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Why gender norms matter

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Abstract

This study examines the influence of gender norms on household behaviour and welfare. Using Japanese household data, we find that households with a conventional norm on gender roles spend more time on housework and less money on family-common goods. To understand the underlying mechanism, we construct a collective labour supply model that explicitly introduces gender norms. We show that an inefficient ratio of wives' household time to that of husbands leads to an increase in the shadow price of domestic goods, through which the norm distorts the time and money allocated to home production and decreases household welfare.

JEL CLASSIFICATION

D13; J16; J22

1 | INTRODUCTION

As codified within the UN Sustainable Development Goals, women's empowerment has emerged as a crucial policy objective that countries worldwide are striving to achieve. Previous studies have examined women's scholastic accomplishments, labour market engagement and political involvement in relation to those of their male counterparts (Galor and Weil 1996; Doepke and Tertilt 2009; de la Croix and Vander Donckt 2010; Goldin 2014; Bertrand 2018). As these choices are formulated within households, it is imperative to gain deeper insights into the factors that affect household decision-making and the underlying mechanisms.

Among potential factors, we explore the influence of social norms. Several recent studies postulate the existence of implicit conventions, otherwise known as social norms, that govern household behaviour. These studies seek to investigate the actual impact of such norms on behaviour (Fernández *et al.* 2004; Farré and Vella 2013; Alesina *et al.* 2013; Bertrand *et al.* 2015, 2021; Goussé *et al.* 2017; Kleven and Landais 2017; Bursztyn *et al.* 2020). Building on this body of literature, we focus on gender norms that mandate that women undertake more household chores than men, a phenomenon that we refer to as the *male-dominant social norm* in this study. Incorporating norm into analyses of household behaviour is particularly important because the unequal division of housework along gender lines impedes women's labour and political

participation. Consequently, it is highly likely that the degree of adherence to the male-dominant social norm is intricately linked to women's empowerment.

Using Japanese household data, we examine the relationship between a conventional norm on gender roles in a family and household behaviour, including expenditure on private and common goods, household time, and work hours in the labour market. As expected, our measure of conventional norms is positively correlated with wives' household time, and negatively correlated with husbands' household time and wives' work hours outside the home. However, we also found that the measure was positively correlated with the sum of wives' and husbands' household time, but negatively correlated with the expenditure on family-common goods. To the best of our knowledge, this is new evidence compared to the literature, and the underlying mechanism needs to be clarified because time use and consumption allocation within households are directly related to the welfare of household members.

To explain this phenomenon, we construct a collective labour supply model (Chiappori 1988, 1992) and investigate the impact of male-dominant social norms on household decision-making. Our model assumes a household comprising a wife and husband, who jointly determine the allocation of time and money. Specifically, households engage in the production of a domestic good that serves as, for example, a measure of children's welfare and the health status of family members (Becker 1973; Blundell *et al.* 2005), and is achieved through the combined household time of wives and husbands, and various market goods and services. We operationalize social norms as a time constraint, whereby the wife is expected to undertake $s \in \mathbb{R}_+$ times more household chores than the husband. A higher value of s indicates a more pronounced male-dominant social norm because women take on a larger share of housework and childcare, resulting in reduced time available for leisure and market work.

Our model demonstrates that a more pronounced male-dominant social norm is associated with an increase in the wife's household time, accompanied by a reduction in the husband's corresponding effort, as dictated by the norm's definition. Interestingly, the total amount of household time spent by couples may increase. In addition, depending on the level of complementarity between time and monetary inputs in home production, the latter may decline. In other words, our theoretical framework establishes that stronger male-dominant social norms induce households to substitute monetary inputs for time inputs. Most importantly, this shift in the input vector leads to a reduction in the output of home production (i.e. level of the domestic good) and hence reduces household welfare.

This study contributes to and builds on two distinct strands of the economics literature. The first explores the influence of social norms on household behaviour. The rationale behind investigating social norms is that certain aspects of household behaviour cannot be explained well by conventional economic theory, which motivates household decisions based solely on financial incentives. To address this issue, Akerlof and Kranton (2000) introduce the notion of identity from sociology and social psychology to economics. This approach has been widely employed to understand household decision-making. For example, Bertrand *et al.* (2015) demonstrate that the distribution of the income earned by wives experiences a sharp decline to the right of one-half, and propose that this pattern can be attributed to gender identity norms. Fernández *et al.* (2004) construct a model that accounts for a man's preference for his wife's labour force participation to explain why the wives of men whose mothers worked were significantly more likely to work themselves. Hwang (2016) and Bertrand *et al.* (2021) apply this model to elucidate the female labour supply in Korea and the USA, respectively. Despite the close relationship between our study and previous ones, there are some critical distinctions. One such distinction is that our evidence and theory endeavour to investigate the impact of social norms under the intrahousehold bargaining framework. Additionally, we utilize data from households in Japan, a country where male-dominant social norms are deeply ingrained, and where the female labour force and political participation remain low compared to other developed countries. Moreover, we clarify the mechanism underlying the impact of gender norms on household behaviour and welfare, and

find that the complementarity between the time and monetary inputs of home production plays an important role.

From a methodological perspective, most theoretical studies on gender norms have introduced gender norms into non-cooperative household models as a disutility arising when deviating from the behaviour dictated by the norm (Fernández *et al.* 2004; Hwang 2016; Bertrand *et al.* 2021). However, diverging from this conventional approach, we introduce gender norms into a cooperative model as a time constraint regarding household time (Gimenez-Nadal *et al.* 2012). Notably, while Gimenez-Nadal *et al.* (2012) impose a constraint solely on the wife's household time, we impose a constraint on the wife's household time relative to that of the husband's. Our method allows for comparative statics via interior solutions, which is particularly important because we introduce a home production function characterized by multiple inputs. Compared with the aforementioned preference models, our framework offers distinct analytical advantages. First, when considering home production and allowing for complementarity among its inputs, cooperative models are more tractable than non-cooperative ones. More importantly, the inherent structure of non-cooperative decision-making induces inefficiency in resource allocation within households due to the strategic interactions between agents. Contrastingly, we demonstrate that gender norms may lead to inefficiency and diminish household welfare even under conditions of cooperative behaviour, thereby highlighting the importance of gender norms.

The second literature strand refers to women's empowerment, and examines the factors that promote it and the reasons for its occurrence, as well as its significance. Regarding the first issue, Lundberg *et al.* (1997) demonstrate that providing child allowances to mothers leads to an increase in expenditures on both themselves and their children. Similarly, Voena (2015) provides evidence that the introduction of unilateral divorce laws with equal property division leads to greater asset accumulation and transfers to wives. Conversely, Doepke and Tertilt (2009) emphasize the importance of the heterogeneity of preferences towards children between genders, highlighting that women typically prefer to allocate more resources to children than men do. As a result, men who initially had the right to vote were incentivized to empower women because altruistic fathers desire higher bargaining positions for their daughters within the household. The implications for women's empowerment are also examined. Doepke and Tertilt (2009) show that empowering women leads to human capital accumulation, which promotes economic growth. Also, de la Croix and Vander Donckt (2010), Fernández (2014) and Hiller and Touré (2021) investigate the relationship between women's empowerment and economic development. Doepke and Tertilt (2019) argue that empowering women does not necessarily lead to economic growth, and suggest that transfers to women are more likely to be beneficial when human capital is the most important factor of production. Our study contributes to this body of work by demonstrating how male-dominant social norms not only result in gender inequality in housework and childcare, but also negatively impact children's development and human capital accumulation.

The remainder of this paper is organized as follows. Section 2 reports the observed relationships between the conventional norm on gender roles and household behaviour. Section 3 presents the theoretical model and comparative statics to interpret the observed patterns. Section 4 presents the results of the welfare analysis, and Section 5 provides concluding remarks.

2 | CONVENTIONAL NORMS ON GENDER ROLES IN A FAMILY AND HOUSEHOLD PRODUCTION IN JAPAN

Japan is known as a male-dominated society, where women are less likely to be in leadership roles and high positions in public activities. There may exist similar social norms about housework and childcare. Specifically, there may be conventional values such as 'Women should be more responsible for housework, and men should be more responsible for work outside the home'.

