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ABSTRACT

This study investigates how spousal age gaps influence the allocation of housework between husbands and wives. Further, we consider the identity formed as a result of respondents' family backgrounds by specifically exploring the effects of the age gaps between the respondents' parents.

We initially collect an individual-level panel dataset covering the periods before and after marriage, by monthly surveys of unmarried persons in the initial period prior to marriage, then the three-year period that follows. After controlling for individual- and time period-fixed effects, the key findings are as follows: (1) after marriage, women older than their husbands tend to become burdened with a larger amount of housework, and the spousal gap effect increases as the marriage duration increases; (2) women with mothers older than their fathers tend to assume a larger allocation of the housework as the marriage duration increases; and (3) the age gap hardly affects the men's allocation of housework, although men with a full-time working mother at age 15 assume a larger allocation of housework as the marriage duration increases.

JEL classification: J12; J16; D13

Keywords: Spousal age gaps; housework allocation; intra-household bargaining

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1. Introduction

The allocation of housework between spouses is increasingly important in considering how the spousal relationship influences economic efficiency in the labor market. The bargaining model assumes that such characteristics as education, weight, and age—which are highly valued in marriage markets—influence an individual's intra-household bargaining power (e.g., Oreffice and Quintana-Domeque, 2012; Grossbard and Mukhopadhyay, 2017). The differences in an individual's characteristics relative to their spouse's generate differences in bargaining power within a couple, and consequently influence the partner-selection process as well as the household specialization after marriage.[1] For instance, economic researchers have constructed theoretical models based on assumption that men prefer younger women (e.g., Siow, 1998; Diaz-Gimenez and Giolito, 2013)[2]. Accordingly, a couple's age difference is a key factor in decision-making about marriage and marital life.[3] In the real world, the number of "toy boy" marital couples—in which the female partner is at least five years older than her male partner—have substantially increased since the 1970s in the United States and United Kindom. Coles and Francesconi (2011) attempted to explain this phenomenon by considering a mechanism in which a wife older than her husband earns more to compensate for the younger husband's disutility; these authors assumed that men and women both prefer younger spouses.[4]

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[1] However, gender differences in such developed countries as Japan have gradually disappeared in the marriage market (Yamamura and Tsutsui, 2017).

[2] Fecundity declines more rapidly for women than men, which results in the genders' difference in preferences regarding the age differences within a couple (Diaz-Gimenez and Giolito, 2013).

[3] Booth and Kee (2009) examined the spousal age gap's effects on fertility, although this gap hardly had an influence.

[4] Bloemen and Stancanelli (2015) used French data to discover that larger spousal age differences are positively associated with couples in which only the wife works, but negatively with dual-earner households, in which the wife out-earns the husband.

Researchers disagree about the optimal spousal age gap to maximize marital gains. The gains from marriage become the largest in older husband-younger wife pairs, which parallels the positive "traditional family" perspective (Bergstrom and Bagnoli, 1993). In contrast, other studies report that similarly aged couples experience the largest marital gains (Choo and Siow, 2006; Mansour and McKinnish, 2014). Analyses incorporating online and speed-dating data provided evidence that both men and women prefer partners similar in age (Belot and Francesconi, 2013). Further, Groot and van den Brink (2002) proposed two different hypotheses about the reasons for marriage—the financial support and social equality hypotheses—which focus on the fact that the husband is typically older and more educated than his wife. The authors use panel data from the Netherlands to demonstrate that this tendency is explained by the financial support hypothesis.

