.22]

Notes: The sample comprises 1,753 households and 17,381 household-year observations.

3.2 Gender role attitudes

The dataset records respondents’ personal views regarding gender roles at home, which I use to construct a measure of individual gender role attitudes. The survey asks respondents a series of questions on family views, including their views on the division of labor between spouses.¹¹ Respondents rate their agreement with each statement. The two statements are:

“Men should work outside the home and women should work at home”

“Mothers should not have jobs and should focus on childcare until their children are about three years old”

¹¹The survey includes another two questions on marriage and divorce. Since this paper focuses on gender role attitudes regarding labor division within marriage, I use only the two questions related to market and domestic labor provision in the household.

Responses are recorded on a four-point scale: 1 = *I agree*, 2 = *I somewhat agree*, 3 = *I somewhat disagree*, and 4 = *I disagree*. I sum responses to the two questions to construct a Gender Value Index (GVI), with higher values indicating more progressive gender views. The index ranges from 2 to 8, yielding seven distinct values.

The survey has included questions on gender roles since 2011, covering the eleven most recent waves. Figure A1 shows the distribution of observed GVI from 2011 to 2021, where respondents' gender values shift gradually toward more progressive attitudes over time. This trend reflects changing views within individuals rather than changes in sample composition. The survey periodically refreshes its sample by adding new cohorts, and within the period covering gender role questions, a new cohort was added only in 2013. In that year, new entrants made up 13.2% of the female sample, and only 2.5% of women left after 2012. The sample therefore consists largely of the same women throughout the period.

Despite the gradual aggregate shift toward more progressive attitudes, GVI is largely stable at the individual level. A regression of GVI on female's age with individual fixed effects shows that the same woman's index rises by only about 0.02 points per year of age (see Table A1). Gender values also do not respond to major life events. Using the full sample of women and controlling for individual and year fixed effects, Table A2 shows that reported GVI does not change significantly around marriage, divorce, or the births of the first, second, and third child. To rule out anticipation effects and temporary changes that a single post-event coefficient could mask, Figure A2 traces time trend around the first childbirth using an event-study design. Panel (a) shows that, in the full sample, the index increases only slightly over the event window, by less than one point on the 2–8 scale across eight years, with no discernible jump at the time of birth. Panel (b) repeats the analysis separately for women classified as progressive, moderate, and conservative based on their individual average GVI. For each group, the estimated values and their confidence intervals remain almost entirely within the range that defines the group throughout the event window, indicating that women do not move across groups after the birth. This supports both the stability of self-reported GVI and the consistency of the group classification.

Since self-reported GVI is largely stable within individuals over time, I use each woman's average GVI across all available waves as a proxy for her gender role attitudes. This approach smooths out short-term reporting noise and expands the usable panels with information on gender values. Respondents who never answered these questions are excluded. Figure 1 shows the distribution of this mean-imputed GVI for married women in the sample, which averages 5.4. Based on this measure, I divide women into three groups with distinct gender role attitudes, which I use throughout the subsequent empirical analysis and the structural model. Women with a mean-imputed GVI below 4 are classified as conservative, those between 4 and 6 (including 4 but not 6) as moderate,

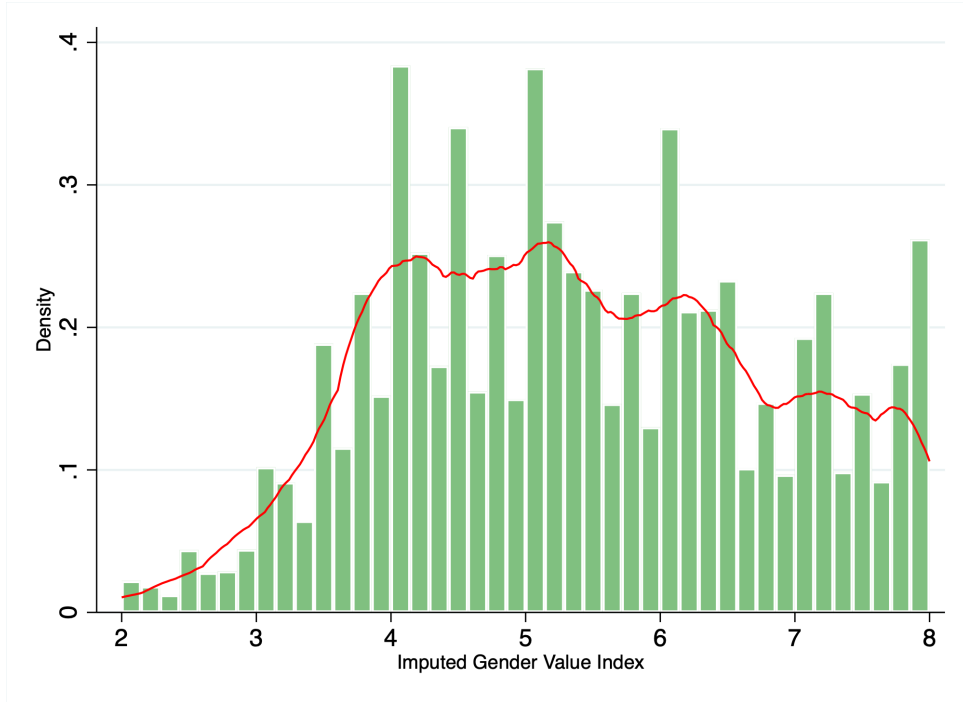


Figure 1: Distribution of the Mean-Imputed Gender Value Index (GVI) for Married Females

and those at 6 or above as progressive. Under this classification, 16.2% of women are conservative, 47.0% are moderate, and 36.3% are progressive.

Respondents' gender role attitudes are largely independent of education and wages. Individuals with higher education and greater earning capacity tend to be more progressive, but the association is weak. A regression of GVI on educational attainment and wages produces a very low R-squared of 0.041%, as shown in Table A3. A similarly weak association between gender views and education or wage is reported by [Goussé et al. \(2017\)](#) for Danish households. In addition, Table A3 presents the share of women with different gender role attitudes at each education level. Women with higher education tend to be more progressive on average, but the differences across education levels are small, and the relationship is not linear. For instance, among women with a tertiary education, 16.5% are classified as conservative—a higher share than among those with a high school degree. This suggests that gender role attitudes are not strictly determined by education, calling for further study of individual gender views and behaviors beyond observable characteristics.

3.3 Fertility intentions

In addition to realized fertility outcomes, the dataset also records women's stated intentions regarding future childbearing, and the determinants of childbearing decisions. Respondents are asked the following question:

“Do you want to have a child or another child?”

with three response options: 1 = *Yes, at any cost*; 2 = *Yes, with condition(s)*; and 3 = *No*. In the pooled sample, 24% of respondents report “*Yes, at any cost*”, 18% report “*Yes, with condition(s)*”, and 58% report “*No*”.

Stated fertility intentions align closely with subsequent fertility decisions.¹² Among respondents who report “*Yes, at any cost*”, 44% have another child within three years, compared with 18% among those who report “*Yes, with condition(s)*” and only 4.7% among those who report “*No*”. This close correspondence between stated intentions and fertility outcomes indicates that self-reported intentions serve as reliable measures of childbearing willingness, providing empirical support for their use as a proxy for underlying fertility preferences.

Depending on their stated fertility intentions, respondents are asked one of two follow-up questions. Those who report a conditional birth intention are asked about the “*conditions for giving birth*”, while those with no intention to have another child are asked about “*reasons for not having children*”. These conditions and reasons, along with the percentage of respondents listing each factor, are presented in Tables A4 and A5.

Among the conditions for having another child, “cooperation from husband and family” is the second most frequently cited condition, cited by 45.3% of respondents, just after affordability of living expenses with children, reported by 76.9% of women. By contrast, continuing to work and access to external childcare services appear less consequential, each cited by roughly 23% of women.

The reasons for not having another child are more diverse. Nevertheless, the heavy childcare burden and educational expenses rank among the top deterrents, cited by 48.8% of women. Since women perform the primary caregiving role, this likely reflects concerns about the substantial time commitment that raising a child demands. Meanwhile, 10.3% of women specifically point to a lack of spousal support, citing “I cannot expect that my husband will help me with childcare”.

The stated conditions and reasons suggest that the heavy childcare burden—particularly the husband’s lack of involvement in childcare—is a major concern shaping women’s fertility intentions. This concern is not offset by external childcare support, such as daycare centers. These findings point to the need to examine the division of childcare time between spouses, and its effect on fertility willingness. In the next section, I use factors related to women’s complaints about their husbands’ childcare involvement to show that concerns over the division of childcare time vary with women’s gender role attitudes, acting as an obstacle to fertility to varying degrees.

¹²Tan and Tey (1994); Thomson (1997) document a similar correspondence between women’s stated fertility intentions and subsequent fertility outcomes.

4 Empirical Evidence

This section presents empirical evidence that motivates the model’s setup and summarizes three key findings. First, women with more progressive views have fewer children and delay their first birth. Second, a gendered division of labor is prevalent in Japanese households and intensifies after childbirth. Although progressive women share housework more equally with their husbands, they still face a substantial career penalty after childbirth. Third, a more unequal division of labor is associated with lower birth intentions, consistent with women experiencing disutility from such an imbalance.

4.1 Fertility patterns and gender views

Females’ gender role attitudes are associated with their fertility decisions. Figure 2 presents completed fertility outcomes for women with different gender role attitudes. GVI is plotted on the x-axis, with higher values indicating more progressive attitudes. On the y-axis, Panel (a) shows the average number of children, and Panel (b) shows women’s average age at first childbirth. The sample is restricted to women aged 35 and above, ensuring that 95% of respondents have had at least one child. The number of children in Panel (a) is measured as the maximum value each woman reports over the sample period, representing her completed fertility.

Figure 2 shows that women with higher GVI tend to have fewer children over the life cycle and delay their first childbirth. Women with a GVI of 2 have lower children on average than those with a GVI of 3, likely because households in this group have lower average income. Apart from this exception, the average number of children decreases with GVI, while the average age at first childbirth increases with GVI.

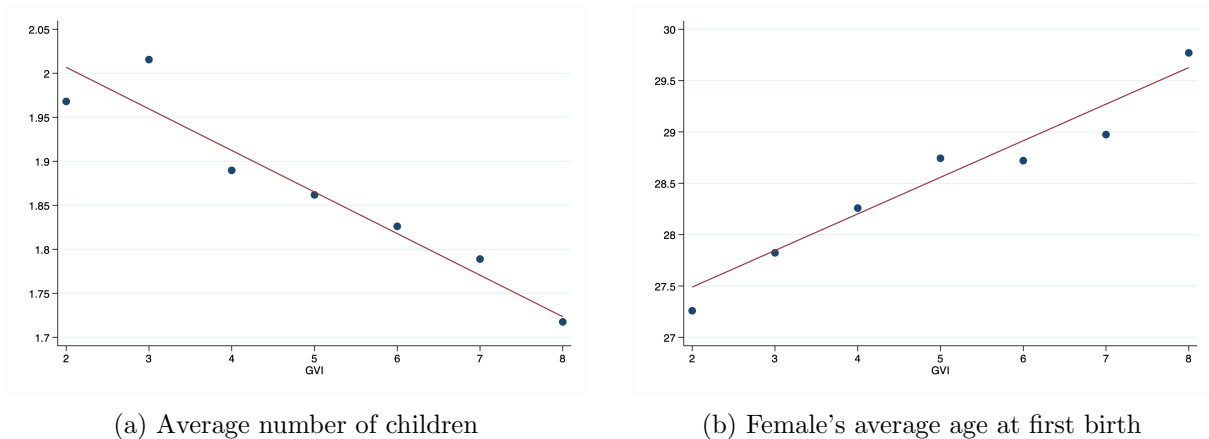


Figure 2: Fertility outcomes by Gender Value Index (GVI)

4.2 Gendered division of labor between spouses

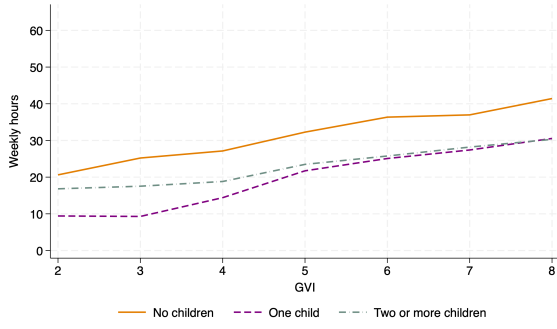
Japanese couples exhibit a pronounced gendered division of labor, and this division becomes markedly reinforced once children arrive. This gendered division is characterized by women performing the majority of housework and childcare duties within the household regardless of their earning ability relative to their spouse, while husbands undertake the majority of market work. Such an unbalanced allocation likely reflects patriarchal social norms and results in inefficient intra-household time allocation (Myong et al., 2021).

Figure 3 presents spouses' time allocation across three groups: childless households, households with one child, and households with two or more children. Spouses' hours are plotted against the wife's GVI on the x-axis for both partners, with the husband's allocation is measured against his wife's GVI rather than his own. Panels (a) and (b) show weekly market work hours for wives and husbands, respectively, while Panels (c) and (d) show weekly home production hours.

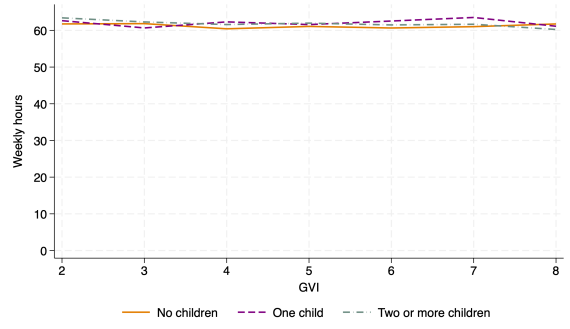
The figure reveals two main patterns. First, women with more progressive gender views devote more time to market work and take on a more balanced share of domestic responsibilities. Across the four panels, wives' market work hours increase with GVI, while their home production hours decline with GVI. Husbands' market work, by contrast, remains largely stable across their wives' gender role attitudes, and their home production hours increase slightly with their wives' GVI, likely reflecting assortative matching on personal values. These patterns are consistent with stronger labor market prospects and greater expectations of within-household equality among more progressive women.

Second, the gendered division of labor is reinforced in households with children. Among childless couples, wives' market work ranges from 20 to 40 hours per week across the GVI distribution, while husbands maintain a stable 60 hours per week. Among households with children, wives' average market work falls by roughly 10 hours per week. Home production hours show a parallel pattern. In childless households, wives spend 20–30 hours per week on home production compared to 0–5 hours for husbands. Once a child is present, wives' home production hours roughly double, ranging from 50–60 hours per week, while husbands' home production hours also roughly double, to 5–10 hours per week. The result is a widening spousal gap in housework from the childless to the with-children state, indicating an intensification of traditional gender roles within the household following childbirth.

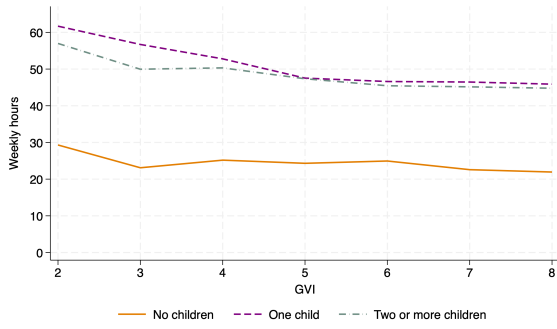
The unbalanced division of labor and the widening gender gap following childbirth cannot be fully explained by economic specialization; gender norms appear to play a substantial role. Figure 4 examines wives' share of home production against their wage relative to their spouse. Relative wage is computed as the wife's hourly wage divided by her husband's hourly wage; non-working spouses are assigned a wage of zero, so a relative wage of zero identifies wives who are out of the labor market. Husbands with



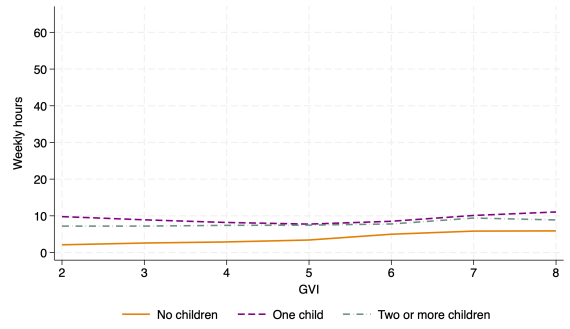
(a) Females' market work hours



(b) Males' market work hours



(c) Females' home production hours



(d) Males' home production hours

Figure 3: Spouses' time allocation by number of children

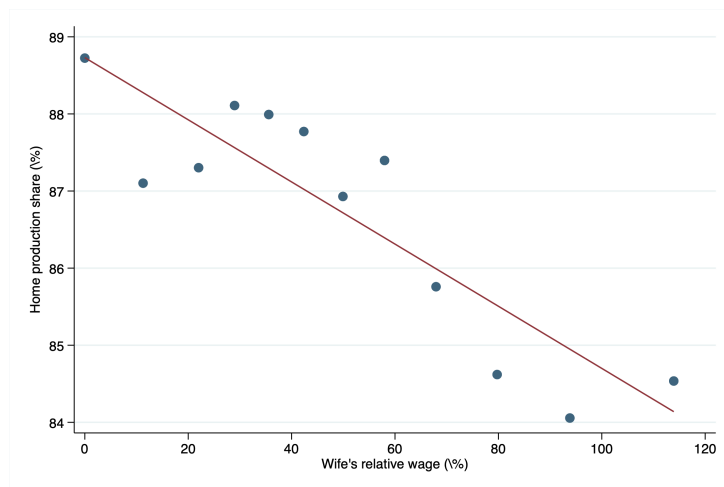


Figure 4: Wife's share of home production by relative wage

zero earnings account for only 1% of the sample and are therefore excluded from the figure.

The figure shows that wives with a higher relative wage bear a lower share of housework on average, though this share remains above 84% even among women who out-earn their husbands. This share is approximately 20 percentage points higher than comparable estimates for the United States and Australia (Stratton, 2020). The persistently high share, even as relative wage rises, is difficult to reconcile with efficient specialization or comparative advantage between spouses.¹³ Instead, it suggests that women in Japanese households take on a substantially higher share of domestic labor than an economic efficiency benchmark alone would predict, consistent with social norms shaping spouses' roles within the household (Siminski and Yetsenga, 2022).

4.3 Child penalty

The highly unequal division of labor between spouses results in a heavier child penalty for women, which in turn shapes their fertility considerations. I assess the impact of first childbirth on the evolution of spouses' time allocation using an event-study design following Kleven et al. (2019, 2024).

Women are assigned to one of three groups—conservative, moderate, and progressive—and I estimate the following event-study regression separately for each group:

$$y_{it}^g = \sum_{t=-2}^6 \alpha_t^g \cdot D_{it}^{Event} + \beta_t^g \cdot D_{it} + v_{it}^g, \quad (1)$$

where y_{it}^g is the outcome for individual i of group g at event time t . The first term includes dummies for each event time t . The second term controls for demographics, including ages, education, working industry, region, and year fixed effects.¹⁴ The event window spans two years before and six years after the first childbirth, with the event year $t = 0$ omitted. The estimated coefficients α_t^g therefore measure the impact of first child relative to the year of birth. Figure 5 plots the GVI-specific estimates across event time.¹⁵ The event-study design allows for the possibility that individuals have subsequent births in later years; more conservative women are more likely to have additional children in subsequent years. To address the concern that the differences across groups are driven by

¹³Here, efficiency refers to Pareto efficiency based on economic factors such as wages and income. Myong et al. (2021) explicitly document distortions from efficient housework allocation in South Korean families using a cooperative household framework. Given the similarities in gender norms and time-use patterns, a comparable inefficiency is likely present in Japanese households.

¹⁴For time-use outcomes, I control for both spouses' age and education; for wage outcomes, I control only for the individual's own age and education. Industry refers to the individual's own working sector, while region and year fixed effects are common to both members of the same household.

¹⁵The figures plot $\hat{\beta}_t + \hat{E}[y_{it}|I[t = 0]]$, the estimated coefficients plus the mean of the outcome in the birth year. This normalization facilitates interpretation of the graphs.

the number of children rather than gender role attitudes, I additionally report the same effects for the subsample of households with only one child during the sample period in Figure A4.

Figure 5 presents effects on female and male market work hours in Panels (a) and (b), followed by home production hours in Panels (c) and (d). Panels (e) and (f) show effects on the hourly wage rate of wage earners.

Comparing wives' outcomes across gender-attitude groups in Panels (a), (c), and (e), all groups of women experience reduced labor market involvement and lower wages after childbirth, and the gap between groups widens substantially—suggesting that childbirth reinforces women's roles in line with their personal attitudes. Panel (a) shows that progressive and moderate women are more likely to return to work after the first birth, though their labor supply fails to recover to pre-birth levels. Both two groups maintain near full-time hours in the two years before childbirth, then shift to part-time work afterward, with progressive women averaging 20 hours per week and moderate women averaging 10 hours per week. Conservative women are the most likely to exit the labor market entirely, with average work hours falling below 5 hours per week. Panel (c) shows that women's home production hours increase sharply after the first birth and decline gradually thereafter; the gap between groups also widens relative to the pre-birth period, with home production stabilizing at 52 hours for progressive women, 60 hours for moderate women, and 66 hours for conservative women by the time the child turns six. A more direct measure of the career penalty is the hourly wage rate. Here I report the average wage among women who have income, so the trend reflects the wage penalty among those who remain employed. All groups experience declining wages following childbirth, with the decline steepest among conservative women, indicating a more severe penalty for this group. Progressive women earn more on average than the other groups, though conservative women sometimes earn more than moderate women—suggesting that conservative women's earning potential is comparable to that of moderate women, and that their reduced labor supply reflects their personal values rather than differences in earning capacity.

Panels (b), (d), and (f) show outcomes for husbands. Husbands whose wives belong to different gender-attitude groups show little variation in their time-use patterns. Their market work hours remain stable at approximately 60 hours per week across the birth of the first child. Although husbands increase their home production hours for childcare, the spousal gap in home production widens substantially nonetheless. The figure f reports the hourly wage rate among husbands who are employed. Unlike women, men do not experience a significant wage decline after childbirth, showing no evidence of a career penalty. Husbands of conservative women earn more on average than husbands in the other two groups.