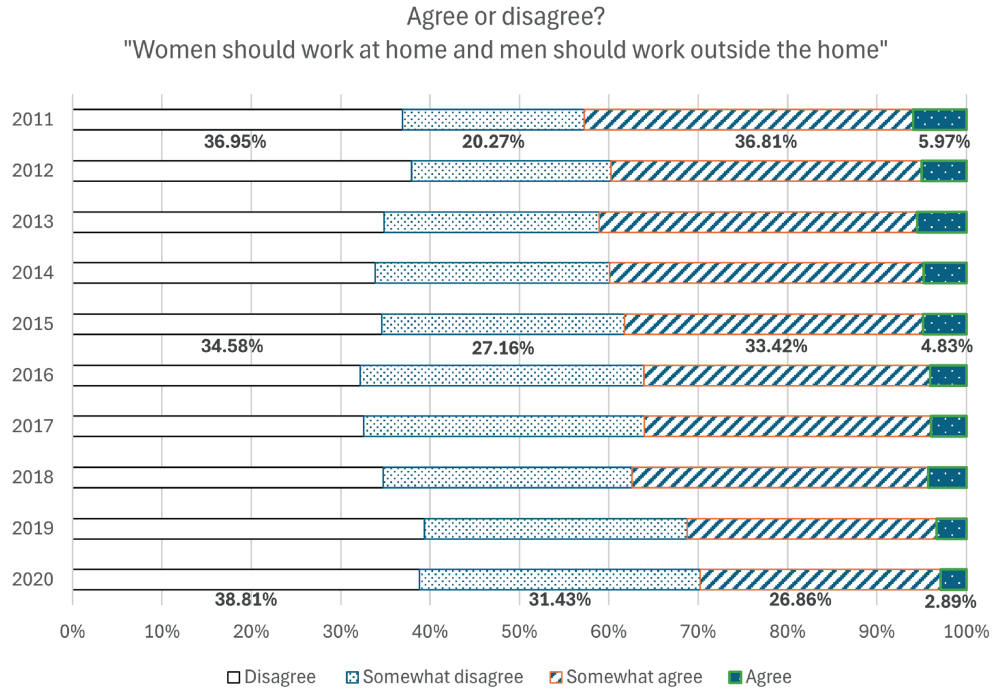

FIGURE 1 Ratio of wives believing the female's responsibilities in housework.

The Japanese Panel Survey on Consumers (JPSC), compiled by Keio University, asks whether the survey respondent, a wife aged between 24 and 60, agrees with such conventional values. The answers can be 1 for agree, 2 for somewhat agree, 3 for somewhat disagree, or 4 for disagree. Figure 1 shows the changes in the answers from 2011 to 2020. This figure illustrates that the number of married women agreeing or somewhat agreeing with women's responsibility for housekeeping work decreased over time in the 2010s, but 30% of the samples still agree with the values even in 2020.

We further create a dummy variable taking value 1 if a wife's answer is 'somewhat agree' or 'agree', and 0 otherwise. It indicates whether a wife has a conventional norm on gender roles in a family. We focus on the dichotomous indicator but not a four-degree categorical answer because the strength of believing in conventional values does not increase linearly as the number of answers increases. That is also because the differential of subjective answers of 'agree' and 'somewhat agree' is not clear, and similarly the difference between 'disagree' and 'somewhat disagree'. However, the cut-off between answers of (somewhat) agree and (somewhat) disagree may be rather clear.

Using the dichotomous indicator of following the conventional norm on gender roles in a family, Figure 2 illustrates the regional differences in the presence of conventional norms, on a map of Japan's 47 prefectures in 2011 and 2020. Japan extends from North to South, and metropolitan cities such as Tokyo, Nagoya and Osaka are in the middle in terms of latitude. The darker colour in Figure 2 indicates a higher ratio of wives believing the conventional gender roles in a family.

According to Figure 2, conventional values are weaker in urban industrialized areas, including metropolitan cities, whereas they are stronger in rural areas. This is because younger generations move into large cities, bringing about new values different from conventional ones. The figure also shows that the colour has become lighter from 2011 to 2020 all over Japan. The conventional norm regarding housekeeping work has become weaker between 2011 and 2020.

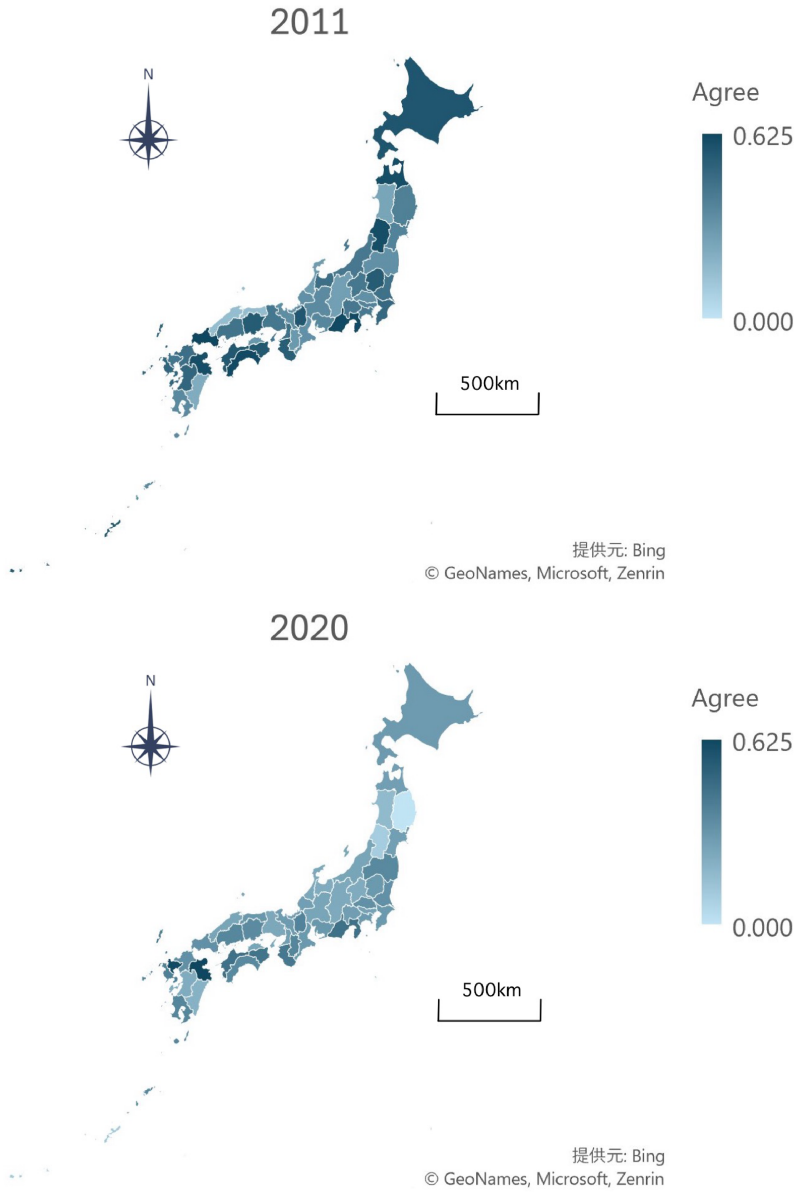

FIGURE 2 Ratio agreeing with the conventional norm 'Women should work at home and men should work outside the home'. *Notes*: The map shows the prefectural differences in the ratio agreeing on 'Women should work at home and men should work outside the home'. The answers can be 1 for agree, 2 for somewhat agree, 3 for somewhat disagree, or 4 for disagree. We create a dummy variable taking value 1 if the answer is 1 or 2, and 0 otherwise, indicating those with a conventional norm. The average is 0.374 for the entire sample (the standard deviation is 0.096). The darker colour on the map indicates the area with a higher conventional norm ratio.