Gender identity theory explains gender differences in the allocation of time between spouses if other things are equal (Akerlof and Kranton, 2000).[5] This is partially why women are less likely than men to be full-time workers, even when her labor quality is high enough to work full-time. According to Bertrand et al. (2015), for couples in which the wife's potential income is likely to exceed the husband's, the wife is less likely to be in the labor force, and earns less than her potential income even if she does work. Further, the wife spends more time on housework than her husband even in couples in which the wife earns more. Empirical analyses have revealed that women are inclined to spend more time on typically "female" tasks, such as cooking and cleaning (e.g., Hersch, 2009; Hersch and Stratton, 2002).[6] Regarding gender identity formation, children learn from their parents to form their world views and social value, while individual preferences are transmitted in communities through families (Bisin and Verdier, 2001; Bisin et al., 2004). Booth and Kee (2009) investigate the family-specific "cultural transmission" to find that the size of the woman's family of origin is positively associated with complete fertility in her destination family. Moreover, men with working mothers tend to prefer working wives (Kawaguchi and Miyazaki, 2009), and thus, the wives of men with working

[5] Existing works use data from Western countries—such as the United Kingdom (Booth and Van Ours, 2008), Australia (Booth and Van Ours, 2009) and the Netherlands (Booth and Van Ours, 2013)—to empirically test the identity theory and investigate gender differences in the relationship between part-time work and subjective well-being.

[6] However, in such developed countries as Japan, gender differences have gradually disappeared from the marriage market (Yamamura and Tsutsui, 2017).

mothers are significantly more likely to work (Fernandez et al., 2004). In the pre-marriage period, family characteristics also influence the selection of a marital partner; individuals marry partners who share the same cultural and social backgrounds (Bisin and Verdier, 2000).

This paper essentially assumes that both genders value a degree of youth in the marriage market, which therefore increases an individual's intra-household bargaining power.[7] Further, we added an identity factor to examine how the spousal age gap impacts the allocation of housework between husband and wife. Further, we also consider the identity formed as a result of the family background by exploring the effects of the differences in age between the respondent's parents. This analysis involves initially collecting an individual-level panel dataset throughout Japan, and covering the periods before and after marriage through monthly surveys of unmarried persons in the initial period, then tracking them for three years after. Compared with existing works (e.g., Booth and Van Ours, 2008; 2009; 2013; Grossbard et al., 2014; Grossbard and Mukhopadhyay, 2017), our original data is advantageous, as it enables us to collect information about the allocation of housework and the timing of such events as marriage, cohabitation, pregnancy, and childbirth. Additionally, frequent surveys in this short period are less likely to suffer from changes in other factors. We also obtain data about the respondent's characteristics as well as those of his or her partner to use information regarding couple and their parents. This novel data allows us to consider the gender identity's role and how the difference in age within a couple influences their allocation of housework.

This paper's major findings are as follows: After marriage, women older than their partners tend to burden with a larger amount of housework, and the age gap's effect increases as the marriage duration increases. Additionally, the age gap between the respondents' mother and father also caused female respondents to increase their allocation of housework; this effect also increases as the marriage duration increases. This paper contributes to current literature by providing evidence that women are primarily affected

[7] In a study of obesity and its effect on the labor market (Oreffice and Quintana-Domeque, 2012; Grossbard and Mukhopadhyay, 2017), it was found that female thinness is valued in marriage markets, which increases her intra-marriage bargaining power (Vaillant and Wolff, 2011).

by a couple's age gap and the identity formed by learning from one's parents.

The remainder of this paper is organized as follows: Section 2 proposes testable hypotheses, while Section 3 explains the data and the empirical method used. Section 4 presents the estimation results and their interpretation, and Section 5 concludes.

2. Hypotheses

Household decision-making is likely to be determined by joint decision-making, and in instances of partners' conflicting preferences, the outcome might depend on the partner's bargaining power. This power is partially determined by the couple's differences in characteristics. For instance, younger people are more valuable in the marriage market, which increases his or her bargaining power relative to his or her spouse (Coles and Francesconi, 2011). A mechanism seems to exist in that the older person is likely to assume a larger allocation of housework to compensate for their disutility toward the younger spouse. Thus, we propose the following *Hypothesis 1*:

Hypothesis 1: Individuals older than their spouses have weaker bargaining power, leading them to assume a larger allocation of housework.