As a robustness check, I plot child penalties across spouses with different levels of ed-

educational attainment in Figure A5, to assess whether education—rather than gender role attitudes—better explains these patterns. The effects of childbirth by education group are far less pronounced than those by gender role attitudes, reinforcing that personal values regarding gender roles are a stronger predictor of women’s career-versus-housework preferences than education.

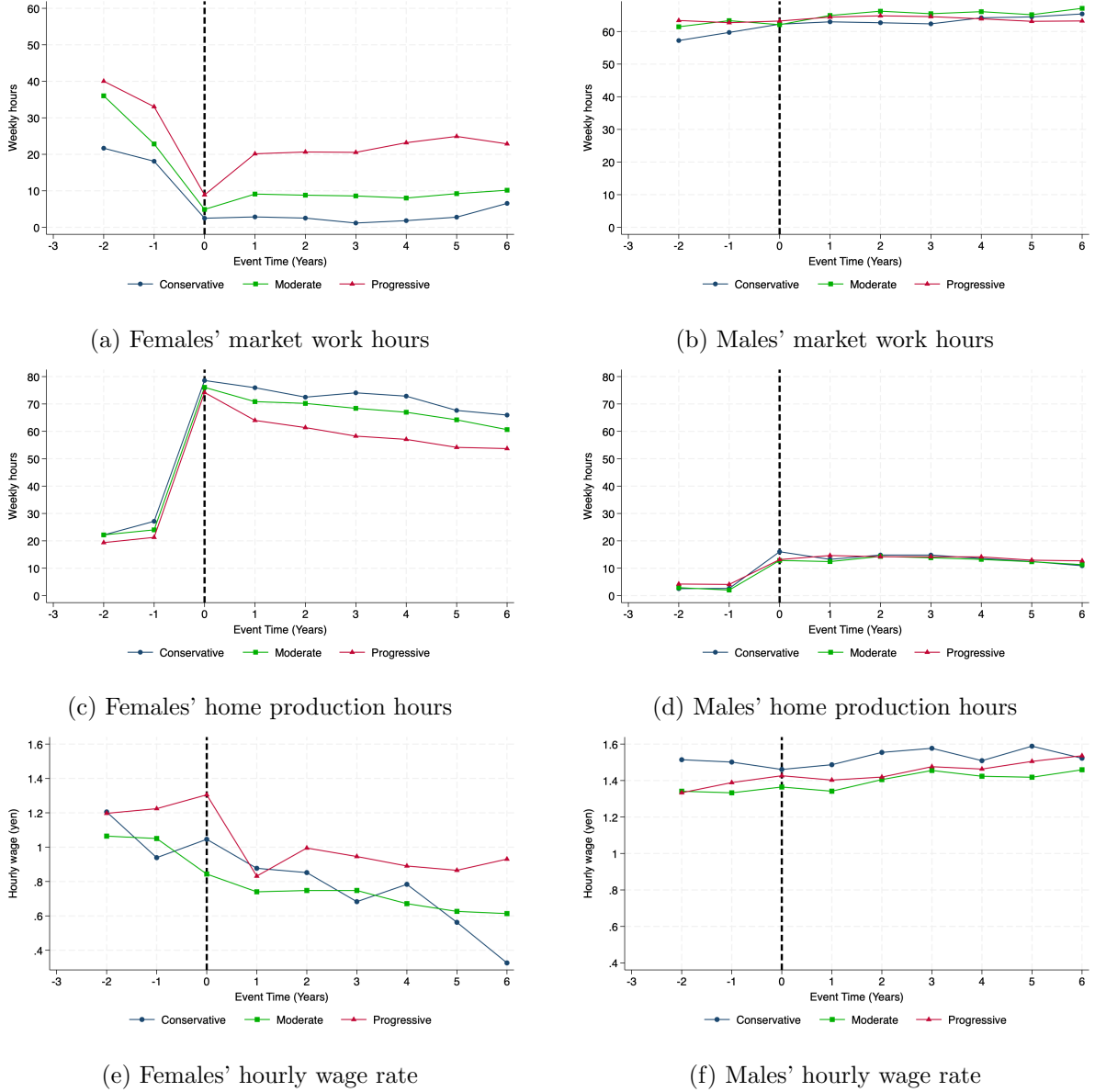


Figure 5: Effect of first childbirth on spouses' time allocation

4.4 Inequality aversion from unequal labor division

The previous analyses show that women with more progressive views have fewer births, even though they achieve a more equal division of market work and housework with their spouses. Part of this outcome is explained by the child penalty in females' career outcomes. Beyond this career channel, this section turns to a second mechanism, examining

women’s psychological cost from an unequal division of labor, which varies with their gender role attitudes.

Progressive women tend to hold higher expectations for egalitarian domestic responsibilities and place greater weight on intra-household equality. Their preference for equal roles may stem from personal beliefs in gender equality across both careers and housework, and it is reflected in their aversion to unequal divisions of labor between spouses. Consequently, even among progressive women—for whom domestic work is relatively more balanced—persistent imbalance can still generate dissatisfaction that discourages additional childbearing.

To examine this mechanism, I estimate a pooled OLS regression of respondents’ birth intentions on the interaction between the wife’s GVI and the spousal gap in home production hours. This specification tests whether progressive women place greater weight on equality in domestic work when forming their fertility intentions. I use survey questions on birth intentions as the dependent variable, rather than realized fertility outcomes such as the number of children, to avoid reverse causality between the number of children and the childcare workload. The equation is:

$$y_i = \beta_{kg} \cdot dk_i \cdot GVI_i + \beta_k \cdot dk_i + \beta_g \cdot GVI_i + \beta'_c \mathbf{X}_i + u_i, \quad (2)$$

where dk_i denotes the absolute difference in spouses’ home production hours for female respondent i , and GVI_i is the individual-level, mean-imputed female gender value index. $\mathbf{X}_i$ is a vector of control variables, including age and education fixed effects for both spouses, the wife’s wage relative to her spouse’s, the number of existing children, and region fixed effects. The dependent variables are the respondent’s fertility intentions and the associated follow-up conditions and reasons, each coded as a dummy equal to 1 if the respondent selects that condition or reason and 0 otherwise. I focus in particular on the reason “I cannot expect that my husband will help me with childcare”, reported by respondents with no intention of having another child. This response links women’s reluctance to have another child directly to the unequal domestic labor.

Figure 6 plots the average marginal effects from the estimated regressions. Panel (a) shows the predicted probability that respondents cite an unsupportive husband as a reason for not wanting another child, plotted against the wife’s GVI. Most estimated effects are significantly different from zero, indicating that a larger spousal gap in home production hours is associated with a lower likelihood of wanting another child specifically due to an unsupportive husband. More importantly, the relationship is upward-sloping: more progressive respondents are more likely to forgo another child because of insufficient spousal support. Panel (b) plots the same marginal effects against women’s educational attainment. While these effects also differ significantly from zero, the slope is flat, suggesting that women’s aversion to an unsupportive husband does not vary meaningfully

with education. Panel (c) plots the effects against employed women’s hourly wage rate, where the slope is positive but smaller than in Panel (a). Together, these results suggest that women experience a disutility from unequal gender roles when forming their birth considerations, and that their reduced birth intentions in response to an unequal division of childcare are driven primarily by gender views, rather than by education or career prospects.

As an additional check, Table A6 reports the estimated interaction effects underlying the average marginal effects plotted in Figure 6, along with the linear probability of citing other follow-up conditions among women with a conditional birth intention, and reasons among women with no birth intention, together with estimates for key control variables. Columns 1–3 report effects on the conditions “supportive husband”, “continue working”, and “childcare centers”. Columns 4–6 report effects on the reasons “unsupportive husband,” “childcare burden”, and “continue working”.

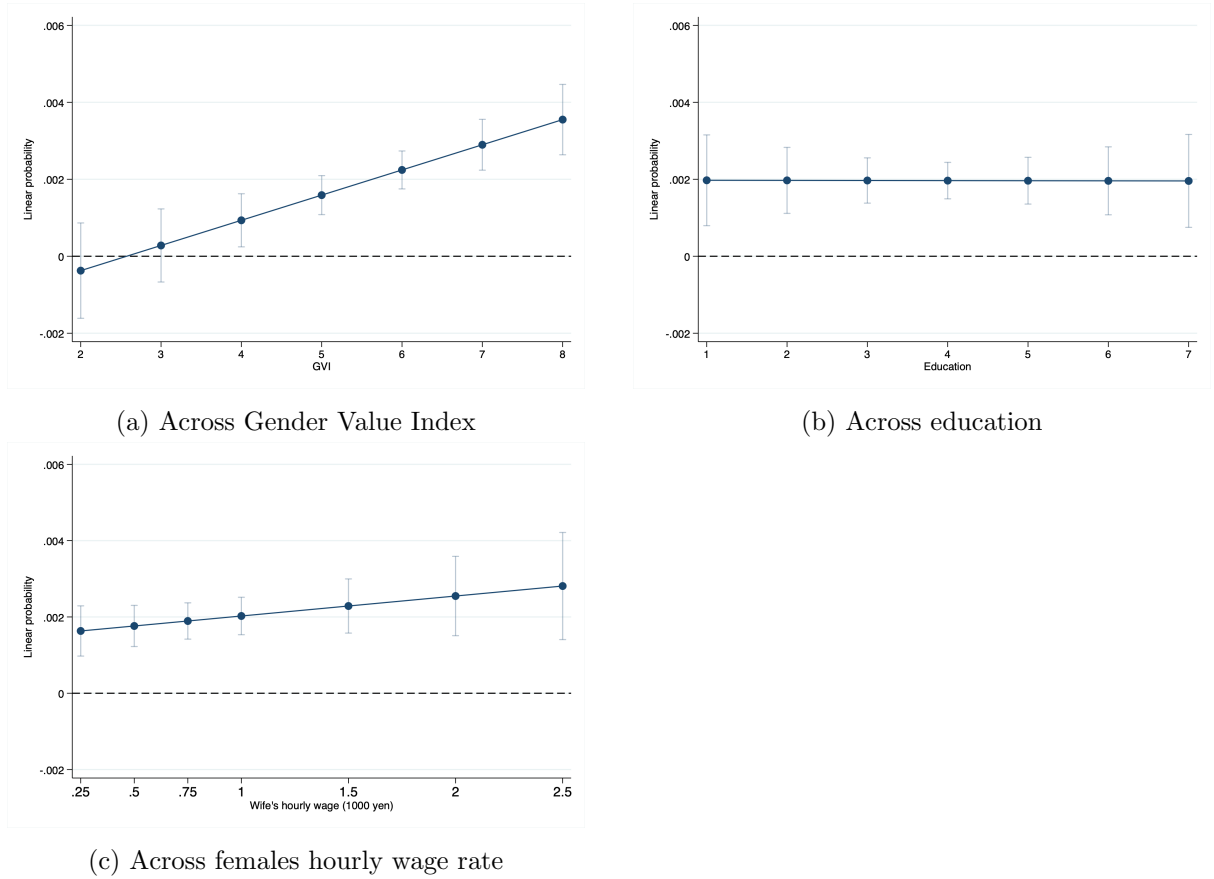


Figure 6: Average marginal effect of housework inequality on low birth intention

5 Model

This section describes a dynamic collective model that characterizes spouses’ intra-household allocation and fertility decisions. The model has three main features. First,

couples make decisions collectively under full commitment, with the Pareto weight determined by their initial wage distribution. Second, fertility is an endogenous discrete choice made in each period. Third, the female spouse incurs a penalty for unequal home production hours between spouses.

The model is set in discrete time, where each period represents two calendar years. Females are 24 years old at the initial period, married, and endowed with an initial distribution of number of children associated with their gender-role views. In each period, spouses maximize the expected discounted sum of utilities over the remaining part of their life by choosing private consumption and household saving, and by allocating time between market work, home production, and leisure. In periods when the female spouse is fertile, the couple also decides whether to try to conceive an additional child.

The two spouses $i = 1, 2$ decide on the intra-household allocation of consumption and time use. I denote spouses' private consumption by c_t^i and joint saving assets by a_t . Each spouse's time endowment is divided among market work h_t^i , home production k_t^i , and private leisure l_t^i . For the fertility decision, I let a binary variable $d_t = 1$ denote that the spouses choose to conceive a child at period t , and $d_t = 0$ otherwise. Whether a child successfully arrives in the subsequent period is probabilistic and depends on the female spouse's age.

Spouses make decisions taking a range of state variables into account, collected in $\Omega_t = (\mu_t, a_t, K_t^1, K_t^2, n_t, o_t, age_t^1, z_1, \epsilon_t^1, \epsilon_t^2, \eta_t^C, \eta_t^{NC})$, where a_t is saving assets carried over from the previous period, K_t^1 and K_t^2 are the human capital of female and male, n_t is the number of children living at home, o_t is the age of the youngest child, age_t^1 is the age of the female spouse, and z_1 is the female spouse's gender-role attitude, which is constant over time. In addition, ϵ_t^1 and ϵ_t^2 denote wage shocks to the spouses, and η_t^C and η_t^{NC} are the spouses' preference shocks toward conception and non-conception, respectively.

Married couples jointly make household decisions over the horizon. I follow the spirit of the collective model, which assumes spouses have distinct preferences and that the household maximizes the weighted sum of both spouses' utilities, with the weights representing their relative bargaining power. The resulting allocation is Pareto efficient (Chiappori, 1988, 1992), and more closely aligned with the preferences of the spouse who holds greater bargaining power. I assume the spouses are married prior to the initial period. Spousal bargaining power is determined at the beginning of the marriage, depends on the spouses' relative wage rates and remains constant thereafter. The model thus follows a full-commitment setting in which spouses agree on the Pareto-efficient allocation at the initial period of marriage, and outside options such as divorce or other shocks do not lead to renegotiation of bargaining power (Mazzocco, 2007; Theloudis et al., 2025).

I impose two core assumptions in the model. First, to reflect Japan's overwork culture and the limited variation in men's long working hours across work and childbirth related characteristics, male spouses' market work hours are fixed at 60 hours per week. Second,

divorce is an absorbing state with no remarriage allowed ¹⁶, and the value of divorce is set very low, making the outside option of marriage unattractive relative to remaining married. ¹⁷

Preferences. A household's flow utility in period t is a weighted sum of the spouses' individual utilities,

$$\begin{aligned}
U(c_t^1, c_t^2, l_t^1, l_t^2, k_t^1, k_t^2, h_t^1, h_t^2, d_t; n_t, o_t, K_t^1, K_t^2, z_1) = \\
\mu_t^1 u^1(c_t^1, l_t^1, h_t^1, k_t^1, d_t; n_t, o_t, K_t^1, z_1) \\
+ (1 - \mu_t^1) u^2(c_t^2, l_t^2, h_t^2, k_t^2, d_t; n_t, o_t, K_t^2, z_1) \\
+ \eta_t^C d_t + \eta_t^{NC} (1 - d_t)
\end{aligned} \tag{3}$$

where $\mu_t^1 \in (0, 1)$ denotes the wife's bargaining power within the household. Each spouse $i \in \{1, 2\}$ has a distinct utility function $u^i(\cdot)$, reflecting differences in preferences across household members. Throughout, I simply assume that $i = 1$ denotes the wife and $i = 2$ denotes the husband. Despite diverging preferences, the spouses face a joint iid preferences shock toward conception or non-conception, denoted $\eta_t^C d_t$ and $\eta_t^{NC} (1 - d_t)$, where the realized shock depends on whether the spouses decide to conceive, indicated by the variable d_t .

The utility of each household member consists of ¹⁸

$$\begin{aligned}
u^i(c_t^i, l_t^i, h_t^i, k_t^1, k_t^2, d_t; n_t, o_t, K_t^i, z_1) = \frac{(c_t^i)^{1+\eta_i}}{1+\eta_i} + \psi_i \frac{(l_t^i)^{1+\gamma_i}}{1+\gamma_i} \\
+ \lambda(n_t, o_t) \frac{(Q_t)^{1+\kappa}}{1+\kappa} + q_i(K_t^i, d_t) \\
+ \mathbf{1}(i=1) \left[g(z_i, h_t^1) + p(z_i, k_t^1, k_t^2) \right]
\end{aligned} \tag{4}$$

Each spouse derives utility from private consumption c_t^i , private leisure l_t^i , and a home-produced good Q_t , with each component entering utility in the standard constant relative risk aversion (CRRA) form.

The home-produced good captures two components: the welfare of children, if the household has children living at home, and the quality of the household environment, such as cleanliness and homemade meals. The output depends on both spouses' domestic

¹⁶This is a common and standard assumption in the previous literature using dynamic collective models.

¹⁷The divorce rate in Japan is low—about 1.5 per 1,000—so I assign married couples a low value for the outside option of divorce, such that only a few reach divorce in the model simulations.

¹⁸As I do not model the divorce state, I do not include the matching shocks for both spouses in the utility function as previous literature commonly do.

labor supply, k_t^1 and k_t^2 , such that $Q_t = Q_t(k_t^1, k_t^2)$. These domestic activities include housekeeping chores—e.g., cleaning and doing laundry—and, if the household has children, childcare duties. The home production technology takes the constant elasticity of substitution (CES) form:¹⁹

$$Q_t = Q(k_t^1, k_t^2) = \left(\pi(k_t^1)^\sigma + (1 - \pi)(k_t^2)^\sigma \right)^{\frac{1}{\sigma}} \quad (5)$$

where $\pi \in [0, 1]$ captures productivity differences between the spouses' domestic time inputs, and σ controls the degree of substitutability between them.

The weight on home production reflects the importance of the home-produced good for individual utility, and thereby determines the spouses' incentives to allocate time to domestic labor. This weight depends on the number of children in the household, n_t , and the age of the youngest child, o_t :

$$\lambda(n_t, o_t) = B \left[1 + \left(b_1 \cdot \mathbf{1}(n_t > 0) + b_2 \cdot (n_t - 1) \right) f(o_t) \right] \quad (6)$$

I assume that spouses' tastes for home production are common within the household and does not differ by gender. The parameter B is the multiplicative scale factor for this taste, and it captures only the quality of living environment when the household has no children. Spouses' additional utility from children is not restricted to be linear in the number of children, allowing the model to capture nonlinearities in how children affect spouses' time use. The parameter b_1 captures the value of being a parent, while b_2 captures the marginal impact of each additional child beyond the first. Apart from the effect of the number of children, this weight decays with the age of the youngest child according to $f(o_t) = \exp(-b_3 \cdot o_t)$ as spouses spend less time on childcare as children grow older.

Each spouse has a fixed time budget T^i per period, allocated between market work h_t^i , home production k_t^i , and private leisure l_t^i , so that each individual faces the time constraint

$$h_t^i + k_t^i + l_t^i = T - \text{sleep}^i, \quad \forall i \in \{1, 2\} \quad (7)$$

where the time budget $T - \text{sleep}^i$ equals 168 hours per week net of sleep. I calibrate weekly sleep time based on gender, number of children, and gender role attitude group (conservative, moderate, or progressive). Childless spouses sleep significantly more than those with children, and spouses in the progressive group sleep less than those in the conservative or moderate groups. Market work and home production hours are directly reported by respondents, while private leisure is measured as the residual.

¹⁹Salazar-Saenz (2022) provide a comprehensive review of commonly used home production specifications. Gayle and Shephard (2019) offer a representative example of the CES specification. Some papers additionally include material inputs in Cobb-Douglas form as a complement to the CES aggregator of time inputs.

The fourth term represents the non-monetary, career-related cost associated with having a child in period t . This cost captures the harm of career interruptions—for instance, lower productivity during the fertility period, and reduced promotion opportunities if employers perceive parents as less committed to their careers. The cost differs by gender and is given by

$$q_i(K_t^i, d_t) = \theta_k^i (K_t^i + 1) d_t \quad (8)$$

where θ_k^i is a cost parameter capturing how costly having a child at time t is for individual i . The cost increases with individual i 's human capital stock, K_t^i , since individuals with greater human capital face higher opportunity costs at the fertile period, and therefore bear a larger career-related cost of childbearing.

The fifth and sixth terms apply only to the female spouse and depend on her gender-role attitudes, z_i . The fifth term captures her (dis)utility from working long hours. Women with conservative gender-role attitudes are more averse to long work hours, as prevailing social norms tie their sense of duty to household labor and stigmatize women who spend more time on market work. In contrast, women with progressive attitudes may face no such stigma, and may even gain utility from working longer hours through a sense of career achievement. The term related to working hours is given by

$$g(z_i, h_t^1) = \psi_{z_i}^{s_i} (h_t^1)^{\varphi_{z_i}}, \quad i = 1 \quad (9)$$

where $z_i \in \{1, 2, 3\}$ indexes her gender-role attitude group, and $s_i \in \{k, nk\}$ indicates whether the female has children. Correspondingly, $\psi_{z_i}^k$ and $\psi_{z_i}^{nk}$ denote the scale of the (dis)utility for females with and without children, respectively, and may take either positive or negative values. $\varphi_{z_i} > 1$ captures the curvature of this (dis)utility and varies with the gender role attitudes, z_i .

The sixth term captures the wife's disutility from an unequal division of domestic duties between spouses, reflecting her aversion to disparities in household labor. This disutility depends on the difference in spouses' domestic labor hours and on the wife's gender-role attitudes. Women who face greater inequality in housework, and who hold more progressive gender-role attitudes, experience higher disutility from an unbalanced division of household labor. This disutility applies only to women, as in Japanese households, women typically perform a larger share of family labor, while husbands benefit from home production with limited time investment of their own. Formally, the wife's disutility is defined as

$$p(z_i, k_t^1, k_t^2) = \theta_{z_i} \max(k_t^1 - k_t^2, 0)^{\rho_{z_i}}, \quad i = 1 \quad (10)$$

where $z_i \in \{1, 2, 3\}$ indexes her gender-role attitude group, and $\theta_{z_i} \leq 0$ and $\rho_{z_i} > 1$ are parameters that reflect the sensitivity of this disutility to the wife's gender-role attitudes,

z_i . The $\max(\cdot, 0)$ operator implies that this disutility arises only when the wife bears a larger share of domestic duties than her husband, and ρ_{z_i} governs the curvature of the aversion.