It is noted that the values on gender roles in a family are strongly correlated with male-dominated social norms in the residential areas. Various regional indicators suggest that male-dominated society spreads across prefectures, as in Figure 2, which illustrates the spread of a conventional norm on gender roles in a family. More specifically, the relative number of male members of a local assembly, the relative number of male workers in management positions, the relative number of males with higher educational outcomes, and the relative number of males attaining higher wages vary across prefectures, and any of these indicators shows a significant positive correlation rate with our above-defined indicator of conventional norms on gender roles in a family.

We use this difference in a conventional norm about gender roles across households, and its changes over time, to find how such a norm affects household decisions on consumption and

time allocation. Since the question about gender roles in a family in the JPSC started in 2011, we can use the dataset from 2011 to 2020.

How is our norm indicator on gender roles related to the household's decision on time and money used for housekeeping work? The JPSC contains information on time allocations during a typical weekday for a wife and husband. Panel A of Table 1 shows descriptive statistics of time used for household production and market work. The average 'total' housekeeping time, which is the sum of the wife's time and husband's time, is about 417 minutes (6.942 hours) per day. The average 'total' working time is about 951 minutes (15.851 hours). Although we focus on these 'total' hours, the table also presents each one's time allocation for reference. The table reveals the well-known features of Japanese married couples: Japanese wives devote long hours to housekeeping work, whereas husbands devote long hours to work outside the home.

The JPSC also contains detailed information on money allocation among family members. The survey asks: *How much did your family spend in the last month (September)? Please answer the total amount of expenditure and break it down into the following: amount for family-common goods and services, for yourself (wife), for your partner (husband), for your child(ren), and for the other family members.* We define consumption of family-common goods as the sum of the expenditures on family-common goods and services, and the expenditure for the child(ren). Panel B of Table 1 shows descriptive statistics of these monthly expenditures. For the following estimation, we calculate their equivalence scale by dividing the square root of the number of family members, and transform it to a real value using the 2018 Consumer Price Index. The average one-month amount of family-common/child's goods and services is about 680 dollars on an equivalence scale, and its share of household total expenditure (excluding loan payments and savings) is about

TABLE 1 Household time and money allocation.

	Mean	S.D.	Min	Max
Panel A: Time allocation				
Housekeeping time [daily; weekday; minutes]				
Sum of wife's and husband's housekeeping time	416.941	254.353	0.000	1800.000
Wife's housekeeping time	373.527	238.495	0.000	1200.000
Husband's housekeeping time	43.414	67.913	0.000	900.000
Working time [daily; weekday; minutes]				
Sum of wife's and husband's working time	950.853	271.888	0.000	2100.000
Wife's working time	299.844	242.438	0.000	1030.000
Husband's working time	651.405	151.743	0.000	1200.000
Panel B: Money allocation				
Monthly expenditure on family-common/child's goods and services				
[in equivalence scale; in real value; thousand yen]				
Expenditure on family-common/child's goods and services [1000 yen]	106.301	64.502	0.000	860.576
Share of family total expenditure [%]	79.131	13.726	0.000	100.000
Wife's expenditure [1000 yen]	9.696	14.503	0.000	528.276
Husband's expenditure [1000 yen]	17.972	16.065	0.000	253.069
Panel C: Household income [annual; in real value; 10 thousand yen]				
Total household's disposable income	691.453	323.428	−420.101	2588.718

Notes: The table presents descriptive statistics for the entire estimation sample of 7856 households (from 2011 to 2020). Time spent housekeeping and working are in daily terms on normal weekdays. The unit is minutes. The expenditures are given in monthly terms (the actual spending last month, in real values, and taken as an equivalence scale). The unit is thousands of yen.

80%. Although we focus on the household total in the estimation, the table also shows private consumption for reference. The wife's own (private) consumption is much less than that of the husband or children.

Table 2 shows the difference in household time and money allocation, separately by households with and without conventional norms on gender roles in a family. We can find three interesting features in the table. First, the total housekeeping time engaged by a couple is longer in the group of households with a conventional norm than in the group without. The difference is significant at the 1% significance level. Second, the wife's working hours (outside the home) are shorter in households with a conventional norm. The opposite relationship is found for husbands' working hours. The difference is significant at the 1% significance level.

Third, looking at Panel B of Table 2, the expenditure on family-common/child's goods and services is smaller in the group with a conventional norm than in the group without. The difference is again significant at the 1% significance level. In contrast, the share of common goods expenditure to total expenditure is larger for households with a conventional norm, which is significant at the 1% level. It should be noted that the share would become larger as total consumption became smaller. Thus the bigger share among the households with conventional norms may indicate a smaller total consumption but not a bigger common goods expenditure. We will check the relationship between conventional norms and family-common goods consumption later, controlling for the amount of income in Table 3.

Table 2 presents the existence of a mean difference between households with and without conventional gender norms. This is examined further, controlling for household income by the regression model. The control is important when income levels and year differences affect gender norms as well as the household's time and money decisions.[1] The testing hypotheses are: (1) household total housekeeping time is longer in households with conventional norms on gender roles in a family than in those without; (2) household total working time is shorter in households with conventional norms than in those without; and (3) household total amount of expenditure on family-common/child's goods and services is smaller in households with conventional norm than in those without.

Table 3 shows the results. We conduct the OLS estimation with year fixed effects but not individual fixed effects, since our focal variable of conventional norms on gender roles in a family might be quite persistent over time. The individual fixed effects may absorb the effect of family norms improperly even if the norm indeed affects the time and money allocation. Note, however, that we also conducted the fixed effects estimation, considering that time-varying norms remain even after controlling for the time-invariant norms as fixed effects. We confirmed that the main implication of the following results is unchanged.

Panel A of Table 3 presents the results on time allocation. Specifically, the results for the entire household are reported in part (1). Households with a conventional norm have a longer total (sum of wife's and husband's) housekeeping time and a shorter total working time. The positive coefficient is significant at the 1% significance level in the housekeeping time estimation, and the negative coefficient is significant at the 1% level in the working time estimation. The estimates suggest that the total housekeeping time is longer and working time is shorter in those with a conventional norm than those without, by about 64 and 79 minutes, respectively. These figures are not too large, considering that the averages of total housekeeping and working time are 437.2 and 910.7 minutes, respectively.

We classify the sample into households with and without a child, and the results are presented in parts (2) and (3) of Table 3, respectively. Part (2) shows that the positive sign of the coefficient on the dummy indicator of a household with a conventional norm is significant at the 1% level in the estimation of total housekeeping time. In addition, its negative sign is significant at the 1% level in the estimation of total working time. Although the same signs of the estimates are found, these are insignificant among the households without a child, according to part (3). These

TABLE 2 Household time and money allocation by households with and without a conventional norm on gender roles in a family.

		Households with/without conventional norms on gender roles		Mean difference test:
		With	Without	With – Without
Panel A: Time allocation				
Housekeeping time	Sum of wife's and husband's housekeeping time [daily, weekday; minutes]	437.198	373.558	63.639***
		(269.220)	(248.821)	(4.569)
	Wife's housekeeping time [daily, weekday; minutes]	398.239	323.856	74.383***
		(250.884)	(228.723)	(4.149)
	Husband's housekeeping time [daily, weekday; minutes]	37.388	47.747	−10.358***
		(61.741)	(75.240)	(1.250)
Working time	Sum of wife's and husband's working time [daily, weekday; minutes]	910.705	1,002.986	−92.281***
		(270.554)	(285.171)	(4.957)
	Wife's working time [daily, weekday; minutes]	253.208	361.337	−108.130***
		(238.281)	(241.465)	(4.213)
	Husband's working time [daily, weekday; minutes]	658.684	643.788	14.896***
		(153.131)	(157.466)	(2.743)
Panel B: Monthly consumption				
Common goods consumption	Expenditure on family-common/child's goods and services [monthly, 1000 yen]	103.592	106.760	−3.168***
		(65.011)	(66.106)	(1.167)
	Share of expenditure on family-common/child's goods and services to total exp. [%]	79.320	78.490	0.830***
		(14.965)	(15.762)	(0.276)
Private goods consumption	Wife's expenditure [monthly, 1000 yen]	9.094	11.552	−2.458***
		(13.067)	(17.750)	(0.286)
	Husband's expenditure [monthly, 1000 yen]	17.792	18.283	−0.492
		(17.007)	(20.420)	(0.340)

Notes: A conventional norm on gender roles in a family is measured by a household's answer to the question: 'Do you agree that women should work at home and men should work outside the home?' We create a dummy variable taking value 1 if the answers are 1 (agree) or 2 (somewhat agree), and 0 if the answers are 3 (somewhat disagree) or 4 (disagree). Housekeeping and working time are in daily terms on normal weekdays. The unit is minutes. The expenditures are given in monthly terms, in real values, and taken as an equivalence scale. The unit is thousands of yen. Standard deviations are shown in parentheses. For the mean difference test, *** shows that the estimate is significant at the 1% level.