However, the spousal age gap's effects depend on gender identity. According to Akerlof and Kranton (2000, p.747), "the husband loses [his] identity when he does housework and when his wife earns more than half the household income. Equality of utility is restored when the wife undertakes more housework than her husband." In contrast, the wife loses her identity when she does not do housework and earn more than husband. Therefore, the age gap's effect on the amount of housework differs between genders. Hence, we propose the following *Hypothesis 2*:

Hypothesis 2: The age gap has a larger effect on women than men regarding the allocation of housework.

Further, the difference in bargaining power between the spouses' parents possibly formed their children's identity about the allocation of housework within a couple. If *Hypothesis 1* and *Hypothesis 2* hold true, a woman with a mother older than her father has grown up in a family in which her mother assumes a larger amount of housework than

families with a mother younger than the father. If so, the woman will follow her mother and assume a larger amount of housework than other women. Accordingly, we propose the following *Hypothesis 3*:

Hypothesis 3: A woman with a mother older than her father tends to assume a larger amount of housework.

The spousal age gap seems to be a key factor in selecting a partner, which subsequently influences the allocation of housework even if bargaining power does not exist. If so, the allocation of housework might be determined before marriage. Existing works argue that couples who marry with imperfect information can change the benefits of marriage, as any benefits could not be predicted at the time of the marriage (Becker, Landes, and Michael, 1977; Weiss and Willis, 1997). Therefore, this imperfect information might cause the marital couple to make decisions about the allocation of housework through intra-household bargaining. As we consider it crucial to identify the age gap's effects, the primary problem is as follows: If women married to younger husbands initially burden them with a greater allocation of housework, does this larger allocation of housework persist, increase, or decrease over the duration of the marriage? If the allocation of housework does not change, this is not the outcome of intra-household bargaining. Thus, *Hypothesis 4* is proposed:

Hypothesis 4: The effects of the spousal age gap increases as the marital duration increases.

3. Methods and Data

3.1. Data

We collected our data through Internet surveys to realize our project objectives; specifically, we commissioned INTAGE Communications Inc., a Japanese market research company with sufficient experience in conducting academic Internet surveys. INTAGE conducted the Internet surveys under the direction of the research team, primarily composed of researchers from Osaka University. The relationship within a couple is likely to change, and depends on various life events, such as marriage or having a child. We aimed to scrutinize these effects by monthly surveys, which pursued the same

people planning to get married in the near future to their current significant other. Specifically, monthly Internet surveys were conducted from March 2012 to March 2015, or a total of 37 waves during this period, and these surveys gathered individual-level panel data covering all regions of Japan. As some individuals from the initial survey dropped out of the sample during the three-year survey period, we added new individuals annually to keep sample size large enough to conduct a statistical estimation; the response rate was approximately 60%.

This paper examines how the spousal age gap influences the allocation of housework, and how this effect changes before and after marriage. Spouses are less likely to live together before marriage, and thus, partners are less likely to influence the allocation of and time spent on housework. Cohabitation substantially forms a household, even if they are not yet married. Accordingly, we considered marriage and cohabitation to be a threshold to change their allocation of housework. Therefore, the surveys' targets were limited to men and women who have been unmarried or were not cohabitating at the time of the initial survey, and have since married or cohabitated during the studied period. Naturally, older individuals were not included; participants' ages ranged between 17 and 51 years.

The questionnaires included various items querying the respondents' individual socioeconomic characteristics, such as whether the couple lived together, their marital status, education, age, sex, household income, mother's work status when the respondent was 15 years old, housework hours, and the allocation of housework. Further, we also obtained detailed characteristics about his or her partner at the initial survey—although we did not directly ask the partner—including the respondent partner's education, age, and parents' ages. We then used the survey panel data to explore how the age gaps within a couple impact time allocation, both before and after a marriage. The sample used for our estimation consists of 300 individuals who frequently appeared in surveys at different time points. Further, a sample size of over 5,800 was used for the estimations, as this data set allows us to conduct a fixed-effects analysis to identify within-marriage changes in the allocation of household work over time; this contrasts a cross-sectional analysis that compares recently married couples to those with a longer marital duration. A substantial advantage of our data is that it enables us to ascertain whether the allocation of housework within a couple evolves differently over the duration of the marriage for differently aged

couples compared to similarly aged couples.