The wife's aversion to an unequal division of home production time affects both the household's time allocation and its fertility decisions. This aversion acts as a penalty on the traditional pattern of specialization, thereby leading to a more equal division of housework between spouses. At the same time, an unequal division of domestic labor raises the psychological cost of childcare time, thereby lowering the household's willingness to have children.

Fertility and children. The household decides whether to have another child in period t through a binary choices $d_t \in \{0, 1\}$.

If the spouses decide to conceive, the child is born in the next period with probability of successful conception $\pi(\text{age}_t^1)$, which depends on the wife's age. The conception probability accounts for biological fecundity and a potential permanent infertility risk, both calibrated based on the medical literature and detailed in Appendix A.4. I assume no possibility of unplanned fertility, so a new child is not born in the next period if the spouses decide not to conceive.

If the child is successfully born, the number of children living at home is increased by one unit in the next period, and the age of the youngest child is set to zero. If no childbirth occurs, the number of children remains unchanged, and the age of the youngest child increases by one period unit. Children move out of the family once they are above 18 years old.

Human capital and wages. The model allows spouses' wages depend on their human capital stocks as:

$$\ln(w_t^i) = \phi_i^0 + \phi_i^1 K_t^i + \epsilon_t^i, \\ \epsilon_t^i \stackrel{\text{iid}}{\sim} \mathcal{N}(0, s_i)$$

where individual human capital K_t^i is discrete with values $\{0, 1, 2, \dots, K_{\max}\}$ and is accumulated through learning-by-doing. The law of motion for human capital is:

$$K_t^i = \begin{cases} \min\{K_{t-1}^i + 1, K_{\max}\} & \text{with prob. } p_K(h_{t-1}^i)(1 - p_{\delta_i}) \\ K_{t-1}^i & \text{with prob. } p_K(h_{t-1}^i)p_{\delta_i} + (1 - p_K(h_{t-1}^i))(1 - p_{\delta_i}) \\ \max\{K_{t-1}^i - 1, 0\} & \text{with prob. } (1 - p_K(h_{t-1}^i))p_{\delta_i} \end{cases} \quad (11)$$

The stock increases by one unit with probability $p_K(h_t^i)$, which is increasing in one's working hours at period h_t^i . The functional form for the probability is imposed as $p_K(h_t^i) = 1 - \exp(-\alpha_i h_t^i)$, where α_i controls how responsive the human capital process is to changes

in work hours. Meanwhile, K_t^i depreciates with exogenous probability p_{δ_i} .

The evolve of human capital allows for accumulation of skills through working experience. If one works longer hours across periods, the human capital is more likely to increase and positively affect wages.

Financial constraint. The household has a budget constraint at each period t :

$$F(c_t^1, c_t^2, n_t) = w_t^1 h_t^1 + w_t^2 h_t^2 + (1 + r)a_t - a_{t+1} \quad (12)$$

where the household expenditure $F(c_t^1, c_t^2, n_t)$ should not exceed the labor income and saving assets.

The household expenditure accommodates child-related expenses and the economies of scale of spouses' private consumption, aligning to [Voena \(2015\)](#); [Foerster \(2024\)](#):

$$F(c_t^1, c_t^2, n_t) = e(n_t) \left((c_t^1)^\delta + (c_t^2)^\delta \right)^{\frac{1}{\delta}}$$

The child-related expenses is a fixed percentage of adult members' private consumption, where the equivalence scale $e(n_t) \geq 1$ increases with the present number of children n_t in the family.

The economies of scale indicates that given fixed expenditure, the spouses are able to consume more than they could if they lived separately. The scaling is shown through an inverse CES function with $\delta \geq 1$.

Bargaining power. Although [Lise and Yamada \(2019\)](#) use the same dataset to show suggestive evidence that Japanese households' decision-making aligns more closely with a limited commitment setting, where wage shocks and marital surplus relative to divorce can shift bargaining weights between spouses, they also present several findings that support the full commitment setup adopted here. First, they find that the arrival of a new child does not significantly alter spousal bargaining power. Second, around 78% of the total variation in spousal bargaining power over the sample period is explained by household heterogeneity at the time of marriage. Among households whose bargaining power is revised over the 20-year sample period, the majority of households (65%) revise the initial weight to a degree of less than 10%. Hence, adopting the full commitment setting does not undermine the paper's primary research question on fertility decisions. Although full commitment may lead to an overestimation of female labor force participation, this framework allows us to focus on the main tradeoff between home production and other aspects of fertility decisions. A limited-commitment extension with an explicit divorce state is left for future work.

Retirement. The model includes a retirement phase for the spouses. Retirement is exogenous at age T_r . There are two key differences in retirement relative to pre-retirement household decision-making. First, both spouses work zero market hours, allocating their time budget between home production and leisure in every period. Second, each spouse receives a pension that is a function of their pre-retirement wage. I assume individuals receive constant retirement income given by $R_s(w_T^i) = 0.388 w_T^i \bar{h}_i$, where 0.388 is the Japanese net pension replacement rate,²⁰ w_T^i is the retiree's pre-retirement wage, and $\bar{h}_i$ is the average work hours for females and males, respectively. For simplicity, the model does not allow for divorce in the retirement phase and ignores potential death and bequests.

Recursive Formation. Given the state space, the household makes optimal decisions by maximizing the spouses' weighted utilities over time, and the value function for the household in period t is given by

$$V_t^{hh}(\Omega_t) = \max_{\mathbf{C}_t} \left[\mu_t \left[u^1(c_t^1, l_t^1, h_t^1, k_t^1, k_t^2, d_t; n_t, o_t, K_t^1, z_1) + \beta \mathbb{E}_t V_{t+1}^1(\Omega_{t+1}) \right] \right. \\ \left. + (1 - \mu_t) \left[u^2(c_t^2, l_t^2, h_t^2, k_t^1, k_t^2, d_t; n_t, o_t, K_t^2, z_1) + \beta \mathbb{E}_t V_{t+1}^2(\Omega_{t+1}) \right] \right] \quad (13)$$

where β is a time discount factor and $\mathbf{C}_t = (c_t^1, c_t^2, l_t^1, l_t^2, k_t^1, k_t^2, h_t^1, h_t^2, d_t, a_{t+1})$ are the choice variables.

The value function for individual i in period t is shown as:

$$V_t^i(\Omega_t) = u^i(c_t^i, l_t^i, h_t^i, k_t^1, k_t^2, d_t; n_t, o_t, K_t^i, z_1) + \beta \mathbb{E}_t V_{t+1}^i(\Omega_{t+1}), \quad i = 1, 2 \quad (14)$$

The Bellman equation can be decomposed into conditional value functions based on the discrete conception choice made at each period. I index the conditional value functions by C when the household chooses to conceive, and by NC when it chooses not to conceive. Since the conception outcomes are stochastic, I further index the value function by P if the spouses successfully give birth to a new child at the beginning of the following period, and by U otherwise. The conditional value function $V^{hh,U}(\cdot)$ nests two distinct possibilities, households with no conception intention at the previous period and households with a conceive intention but did not result in a successful fertile outcome.

²⁰Source for the net pension replacement rate: [OECD \(2023\)](#).

Given the state space, the value of conceiving is written as

$$\begin{aligned}
V_t^{hh,C}(\Omega_t) = & \mu_t u^1(c_t^1, l_t^1, h_t^1, k_t^1, k_t^2, d_t; n_t, o_t, K_t^1, z_1) \\
& + (1 - \mu_t) u^2(c_t^2, l_t^2, h_t^2, k_t^1, k_t^2, d_t; n_t, o_t, K_t^2, z_1) \\
& + \beta \left[\pi(\text{age}_t^1) \mathbb{E}_t V_{t+1}^{hh,P}(\Omega_{t+1}^P) \right. \\
& \left. + (1 - \pi(\text{age}_t^1)) \mathbb{E}_t V_{t+1}^{hh,U}(\Omega_{t+1}) \right]
\end{aligned} \tag{15}$$

where the first two lines consist of the flow utilities of both spouses. The third line is the future flow of utility if conception is successful, which occurs with probability $\pi(\text{age}_t^1)$. This value depends on the next state space Ω_{t+1}^P , where the superscript P indicates that the number of children increases by one and the age of the youngest child is set to zero. The last line describes the case in which conception is unsuccessful, with continuation value of $V_{t+1}^{hh,U}$, which depends on the next state space Ω_{t+1} .

The value of non-conceiving is given by

$$\begin{aligned}
V_t^{hh,NC}(\Omega_t) = & \mu_t u^1(c_t^1, l_t^1, h_t^1, k_t^1, k_t^2, d_t; n_t, o_t, K_t^1, z_1) \\
& + (1 - \mu_t) u^2(c_t^2, l_t^2, h_t^2, k_t^1, k_t^2, d_t; n_t, o_t, K_t^2, z_1) \\
& + \beta \mathbb{E}_t V_{t+1}^{hh,U}(\Omega_{t+1})
\end{aligned} \tag{16}$$

The conception decision is made as

$$V_t^{hh}(\Omega_t) = \max \left[V_t^{hh,C}(\Omega_t), V_t^{hh,NC}(\Omega_t) \right] \tag{17}$$

As the preference shocks toward conception and nonconception η_t^C and η_t^{NC} , which are part of the state vector Ω_t , are drawn from an extreme value distribution, the probability of conception takes a logistic form, with the values of conception and nonconception as arguments:

$$\Pr(d_t = 1 \mid \Omega_t) = \frac{1}{1 + \exp \left(V_t^{hh,NC}(\Omega_t) - V_t^{hh,C}(\Omega_t) \right)} \tag{18}$$

The decision to conceive, noted d_t in Equation (13), is the argmax of expression (17).

The conception choice involves a trade-off between the benefits and costs of having children. Having more children increases the utility from home production for both spouses, but incurs several costs, including career costs, a reduction in private consumption and leisure, and inequality aversion arising from an unbalanced gender role in domestic duties. Conditional on successful conception, spouses spend more time on childcare, especially during the child's early years, which reduces market work hours and private leisure. This reduction in market work further affects household income and wages in two

ways. First, shorter work hours lower household income in the current period, reducing household consumption. Second, shorter work hours slow human capital accumulation, thereby affecting future wages. In addition, since female spouses take on the majority of childcare activities after childbirth, domestic duties become more unequal, incurring a higher disutility from unequal domestic duties as a psychological cost for females. Conversely, if the household does not conceive or conception is unsuccessful, spouses enjoy higher consumption and leisure and face lower inequality aversion, but produce less home production.

6 Estimation

The estimation of model parameters proceeds in two steps. First, a small subset of the model parameters is preset to match values from the existing literature and data source. Second, the remaining parameters are estimated directly from the JPSC data using the method of simulated moments (MSM), a numerical technique that estimates parameters by matching moments from simulated data to those from observed data (McFadden, 1989; Gourieroux et al., 1993).

6.1 Parameters set outside the model

The preset model parameters and their values are summarized in Table 2. The annual discount factor and interest rate are set to 0.98 and 0.02, respectively, in line with the literature (Attanasio et al., 2008; Foerster, 2024). The economies of scale in spouses' consumption is set to 1.4, following Voena (2015) and Foerster (2024). The probability of successful conception depends on the wife's age and is calibrated using medical evidence (Trussell and Wilson, 1985; Leridon, 2004; Sommer, 2016), with details provided in Appendix A.4.

Each period t in the model corresponds to two calendar years, and the total horizon spans $T = 20$ periods, covering women's ages 24 to 64. Women are assumed to be biologically fertile between ages 24 and 46, during which they face a fertility decision; after age 46, fertility is no longer possible. The model includes two periods of retirement phase, as I assume all agents retire at age 60.²¹

²¹Japanese employers may set a mandatory retirement age no lower than 60, at which point an employee's original employment contract formally ends. However, employers are required to offer continued employment—typically through a new, often less favorable contract—to any employee who wishes to keep working until age 65. Age 65 is also the age at which workers become eligible for the full public pension; claiming before 65 permanently reduces the monthly benefit by 0.4% for each month claimed early, amounting to a 24% permanent reduction if claimed at 60. Because of this financial disadvantage, most workers do not claim their pension early despite having the option. To ease the computational burden, however, I assume all workers retire and begin claiming their full pension at age 60. I include a retirement phase primarily to provide variation for the backward induction at the end of the model horizon, and since I do not target moments during the retirement phase, this simplification should not

The equivalence scale of child-related expenses is calibrated from the data as a function of the number of children, and differs across the three gender role attitude groups: conservative, moderate, and progressive. This scale captures the additional resources required for children relative to a childless couple, while accounting for economies of scale in spousal consumption. The values defining this child-dependent equivalence scale are detailed in Appendix A.5.

I calibrate the initial distribution of four state variables from the data: the number of children, spouses' human capital stock, and spousal relative bargaining power; further details are provided in Appendix A.6. All women enter the model at age 24, and some already have children in the initial period. I draw each woman's initial number of children and the age of her youngest child from the empirical distribution in the data, conditional on her gender role attitudes. Spouses' initial human capital is calibrated based on education, prior work experience, industry of employment, and region of residence, while the law of motion for human capital is estimated within the model. Spousal relative bargaining power is determined by spouses' relative wages in the initial period, when women are aged 24–25 and their husbands range in age from 20 to 42; I use the wife-to-husband wage ratio as a proxy for bargaining power, capturing spouses' relative economic position at the start of the decision horizon. This relative wage ratio is likewise drawn from the empirical distribution in the data.

The model is solved using a grid search method, in which state and choice variables are discretized and the objective function is evaluated at each grid point to identify the optimal solution. The main advantage of this approach is that it does not require differentiability of the value function—an important feature here, since the model combines a discrete fertility choice with multiple continuous choices, making differentiability difficult to guarantee. Accordingly, I also preset the grid points for several model variables, listed in Appendix A.5.

Female weekly work hours are discretized into four categories based on the empirical distribution: non-participation (0 hours), part-time (25 hours), full-time (40 hours), and overwork (55 hours). Male weekly work hours are fixed at 60 hours. Annual hours are computed assuming 49 working weeks per year. Each spouse has a weekly time endowment of 168 hours, and sleep time is calibrated from self-reported sleep hours in the data, varying with the number of children and the wife's gender role attitudes. Both the number of children living at home and spouses' human capital stocks are top-coded at 3, to keep the estimation computationally tractable. The age of the youngest child is discretized into six categories: 0–2, 2–4, 4–6, 6–8, 8–10, and 10+.

affect the estimation results or model fit during the fertile periods.

Table 2: Preset parameters

Parameter	Value	Source
Annual discount factor, β	0.98	Attanasio et al. (2008); Foerster (2024)
Annual interest rate, r	0.02	Attanasio et al. (2008); Foerster (2024)
Economies of scale, δ	1.40	Voena (2015); Foerster (2024)
Probability of successful conception	App. A.4	Trussell and Wilson (1985); Leridon (2004); Sommer (2016)
Child-related expenses, $e(n_t)$		See Appendix A.5, JPSC data
Female and male sleep time		See Appendix A.5, JPSC data
Initial distribution of children		See Appendix A.6, JPSC data
Initial human capital		See Appendix A.6, JPSC data
Initial relative bargaining power		See Appendix A.6, JPSC data

6.2 Methods of simulated moments estimation

The remaining parameters are estimated by the Method of Simulated Moments (MSM). MSM is commonly used in dynamic household models because the objective function arising from discrete choices is typically non-smooth (Sauer and Taber, 2017). Under this approach, the model is first solved for a candidate parameter vector, and artificial data are simulated from the resulting data-generating process. Moments relevant to the parameters of interest are then computed from the simulated data. The estimation objective is to minimize the distance between the simulated model moments and the corresponding empirical moments from the data:

$$\min_{\theta} (m(\theta) - \hat{m})' \widehat{W} (m(\theta) - \hat{m}).$$

The empirical moments I target include both spouses' weekly home production hours and the wife's weekly work hours, conditional on the number of children, the age of the youngest child (for households with children), and gender role attitudes. I also target spouses' wage rates conditional on human capital stock, number of children, and the age of the youngest child. As a third set of moments, I target households' average number of children by gender role group at period 11, corresponding to a female age of 46, to match completed fertility. In total, I target 363 moments. For the weighting matrix $\widehat{W}$, I use a diagonal matrix with the inverse variances of the empirical moments as diagonal entries, adjusting the weights of several moment sets to place additional emphasis on key variables. The estimated MSM parameters, along with their asymptotic standard errors, are reported in Table 3.

6.3 Model fit

This section evaluates the model's fit to the data by comparing average outcomes from the model simulations with the corresponding empirical moments. Figure 7 illustrates time allocation for childless spouses. For parents, Figure 8 traces how time use evolves with the youngest child's age. Figure 9 displays the fits for spouses' private consumption,

Table 3: Estimated parameters

Parameter	Estimate	Standard error	Description
<i>Leisure preferences</i>			
γ_1	-0.7093	0.0004	Female leisure, curvature
ψ_1	0.4612	0.0006	Female leisure, scale
γ_2	-0.3102	0.0004	Male leisure, curvature
ψ_2	0.1037	0.0002	Male leisure, scale
<i>Wage processes</i>			
ϕ_1^0	-0.9527	0.0009	Female intercept
ϕ_1^1	0.2916	0.0003	Female human capital slope
s_1	0.7854	0.0008	Female residual s.d.
α_1	0.0003	3.29×10^{-7}	Female probability of increase
p_{δ_1}	0.0021	2.53×10^{-6}	Female depreciation probability
ϕ_2^0	0.1611	0.0002	Male intercept
ϕ_2^1	0.1181	0.0002	Male human capital slope
s_2	0.1763	0.0002	Male residual s.d.
α_2	0.0001	1.16×10^{-7}	Male probability of increase
p_{δ_2}	0.2468	0.0003	Male depreciation probability
<i>Home production</i>			
κ	-0.7858	0.0002	Preference, curvature
B	0.6330	0.0006	Preference, scale
σ	-0.3326	0.0005	Substitutability between spouses
π	0.5915	0.0007	Spouses' share
b_1	4.2277	0.0044	Preference for the first child
b_2	0.0268	2.83×10^{-5}	Preference for two or more children
b_3	-0.1680	0.0002	Decay rate
<i>Non-monetary career cost of fertility</i>			
θ_k^1	-5.2154	0.0059	Female cost
θ_k^2	-28.2925	0.0252	Male cost
<i>(Dis)utility from housework inequality</i>			
θ_{z_1}	-0.0647	0.0001	Scale: conservative
θ_{z_2}	-0.0296	5.98×10^{-5}	Scale: moderate
θ_{z_3}	-0.0086	2.60×10^{-5}	Scale: progressive
ρ_{z_1}	1.4376	0.0018	Curvature: conservative
ρ_{z_2}	1.2646	0.0013	Curvature: moderate
ρ_{z_3}	1.8424	0.0020	Curvature: progressive
<i>(Dis)utility from working long hours</i>			
$\psi_{z_1}^{nk}$	-0.1500	0.0001	Scale without children: conservative
$\psi_{z_2}^{nk}$	0.0300	3.05×10^{-5}	Scale without children: moderate
$\psi_{z_3}^{nk}$	0.2499	0.0003	Scale without children: progressive
$\psi_{z_1}^k$	-0.2999	0.0003	Scale with children: conservative
$\psi_{z_2}^k$	-0.1000	0.0001	Scale with children: moderate
$\psi_{z_3}^k$	0.3998	0.0004	Scale with children: progressive
φ_{z_1}	1.1192	0.0011	Curvature: conservative
φ_{z_2}	1.0100	0.0010	Curvature: moderate
φ_{z_3}	1.0293	0.0010	Curvature: progressive

which are untargeted in the estimation. Figure 10 summarizes the fertility patterns.

Figure 7 reports average market hours and home production time for childless spouses, most of whom eventually become parents in later years. Each panel plots model prediction and empirical means across the three gender-view groups. Panel (a) reports females' market hours; since husbands' market hours are fixed at 60 per week, their fit is neither targeted nor displayed. Home production hours appear separately for females in panel (b) and husbands in panel (c).²² The simulated moments track the data closely, and the model reproduces cross-group variation well. Relative to conservative women, moderate women work 29% more market hours and progressive women 71% more. In contrast, female home production hours vary little across groups in levels. Moderate women's share exceeds conservative women's by 5%, while progressive women's falls short by the same margin. Husbands show negligible absolute differences in home production but sizable percentage differences, with husbands of moderate females contributing 23% more than husbands with conservative wives, and husbands who have progressive wives work 78% more at home.

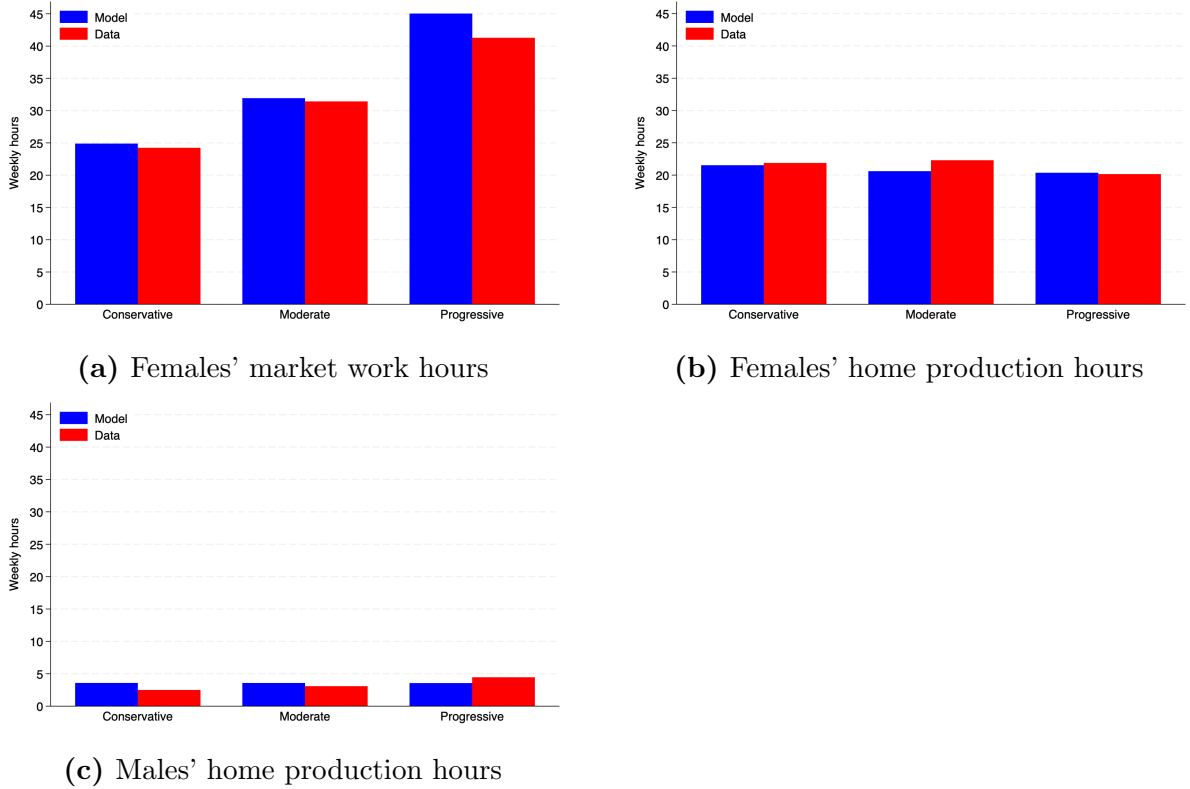


Figure 7: Childless families: market work and home production

For spouses who have children, Figure 8 shows the trend of females average market work across age of the youngest child in Plot (a), and home production hours for females in Plot (b) and for their husbands in Plot (c). The figure pools across gender-view groups,

²²The outcomes for childless families reflect the cross-sectional mean across agents when they are childless and therefore differ from the event-study estimates in 5, which are computed across event time.