TABLE 3 Does the conventional norm on gender roles in a family affect household time allocation and consumption?

	(1) The entire household		(2) Household with a child		(3) Household without a child	
Panel A: Time allocation on housekeeping and working time	Housekeeping time	Working time	Housekeeping time	Working time	Housekeeping time	Working time
Households with a conventional norm	64.824***	−79.298***	62.596***	−78.525***	0.406	−42.501
	(5.806)	(5.981)	(5.903)	(6.031)	(15.106)	(35.243)
Household disposable income	−0.189***	0.214***	−0.204***	0.205***	−0.070***	0.444***
	(0.009)	(0.011)	(0.009)	(0.011)	(0.025)	(0.057)
Constant	573.030***	816.058***	562.592***	819.486***	265.039***	715.374***
	(11.048)	(11.615)	(11.323)	(11.835)	(24.897)	(53.230)
Number of observations	7856	7877	7478	7501	378	376
R-squared	0.072	0.082	0.080	0.079	0.053	0.212
Panel B: Consumption of family-common/ child's goods and services	(a) Family-common goods	(b) Family-common goods share	(a) Family-common goods	(b) Family-common goods share	(a) Family-common goods	(b) Family-common goods share
Households with a conventional norm	−3.476**	0.442	−3.865***	0.486	5.880	−3.946*
	(1.439)	(0.316)	(1.473)	(0.315)	(7.224)	(2.303)
Household disposable income	0.052***	−0.006***	0.054***	−0.006***	0.025**	−0.017***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.012)	(0.004)
Constant	75.330***	82.979***	74.888***	83.199***	82.213***	83.966***
	(2.632)	(0.608)	(2.744)	(0.605)	(8.937)	(3.586)
Number of observation	7880	7845	7508	7473	372	372
R-squared	0.062	0.019	0.065	0.019	0.052	0.096

Notes: The table shows the OLS estimation with year fixed effects. 'Household disposable income' is the annual total household disposable income of all the family members. That is measured in real terms and as an equivalence scale. Household-cluster robust standard errors are shown in parentheses.
***, **, * indicate significance at the 1%, 5%, 10% level, respectively.

results are robust in the case of controlling for observed household characteristics such as the wife's/husband's educational years, age, birth years, and the number of children.

Panel B of Table 3 presents the effects on money allocation. In each column (a), we use the expenditures on family-common goods (family-common/child's goods and services) as a dependent variable. The coefficient on the dummy indicator of a household with a conventional norm is negative and significant at the 1% significance level. This is true for households with a child but not for households without. The households with a conventional norm lower monthly common goods consumption by 3476 yen (about 27 US dollars).

In each column (b) of Table 3, the dependent variable is the expenditure share of family-common goods to total consumption. The coefficients on norms are not significant even for households with a child. Although the coefficient on norms looks significantly negative for households without a child, this should be interpreted carefully. The coefficient is too big and too noisy.[2] The problem may be driven by the insufficient number of observations for those without a child. Thus we interpret the amount of expenditure rather than this noisy indicator of the share consumption.

There are some notes on the specifications of the estimation model. First, year control may not be necessary. We confirmed very similar size and significance of all the coefficients with and without year controls. Second, in the case of controlling for time-invariant unobserved heterogeneity as individual fixed effects, the signs of the coefficients are the same for all the variables as in Table 3, but most of them are insignificant at the 10% level, except for working hours. Large standard errors, and thus statistically insignificant results, can be found because individual fixed effects absorb the effects of a gender norm improperly. As mentioned, we rather focus on Table 3, using the specifications without individual fixed effects. Third, the results in Table 3 are obtained regardless of functional forms. For example, taking logarithms of time and money variables does not change the implications of the results.

Thus the results reveal that a household with a conventional norm regarding gender roles in housework and childcare tends to devote more time to housekeeping, possibly reducing money inputs for family-common goods. These households work less in the market. The tendencies are more prominent in couples with a child. Households with conventional norms are likely to sacrifice their time for household production, possibly inputting less money into the production. In the following sections, we attempt to show the household models that can explain those facts observed in our Japanese dataset.

3 | THE MODEL

3.1 | Structure

A household comprises a wife and husband, denoted by $i \in \{f, m\}$.[3] Some households have children. Households decide on the allocation of consumption, home production and labour supply. Each individual is endowed with one unit of time, and their time constraint equation is given by $\ell_i + h_i + m_i = 1$, where ℓ_i is leisure, h_i is household time (e.g. housework and childcare), and m_i denotes market work. A domestic good q is produced within the household by combining time (i.e. h_f and h_m) with market goods and services g. The production function is given by

$$q = \left[(h_f^{\eta} + h_m^{\eta})^{\alpha/\eta} + g^{\alpha}\right]^{1/\alpha}. \tag{1}$$

Following Becker (1973), output of home production q includes the quality of meals, the quality and quantity of children, prestige, recreation, companionship, love and health status. Accordingly, g corresponds to a variety of market goods and services that increase the level of q. We call g the monetary input of home production. Parameter η represents the degree of substitution

between the wife's and husband's household time. We assume that $\eta < 1$, implying that their time inputs are complementary (Del Boca *et al.* 2016; Chiappori *et al.* 2017). Here, α is the substitution parameter between the time and monetary inputs for home production—we assume that $\alpha < 1$, implying that they are complementary (Hazan and Zoabi 2015; Lise and Yamada 2019).

A crucial assumption regarding the gender division of household time is

$$s = \frac{h_f}{h_m}. \tag{2}$$

Equation (2) serves as a time constraint to the household's problem—the wife must allocate her time to home production $s \in \mathbb{R}_+$ times longer than the husband. Note that a greater s does not imply that the wife is less efficient[4] in home production than the husband; rather, it indicates that a more disproportionate burden of household chores and childcare is placed on women, which we call the *male-dominant social norm*.[5]

The household joint budget constraint is given by

$$c_f + c_m + pg = (1 - \ell_f - h_f)w_f + (1 - \ell_m - h_m)w_m, \tag{3}$$

where c_i is individual i's private consumption of market goods and services, p is the price of g, and w_i denotes individual i's market wage.

The individual utility function is given by

$$u_i(c_i, \ell_i, q) = \ln c_i + \beta \ln \ell_i + \gamma \ln q, \tag{4}$$

where $\beta > 0$ and $\gamma > 0$ are preference parameters. Following Chiappori (1988, 1992), the household maximizes its utility function, expressed as

$$U^H = \theta(s)\, u_f + [1 - \theta(s)]\, u_m,$$

where $\theta(s) \in [0, 1]$ denotes the Pareto weight placed on the wife's utility. In line with the literature on intrahousehold bargaining, we interpret the Pareto weight as her bargaining power. We allow the bargaining power to depend on the social norm; that is, s is a distribution factor.[6]

As in Cherchye *et al.* (2012), households choose pairs of inputs for efficient home production. Hence we first solve the cost minimization problem regarding home production to derive the input demand function, and then consider the household's utility maximization problem.