Figure 1 illustrates how the observations changed, both before and after a marriage or cohabitation.[8] The zero on the horizontal line indicates the time point at which respondents got married or began to cohabitate with their partner. If respondents began cohabitating before marriage, we define zero as the point at which cohabitation began, even if the couple is not yet married. Positive values are the months after the marriage or cohabitation, while the negative values are the months before it. This demonstrates that the observations after marriage (or cohabitation) are larger than before it, although the number of the samples before is considered large enough to compare the situations before and after.

Table 1 presents the definitions of the variables used in this research and their mean values for the questionnaire respondents, but not their spouses. We can observe from Table 1 that the spousal age gap reveals positive and negative values for men and women, respectively. This seems to reflect that older men tend to marry younger women. Let us consider the age-gap distribution within a couple, as illustrated in Figure 2. The respondent's partner is the same for the studied period in the sample, and thus, the gaps do not change during the period. A zero indicates that the age values are the same within a couple. Figure 2 demonstrates that the percentages of couples with no age gap are higher than the other groups for both genders. However, the age difference between men and women is not symmetrical, with a higher percentage of men than women that are older than their partners.

Table 1 also reveals the age gaps regarding the respondents' and partners' parents, which implies that the father is older than the mother. These indicate that the husbands' ages are greater than the wives', which is generally observed in existing works (e.g., Grossbard et al., 2014; Lee and McKinnish, 2018). Regarding the respondent parents' age gaps, the gap in the men's sample is measured by the equation "(father's age – mother's age)," while the gap in the women's sample is measured by "(mother's age – father's age)." This is because we aim to explore the effects from parents with the same gender as the respondent and the latter's relationship to the different gendered parent to consider

[8] This includes observations not used for the regression estimation, as some independent variables are not obtained.

how the respondent's gender identity formed. Specifically, in the men's sample, we compare the age gap (his age – his wife's age) with his parents' age gap (his father's age – his mother's age). In the women's sample, we compare the age gap (her age – her husband's age) with her parents' age gap (her mother's age – her father's age). The parents' gap demonstrates the positive and negative values for the men's and women's samples, respectively. The partner parents' gaps also suggest the same results. Collectively, this indicates that the fathers are older than the mothers. Therefore, the respondents inherited their spousal age gap patterns from their parents.

The questionnaire also asks about the respondents' hours spent on housework. Additionally, seven specific items query the allocation of housework hours between spouses. We can use this data to estimate the housework hours of respondent husbands and wives, although we do not ask how housework hours are allocated to specific housework activities. Aside from questions regarding housework hours, we also ask about the allocation of specific housework within a household—divided into "respondent's share," "partner's share," and "others' share" categories—to obtain information regarding the respondent's share of seven housework categories.[9] We aggregate this information to calculate the respondent's share of total housework, although we exclude childcare from our definition of "housework" because the couples in our sample did not have children before marriage or cohabitation.[10]

Table 1 indicates women spent on average 135.7 minutes on housework per day, or more than twice as long as men. The housework allocation indicates that women are burdened with 71% of the housework, while men only assume approximately 39%.

Figure 3 illustrates the average housework time in the sample period, while Figure 4 indicates the allocation (%) of housework. The horizontal line is defined the same as in Figure 1. We consider that the sample size is not large enough to suggest unbiased results when observations are less than 20 in each time period. Thus, we restricted the time period

[9] The seven categories are "cooking," "clear the dishes from the table," "cleaning and sweeping," "washing," shopping," "taking out the garbage," and "childcare."