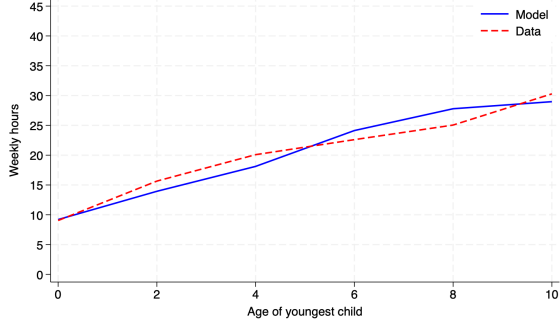
so it captures the population-wide pattern. For group-specific behavior, the figures in Appendix breakdowns separately, with market hours by attitude group in Figure A6, females' home production in Figure A7, and husbands' home production in Figure A8.

In general, the model predicts the trend well. Females increase their market work hours and reduce home production hours as the child grows, and husbands' housework time follows the same declining pattern. Due to grid discretization, child age is grouped into 0–2, 2–4, 4–6, 6–8, 8–10, and 10–18, so the value plotted at age 10 reflects outcomes for youngest children aged 10 to 18. Fit quality varies in the breakdown of gender-role groups. Female market work is predicted relatively well for conservative and moderate group, but the model overpredicts progressive women's hours once the child reaches age 4 and above. A plausible explanation is that progressive women return to the labor market sooner than other groups and reach a plateau in hours earlier. Those who intend to return do so in the early years, so the growth rate does not persist later on in data, whereas the model imposes an identical housework decay rate across ages and cannot generate this flattening.

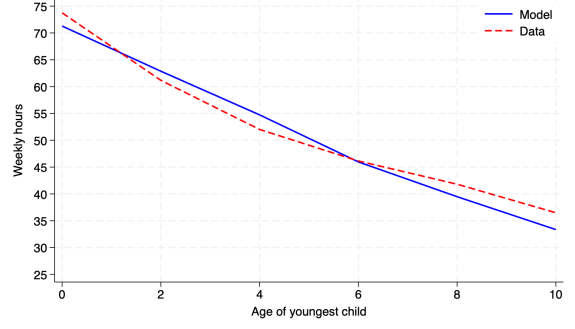
In addition, the model underpredicts the home production hours of conservative and progressive women once the youngest child reaches 6 years old and above. This likely stems from two reasons. First, although the model matches the completed fertility rate well, it overstates the early birth rate when females are young, for reasons I outline in the subsequent paragraphs. In the data, however, progressive women are more likely to postpone childbirth, but the model fails to capture this. Children in the simulation are older than the data reports, which accelerates the decaying rate of home production hours for both spouses. Second, the model calibrates children's move-out rate according to child age, based on the empirical distribution, and sets this rate identical for all groups. In reality, some children may still live with their parents, leading to an model under-prediction of domestic labor investment in later years. This mainly affects the conservative group, since the data show the move-out rate of adult children for conservative women is lower than for other groups, particularly for the first child.

The model also reports the fit of untargeted moments. One of these is the private consumption of each spouse, shown in Figure 9, with females' average consumption in panel (a) and husbands' average consumption in panel (b). I present agents' average expenses across gender-view groups in separate bars. As a supplementary check, the fit for childless couples and across the age of the youngest child are displayed in Figure A9.

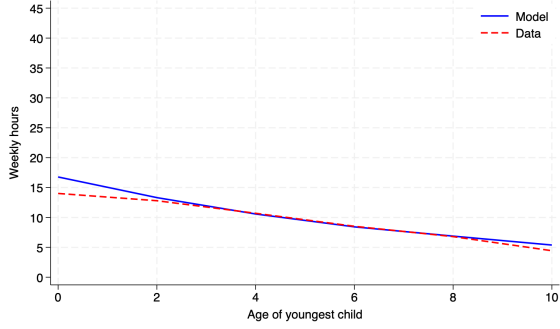
Spouses' consumption rises steadily with the progressiveness of their gender-role attitudes. The first reason is the income effect. Progressive women are more likely to participate actively in the labor market, with women's labor participation rates of 41.7%, 55.6%, and 69.4% across the three groups, and longer average working hours for more progressive women as shown in the earlier patterns. Meanwhile, they earn higher wages and thus have greater bargaining power, proxied by the relative wage rate between spouses;



(a) Females' market work hours



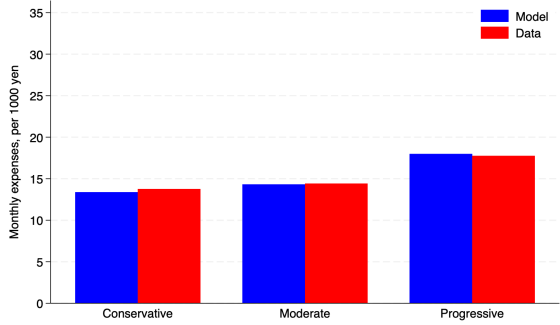
(b) Females' home production hours



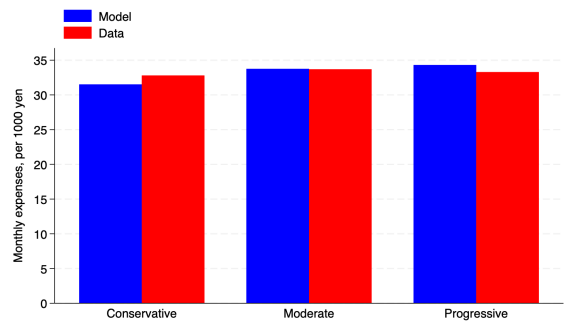
(c) Males' home production hours

Figure 8: Market work and home production across age of youngest child

this fit is shown in Figure A10. Due to the bargaining effect, progressive women gain a higher consumption share than other groups in the intrahousehold expense allocation. Meanwhile, male consumption rises with their wives' gender-role attitudes due to the income effect from assortative matching.



(a) Females average consumption



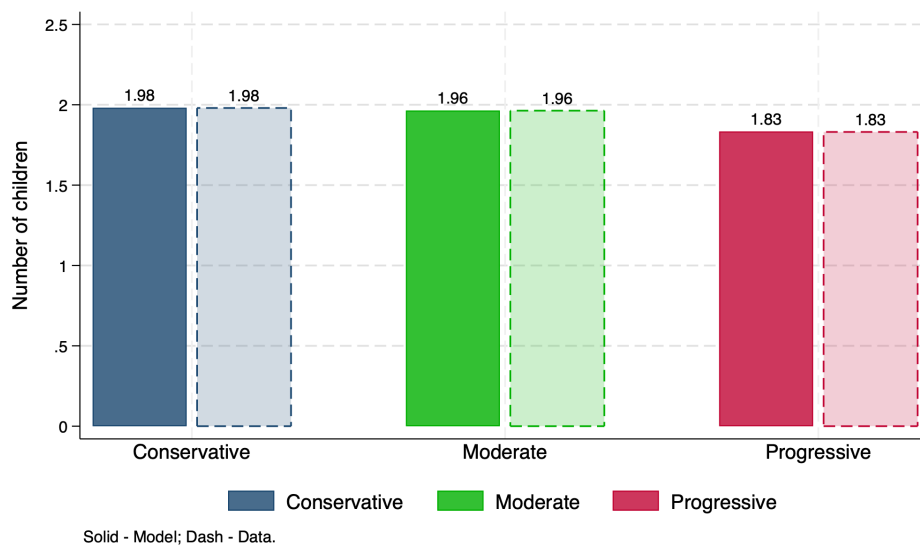
(b) Males average consumption

Figure 9: Untargeted moments: consumption

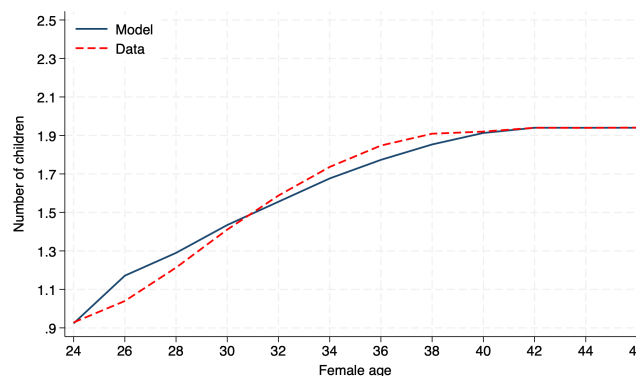
Figure 10 presents the model fit for fertility outcomes. Panel (a) shows completed fertility, defined as the average number of children per household when the wife is 46. Panel (b) shows the average number of children by female age; although this moment is not targeted, the model fits it relatively well.

Panel (a) shows a good fit for the number of children across gender-view groups. Panel

(b) shows the average number of children across female age, reflecting the cumulative birth rate of the sample, with the x-axis representing age bins across time periods. The model predicts an earlier birth rate than observed in the data. This is because the model captures three factors in the birth decision: child-related expenses, career costs, and personal beliefs about domestic labor. In reality, however, couples may also weigh other considerations, such as housing space, child-free lifestyle, and physical conditions, generating further postponement in childbirth timing. Nevertheless, the model converges to the data moments after female age 36, providing a reliable pattern for analyzing completed fertility.



(a) Completed fertility



(b) Untargeted Moment: Number of children by age

Figure 10: Fertility pattern

Some samples do not report the arrival of children that occurred before respondents entered the survey at age 24. As a result, an initial number of children is assigned to females by gender-view group, matched to the empirical distribution. Figure A11 presents the composition of the average number of children assigned to each gender-

view group at the initial period and the subsequent increase predicted by the model. Conservative females start with an average of 0.92 children, moderate females with 0.95, and progressive females with 0.88. The three groups subsequently increase their average number of children by 1.07, 1.01, and 0.95, respectively. This pattern shows that the higher fertility outcome among the conservative group is not driven by initial children, but by a higher birth rate that emerges endogenously from the mechanisms incorporated in the model.

Overall, the simulated moments align closely with the empirical moments at the mean level. The model’s prediction of consumption should be interpreted with caution, but the predictions for time use largely match the data moments and exhibit a good overall fit.

7 Counterfactual Analyses

This section uses the estimated parameters to examine, through counterfactual simulations, the channels that shape couples’ fertility decisions and intra-household allocation. I first assess the role of gender role attitudes in these outcomes. I then examine how a reduction in husbands’ market work affects fertility and time allocation, and whether a more equal division of labor between spouses raises fertility further.

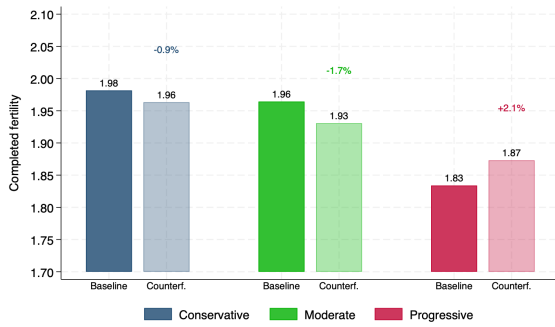
7.1 Gender view channel

I assess the role of the gender view channel using two counterfactual exercises. I first examine whether, and in which direction, the channel affects fertility decisions and time allocation. I then quantify how much of the fertility differences between groups it explains, which also indicates how fertility may evolve if attitudes continue to shift in a progressive direction over time.

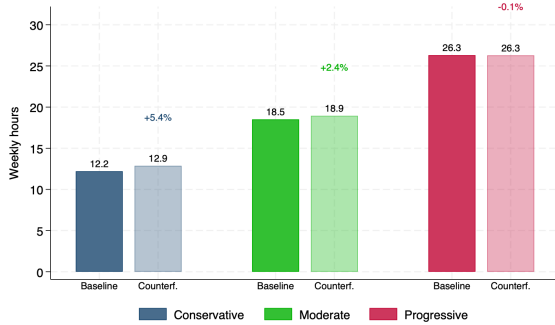
In the first simulation, I shut down the gender view channel by eliminating women’s perceived unfairness of housework inequality and their (dis)utility from working long hours (Equation 9 and Equation 10). Figure 11 reports the resulting completed fertility and time allocation of women. The results suggest that gender role attitudes reinforce household specialization and raise fertility among conservative and moderate women, while discouraging domestic labor and lowering fertility among progressive women. Without the preferences associated with gender role attitudes, completed fertility falls by about 1% among conservative women and 1.7% among moderate women, but rises by 2.1% among progressive women. The adjustment in time allocation mirrors this asymmetry and operates predominantly through unpaid work. Conservative women reduce their housework by 4.6 hours per week (9%) while increasing their market work by only 0.7 hours. Moderate women adjust in the same direction on a smaller scale, whereas progressive women slightly increase their housework and reduce their market work. These

patterns point to the mechanism behind the fertility responses, in which traditional attitudes lower the non-pecuniary cost of the unequal division of labor that accompanies children, whereas progressive attitudes raise it.

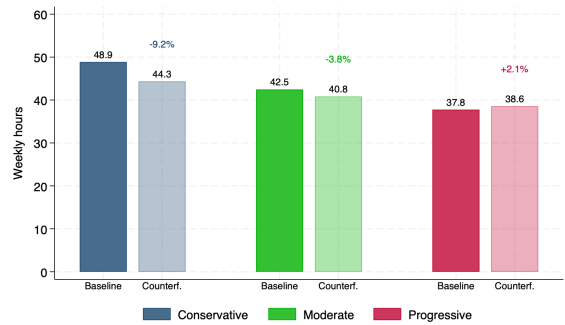
Moreover, the fertility responses contrast with the changes in time allocation. Gender views distort the time allocation of conservative and moderate women the most, yet their fertility responds only modestly. Progressive women display the opposite pattern, with the smallest change in time allocation but the largest fertility response. The non-pecuniary costs thus appear to weigh more heavily on the fertility decisions of progressive women than on their time use. While these results establish that gender role attitudes affect fertility, they do not reveal how much of the fertility gap between groups the attitudes explain. The second simulation addresses this question.



(a) Completed fertility



(b) Female's market work



(c) Female's home production

Figure 11: Outcomes without the gender view channel

Gender role attitudes are not the only factor that shapes fertility. Women with different attitudes also differ in education, earning potential, and the economic constraints they face, so the observed fertility gap between groups reflects both their views and other characteristics. How much of the gap gender role attitudes account for remains an open question, and the answer matters for policy in two ways. First, it identifies women whose fertility is held back by economic constraints, for whom policies such as childcare subsidies are more promising. Second, since attitudes are steadily shifting toward progressive views, policymakers need to know how much fertility would fall if more women held progressive views, and whether this decline operates through women's market work or the division

of childcare. Quantifying this decline is particularly relevant while gender roles are in transition, since it helps assess whether policies that make the division of labor within households more equal can offset it.

The second exercise assigns progressive views to all women while holding their other characteristics fixed. Specifically, I set the gender-view-specific parameters of conservative and moderate women equal to those of progressive women, including women's utility or disutility from market work and their perceived unfairness of an unequal domestic labor. Conservative and moderate women thus face a lower disutility of market work and a stronger preference for an equal division of housework. All other characteristics, including spouses' initial human capital and their preferences over intra-household allocation, remain unchanged.

Figure 12 compares the resulting completed fertility with the baseline. Conservative women, whose views differ most from those of progressive women, reduce their completed fertility by only 2.5% (0.05 children), whereas moderate women reduce theirs by 4.0% (0.08 children). The shift in views therefore closes 33.7% of the fertility gap between conservative and progressive women and 60.2% of the gap between moderate and progressive women. The gender view channel thus accounts for a substantial share of the fertility differences across groups, particularly for moderate women. The remaining gap reflects other differences across groups, such as earning potential, which matter more for conservative women, given the smaller share of their gap explained by gender views.

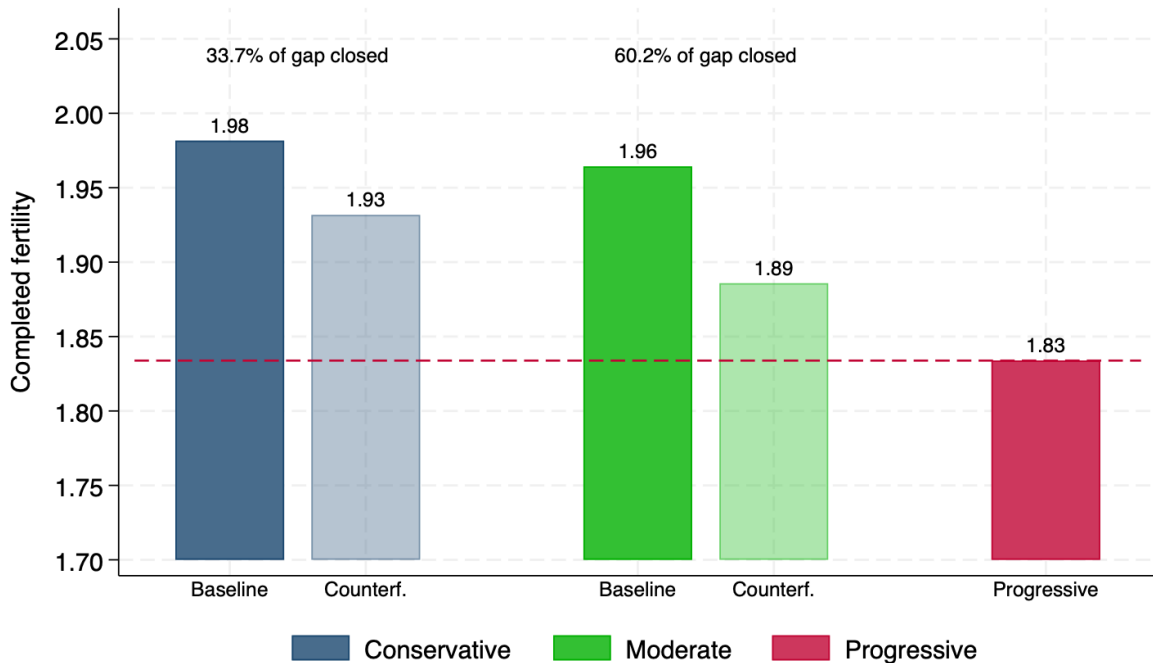


Figure 12: Completed fertility if all women hold progressive views

The results are accompanied by several changes of households allocation following

the gender view change shown in Figure A12. As expected, conservative and moderate women's market work increases and home production time reduces. Driven by the human capital accumulation, women's hourly wage rate increases. Since husbands market work is fixed at 60 hours per week, the spouses overall household incomes increases, which leads to the increase of private consumption for both spouses. Besides, husband's home production hours slightly reduces due to the declining fertility outcomes. This pattern suggests that the gender view channel mainly change women's paid and unpaid work pattern, despite the husbands behaviors barely change, the spouses relative labor division is prone to be more equal. This increase the non-pecuniary costs of deviating from such equal division and having children. The change also increases the pecuniary costs, by both spouses higher personal expenses.

I further disentangle the effects by examining the responses of women with varying initial human capital but the same gender role attitudes, displayed in Figure 13, with absolute levels shown in Figure A13. I measure human capital at the initial period to isolate its effect before shifts in gender role attitudes alter housework and market-work time allocation. Initial human capital reflects education and past work experience at female age 24, and is a good proxy for potential wages around the time of marriage and child-birth. By equipping them with progressive views, previously conservative women with varying human capital backgrounds reduce their completed fertility by 1.8-4.3 percentage points, corresponding to a reduction in the number of children of around 0.04-0.08. Conservative women with higher initial human capital, likely those with higher potential wages, show a larger decrease in their number of children. The pattern for the moderate group differs. Completed fertility declines at every level of female human capital, and the decline becomes smaller as initial human capital rises from 0 to 2, falling from 4.23% to 3.72% and then to 2.56%. Women with the highest initial human capital, however, show the largest decrease, reducing their completed fertility by 4.88 percentage points.

To understand these fertility patterns, I examine how women's private consumption and market work respond by initial human capital within each gender-view group, shown in panels (c)–(f) of Figure A13. Women in both groups substantially increase their market work. Conservative women roughly double their weekly hours, with increases ranging from 13.5 hours for women with the lowest human capital to 11.9 hours for those with the highest. Moderate women, who already work more in the baseline, raise their hours by a smaller 6.2 to 7.1 hours per week. These increases in labor supply translate into higher private consumption, by 2.1 to 2.4 thousand yen for conservative women and 1.1 to 1.4 thousand yen for moderate women. Adopting progressive views thus leads women to devote more time to market work, raising their earnings and consumption. As a result, the relative value of additional children declines, and completed fertility falls in every group.