3.2 | Decision-making

3.2.1 | Cost minimization of home production

The household minimizes the cost of home production,

$$\min_{h_f, h_m, g} \; w_f h_f + w_m h_m + pg,$$

subject to home production technology (1) and the male-dominant social norm (2). Let $w_H := sw_f + w_m$. The first-order conditions are presented in Appendix Subsection A.1, and arranging those conditions yields the following input demand functions:

$$h_f(q) = s\, h_m(q), \tag{5}$$

$$h_m(q) = \chi^{-1/\alpha}(1 + s^\eta)^{\alpha/\eta(1-\alpha)} w_H^{-1/(1-\alpha)} q, \tag{6}$$

$$g(q) = \chi^{-1/\alpha} p^{-1/(1-\alpha)} q, \tag{7}$$

where $\chi = (1 + s^{\eta})^{\alpha/\eta(1-\alpha)} w_H^{-\alpha/(1-\alpha)} + p^{-\alpha/(1-\alpha)}$. Substituting equations (5), (6) and (7) into the objective function yields the cost function

$$c(q) = \widehat{C}(s)\, q,$$

where $\widehat{C}(s) := \chi^{(\alpha-1)/\alpha}$. As home production function (1) exhibits homogeneity of degree one, the cost function is linear with respect to q. The shadow price of the domestic good $\widehat{C}(s)$ depends on s, implying that the degree of the male-dominant social norm affects the level of domestic good production. The following lemma reflects this relationship.

Lemma 1. *There exists s^* such that $\widehat{C}(s)$ increases in s for all $s > s^*$.*

Proof. The derivative of the shadow price $\widehat{C}(s)$ with respect to s is given by

$$\frac{\partial \widehat{C}(s)}{\partial s} = \chi^{-1/\alpha}(1 + s^{\eta})^{\alpha/\eta(1-\alpha)-1} w_H^{-1/(1-\alpha)}(w_f - s^{\eta-1} w_m).$$

As $\chi^{-1/\alpha}(1 + s^{\eta})^{\alpha/\eta(1-\alpha)-1} w_H^{-1/(1-\alpha)} > 0$, we obtain

$$\frac{\partial \widehat{C}(s)}{\partial s} \gtreqless 0 \quad \Longleftrightarrow \quad s \gtreqless \left(\frac{w_m}{w_f}\right)^{-1/(1-\eta)} = s^*.$$

■

Lemma 1 implies that if the household's decision-making is not constrained by the social norm (2), then the household chooses h_f and h_m such that $h_f/h_m = s^*$, because this input ratio is efficient in producing the domestic good given a price vector (i.e. w_f and w_m) and technology (i.e. η). Hence when $s = s^*$, the social norm does not affect household decisions. By contrast, when $s > s^*$, ratio h_f/h_m must be greater than s^* in equilibrium, increasing the shadow price of the domestic good. Therefore the male-dominant social norm may lead to inefficiency in household decisions by preventing the household from choosing an efficient division of home production between spouses.

The efficient division of home production between spouses is determined by individual wages and the degree of substitution between household time, η. This is because for individual i, the opportunity cost of home production is w_i, and η is associated with the marginal rate of substitution between household time. If $\eta = 1$—that is, h_f and h_m are perfect substitutes—then only the less productive individual in the labour market is involved in housework and childcare. However, assuming that $\eta < 1$, both individuals participate in housework and childcare. Moreover, the more complementary their household time (i.e. the smaller η), the more equal the division that must be chosen. Hence efficiency ratio s^* depends on w_f, w_m and η.

In this study, we model social norms as equality constraints. However, because we aim to investigate whether and how male-dominant social norms affect household behaviour, the inequality constraint of form $h_f \geq s h_m$ is more suitable. We address this issue by focusing on the case in which $s > s^*$, that is, the inequality constraint is binding.

3.2.2 | Utility maximization

Combining the cost function of home production with budget constraint (3) yields

$$c_f + c_m + w_f \ell_f + w_m \ell_m + \widehat{C}(s)\, q = w_f + w_m. \tag{8}$$

The household solves the problem

$$\max_{c_f,c_m,\ell_f,\ell_m,q} \theta(s)\,(\ln c_f + \beta \ln \ell_f + \gamma \ln q) + [1-\theta(s)](\ln c_m + \beta \ln \ell_m + \gamma \ln q)$$

subject to equation (8). The first-order conditions are presented in Appendix Subsection A.1, and we obtain the following demand functions:

$$c_f^* = \frac{\theta(s)}{1+\beta+\gamma}(w_f + w_m), \tag{9}$$

$$c_m^* = \frac{1-\theta(s)}{1+\beta+\gamma}(w_f + w_m), \tag{10}$$

$$\ell_f^* = \frac{\theta(s)\,\beta}{1+\beta+\gamma} \cdot \frac{w_f + w_m}{w_f}, \tag{11}$$

$$\ell_m^* = \frac{[1-\theta(s)]\,\beta}{1+\beta+\gamma} \cdot \frac{w_f + w_m}{w_m}, \tag{12}$$

$$q^* = \frac{\gamma}{1+\beta+\gamma} \cdot \frac{w_f + w_m}{\widehat{C}(s)}. \tag{13}$$

Note that both private goods (i.e. c_i^* and ℓ_i^*) and the public good (i.e. q^*) depend on the degree of male-dominant social norms in equilibrium; however, the pathways are different. Specifically, the norm affects the allocation of private goods through bargaining power $\theta(s)$, and the level of public goods through the shadow price $\widehat{C}(s)$. This point is discussed in Subsection 3.3.

The optimal level of domestic good q^* determines the time and monetary inputs of home production in equilibrium as follows:

$$h_f^* = s h_m^*,$$

$$h_m^* = \chi^{-1}(1+s^\eta)^{\alpha/\eta(1-\alpha)} w_H^{-1/(1-\alpha)} \frac{\gamma(w_f + w_m)}{1+\beta+\gamma},$$

$$g^* = \chi^{-1} p^{-1/(1-\alpha)} \frac{\gamma(w_f + w_m)}{1+\beta+\gamma}.$$

Importantly, male-dominant social norms affect not only time but also monetary inputs. Using the time constraint, the labour supply function is given by

$$m_i^* = 1 - \ell_i^* - h_i^*.$$

3.3 | Comparative statics regarding social norms

To explore the influence of male-dominant social norms on household behaviour, we perform comparative statics. The norm stipulates the gender division of home production and simultaneously affects the intrahousehold bargaining power and shadow price of the domestic good. Therefore we must examine the direct effect of the norm and its indirect effect through changes in bargaining power and shadow prices.

3.3.1 | Consumption and leisure

First, we examine the influence of the male-dominant social norm on private consumption and leisure.

Lemma 2. *An increase in s decreases c_f^* and ℓ_f^*, and increases c_m^* and ℓ_m^*, if and only if $\partial\theta(s)/\partial s < 0$, and vice versa.*

Proof. Differentiating equation (9) with respect to s yields

$$\frac{\partial c_f^*}{\partial s} = \frac{\partial \theta(s)}{\partial s} \cdot \frac{w_f + w_m}{1 + \beta + \gamma},$$

which is negative if and only if $\partial\theta(s)/\partial s < 0$, and positive if and only if $\partial\theta(s)/\partial s > 0$. Similarly, we derive the following results by differentiating equations (10), (11) and (12). ∎

The interpretation is that each individual's private consumption and leisure are affected by the norm only through a change in bargaining power. Specifically, if the male-dominant social norm is positively correlated with men's intrahousehold bargaining power (i.e. $\partial\theta(s)/\partial s < 0$), then the stronger norm increases the husband's consumption and leisure, and decreases the wife's.

Further, the norm does not affect private goods through a change in the shadow price of the domestic good, $\widehat{C}(s)$. This follows from the additive separability imposed on the individual utility function, which makes the demand function of a good independent of the prices of other goods. Appendix Subsection A.2 introduces the non-separable individual utility function.

3.3.2 | Home production

We examine the impact of the male-dominant social norm on: the time input of each spouse, h_i^*; the total time input provided by both spouses, $h_f^* + h_m^*$; the monetary input, g^*; and the level of the domestic good q^*.