[10] Grossbard et al. (2014) also exclude childcare from our definition of "housework" because previous works have reported that parents found spending time with their children more enjoyable than other kinds of housework (Kahneman et al., 2004; Kahneman and Krueger, 2006).

to those that contain more than 20 observations to illustrate Figures 3 and 4. A cursory examination of Figure 3 suggests that women's housework time is consistently longer than men's, even in the pre-marriage period. However, the gap distinctly widened after marriage or cohabitation, as women's housework time remarkably increased while men's housework time increased slightly as time passed. Regarding Figure 4, the housework allocation gap between men and women widened over time, similar to Figure 3. However, the former differs from Figure 3, in that the share of housework at the initial time point is almost same between partners. The women's allocation of housework then increased after marriage, while men's decreased over the course of time. Our interpretation reveals that although men's time spent on housework increased, women spent predominantly more time than men; thus, men's allocation of housework decreased. Collectively, a division of labor within a household can be observed after marriage (or cohabitation). Our interpretation in Figures 3 and 4 illustrates that before marriage or cohabitation, men who have lived alone tend to do housework for themselves; thus, the allocation increased even though they have not spent substantial time on housework.

Individuals learn much from their parents in their childhood, and are consequently influenced by the marital relationship between their parents. For instance, their parents can impact their selection of a marital partner. As we have observed in Table 1, respondents' and their partners' fathers are older than their mothers, on average. We more closely examine this by confirming the correlation between the parents' and respondents' spousal age gaps. Table 2 indicates that the respondents' spousal age gap is positively correlated with their and their partner's parents' age gap. Therefore, the selection of a marital partner seems to be influenced by the couple's parents, who provide a spousal model for their children that inevitably influences the child's selection of marital partner later in life. Consequently, similar spousal relationships occur. Further, a noteworthy, positive correlation can be observed between the respondent parents' age gap and that of their partner. This indicates that respondents select partners with similar family backgrounds, reflected in the spousal age gap; thus, the marital couple shares an identity formed through their parents' marital relationship.

We then confirm the inference that older spouses can compensate for their disutility by assuming a larger allocation of housework. Table 3 compares the housework time before and after the marriage, according to groups divided by the spousal differences in

age. The upper part of the panel illustrates the men's sample, which indicates that respondents have spent a longer time on housework after marriage than before marriage in all groups. Further, in the group with men older than their wives, the men spent 29 minutes longer on housework after the marriage than before. The differences are 13 and 3 minutes for the same age groups and groups in which the husband is younger than his wife, respectively. Hence, a larger difference in housework hours can be observed as men's ages are relatively higher than their wives'. The same tendency is also observed for the women's sample in the lower part of the panel. However, the women's level of time is remarkably longer than the men's. Additionally, the difference in time between the periods for women is remarkably longer than for men.

Similarly, Table 4 compares the allocation of housework, although it differs from Table 3 in that the former notes a lower allocation of housework for men after marriage than before. However, the difference decreases if the man is relatively older than his wife, which implies that men relatively older than their wives are more likely to carry the burden of housework after marriage. Alternatively, women assume a larger burden of housework after marriage than before. The increase in the wife's allocation is 16% for the group of women older than their husbands, which is a larger share than in other groups. Collectively, the observations of Tables 3 and 4 are consistent with the inferences stated in *Hypotheses 1* and *2*.

We then scrutinize how marriage changes housework time and allocation by decomposing this into the outcomes of partner selections and intra-household bargaining. The following section introduces a simple methodological framework to meet this objective.

3.2. Methods

We test our hypotheses by exploring how the spousal age gaps among respondents and their parents impact hours of housework. The estimated function takes the following form:

$$Housework_{it} = \alpha_1 Gap\ of\ age_i * Married_{it} + \alpha_2 Gap\ of\ ages_i * Marital\ duration_{it} + \alpha_3 Marital\ duration_{it}$$

$+\alpha_7 Parents'\ gap\ of\ ages_i * Married_{it} + \alpha_8 Parents'\ gap\ of\ ages_i * Marital\ duration_{it}$
$+\alpha_9 Partner's\ parents'\ gap\ of\ ages_i * Married_{it} + \alpha_{10}\ Partner's\ parents'\ gap\ of\ ages_i * Marital\ duration_{it} + + \alpha_{11}\ Working\ mother_i * Married_{it} + \alpha_{12}\ Working\ mother_i * Marital\ duration_{it} + X_{it} + k_i + e_t + u_{it},$

where $Housework_{it}$ represents the minutes of housework per day (or the allocation of housework) for respondent *i* and time period *t*, and α represents the independent variables' marginal effect. The panel data feature allows us to control for the time-invariant, individual-fixed effect k_i, and the time period effect e_t, while u_{it}, is the error term.