The size of the fertility decline varies with women's initial human capital, but the

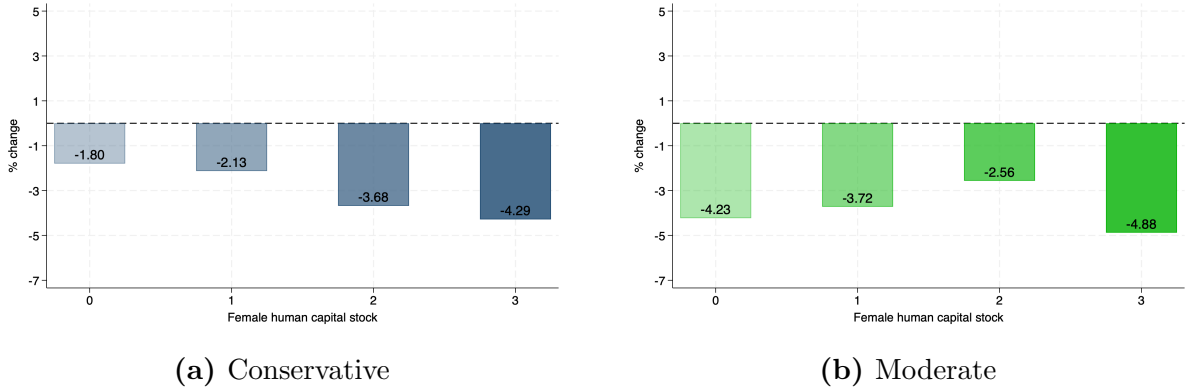
pattern differs between the two groups. Two forces shape the fertility response. The first is the opportunity cost of children. With progressive views, women devote more time to market work and earn more, so time spent on children becomes more costly. The second is a more balanced division of housework. Because women’s more progressive views shift the intra-household allocation toward greater equality,²³ the housework gap between spouses narrows, which reduces the penalty from unequal gender roles for mothers and makes additional children relatively less costly. The first force dominates among conservative women, while the second plays a larger role among moderate women. Among conservative women, the decline grows with initial human capital, from 0.04 fewer children at the lowest level to 0.08 at the highest. Conservative women work few hours in the baseline, so all of them increase their market work by a similarly large amount, and differences in wages determine the fertility response. Women with more human capital earn higher wages, which makes market work more rewarding and children relatively more costly. Among moderate women, the decline instead shrinks as initial human capital rises from level 0 to level 2, from 0.08 to 0.05 fewer children. Since moderate women already work more in the baseline, the additional earnings from working more are smaller than for conservative women, and the more balanced division of housework makes additional children less psychologically costly. Women with the highest human capital break this pattern and show the largest decline, with 0.10 fewer children, as their high earnings potential makes the opportunity cost of children dominate.

Overall, the counterfactual analysis reveals that gender views channel accounts for 60.2% of the fertility premium between moderate and progressive women, and 33.7% between conservative and progressive women. This aggregate effect, however, masks considerable heterogeneity by female’s initial human capital, which relates to their educational attainment and earning potential. Among conservative women, the fertility decline grows with initial human capital, as women with better career prospects face a higher opportunity cost of children once they adopt progressive views and expand their market work. Among moderate women, the decline shrinks as human capital rises from the lowest level to the second highest, as these women already work more in the baseline and the more equal labor division under progressive views partly offsets the decline. Across both groups, the women with the strongest earnings potential are therefore the most sensitive to the costs that progressive views place on motherhood.

These findings have several policy implications. First, more progressive gender role attitudes alone reduce fertility in every group, as women shift their time toward market work and the opportunity cost of children rises. Progress toward egalitarian attitudes therefore needs to be accompanied by policies that make it easier to combine work and motherhood. Second, the largest declines occur among women with the highest earn-

²³The counterfactual assumes that husbands’ preferences are unchanged, so the more equal allocation is driven by women’s more progressive views.

ings potential, 0.08 fewer children among conservative women and 0.10 among moderate women, for whom the opportunity cost of children is greatest. Policies that lower the career cost of motherhood, such as accessible childcare, job-protected parental leave, and support for returning to work after birth, are particularly relevant for these women. Third, a more equal division of housework between spouses mitigates the fertility decline. Policies that increase men’s involvement in home production, such as paternity leave or limits on long working hours, can therefore complement changes in gender norms and help sustain fertility as attitudes become more egalitarian.



Note: The framed segment in Panel b shows the simulated increment from the counterfactual, relative to the baseline value shown in the unframed segment below.

Figure 13: Changes in completed fertility by human capital stock (%)

7.2 Husband’s overtime work and domestic labor

Despite the legal limit of 40 working hours per week, men’s actual work hours show little variation, remaining around 60 hours per week even around the time of childbirth. This persistence reflects workplace norms that treat long hours as a signal of dedication, pressuring employees to stay late regardless of formal regulations. The model captures this feature of the work environment by fixing men’s working time at 60 hours per week, leaving husbands only about 33 hours per week for home production and leisure—a constraint that substantially intensifies the unequal division of childcare between spouses.

I counterfactually reduce men’s market work hours from the current 60 to the legal limit of 40 hours per week and examine the resulting fertility responses and reallocation of freed-up time. Figure 14 reports completed fertility across gender role groups, with the percentage change relative to baseline reported in Figure A14.

Reducing husbands’ weekly market work raises completed fertility, measured as the average number of children by the woman’s age 46, in all three groups. Husbands’ long working hours appear to act as a binding constraint on fertility, as freeing up their time allows couples to have more children. I first consider a modest reduction from 60 to 54 hours per week, which corresponds to a 10% cut in husbands’ working time and represents

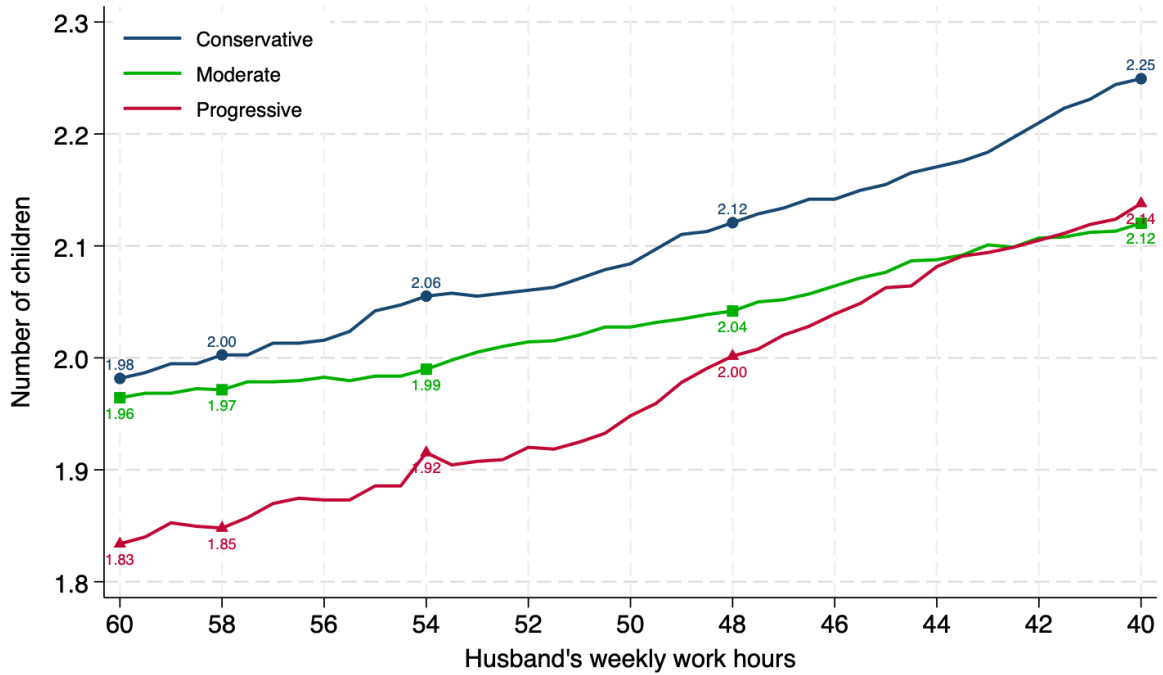


Figure 14: Completed fertility if husbands reduce market work

a realistic policy target for husbands working long hours. Under this scenario, progressive women show the largest response, as their completed fertility rises by 0.08 children to 1.92 and lies 4.4% above the baseline. The effect is somewhat smaller for conservative women, whose completed fertility increases by 3.7% to 2.06 children. Moderate women respond the least. For this group, completed fertility rises by only 0.03 children to 1.99, which amounts to an increase of 1.3%. We then consider a larger reduction to the statutory 40-hour workweek, which amplifies these gains substantially. Progressive women again respond most strongly, as their completed fertility rises by 16.6% to 2.14 children. Among conservative women, completed fertility reaches 2.25 children and is thus 13.5% higher than in the baseline. The increase is smallest for moderate women, whose completed fertility rises by 7.9% to 2.12 children. In both scenarios, progressive women respond most to shorter working hours, followed by conservative and moderate women, since progressive women devote the most time to market work and bear the highest non-pecuniary costs of an unequal division of household labor. Additional paternal involvement at home therefore reduces their opportunity cost of childrearing the most, which gives them the strongest incentive to have more children.

The fertility effects are closely linked how husbands reallocate the time released from market work. Figure 15 decomposes this freed-up time into home production and private leisure. The reallocation is strongly tilted toward leisure, with husbands devoting 86-90% of the released time to private leisure and only 10-14% to home production. Male home production therefore increases only modestly, from below 9 hours per week in

the baseline to between 11 and 12 hours per week (see Figure A15 in the Appendix for the absolute changes). The level of paternal involvement varies systematically with gender role attitudes. Husbands of conservative women contribute the most to home production as they have more children, while husbands of moderate women contribute the least. Among progressive group, however, husbands' home production rises markedly once husbands' market hours fall below 50 per week, coinciding with the sharper increase in fertility in this group and the correspondingly higher demand for childcare.

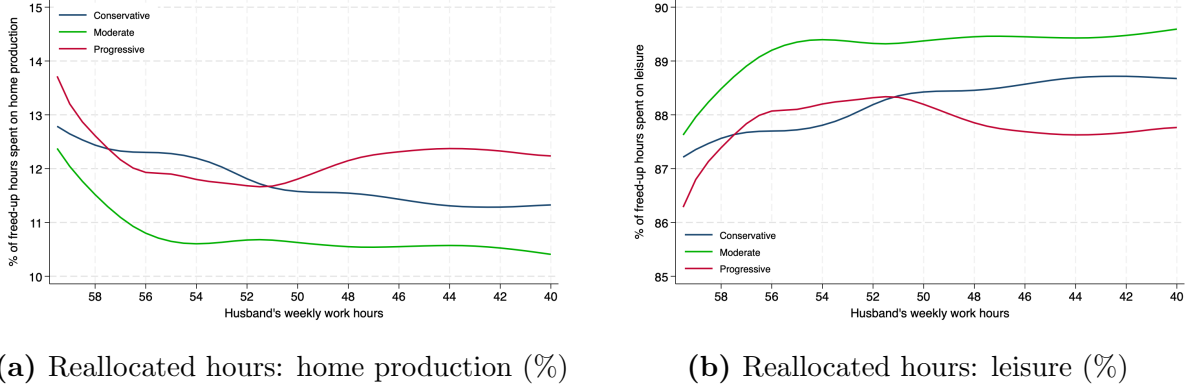


Figure 15: Husbands' allocation of freed hours (%)

Women's time allocation and wages adjust in response to the reduction in husbands' market work (Figure A15 in the Appendix). Shorter working hours for husbands induce women to expand their own market work and reduce their private leisure, consistent with an added-worker effect that partly compensates for the decline in household earnings. The magnitude of this response, however, depends on women's initial attachment to the labor market. Progressive women supply the most market work in all scenarios, yet their relative adjustment is the smallest given their already high baseline hours. When husbands' hours fall from 60 to 40, progressive women increase their market work by less than two hours, from 26.3 to 28.1 hours per week. Conservative and moderate women start from considerably lower levels and therefore exhibit larger relative gains of roughly 20% and 14%, which correspond to 2.5 and 2.7 additional hours per week, respectively. Women's home production, in contrast, responds only marginally, indicating that it remains sticky despite husbands' greater involvement in childcare. Conservative and moderate women barely change their home production hours. Progressive women follow a different pattern. Their home production increases slightly once husbands' hours fall to 50 and rises roughly twice as fast below that threshold, reflecting the stronger fertility response and the resulting higher demand for childcare in their households. Wages adjust in line with these changes in market work. Wives' hourly wages rise through human capital accumulation, while husbands' wages decline due to their reduced market work. When husbands' hours fall from 60 to 40, conservative wives' wages increase by about 4.6% and their husbands' wages decrease by about 3%. Among moderate couples, the

two changes are of similar size, at 2.9% and 2.8%, whereas progressive wives' wages rise by only 1%, against a 3% decline for their husbands. Household earnings nonetheless fall substantially in all groups. Husbands earn considerably more and lose a third of their working hours, a loss that wives' modest increase in market work cannot offset. This decline in household earnings is a key challenge for households when husbands reduce their working hours.

Japan's 2018 Work Style Reform was introduced within a broader policy agenda to counter declining fertility and low female labor force participation, and it established, for the first time, legally binding caps on overtime beyond the statutory 40-hour workweek. Evaluations of the reform document a decline in average monthly overtime of about 25%, equivalent to roughly five hours per week, with no detectable change in hourly wages (Burdin et al., 2024). Taking this reduction as an exogenous shift in husbands' working time, I simulate the reform's implications for fertility. The model predicts an increase in completed fertility of up to 0.06 children (about 3%) in the conservative group, 0.05 children (2.8%) in the progressive group, and 0.02 children (1%) in the moderate group. These magnitudes are subject to two countervailing sources of bias. First, the simulation treats the reform as a shock to husbands' hours alone, whereas women working overtime also reduced their hours, and by more than men. Insofar as wives' shorter hours relax the household's time constraint further, the simulation understates the fertility response, although the accompanying loss in women's earnings partly dampens this channel. Second, Burdin et al. (2024) show that men partially offset the reduction in paid overtime with additional unpaid overtime, consistent with rat-race dynamics in which workers continue to signal commitment through long hours once the cap on paid overtime binds. The reduction in men's actual working time is therefore likely smaller than the decline in recorded overtime, which biases the simulated effect upward. The net direction of these two biases cannot be determined within the model. Identifying the reform's fertility effect would require data that link both spouses' actual working hours to fertility outcomes, a task I leave for future research.

I next examine whether fertility rises further when husbands devote a larger share of their freed-up time to home production. In this counterfactual, husbands devote half of their freed-up time to home production, and women re-optimize their time allocation. The scenario therefore represents a more equal division of labor between spouses. For fertility decisions, this reallocation involves a trade-off. On the one hand, departing from household specialization lowers household earnings, since women earn lower wages on average, and women's greater labor market attachment raises the career costs of childbearing through human capital accumulation. On the other hand, a more equal division of labor reduces the non-pecuniary costs that women bear under an unequal allocation of domestic work, particularly among progressive women. Whether fertility increases further is therefore an open question.

Figure A16 compares fertility and other outcomes across two scenarios. In the first, spouses re-optimize their time allocation in response to husbands' shorter market hours. In the second, husbands spend half of their freed-up time on home production, which replaces part of their wives' home production, and wives re-allocate the time released between leisure and market work. Relative to the first scenario, the more equal division of labor further raises fertility. At 40 working hours, completed fertility increases by an additional 1.7 percentage points among moderate and progressive women and 1.5 percentage points among conservative women, corresponding to about 0.03 additional children in each group.

Husbands' additional home production substitutes only partly for wives'. About 60% of husbands' additional home production replaces wives' home production. About 60% of it replaces wives' housework, while the other 40% comes on top and raises the couple's total home production, reflecting both the larger number of children and the persistence of wives' domestic work. When husbands' hours fall to 40, for example, every 10 additional hours of husbands' home production reduce wives' home production by about 6 hours. Wives allocate the time released between leisure and market work, with about one third going to additional market work. Relative to the baseline, conservative women's market work therefore rises by 32% to 18.3 hours per week, compared with 20% in the first scenario. The corresponding increases are 22% to 25.6 hours for moderate women, compared with 14%, and 14% to 33.9 hours for progressive women, compared with 7%.

Taken together, the results point to two positive outcomes. First, a more equal division of labor raises fertility beyond the gains from shorter working hours alone, which shows that the division of labor matters for fertility decisions. Second, combining shorter working hours for husbands with a more equal division of labor expands female labor supply without compromising fertility, while also giving men better work life balance. Such a policy mix could help narrow gender gaps in the labor market and weaken the culture of long working hours in Japan.

The additional fertility gain from the reallocation is, however, considerably smaller than the gain from husbands' shorter work hours itself. Two factors explain this. First, even in the first scenario, husbands devote 11–15% of their freed-up time, or about 2–3 hours per week, to home production, which already narrows the gender gap in domestic work. Part of the fertility gain from a more equal division is therefore already captured by the first scenario. Second, compared with the first scenario, the reallocation entails additional costs that offset part of its benefits for fertility. In the first scenario, husbands' additional non-market time raises their utility through both more leisure and more home production. The reallocation, however, shifts part of non-market time from leisure to home production, raising the childcare time husbands must invest. This may lower husbands' birth intention. In addition, wives' additional market work further raises their

wages through human capital accumulation, which increases the opportunity cost of children. Nevertheless, fertility still rises above its level in the first scenario, implying that the benefits of a more equal division of labor for wives outweigh these costs.

8 Conclusion

In this paper, I examine how the unequal division of labor between spouses shapes fertility decisions through the non-pecuniary costs associated with women's gender role attitudes. These costs arise from women's disutility from a disproportionate childcare burden and the loss of career fulfillment, and are particularly pronounced among progressive women, whose beliefs about gender roles conflict most with an unbalanced division of labor. Beyond preferences shaped by deeply rooted gender norms, the analysis also considers an important friction that sustains this unequal division at home, that is, husbands' long working hours driven by workplace norms and rat-race dynamics. The results show that shorter working hours for husbands raise fertility, and that imposing a more balanced division of labor maintains or slightly raises fertility even when women work more in the market.

The paper uses Japan as the empirical setting, given the country's long-standing ultra-low fertility rate and its large gender gaps in paid and unpaid work. Using data from the Japanese Panel Survey of Consumers, I estimate a life-cycle model in which spouses jointly determine their time allocation and fertility. The key feature of the model is the inclusion of women's non-pecuniary utility costs (or benefits) from an unequal division of domestic labor between spouses and from lost career fulfillment, both of which vary with women's gender role attitudes.

Three main conclusions are to be drawn. First, gender role attitudes determine how women perceive an unequal division of labor and thereby shape their fertility decisions. The resulting non-pecuniary costs account for 60.2% of the fertility gap between moderate and progressive women and 33.7% of the gap between conservative and progressive women. The fertility premium of conservative women is also closely tied to their earning potential, proxied by their human capital stock at age 24. Conservative women with low human capital face lower opportunity costs of childbearing and maintain higher fertility intentions, whereas those with high earning potential reduce their fertility substantially when their views shift toward progressive attitudes. This suggests that policies safeguarding the career prospects of women with high earning potential after childbirth could prevent further decline in fertility. For moderate women, gender attitudes play a more dominant role, and a more equal division of labor between spouses would likely be particularly effective in this group.

Second, husbands' long working hours act as a binding constraint on fertility. A modest reduction from 60 to 54 hours per week raises completed fertility by 4.4% among

progressive women, 3.7% among conservative women, and 1.3% among moderate women, even though husbands devote only 10–14% of their freed-up time to domestic labor. Progressive women respond most strongly since they work the most in the market and bear the highest non-pecuniary costs of an unequal division of labor. Policies limiting excessive working hours, such as Japan’s 2018 Work Style Reform, can therefore raise fertility, and their effect would likely be larger if combined with measures that encourage fathers to spend more freed-up time on childcare.

Third, a transition toward a more egalitarian division of labor need not lower fertility. A more equal division moves households away from specialization, which may reduce household earnings and raise women’s career costs of childbearing. Nevertheless, when husbands’ working hours are reduced, imposing an egalitarian division maintains or slightly raises fertility relative to letting spouses freely re-optimize their time allocation. These results suggest that fertility can be sustained under a more equal allocation of paid and unpaid work between spouses, in which husbands work shorter hours and take on more domestic work while wives work more in the market. A shift toward this allocation could also help narrow gender gaps in the labor market and ease the rat-race culture of long working hours in Japan.

References

- Adda, J., C. Dustmann, and K. Stevens (2017). The career costs of children. *Journal of Political Economy* 125(2), 293–337.
- Aguilar-Gomez, S., E. O. Arceo-Gomez, and E. De la Cruz Toledo (2026). Inside the black box of child penalties: Unpaid work and household structure. *Journal of Development Economics* 178, 103554.
- Akerlof, G. A. and R. E. Kranton (2000). Economics and identity. *The quarterly journal of economics* 115(3), 715–753.
- Akerlof, G. A. and R. E. Kranton (2016). Identity economics: How our identities shape our work, wages, and well-being. In *Identity Economics*. Princeton University Press.
- Alesina, A., P. Giuliano, and N. Nunn (2013). On the origins of gender roles: Women and the plough. *The quarterly journal of economics* 128(2), 469–530.
- Andresen, M. E. and E. Nix (2022). What causes the child penalty? Evidence from adopting and same-sex couples. *Journal of labor economics* 40(4), 971–1004.
- Angelov, N., P. Johansson, and E. Lindahl (2016). Parenthood and the gender gap in pay. *Journal of labor economics* 34(3), 545–579.
- Attanasio, O., H. Low, and V. Sánchez-Marcos (2008). Explaining changes in female labor supply in a life-cycle model. *American Economic Review* 98(4), 1517–1552.
- Becker, G. S. (1993). *A treatise on the family: Enlarged edition*. Harvard university press.
- Bertrand, M., P. Cortes, C. Olivetti, and J. Pan (2021). Social norms, labour market opportunities, and the marriage gap between skilled and unskilled women. *The Review of Economic Studies* 88(4), 1936–1978.
- Bertrand, M., E. Kamenica, and J. Pan (2015). Gender identity and relative income within households. *The Quarterly Journal of Economics* 130(2), 571–614.
- Blundell, R., L. Pistaferri, and I. Saporta-Eksten (2018). Children, time allocation, and consumption insurance. *Journal of Political Economy* 126(S1), S73–S115.
- Boling, P. (2008). Demography, culture, and policy: Understanding Japan’s low fertility. *Population and Development Review* 34(2), 307–326.
- Boneva, T., M. Golin, K. Kaufmann, and C. Rauh (2026). Beliefs about maternal labour supply. *The Economic Journal* 136(674), 373–401.