Lemma 3. *An increase in s decreases the husband's household time h_m^* if and only if*

$$\alpha\left[(1+s^\eta)w_f + s^{\eta-1}p^{-\alpha/(1-\alpha)}w_H\right] - \chi(1+s^\eta)w_f < 0.$$

Proof. By differentiating h_m^* with respect to s, we obtain

$$\begin{aligned}\frac{\partial h_m^*}{\partial s} =& \left\{\alpha\left[(1+s^\eta)w_f + s^{\eta-1}p^{-\alpha/(1-\alpha)}w_H\right] - \chi(1+s^\eta)w_f\right\} \\ &\times \frac{1}{1-\alpha}\,\chi^{-2}(1+s^\eta)^{\alpha/\eta(1-\alpha)-1}w_H^{-1/(1-\alpha)-1}\,\frac{\gamma(w_f+w_m)}{1+\beta+\gamma},\end{aligned}$$

which is below zero if and only if the sign of the brace is negative. ∎

Lemma 4. *Suppose that $s > s^*$. Then an increase in s increases the wife's household time h_f^* if and only if*

$$(1-\alpha)\chi(1+s^\eta)w_m - \alpha p^{-\alpha/(1-\alpha)}s(w_f - s^{\eta-1}w_m) > 0.$$

Proof. Differentiating $h_f^* = sh_m^*$ with respect to s yields

$$\frac{\partial h_f^*}{\partial s} = h_m^* + s \cdot \frac{\partial h_m^*}{\partial s}$$

$$= \left[(1-\alpha)\chi(1+s^{\eta})w_m - \alpha p^{-\alpha/(1-\alpha)} s(w_f - s^{\eta-1}w_m)\right] \times \frac{1}{1-\alpha}\,\chi^{-2}(1+s^{\eta})^{\alpha/\eta(1-\alpha)-1} w_H^{-1/(1-\alpha)-1}\,\frac{\gamma(w_f+w_m)}{1+\beta+\gamma},$$

which is above zero if and only if the sign of the bracket is positive. ■

Lemmas 3 and 4 imply that whether the stronger male-dominant social norm decreases h_m^* (increases h_f^*) hinges on the complementarity between the time and monetary inputs of home production. In particular, the sufficient condition for $\partial h_m^*/\partial s < 0$ and $\partial h_f^*/\partial s > 0$ is $\alpha \leq 0$ (i.e. the time and monetary inputs are relatively complementary). Because a higher s increases the wife's household time and decreases that of the husband when $\alpha \leq 0$, it is ambiguous whether an increase in s increases the total household time. The following proposition addresses this issue.

Proposition 1. *Assume that $s > s^*$, $\alpha \leq 0$ and $w_m \geq w_f$. Then an increase in s increases total household time $h_f^* + h_m^*$.*

Proof. Differentiating $h_f^* + h_m^* = (1+s)h_m^*$ with respect to s, we obtain

$$\frac{\partial(1+s)h_m^*}{\partial s} = h_m^* + (1+s)\cdot\frac{\partial h_m^*}{\partial s} = \left[(1-\alpha)\chi(1+s^{\eta})(w_m - w_f) - \alpha(1+s)p^{-\alpha/(1-\alpha)}(w_f - s^{\eta-1}w_m)\right] \times \frac{1}{1-\alpha}\,\chi^{-2}(1+s^{\eta})^{\alpha/\eta(1-\alpha)-1} w_H^{-1/(1-\alpha)-1}\,\frac{\gamma(w_f+w_m)}{1+\beta+\gamma},$$

which is greater than zero if $s > s^*$, $\alpha \leq 0$ and $w_m \geq w_f$. ■

Proposition 1 implies that when h_f and h_m are relatively complementary, a stronger male-dominant social norm increases $h_f^* + h_m^*$. Combined with the results of Lemma 1, the male-dominant social norm induces households to choose inefficiently long household durations, which is consistent with Table 2.

Proposition 2. *We assume that $s > s^*$. Then an increase in s decreases the monetary input of home production g^* if and only if $\alpha < 0$.*

Proof. By differentiating g^* by s, we obtain

$$\frac{\partial g^*}{\partial s} = \chi^{-2}\,\frac{\alpha}{1-\alpha}(1+s^{\eta})^{\eta/\alpha(1-\alpha)-1} w_H^{-\alpha/(1-\alpha)-1}(w_f - s^{\eta-1}w_m) \times p^{-\alpha/(1-\alpha)}\,\frac{\gamma(w_f+w_m)}{1+\beta+\gamma} < 0$$

if and only if $\alpha < 0$. ■

Proposition 2 indicates the importance of a complementarity α when interpreting the effect of the male-dominant social norm on the pattern of home production inputs. First, the norm that stipulates an inefficiently large fraction of the burden of home production by women (i.e. $s > s^*$) may affect the monetary input in equilibrium g^* via both substitution and income effects. The substitution effect indicates that because the inability to choose the efficient ratio $h_f/h_m = s^*$ increases the unit price of the spousal time used in home production, w_H, relative to the price of the monetary input p, the time input is substituted by the monetary input. By contrast, the income effect is that an increase in the shadow price of the domestic good $\widehat{C}(s)$ decreases the monetary input. Hence an increase in s decreases the monetary input if and only if the income

effect outweighs the substitution effect, which is determined by the complementarity between time and monetary inputs, α. Let us consider the case in which α is sufficiently small, that is, time and monetary inputs are sufficiently complementary. In this case, the household cannot substitute the time input with the monetary input; hence the substitution effect is less significant. Consequently, the income effect is likely to outweigh the substitution effect. When $\alpha = 0$, the home production function takes the Cobb–Douglas form. In this case, because these effects are offset, the male-dominant social norm does not affect decisions regarding the monetary input.

We now summarize the effects of male-dominant social norms on the pattern of home production inputs. Consider two levels of the norm, denoted by s_a and $s_{a'}$, and assume that $s^* < s_a < s_{a'}$. Additionally, we consider the situation in which the norm of an economy changes from s_a to $s_{a'}$. Figure 3 illustrates how this change in s affects the choice of home production inputs when $\alpha < 0$, that is, the time and monetary inputs are relatively complementary. In this case, because the income effect outweighs the substitution effect, the monetary input in home production, g^*, decreases (Proposition 2). Moreover, $\alpha < 0$ ensures that an increase in s lowers the husband's household time (Lemma 3) and increases that of the wife (Lemma 4). By definition, ratio h_f^*/h_m^* is equal to s_a before the change in social norm, and becomes $s_{a'}$. As Proposition 1 shows, total household time $h_f^* + h_m^*$ increases in response to an increase in s. That is, the blue line (i.e. the sum of h_f^* and h_m^* when $s = s_{a'}$) is immediately above the red line (i.e. the sum when $s = s_a$).

Figure 3 illustrates Proposition 1. An increase in s influences the time input for home production through the three channels. First, an increase in s makes the input ratio $h_f/h_m > s^*$ inefficient, hence more spousal time is necessary to achieve a given level of domestic goods (i.e. cost minimization). Second, related to the first channel, inefficient input ratio $h_f/h_m > s^*$ increases the shadow price of the domestic good $\widehat{C}(s)$, leading to a decline in the production and inputs of the domestic good (i.e. the income effect). Third, an increase in s raises the unit price of the time input, w_H, which reduces the demand for the time input and increases the demand for the monetary input (i.e. the substitution effect). The first and third effects are positive, whereas the second effect is negative; $\alpha < 0$ is the sufficient condition under which the latter effect outweighs the former. Higher complementarity prevents the household from substituting time input with monetary input; consequently, the income effect matters more.