As described in Table 1, these gaps are calculated as the "(respondent's age – their partner's age)." As proxies for bargaining power, we use the age differences between partners, expressed as *Gap of age* (Booth and Kee, 2009). The spousal age gap's effects can be decomposed into the partner selection and bargaining effects. The key variables are the cross-terms of the spousal age gaps and a dummy for getting married (or cohabitation): *Gap of ages*Married.* This effect represents the partner selection effect, rather than the bargaining effect captured by *Gap of ages*duration*; specifically, younger men tend to marry girlfriends who tend to assume a larger burden of housework to compensate for his disutility. Older women who prefer housework as part of their gender identity might marry boyfriends who prefer she assume housework responsibilities to compensate for his disutility in having an older wife. Namely, the partner selection effect is possibly reflected in how the spousal gap influences the housework allocation between husband and wife. Thus, it is necessary to decompose the spousal age gap's effect into the partner selection effect before marriage and the intra-household bargaining effect after marriage.

In more recent work using panel data from Australia, Lee and McKinnish (2018) decomposed the spousal age gap's effect into its impact on satisfaction levels at the time of marriage and the changes in satisfaction over the duration of marriage. They discovered that individuals tended to be more satisfied with younger spouses at the time of marriage, and less satisfied with those who were older. As time passed, marital satisfaction decreased more in differently aged couples than those who were similarly aged (Lee and

McKinnish, 2018).[11] We follow Lee and McKinnish's (2018) specification by including *Gap of ages*Marital duration*, an interaction term. Thus, the *Gap of ages*Marital duration* can be interpreted as capturing the effects of intra-household bargaining through marital life after controlling for the partner selection effect by *Gap of ages*Married.* These interaction terms are anticipated to be positive based on *Hypotheses 1* and *4*, while *Hypothesis 2* leads us to predict that women exhibit a greater coefficient than men women exhibit a greater coefficient than men.

The relationships between parents possibly form the child's view (or preference) about the division of labor within a household. This can consequently influence the child's time allocation within a household after the child marries in adulthood. We thus obtain such variables as the respondent parents' and partner parents' spousal age gaps. As described in Table 1, these gaps are the "(father's or mother's) value – the (mother's or father's) value when the respondent is (male or female)," respectively. Booth and Kee (2009) revealed that a woman's fertility depends on the size of her family of origin, as well as that of her husband's. This indicates that decision-making within a household is influenced by the spouse's origin-family characteristics through a family-specific cultural transmission. Therefore, we must also examine the effect of partner parents' age gaps. Hence, in the same way that the spousal age gap's interaction term was created, *Parents (partner's parents) gap of ages*Marital duration* and *Parents (partner's parents) gap of ages*Marriage* are included to consider the effect of identities inherited from parents. *Hypotheses 3* and *4* lead us to predict that these interaction terms have a positive sign for women.

Aside from parents' age gaps, we follow existing works (e.g., Fernandez et al., 2004; Kawaguchi and Miyazaki, 2009) to anticipate the mother's work status will determine preferences and perspectives about the allocation of time within a household. We interpret this effect as forming gender identity, and test this effect by including *Working mother *Marital duration* and *Working mother*Marriage.* Mothers who work full-time during one's childhood are thought to spend less time on housework; if so, the woman will decrease her allocation of housework, while the man will increase it. These interaction

[11] Sohn (2016) found that women with taller husbands experienced happiness after marriage, but these effects declined as time passed.

terms for the *working mother* are predicted to have negative and positive signs for females and males, respectively.