- Brinton, M. C. and D.-J. Lee (2016). Gender-role ideology, labor market institutions, and post-industrial fertility. *Population and Development Review*, 405–433.
- Brinton, M. C. and E. Oh (2019). Babies, work, or both? highly educated women’s employment and fertility in East Asia. *American Journal of Sociology* 125(1), 105–140.
- Briselli, G. and L. González (2025). *Are Men’s Attitudes Holding Back Fertility and Women’s Careers? Evidence from Europe*. Universitat Pompeu Fabra, Department of Economics and Business.
- Brown, M., C. J. Flinn, and J. Mullins (2025). Family law effects on divorce, fertility, and child investment. *Journal of Labor Economics* 43(S1), S351–S397.
- Burdin, G., R. Kambayashi, and T. Kato (2024). The impact of overtime limits on firms and workers: Evidence from Japan’s work style reform.
- Bursztyn, L., T. Fujiwara, and A. Pallais (2017). ‘Acting wife’: Marriage market incentives and labor market investments. *American Economic Review* 107(11), 3288–3319.
- Cardia, E. and P. Gomme (2018). Market work, housework and childcare: A time use approach. *Review of Economic Dynamics* 29, 1–14.
- Caucutt, E. M., N. Guner, and J. Knowles (2002). Why do women wait? Matching, wage inequality, and the incentives for fertility delay. *Review of Economic Dynamics* 5(4), 815–855.
- Chiappori, P.-A. (1988). Rational household labor supply. *Econometrica: Journal of the Econometric Society*, 63–90.
- Chiappori, P.-A. (1992). Collective labor supply and welfare. *Journal of Political Economy* 100(3), 437–467.
- Chiappori, P.-A., B. Fortin, and G. Lacroix (2002). Marriage market, divorce legislation, and household labor supply. *Journal of Political Economy* 110(1), 37–72.
- Coltrane, S. (2000). Research on household labor: Modeling and measuring the social embeddedness of routine family work. *Journal of Marriage and family* 62(4), 1208–1233.
- De Laat, J. and A. Sevilla-Sanz (2011). The fertility and women’s labor force participation puzzle in OECD countries: The role of men’s home production. *Feminist Economics* 17(2), 87–119.

- Del Boca, D., C. Flinn, and M. Wiswall (2014). Household choices and child development. *Review of Economic Studies* 81(1), 137–185.
- Doepke, M. and F. Kindermann (2019). Bargaining over babies: Theory, evidence, and policy implications. *American Economic Review* 109(9), 3264–3306.
- Eckstein, Z., M. Keane, and O. Lifshitz (2019). Career and family decisions: Cohorts born 1935–1975. *Econometrica* 87(1), 217–253.
- Fernández, R. (2013). Cultural change as learning: The evolution of female labor force participation over a century. *American Economic Review* 103(1), 472–500.
- Fernández, R. and A. Fogli (2006). Fertility: The role of culture and family experience. *Journal of the European economic association* 4(2-3), 552–561.
- Fernández, R. and A. Fogli (2009). Culture: An empirical investigation of beliefs, work, and fertility. *American Economic Journal: Macroeconomics* 1(1), 146–177.
- Fernández, R. and J. C. Wong (2017). Free to leave? A welfare analysis of divorce regimes. *American Economic Journal: Macroeconomics* 9(3), 72–115.
- Feyrer, J., B. Sacerdote, and A. D. Stern (2008). Will the stork return to Europe and Japan? Understanding fertility within developed nations. *Journal of Economic Perspectives* 22(3), 3–22.
- Foerster, H. (2024). Untying the knot: How child support and alimony affect couples’ dynamic decisions and welfare. *Review of Economic Studies*, rdae105.
- Gayle, G.-L. and A. Shephard (2019). Optimal taxation, marriage, home production, and family labor supply. *Econometrica* 87(1), 291–326.
- Goldin, C. (2006). The quiet revolution that transformed women’s employment, education, and family. *American economic review* 96(2), 1–21.
- Goldin, C. (2014). A grand gender convergence: Its last chapter. *American economic review* 104(4), 1091–1119.
- Goldin, C. (2025a). Babies and the macroeconomy. *Economica* 92(367), 675–700.
- Goldin, C. (2025b). The downside of fertility. Technical report, National Bureau of Economic Research.
- Gourieroux, C., A. Monfort, and E. Renault (1993). Indirect inference. *Journal of Applied Econometrics* 8(S1), S85–S118.

- Goussé, M., N. Jacquemet, and J.-M. Robin (2017). Marriage, labor supply, and home production. *Econometrica* 85(6), 1873–1919.
- Greenstein, T. N. (1996). Gender ideology and perceptions of the fairness of the division of household labor: Effects on marital quality. *Social forces* 74(3), 1029–1042.
- Hara, H. and N. Rodriguez-Planas (2025). Long-term consequences of teaching gender roles: Evidence from desegregating industrial arts and home economics in Japan. *Journal of Labor Economics* 43(2), 349–389.
- Hu, Y. and D. Yucel (2018). What fairness? Gendered division of housework and family life satisfaction across 30 countries. *European Sociological Review* 34(1), 92–105.
- Hwang, J. (2016). Housewife, “gold miss,” and equal: The evolution of educated women’s role in Asia and the US. *Journal of Population Economics* 29(2), 529–570.
- Jakobsen, K., T. Jørgensen, and H. Low (2025). Fertility and family labor supply.
- Jones, G. W. (2019). Ultra-low fertility in East Asia: Policy responses and challenges. *Asian Population Studies* 15(2), 131–149.
- Jones, R. S. (2024). Addressing demographic headwinds in Japan: A long-term perspective. *Documents de travail du Département des Affaires économiques de l’OCDE*.
- Kawamura, Y. and K. Totake (2024). Pluralistic ignorance did not prevent paternity leave in Japan in December 2021: A replication study. *Japanese Psychological Research*.
- Kim, S., M. Tertilt, and M. Yum (2024). Status externalities in education and low birth rates in Korea. *American Economic Review* 114(6), 1576–1611.
- Kleven, H., C. Landais, and G. Leite-Mariante (2024). The child penalty atlas. *Review of Economic Studies*, rdae104.
- Kleven, H., C. Landais, and J. E. Søgaaard (2019). Children and gender inequality: Evidence from denmark. *American Economic Journal: Applied Economics* 11(4), 181–209.
- Lennon, M. C. and S. Rosenfield (1994). Relative fairness and the division of housework: The importance of options. *American journal of Sociology* 100(2), 506–531.
- Leridon, H. (2004). Can assisted reproduction technology compensate for the natural decline in fertility with age? A model assessment. *Human reproduction* 19(7), 1548–1553.

- Lise, J. and K. Yamada (2019). Household sharing and commitment: Evidence from panel data on individual expenditures and time use. *The Review of Economic Studies* 86(5), 2184–2219.
- Ma, Y. and X. Shi (2020). Are spousal labor supplies substitutes? Evidence from the workweek reduction policy in China. *Journal of Development Economics* 145, 102472.
- Mazzocco, M. (2007). Household intertemporal behaviour: A collective characterization and a test of commitment. *The Review of Economic Studies* 74(3), 857–895.
- McFadden, D. (1989). A method of simulated moments for estimation of discrete response models without numerical integration. *Econometrica: Journal of the Econometric Society*, 995–1026.
- Mensingher, T. and C. Pugnaghi Zimpelmann (2025). How gender role attitudes shape maternal labor supply.
- Myong, S., J. Park, and J. Yi (2021). Social norms and fertility. *Journal of the European Economic Association* 19(5), 2429–2466.
- Nagase, N. and M. C. Brinton (2017). The gender division of labor and second births: Labor market institutions and fertility in Japan. *Demographic Research* 36, 339–370.
- Nemoto, K. (2013). Long working hours and the corporate gender divide in Japan. *Gender, work & organization* 20(5), 512–527.
- OECD (2023). Pensions at a glance 2023: OECD and G20 indicators. Technical report, OECD Publishing, Paris.
- OECD (2025). *Gender gaps in paid and unpaid work persist*. Paris: OECD Publishing.
- Ono, H. (2018). Why do the Japanese work long hours. *Japan labor issues* 2(5), 35–49.
- Reynoso, A. (2024). The impact of divorce laws on the equilibrium in the marriage market. *Journal of Political Economy* 132(12), 4155–4204.
- Sakamoto, R. and M. Kohara (2025). Why gender norms matter. *Economica* 92(365), 150–172.
- Salazar-Saenz, M. (2022). A household search model with home production.
- Sauer, R. M. and C. R. Taber (2017). Indirect inference with importance sampling: An application to women’s wage growth. Technical report, National Bureau of Economic Research.

- Siminski, P. and R. Yetsenga (2022). Specialization, comparative advantage, and the sexual division of labor. *Journal of Labor Economics* 40(4), 851–887.
- Sommer, K. (2016). Fertility choice in a life cycle model with idiosyncratic uninsurable earnings risk. *Journal of Monetary Economics* 83, 27–38.
- Stratton, L. S. (2020). The determinants of housework time. *IZA World of Labor*.
- Sun, A., F. Xia, and X. Zhang (2025). The motherhood penalty on health: Evidence from China. *Journal of Economic Behavior & Organization* 238, 107241.
- Tan, P. C. and N. P. Tey (1994). Do fertility intentions predict subsequent behavior? Evidence from Peninsular Malaysia. *Studies in family planning*, 222–231.
- Tartari, M. (2015). Divorce and the cognitive achievement of children. *International Economic Review* 56(2), 597–645.
- Theloudis, A., J. Velilla, P.-A. Chiappori, J. I. Giménez-Nadal, and J. A. Molina (2025). Commitment and the dynamics of household labour supply. *The Economic Journal* 135(665), 354–386.
- Thomson, E. (1997). Couple childbearing desires, intentions, and births. *Demography* 34(3), 343–354.
- Trussell, J. and C. Wilson (1985). Sterility in a population with natural fertility. *Population studies* 39(2), 269–286.
- Voena, A. (2015). Yours, mine, and ours: Do divorce laws affect the intertemporal behavior of married couples? *American Economic Review* 105(8), 2295–2332.
- World Economic Forum (2025). Global gender gap report 2025.

A Appendix

A.1 Gender Value Index (GVI)

Figure A1 reports the distribution of the observed Gender Value Index (GVI) across survey years from 2011 to 2021, showing the sample shifts gradually toward more progressive views over time.²⁴

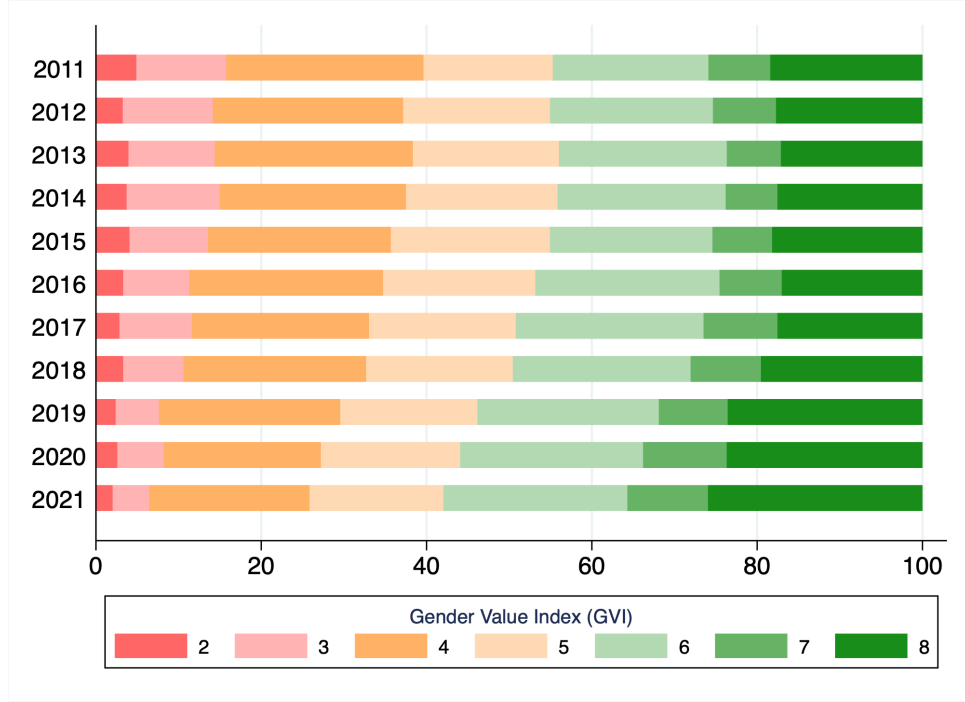


Figure A1: Distribution of Gender Value Index (GVI) by Year

Table A1: Within-Individual Change in GVI with Age

	GVI
Female's age	0.023*** (0.006)
Standard errors in parentheses	
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$	

Despite this evolving trend, individual GVI remains highly stable across years. Controlling for individual fixed effects, Table A1 indicates that GVI rises by only 0.023 points per additional year of age, so on the 2–8 scale it would take more than 40 years for the same woman's index to increase by one unit.

I further examine whether observed GVI changes around major life events, controlling for individual and year fixed effects in Table A2. Columns 1–5 report the estimated

²⁴The sample shown in this figure includes all female respondents—both single and married—for the years 2011–2021 where the GVI is reported, without applying the sample selection criteria.

changes in GVI associated with marriage, divorce, and the births of a first, second, and third child, respectively, and Column 6 includes all these events jointly. None of the coefficients is statistically significant, providing no evidence that individual gender role attitudes respond to these life events. The bottom panel reports the standard deviation of the individual effects (σ_u), the standard deviation of the idiosyncratic error (σ_e), and the intraclass correlation (ρ). These statistics indicate that approximately 66% of the variance in observed GVI is explained by persistent differences across individuals, with the remainder attributable to within-individual fluctuations over time.

To address concerns about anticipation effects and temporary changes around life events, Figure A2 uses the first childbirth as an example and traces the time trend of GVI around it using an event-study design. As discussed in the main text, GVI shows no discernible jump at the time of birth, both in the full sample and within each gender view group, and the estimates for each group remain almost entirely within the range that defines the group. Together, these results support both the stability of self-reported GVI and the consistency of the group classification.

To address concerns about anticipation effects and temporary changes around life events, Figure A2 uses the first childbirth as an example and traces the time trend of GVI around it using an event-study design. As discussed in the main text, GVI shows no discernible jump at the time of birth, both in the full sample and within each gender view group. The estimates for each group remain mainly within the range that defines the group. This evidence further supports the stability of self-reported GVI and the consistency of the group classification.

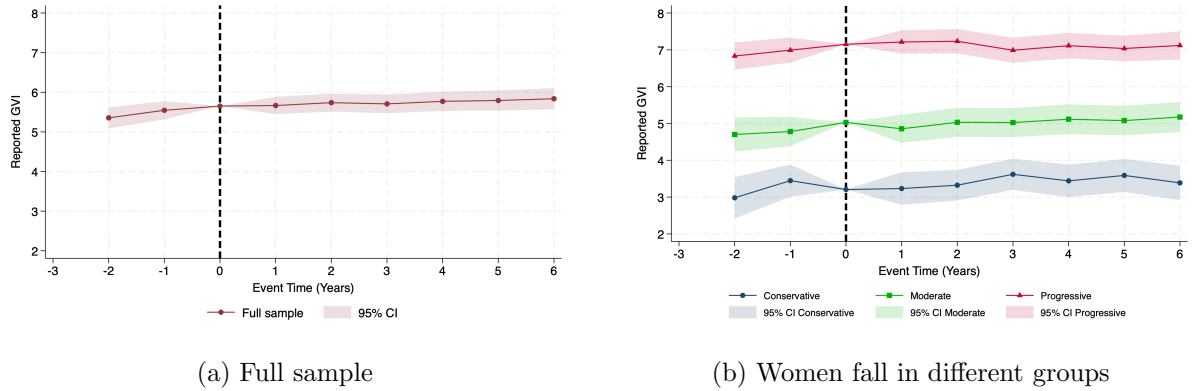
Overall, although individuals' reported gender values fluctuate across waves, their GVI remains largely stable over time. Accordingly, I use each woman's time-averaged GVI to represent her gender role attitudes. This approach enlarges the sample used in the main analysis while reducing the influence of short-run reporting noise.

I further show that GVI is essentially independent of education and wages, as a regression of GVI on education and wage yields a very low R^2 , reported in Table A3. Figure A3 further presents the share of women with different gender role attitudes by education group.

Table A2: Gender Value Index and Life Events

	(1) Marriage	(2) Divorce	(3) First Childbirth	(4) Second Childbirth	(5) Third Childbirth	(6) All
Marriage	-0.095 (0.061)					-0.093 (0.061)
Divorce		0.101 (0.097)				0.099 (0.097)
First childbirth			0.080 (0.058)			0.078 (0.058)
Second childbirth				0.006 (0.059)		0.007 (0.059)
Third childbirth					-0.066 (0.090)	-0.063 (0.090)
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Between SD	1.425	1.425	1.425	1.425	1.425	1.425
Within SD	1.025	1.026	1.025	1.026	1.026	1.025
ρ	0.659	0.659	0.659	0.659	0.659	0.659
Observations	16192	16192	16192	16192	16192	16192

Notes: Standard errors in parentheses. *** 1%, ** 5%, * 10%. The sample includes all female respondents—both single and married—for the years 2011-2021 where the GVI is reported, without applying the sample selection criteria described in Section 3. The table presents coefficients from a regression of the self-reported Gender Value Index (GVI, 2–8 scale) on event dummies, controlling for individual and year fixed effects.

**Figure A2: Gender Value Index around the first childbirth**

Notes: The sample includes all female respondents—both single and married—for the years 2011-2021 where the GVI is reported. The figure plots event-time coefficients from a regression of the self-reported Gender Value Index (GVI, 2–8 scale) on event-time dummies relative to the birth of the first child, controlling for individual and year fixed effects. The year of birth ($t = 0$) is the omitted reference period, so each coefficient measures the change in GVI relative to the birth year. Coefficients are shown in levels by adding the mean GVI at $t = 0$. Shaded areas show 95% confidence intervals based on conventional standard errors. In panel (b), the regression is estimated separately for each group. Women are classified as conservative (below 4), moderate (4 to below 6), or progressive (6 or above) based on their individual average GVI across all survey years.

Table A3: Low R^2 of GVI regressed on Education and Wage

	(1) GVI
Educational attainment	0.116*** (0.0157)
Hourly wage rate	0.465*** (0.0193)
Constant	4.843*** (0.0453)
Observations	16192
R^2	0.041

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The sample includes all female respondents—both single and married—for the years 2011-2021 where the GVI is reported, without applying the sample selection criteria described in Section 3. Educational attainment is scaled from 0 to 7, reflecting a detailed educational degree ranging from junior high school to graduate school. Women who are not wage earners have a wage rate of 0.

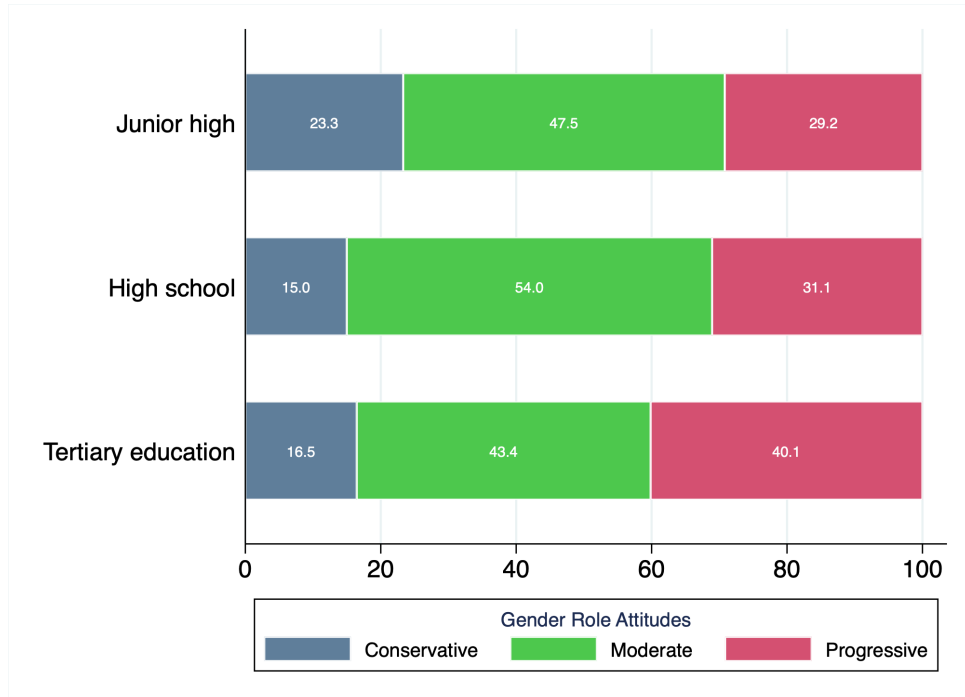


Figure A3: Share of Gender Role Attitudes by Education Group

A.2 Stated Birth Intentions

Table A4: Conditions for Additional Childbirth

	Answer: Yes	Answer: No
To be able to pay living expenses with a child or another child	2029 (76.9%)	611 (23.1%)
Cooperation from husband and family	1196 (45.3%)	1444 (54.7%)
To have a larger house	678 (25.7%)	1962 (74.3%)
To be able to continue working after giving birth	611 (23.1%)	2029 (76.9%)
Available social systems (daycare centers and childcare moms)	632 (23.9%)	2008 (76.1%)

Table A5: Reasons Against Additional Childbirth

	Yes	No
I am satisfied with having my children	5385 (63.8%)	3057 (36.2%)
I am too weak physically to have a child	4559 (49.8%)	4590 (50.2%)
Childcare burden and educational expenses will be heavy	4468 (48.8%)	4681 (51.2%)
Raising a child to become a full member of society is not easy	3329 (36.4%)	5820 (63.6%)
I consider my own life as more important	1498 (16.4%)	7651 (83.6%)
Need to get a larger house	1148 (12.5%)	8001 (87.5%)
I want to continue working	1137 (12.4%)	8012 (87.6%)
I worry whether or not I will have a healthy child	1099 (12.0%)	8050 (88.0%)
I cannot expect that my husband will help me with childcare	941 (10.3%)	8208 (89.7%)
I consider mine and husband's lives as more important	383 (4.2%)	8766 (95.8%)
I don't like children	169 (1.8%)	8980 (98.2%)
I am simply satisfied having my daughter	32 (0.3%)	9117 (99.7%)
I am simply satisfied having my son	15 (0.2%)	9134 (99.8%)

Table A6: Interaction effect of housework inequality and gender values

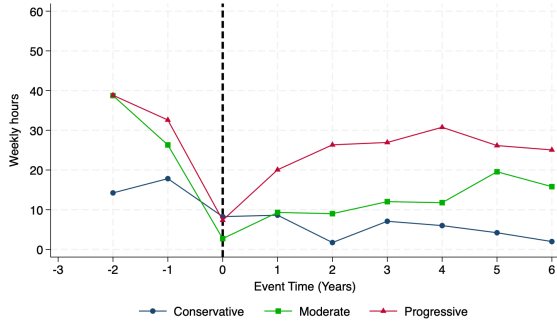
	Condition			Reason		
	(1) Supportive husband	(2) Continue working	(3) Childcare centers	(4) Unsupportive husband	(5) Childcare burden	(6) Continue working
Gap $\times$ GVI	0.000 (0.000)	-0.001*** (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
Home production gap	0.000 (0.001)	0.002** (0.001)	-0.002 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.002*** (0.001)
GVI	0.008 (0.013)	0.071*** (0.010)	0.019* (0.011)	-0.015*** (0.005)	-0.020*** (0.007)	0.005 (0.005)
Wife's relative wage	0.001** (0.000)	0.003*** (0.000)	0.001** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.002*** (0.000)
Number of children	-0.045*** (0.013)	0.007 (0.010)	-0.011 (0.011)	-0.013*** (0.004)	0.029*** (0.007)	0.009* (0.005)
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Female education FE	Yes	Yes	Yes	Yes	Yes	Yes
Male education FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2309	2309	2309	8015	8015	8015

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Wife's relative wage is computed as the wife's wage relative to her husband's wage, multiplied by 100. For unemployed women, the wage is set to 0.