Proposition 3. *Assume that $s > s^*$. Then an increase in s decreases the level of the domestic good q^*.*

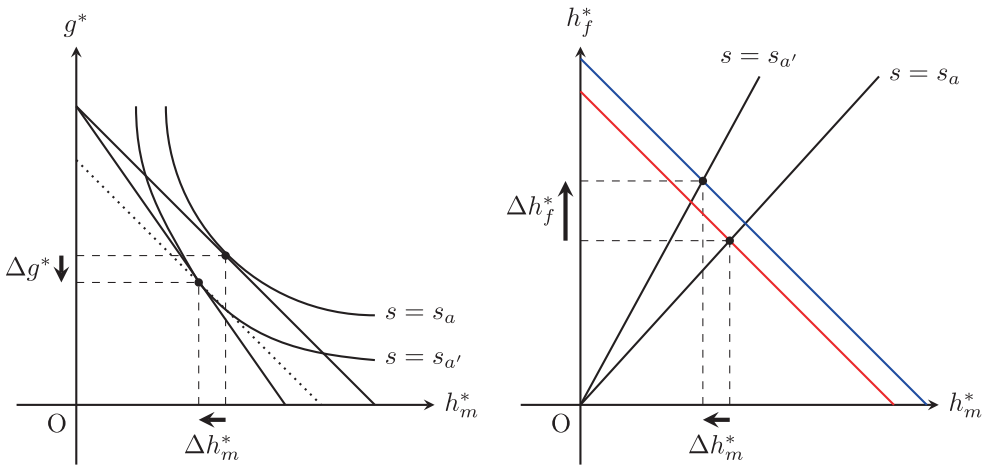

FIGURE 3 Effects of the male-dominant social norm on home production inputs.

Proof. By differentiating q^* with respect to s, we obtain

$$\frac{\partial q^*}{\partial s} = -\frac{\gamma(w_f + w_m)}{1+\beta+\gamma}\left[\widehat{C}(s)\right]^{-2}\frac{\partial \widehat{C}(s)}{\partial s} < 0$$

if and only if $s > s^*$. ∎

Although the total time input $h_f^* + h_m^*$ may increase, and simultaneously the monetary input g^* may decrease, in response to an increase in s, the level of the domestic good q^* necessarily decreases because its shadow price $\widehat{C}(s)$ increases due to inefficiency in home production. Proposition 3 is independent of the complementarity of α. This is one of the most important results of this study: the male-dominant social norm has a detrimental effect on the domestic good level. Given that the domestic good includes the quality of children and the health status of household members (Becker 1973), the male-dominant social norm could reduce household members' wellbeing in a variety of ways.

It is difficult for researchers to precisely observe and measure domestic goods using household data. By contrast, we can observe the relationship between social norms and various inputs of home production. Our theoretical model shows one of the pathways through which male-dominant social norms are positively associated with total household time, and negatively associated with public goods consumption, as reported in Table 2. If this is the actual mechanism, then we can indirectly examine the influence of the male-dominant social norm on the level of the domestic good, although data on its direct indices are unavailable.

Our arguments are based on the assumption of sufficient complementarity among inputs for home production. Several analytical studies on intrahousehold resource allocation impose (perfect) substitutability among them for tractability. However, as confirmed above, the restriction obscures crucial links between the male-dominant social norm and resource allocation. In fact, previous work using structural estimation or calibration suggests complementarity among inputs of home production (Cherchye *et al.* 2012; Greenwood *et al.* 2016; Goussé *et al.* 2017; Eckstein *et al.* 2019; Gayle and Shephard 2019; Lise and Yamada 2019). Allowing for this complementarity, we have investigated and demonstrated the manner in which gender norms affect household behaviour, as well as why gender norms matter.

3.3.3 | Labour supply

Finally, we examine the effect of the male-dominant social norm on the labour supply.

Lemma 5. *Suppose that $s > s^*$. Then an increase in s increases the wife's market work m_f^* if and only if*

$$-\frac{\partial\theta(s)}{\partial s}\cdot\frac{\beta}{1+\beta+\gamma}\cdot\frac{w_f + w_m}{w_f} - \frac{\partial h_f^*}{\partial s} > 0,$$

and increases the husband's market work m_m^* if and only if

$$-\frac{\partial\theta(s)}{\partial s}\cdot\frac{\beta}{1+\beta+\gamma}\cdot\frac{w_f + w_m}{w_m} - \frac{\partial h_m^*}{\partial s} > 0.$$

Proof. Combining the time constraint equations with Lemmas 2,3 and 4 yields the above results. ∎

Each individual allocates time to leisure, home production and market work. Hence the changes in market work are determined by changes in leisure and household time. Because the sign of $\partial \ell_i^*/\partial s$ can be opposite to that of $\partial h_i^*/\partial s$, the sign of $\partial m_i^*/\partial s$ is not deterministic. However, an intuitive case is useful for interpreting the argument in Lemma 5. Assume that $\alpha < 0$, that is, the time and monetary inputs of home production are relatively complementary, and $\partial\theta(s)/\partial s < 0$, that is, a stronger male-dominant social norm enhances men's intrahousehold bargaining power. Then an increase in s increases the wife's household time and simultaneously decreases their leisure time. The opposite argument holds for the husband.

Table 2 reports the negative association between wives' work time in the labour market and the male-dominant social norm. Our model suggests that the positive effects on household time outweigh the negative effects on leisure time. However, for husbands' time use, these effects almost offset one another.

3.3.4 | Heterogeneity across households with and without children

Although we do not explicitly introduce the presence of children, the home production inputs and outputs may differ across households with and without children. For childless households, the home production time h_i includes hours spent cooking, shopping, cleaning, and so on. The monetary inputs g include ingredients, seasonings, detergent and home appliances, accordingly. Combined with these inputs, healthy meals and tidy rooms are produced. By contrast, in households with children, the home production time additionally includes childcare and parenting time, which are combined with the monetary inputs of picture books, educational materials and stationery. The outputs of home production thus include the quality of children.

Given that our arguments depend highly on the complementarity among inputs for home production, the male-dominant social norm may have heterogeneous effects across households with and without children, as suggested in Section 2. For instance, if the wife's and husband's parenting times are more complementary than their time spent on cooking, then η is more likely to be smaller for households with children than for those without. This implies that the male-dominant social norm matters more for households with children (Lemma 1). In addition, if parenting time and picture books are more substitutable than time spent on cooking and home appliances are, then α may be smaller for households without children. In this case, the positive (negative) effect of the male-dominant social norm on the sum of wives' and husbands' time (monetary inputs) is greater for childless households (Propositions 1 and 2).

4 | WELFARE ANALYSIS

To understand how the male-dominant social norm affects household welfare, we derive the indirect household utility function as

$$V^H = (1+\beta)\ln\left[\theta^\theta(1-\theta)^{1-\theta}\right] - \beta\left[\theta\ln w_f + (1-\theta)\ln w_m\right] - \gamma\ln\widehat{C}(s) + \ln\left[\frac{\beta^\beta\gamma^\gamma(w_f+w_m)^{1+\beta+\gamma}}{(1+\beta+\gamma)^{1+\beta+\gamma}}\right].$$

The first term corresponds to the impact of intrahousehold bargaining power on welfare through bargaining over private consumption and leisure activities. The second and third terms represent the opportunity cost of leisure and shadow price of the domestic good, respectively.[7] Taking the

derivative with respect to s yields

$$\frac{\partial V^H}{\partial s} = \left[(1+\beta)\ln\left(\frac{\theta}{1-\theta}\right) + \beta\ln\left(\frac{w_m}{w_f}\right)\right]\frac{\partial\theta(s)}{\partial s} - \frac{\gamma}{\widehat{C}(s)}\cdot\frac{\partial\widehat{C}(s)}{\partial s}. \tag{14}$$

The first term in equation (14) represents the welfare effect of the male-dominant social norm through a change in the bargaining power $\theta(s)$, whereas the second term describes the welfare effect through a change in the shadow price $\widehat{C}(s)$. From Lemma 1, the second term is negative if and only if $s > s^*$. For the first term, let us assume that $\partial\theta(s)/\partial s < 0$, that is, a stronger male-dominant social norm reduces women's bargaining power. The sign of the bracket in equation (14) is negative if and only if

$$f(\theta) := \frac{\theta}{1-\theta} < \left(\frac{w_f}{w_m}\right)^{\beta/(1+\beta)}. \tag{15}$$

We have that $f(\theta)$ strictly increases in $\theta \in (0,1)$, $f(\theta) \to 0$ when $\theta \to 0$, and $f(\theta) \to \infty$ when $\theta \to 1$. Hence, there exists $\widetilde{\theta} \in (0,1)$ such that the inequality in (15) holds for all $\theta < \widetilde{\theta}$. In summary, if women's bargaining power is sufficiently low, then a stronger male-dominant social norm has a detrimental effect on household welfare. The threshold level of bargaining power is relevant because of the quasi-concavity of the household utility function for the wife's and husband's private goods. Overall, a stronger male-dominant social norm can decrease household welfare by increasing the shadow prices of domestic goods and decreasing women's bargaining power.