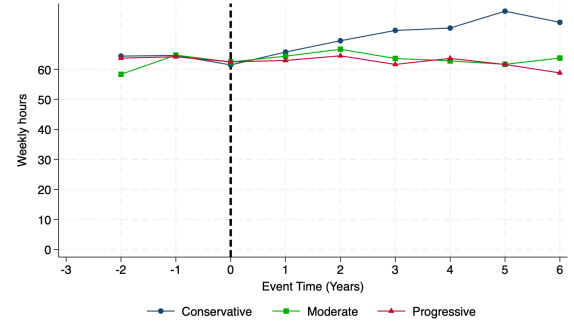
A.3 Supplementary Event-Study Analysis

Figure A4 presents the effect of childbirth on spouses' time allocation, restricting the sample to couples who had one child and no subsequent births during the observation period. This addresses the concern that more conservative groups tend to have more children in the years following the first birth, which could confound the group comparisons in the full sample. The number of households with the most conservative gender role attitudes and only one child is small—just 39 households—so the event-study estimates for this group are relatively noisy. Nevertheless, the figure shows patterns consistent with the full sample in Figure 5: wives' market work hours and housework hours continue to exhibit pronounced differences across groups.

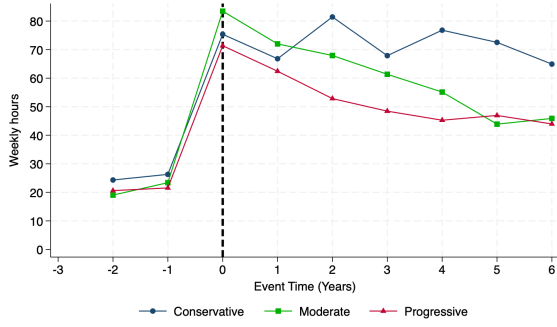
As an additional check that the effects across gender-value groups are not driven by education, I present the effects of childbirth for agents with different levels of educational attainment in Figure A5. I consider three groups: agents who completed high school or below, agents with a three-year college degree, and agents with a university or postgraduate degree. I combine junior high and high school into a single group to achieve more even sample sizes across categories. Unlike the specification in Equation 1, the control variables used here exclude the individual's own education, though spousal education is still included. All other regressors remain identical to the baseline specification.



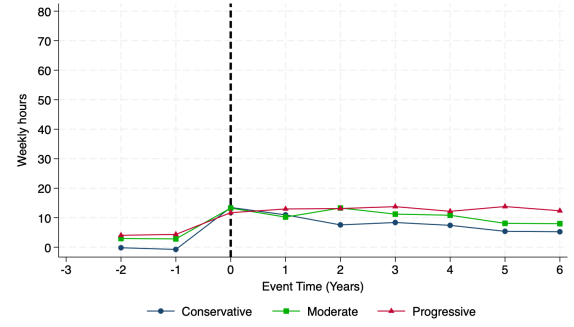
(a) Females' market work hours



(b) Males' market work hours

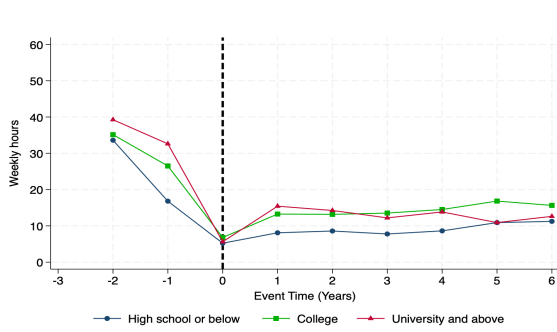


(c) Females' home production hours

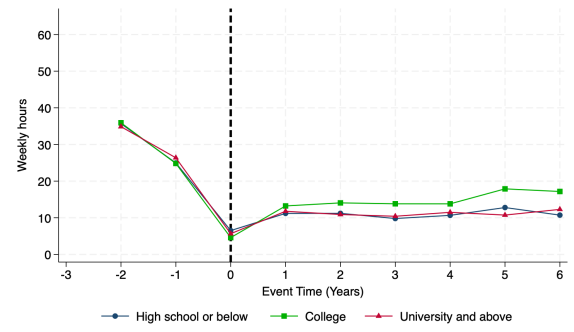


(d) Males' home production hours

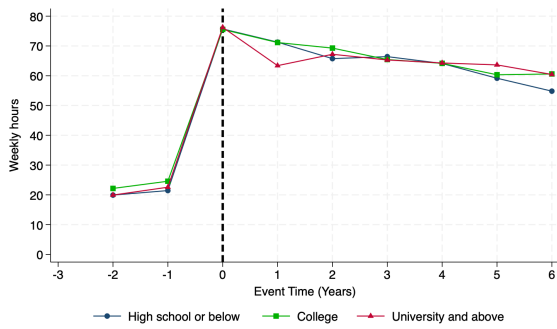
Figure A4: Effect of first childbirth on time allocation, among families with one child



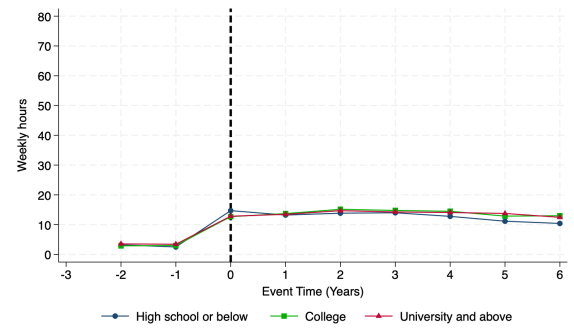
(a) Females' market work hours



(b) Males' market work hours



(c) Females' home production hours



(d) Males' home production hours

Figure A5: Effect of first childbirth on time allocation, by education

A.4 Conception Probability

The probability of conception declines with age, consistent with medical evidence and prior work on fertility. This decline reflects two underlying components, biological fecundity and the risk of permanent infertility. The literature typically calibrates age-dependent fecundity profiles based on medical evidence, but differs in the treatment of infertility risk.

Among the closest literature, [Adda et al. \(2017\)](#) assume women do not anticipate permanent infertility risk and fix 5% of women as permanently infertile ex-ante, with no age variation. Some other papers treat permanent infertility as an absorbing state by allowing the share of infertile women to increase with age, and assume women fully anticipate this risk when making decisions ([Sommer, 2016](#); [Jakobsen et al., 2025](#)).²⁵

My approach takes a middle ground. I allow the permanent infertility risk to increase with age and occur to individual women stochastically each period, but assume women do not anticipate their individual infertility risk when making decisions. As a result, women are slightly over-optimistic about their individual conception probability. However, the population-level birth probability used in the model solution is correctly calibrated as the product of the biological fecundity rate and the share of fertile women at each age, so the aggregate fertility dynamics are consistent with the data.

Let $f_t = 1$ indicate that a woman is permanently infertile and $f_t = 0$ that she is fertile. Let $e_t = 1$ indicate that a couple is trying to conceive and $e_t = 0$ otherwise. The total probability of a birth occurring next period for couples trying to conceive is given by:

$$\begin{aligned} P(b_{t+1} = 1 \mid e_t = 1) &= P(b_{t+1} \mid e_t = 1, f_t = 0)P(f_t = 0) + \underbrace{P(b_{t+1} \mid e_t = 1, f_t = 1)}_{=0}P(f_t = 1) \\ &= P(b_{t+1} \mid e_t = 1, f_t = 0) \cdot P(f_t = 0) \end{aligned} \tag{19}$$

Since permanently infertile women cannot conceive, their contribution to the birth probability is zero, and the total probability reduces to the product of two components: the biological fecundity rate $P(b_{t+1} \mid e_t = 1, f_t = 0)$ and the share of fertile women at age t : $P(f_t = 0)$.

The fecundity rate measures the probability of conception for a fertile woman trying to conceive within one year. I calibrate this from [Leridon \(2004\)](#), who reports the following age-specific rates: 90% at age 20, 75% at age 30, 66% at age 35, and 44% at age 40. I additionally assume that fecundity is 0% at age 45 and above, and use linear interpolation to construct the complete age profile from these data points.

²⁵[Jakobsen et al. \(2025\)](#) additionally incorporate unplanned births, whereas this paper, in line with the rest of the literature, abstracts from this margin to facilitate identification.

The share of permanently infertile women increases with age. Drawing on [Sommer \(2016\)](#) and [Trussell and Wilson \(1985\)](#), I use the following age-specific rates of permanent infertility: 1% at age 25, 3% at age 30, 7% at age 35, 17% at age 40, and 97% at age 45 and above. The share of fertile women at age t is then $P(f_t = 0) = 1 - P(f_t = 1)$. As with fecundity, I use linear interpolation to obtain the complete age profile.

I assume infertility is an absorbing state, meaning a woman remains permanently infertile once she becomes infertile. The likelihood of a fertile women becomes infertile in the following period as:

$$\begin{aligned} P(f_{t+1} = 1) &= P(f_{t+1} = 1 \mid f_t = 0)P(f_t = 0) + \underbrace{P(f_{t+1} = 1 \mid f_t = 1)}_{=1} P(f_t = 1) \\ &= P(f_{t+1} = 1 \mid f_t = 0)(1 - P(f_t = 1)) + P(f_t = 1) \end{aligned} \tag{20}$$

This transition probability enters the model each period as an exogenous risk faced by fertile women.

A.5 Grid Points

Table A7: Preset grid points for the model variables

Variable	Value
Bargaining power	[0.48, 0.72, 0.98, 1.38]
Number of children	[0, 1, 2, 3]
Age of youngest child	[0, 2, 4, 6, 8, 10]
Females' weekly work hours	[0, 25, 40, 55]
Males' weekly work hours	[60]
Human capital stock	[0,1,2,3]
Assets	$[0, 0.46, 1.85, 4.2, 6]) \cdot (31/7) \cdot 12 \cdot 2$
Equivalence scales of child-related expenses: conservative	[1, 1.52, 2.03, 2.24]
Equivalence scales of child-related expenses: moderate	[1, 1.53, 2.09, 2.48]
Equivalence scales of child-related expenses: progressive	[1, 1.54, 2.15, 2.32]
Female sleep time by number of children: conservative	[85, 76, 77, 75]
Female sleep time by number of children: moderate	[83, 76, 76, 76]
Female sleep time by number of children: progressive	[79, 73, 75, 71]
Male sleep time by number of children: conservative	[78, 73, 75, 74]
Male sleep time by number of children: moderate	[77, 75, 75, 76]
Male sleep time by number of children: progressive	[75, 73, 75, 72]

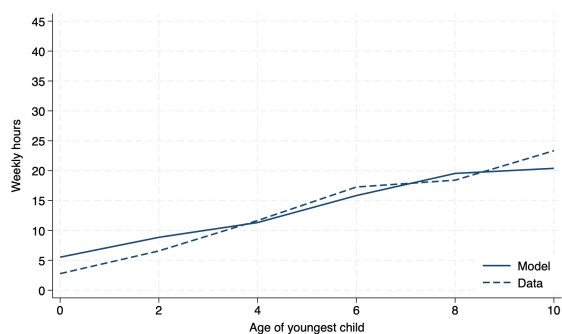
A.6 Initial Distribution

The distribution of the number of children at the initial period varies by female gender role attitudes. Among conservative women, 31.58% have no children at age 24-25, 47.37% have one child, 18.42% have two children, and 2.63% have three or more children. Among moderate women, the corresponding shares are 33.65%, 35.58%, 27.88%, and 2.88%. Among progressive women, the shares are 37.88%, 39.39%, 21.21%, and 1.52%. I randomly draw each household's number of children at period 1 from the distribution corresponding to the wife's gender role attitudes.

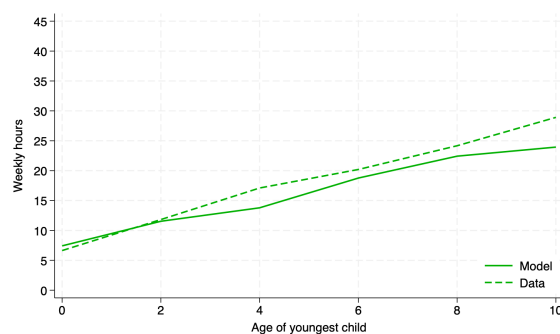
The relative wage ratio, which defines the bargaining power states in the model, is discretized into four grid points corresponding to the sample quartiles. Specifically, 25% of women have a relative wage of 0.48 or below, 50% fall below 0.72, 75% fall below 0.98, and the top quartile reaches 1.38. These cutoffs are taken directly from the data. Each agent's wage rate, in turn, depends on their human capital stock, described next.

Agents' initial human capital stock is imputed from a wage regression estimated separately for each gender on the sample of wage earners. Specifically, I regress the log wage rate on education, work experience, working industry, and region of residence. I then use the estimated coefficients to compute each individual's predicted wage, including those not currently employed, based on these same characteristics. For the unemployed, the predicted wage represents their potential wage if they were to work. The predicted wages are then discretized into four quartile bins, which serve as a proxy for human capital stock. Work experience represents potential working years, computed as an individual's age minus years of schooling and 6 pre-schooling years. Agents' initial human capital follows the empirical distribution of these quartile bins by gender. Among females, 57.21% fall into the lowest bin, 23.08% into the second, 13.94% into the third, and 5.77% into the highest. For males, the corresponding shares are 64.9%, 22.12%, 8.17%, and 4.81%.

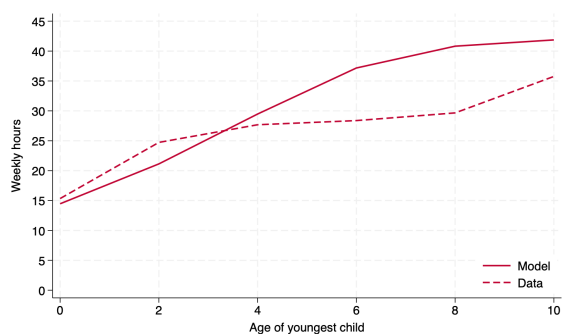
A.7 Supplementary model fits



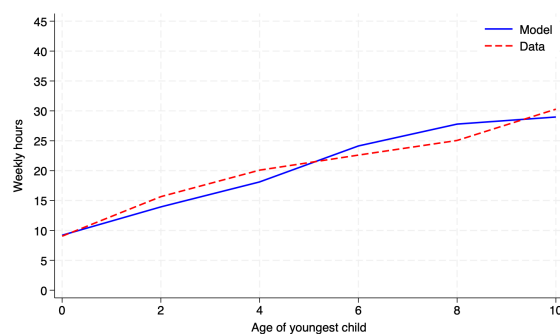
(a) Conservative women



(b) Moderate women

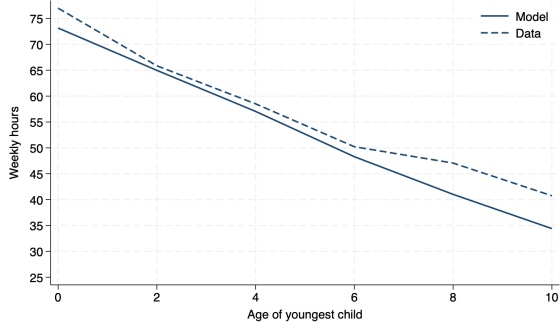


(c) Progressive women

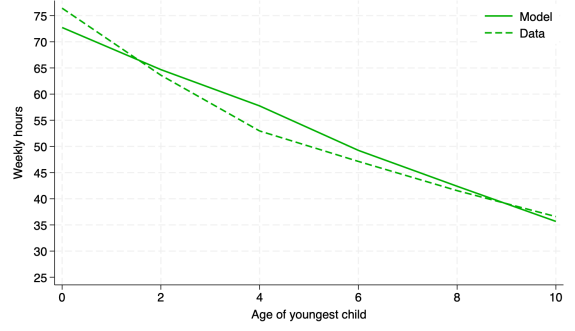


(d) All women

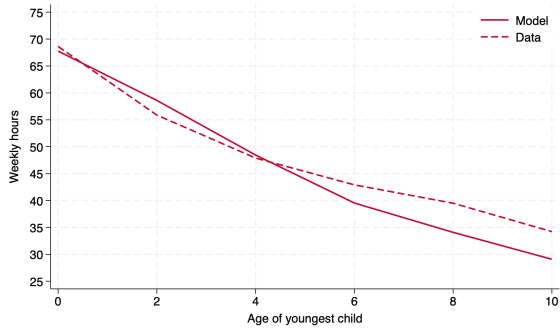
Figure A6: Female market work hours across age of youngest child



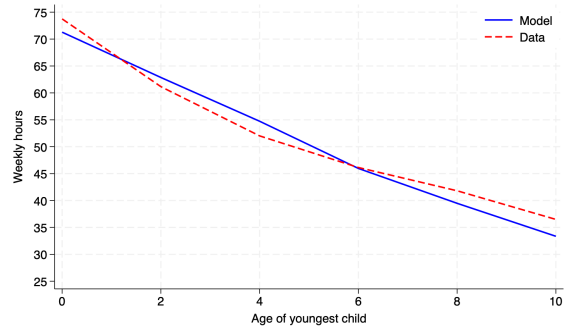
(a) Conservative women



(b) Moderate women

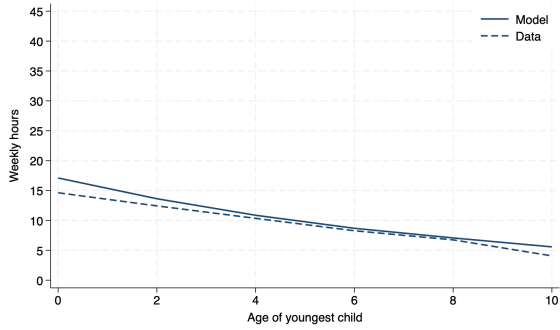


(c) Progressive women

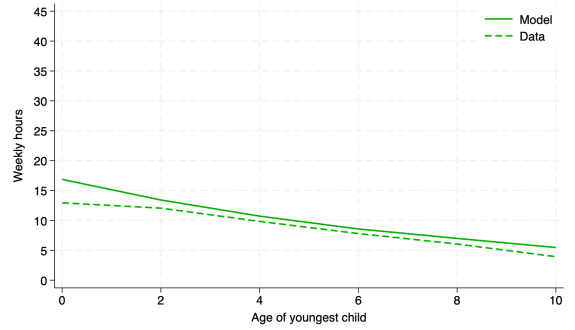


(d) All women

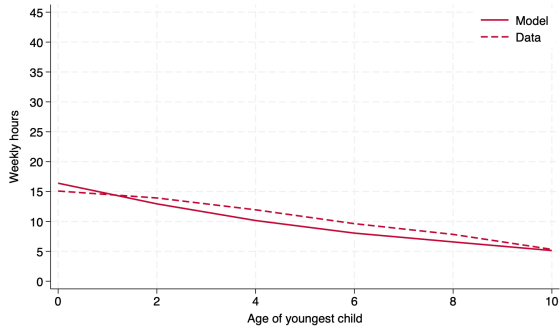
Figure A7: Female home production hours by age of the youngest child



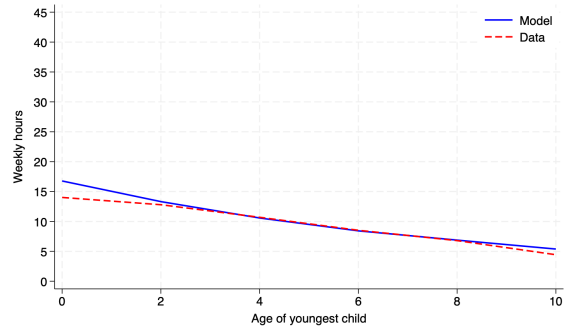
(a) Husbands of conservative women



(b) Husbands of moderate women

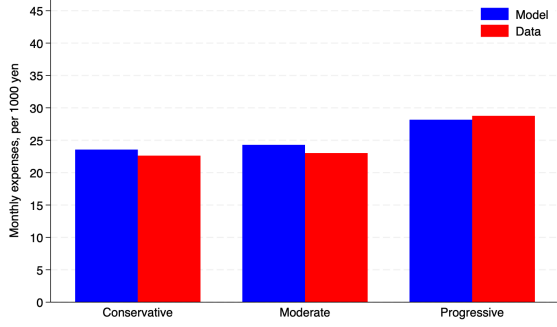


(c) Husbands of progressive women

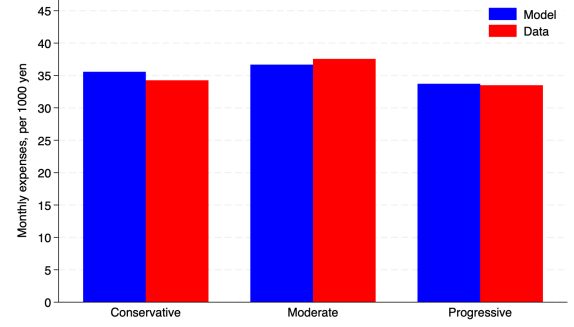


(d) All men

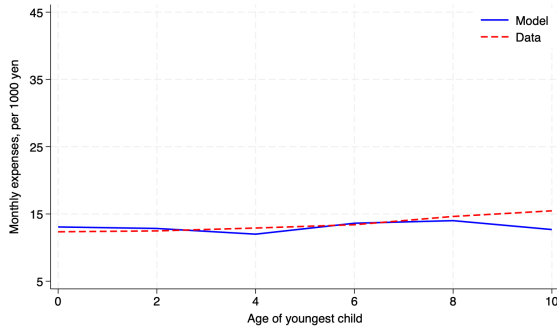
Figure A8: Male home production hours by age of the youngest child



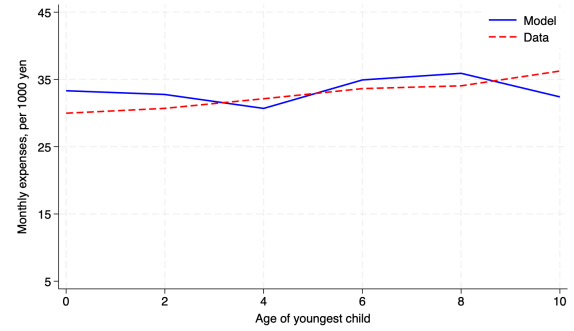
(a) Women's expenses in childless households



(b) Men's expenses in childless households



(c) Women's expenses by age of the youngest child



(d) Men's expenses by age of the youngest child

Figure A9: Untargeted moments: consumption

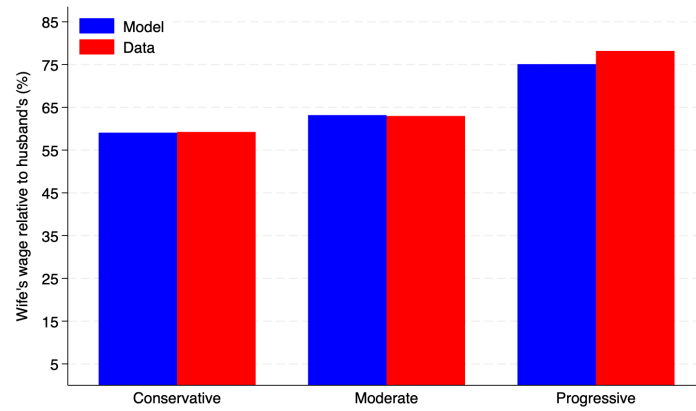


Figure A10: Spouses relative wage across gender view groups

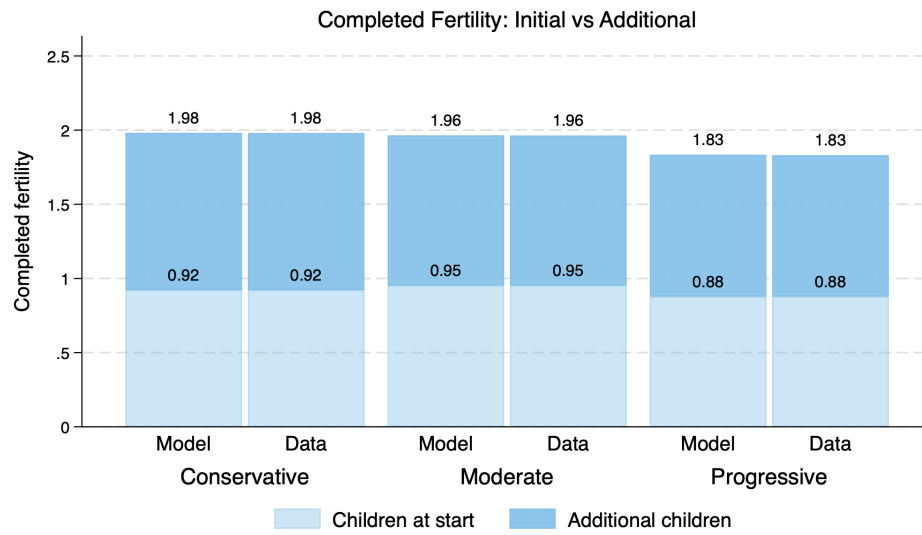
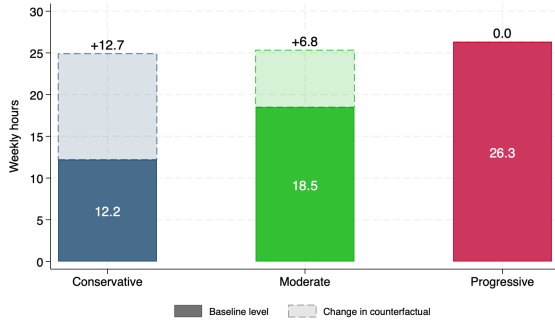
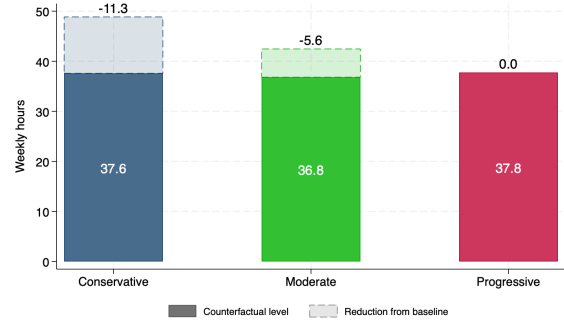


Figure A11: Initial versus completed number of children

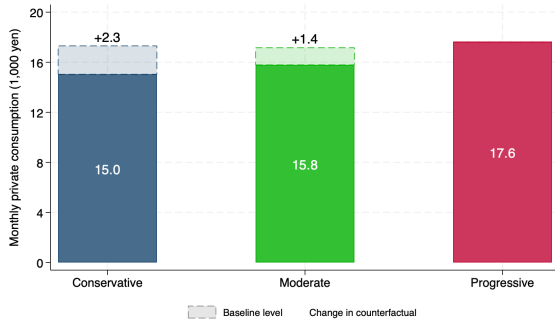
A.8 Supplementary counterfactual results



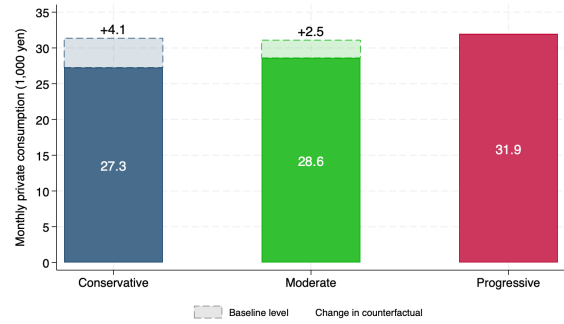
(a) Female's market work



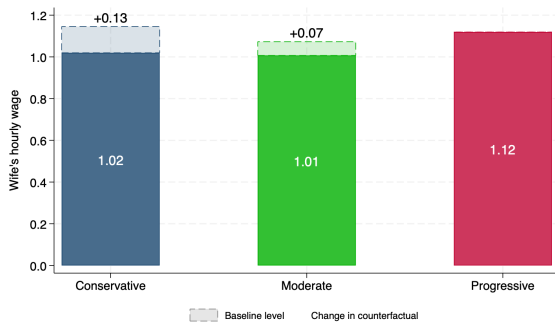
(b) Female's home production



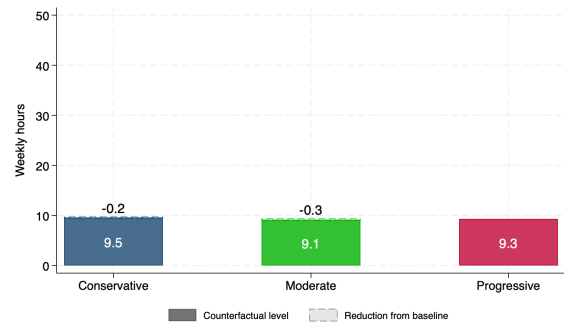
(c) Female's private consumption



(d) Male's private consumption

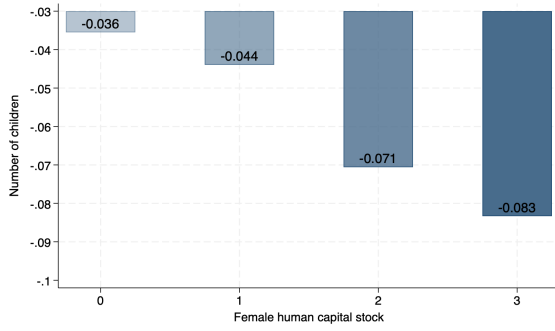


(e) Female's hourly wage



(f) Male's home production

Figure A12: Intra-household outcomes if all women hold progressive views



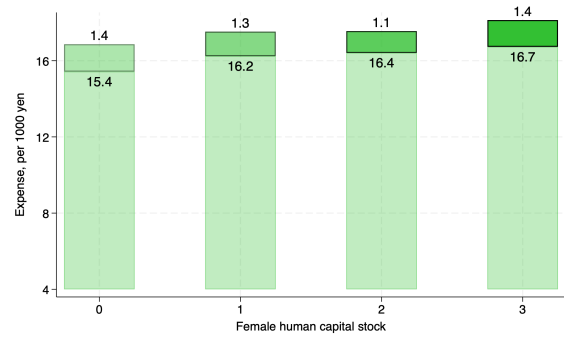
(a) Conservative women: completed fertility



(b) Moderate women: completed fertility



(c) Conservative women: consumption



(d) Moderate women: consumption

Note: The framed segments in plots c-f show the simulated increment from the counterfactual, relative to the baseline values shown in the unframed segment below.

Figure A13: Changes by human capital stock, level

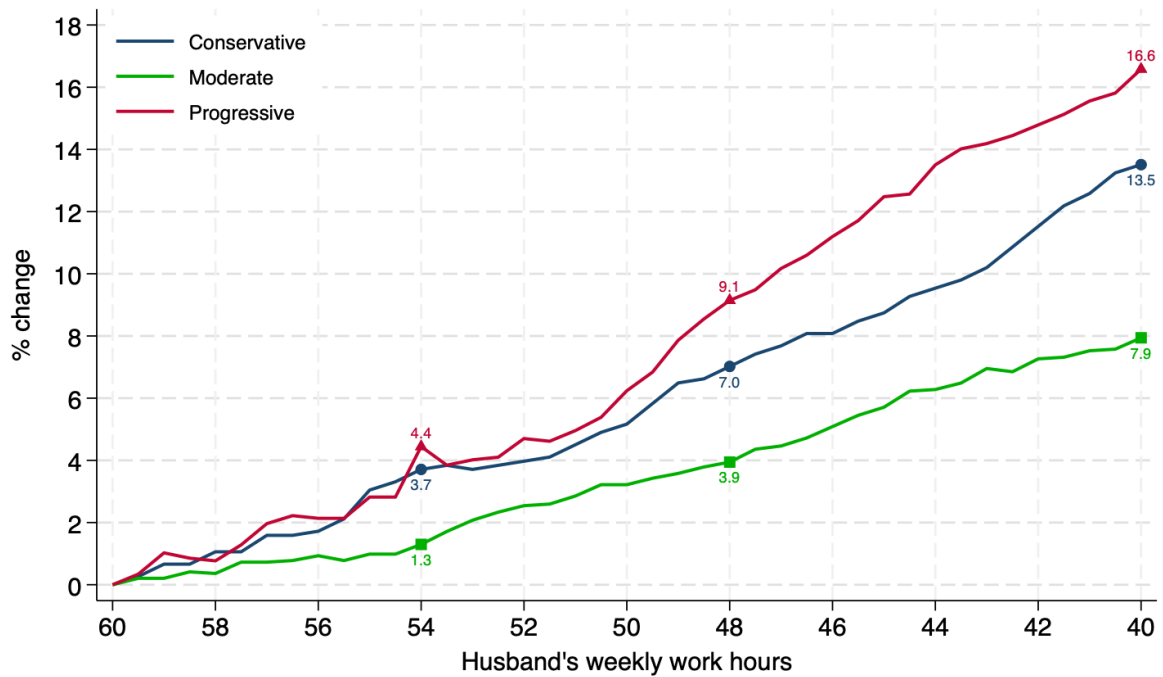
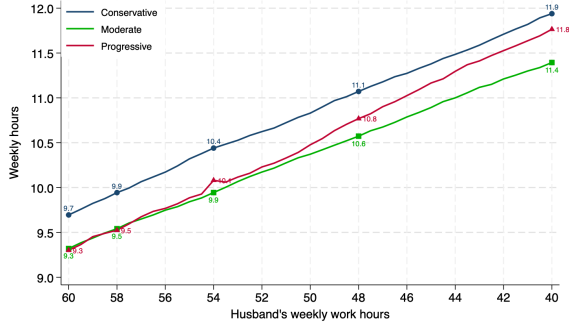
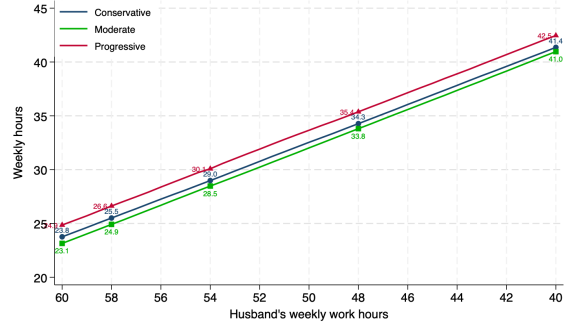


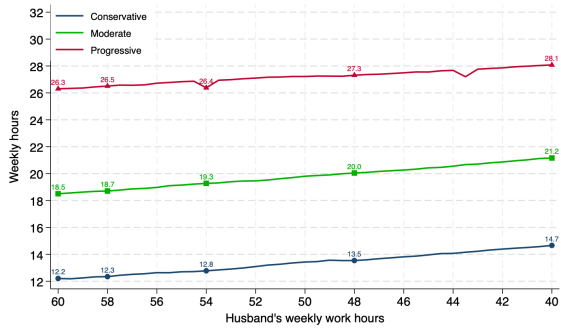
Figure A14: Completed fertility change (%) if husbands reduce market work



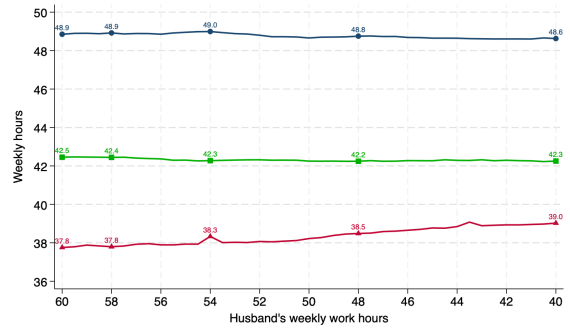
(a) Male's home production



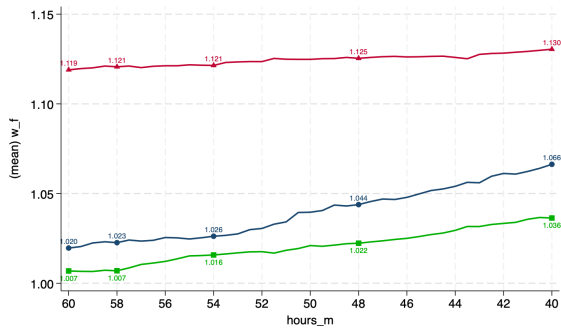
(b) Male's leisure



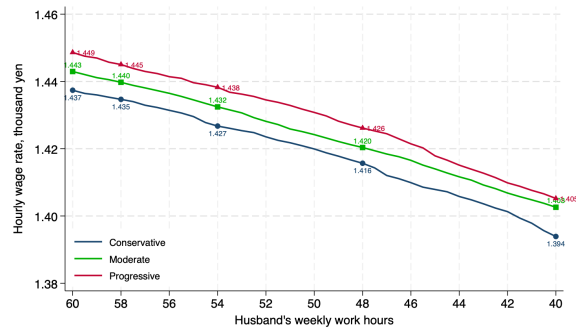
(c) Female's market work



(d) Female's home production

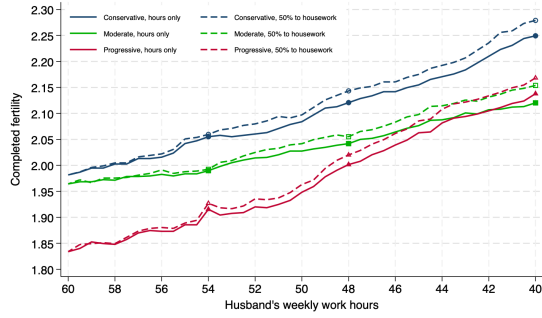


(e) Female's hourly wage

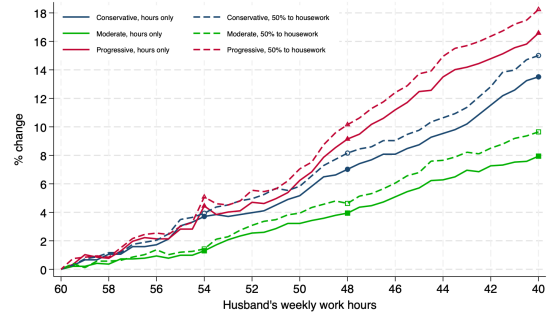


(f) Male's hourly wage

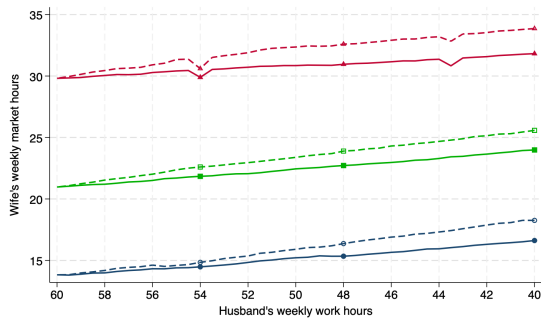
Figure A15: Responses to reduced market hours for husbands



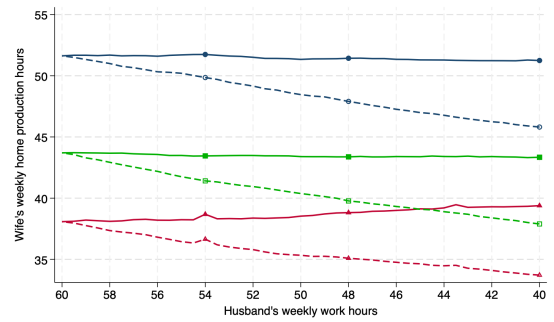
(a) Completed fertility



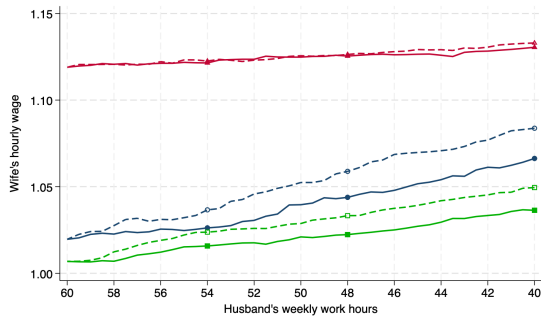
(b) % change in completed fertility



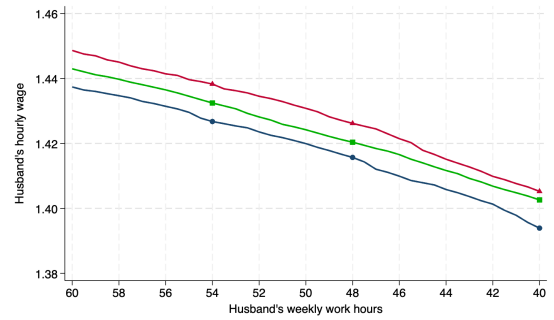
(c) Female's market work



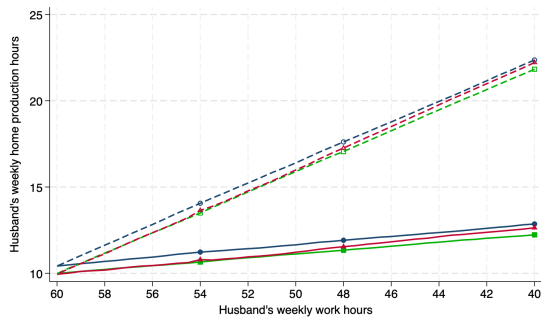
(d) Female's home production



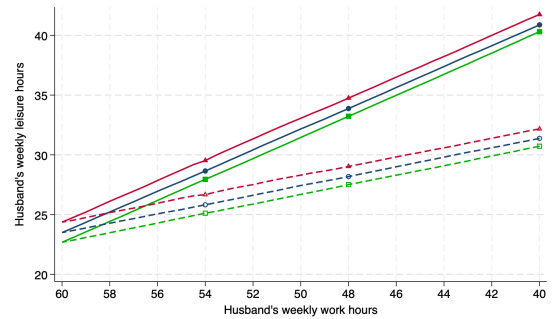
(e) Female's hourly wage, thousand yen



(f) Male's hourly wage, thousand yen



(g) Male's home production, thousand yen



(h) Male's private leisure, thousand yen

Figure A16: Husbands reduced market hours with 50% reallocated to home production