5 | CONCLUSIONS

This study investigates empirically and theoretically the relationship between gender norms and household behaviour. Using Japanese household data, we find that a conventional norm on gender roles is positively correlated with the total time spent on home production by both wives and husbands, and negatively correlated with expenditure on family-common goods. To understand the underlying mechanisms better, we develop a collective labour supply model that explicitly incorporates gender norms. Our model suggests that a stronger norm may distort the inputs of home production, as the norm increases the total household time provided by wives and husbands, and decreases monetary input. Consequently, the norm decreases the level of domestic goods and hence reduces household welfare. These results hinge on the degree of complementarity between wives' and husbands' household time, as well as between time and monetary inputs.

Our findings underscore the possible deleterious effects of the male-dominant social norm on gender equality in terms of time allocation and household welfare. We contend that without remedying the norm, women's empowerment will remain unattainable. Despite Japan's high score for educational attainment relative to men in the *Global Gender Gap Report* (World Economic Forum 2023), it ranks poorly in terms of labour force and political participation. Although women are as proficient as men in accumulating human capital, the unequal apportionment of domestic responsibilities due to ingrained social norms precludes women's engagement in the labour force and political realm. More importantly, while these gender inequalities are serious problems *per se*, we also identified associated welfare losses. It is thus imperative to continue discussing effective policy implementations that help to remedy social norms to achieve gender equality and increase household welfare.

In future studies, it will be interesting to include marriage decisions, because gender norms affect the incentive to marry (Bertrand *et al.* 2015). Additionally, extending the analysis of the

vertical and horizontal transmissions of gender norms is also important (Bisin and Verdier 2001). As suggested by Fernández *et al.* (2004), social norms may be endogenous; that is, norms affect household behaviour, but behaviours also shape norms. Examining the dynamics of norms is essential to evaluate the long-term effects of various policies.

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ENDNOTES

[1] Although there are many other possible control variables, we minimize the covariates to avoid an over-control problem. As is easily imagined, household income is strongly correlated to most household characteristics.

[2] To see how noisy the estimate was, we attempted to get the estimates repeatedly, based on the 362 replicated samples from the 372 original observations (200 times). We found that the estimates are from −29.722 to 21.875, and the p-values are larger than 0.100 in about half the cases.

[3] As we examine the influence of gender norms on household behaviour and welfare, we use subscripts that explicitly describe gender (i.e. f and m). However, it is worth noting the recent increase in same-sex couples. In Japan, there is no law that entitles members of the same sex to marry each other. In response to this, on 14 February 2019, the 'Freedom of marriage for all' lawsuit was initiated to make marriage available to all, regardless of gender, in Sapporo, Tokyo, Nagoya and Osaka. As of 8 June 2023, rulings have been handed down by five district courts in Sapporo, Tokyo, Nagoya, Osaka and Fukuoka, with four of the five rulings holding that the law is unconstitutional. Seven of the nine major political parties insist that same-sex marriage legislation should proceed immediately, while the remaining two parties, including the ruling party, are cautious.

[4] Browning *et al.* (2014, p. 103) argue that: 'existing social norms impose patterns of behaviour that may conflict with efficiency. One example for apparent inefficiency is when, because of the traditional norms, the wife is expected to stay at home and the husband to work in the market'. Our model explicitly imposes social norms on the gendered division of labour, and reveals the pathways through which such norms lead to inefficiency.

[5] Using individual-level data from the JPSC, we confirm the correlation between gender norms and wives' household time relative to that of husbands, h_f/h_m. The correlation coefficients are 0.145 for the entire sample, 0.135 for households with children, and 0.182 for households without children, and they are significant at the 1% level. In addition, using country-level data from the Integrated Values Survey and OECD Family Database, we also confirm correlations between gender norms and the gender gap in unpaid and care work. As in Bertrand *et al.* (2021), the indicator of gender norms is created by the survey question about the statement: 'When jobs are scarce, men have more right to a job than women.' The gender gap in unpaid and care work is defined as $(h_m - h_f)/(h_m + h_f) \in [-1, 1]$. The correlation coefficients are −0.91 and −0.62, respectively, and are significant at the 5% level. These micro- and macro-level correlation coefficients imply that women are more responsible for housework than men in households (or countries) where gender norms are more conservative (i.e. male-dominant), consistent with our assumption.

[6] Lundberg and Pollak (1993) argue that social norms directly and/or indirectly affect intrahousehold bargaining power. In addition, we denote the vector containing the other distribution factors as z; hence bargaining power is expressed as $\theta(s, z)$. This z includes, for example, the relative educational attainment, age differences and relative income between spouses (Browning *et al.* 1994; Browning and Chiappori 1998; Chiappori *et al.* 2002; Cherchye *et al.* 2012). For notational simplicity, we denote the bargaining power by $\theta(s)$. Note that assuming that s does not affect the Pareto weight does not change the main results and implications of this study.

[7] The price of private consumption is also included in this expression but does not appear because it is zero: $\theta \ln 1 + (1 - \theta) \ln = 0$.

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APPENDIX A

A.1 Derivations of the household problem

A.1.1 Cost minimization of home production

The first-order conditions with respect to h_m and g are given by

$$\mu\left[(1+s^{\eta})^{\alpha/\eta}h_m^{\alpha}+g^{\alpha}\right]^{1/\alpha-1}(1+s^{\eta})^{\alpha/\eta}h_m^{\alpha-1}=w_H,$$
$$\mu\left[(1+s^{\eta})^{\alpha/\eta}h_m^{\alpha}+g^{\alpha}\right]^{1/\alpha-1}g^{\alpha-1}=p,$$

where μ is the Lagrange multiplier. Combining these equations yields the input demand functions presented in Section 3.

A.1.2 Utility maximization

The first-order conditions are given by

$$c_f: \quad \frac{\theta(s)}{c_f}=\lambda,$$
$$c_m: \quad \frac{1-\theta(s)}{c_m}=\lambda,$$
$$\ell_f: \quad \frac{\theta(s)\,\beta}{\ell_f}=\lambda w_f,$$
$$\ell_m: \quad \frac{[1-\theta(s)]\,\beta}{\ell_m}=\lambda w_m,$$
$$q: \quad \frac{\gamma}{q}=\lambda\,\widehat{C}(s),$$

where λ denotes the Lagrange multiplier with respect to budget constraint (8). Arranging these equations yields the demand functions presented in Section 3.

A.2 Alternative specification of the utility function

Our main analysis assumes an additively separable utility function, represented by equation (4). To explain the possible negative correlation between the male-dominant social norm and wives' and husbands' private consumption in Table 2, we consider the individual utility functions

$$u_i(c_i,\ell_i,q)=\left(c_i^{\phi^i}+\beta\ell_i^{\phi^i}+\gamma q^{\phi^i}\right)^{1/\phi^i},$$

where ϕ^i, $i \in \{1, 2\}$, represents the degree of complementarity among private consumption, leisure and the domestic good. When $\phi^i = 0$, the utility function takes the Cobb–Douglas form (i.e. additively separable). In this case, a change in the shadow price of the domestic good does not affect the demand functions for private consumption or leisure. By contrast, if $\phi^i < 0$, then an increase in the shadow price decreases both private consumption and leisure because the income effect dominates the substitution effect.

We assume that $\partial\theta(s)/\partial s < 0$, that is, wives' bargaining power is lower when the social norm is more male-dominant. Then wives' private consumption decreases with the male-dominant social norm through decreased bargaining power, which is consistent with Table 2. Although this argument implies a positive association between social norms and husbands' private consumption, Table 2 shows a negative association. This gap is reconciled by considering the price effect because an increase in the shadow price of the domestic good reduces husband's private consumption if the income effect dominates the substitution effect. Therefore the negative association between male-dominant social norms and husbands' private consumption is interpreted as the case in which the price effect outweighs the positive effect via increased bargaining power.