One critical issue involves controlling for bias, and instrumental variables (IVs) are traditionally used to control it. However, it is difficult to discover valid IVs, as we have already controlled for individual-fixed effects, and most potential IVs are captured by fixed effects.[12] Thus, we attempted to disentangle the intra-household bargaining and partner selection effects as noted above.

Various other factors can be controlled by a vector of control variables X_{it}, including dummies for employment status, the number of children, and the respondent's or partner's period of pregnancy. These control variables are included in all specifications, although their results are not presented in Tables 5 to 8.

4. Results and Interpretation

Tables 5 to 8 illustrate the fixed effects' estimation results based on the men's and women's samples, respectively. Tables 5 and 6 provide the results when housework hours are the dependent variable, while Tables 7 and 8 exhibit results for the allocation of housework as the dependent variable. Respondents' ages across the generation gap are thought to influence the results; therefore, robust standard errors are clustered by age.

We can observe from Table 5—based on the male sample—that the interaction terms for *Gap of ages*Married* indicate a negative sign for most results. However, not all columns exhibit statistical significance. For example, no statistical significance can be observed for the interaction terms for the parents' age gap. In our interpretation, the male's gender identity plays a key role, as this can discourage men to assume the burden of housework (Akerlof and Kranton, 2000). This identity is considered as neutralizing males' motivation to do housework to compensate for his wife's disutility from having an older husband. We should carefully focus on the possibility that household activities can be outsourced (Burda et al., 2008), although we cannot further examine this due to data limitations. If this is the case, men might earn more to employ a maid or order housework

[12] Lee and McKinnish (2018) controlled for a similar bias from mate selection by attempting to conduct IV estimations, but could not discover any valid IVs. Grossbard and Mukhopadhyay (2017) used panel data to conduct IV estimations, but could not use the IV method when controlling for fixed effects because the IVs are time-invariant.

services instead of the wives assuming the burden of housework. In contrast, the coefficients for *Working mother*Marital duration* and *Working mother*Married* indicate positive signs. Columns 4 to 6 in Table 5 reveal *Working mother*Marital duration* is statistically significant, suggesting that husbands who had full-time working mothers in childhood tend to increase their housework hours to support their wives as a consequence of intra-household bargaining.

Concerning the control variables, the coefficient of *Children* produces significant, positive signs in all columns, which indicates that the emergence of children will lead husbands to increase their housework hours.

Regarding the results of Table 6, and consistent with the female gender (Akerlof and Kranton, 2000; Booth and Van Ours, 2009), *Married* exhibits a positive, significant sign in all columns, implying that marriage (or cohabitation) leads women to increase their housework hours. Further, the *Gap of ages*Married* and *Gap of ages*Marital duration* demonstrate positive signs in all results; *Gap of ages*Married* is positive and statistically significant at the 1% level in all columns, while *Gap of ages*Marital duration* is not significant in any columns. This indicates that the age gap does not influence intra-household bargaining, although a partner-selection effect can be observed. No statistical significance can be observed in any results concerning the interaction terms for the parents' age gaps.

We now focus on the results of housework allocation in Tables 7 and 8. The results of Table 7, which include the male sample, are nearly similar to those in Table 5. Specifically, the spousal age gap does not influence men's housework hours or the allocation of housework. Further, *Married* reveals a negative, significant sign in all columns, which reflects a decreased allocation of housework after marriage. The age gap between respondents' mother and father has no influence on the allocation of housework. These results do not support *Hypotheses 1, 2* and *4*. Alternatively, the coefficients of *Working mother*Marital duration* and *Working mother*Marriage* exhibit positive signs. Columns 4 and 6 in Table 7 indicate that *Working mother*Marital duration* is statistically significant; therefore, men are influenced by their mothers' work status in childhood to share the housework with his wife after marriage. This parallels existing works (Fernandez et al., 2004; Kawaguchi and Miyazaki, 2009).

We can observe in Table 8 that the *Gap of ages*Married* and *Gap of ages*Marital*

duration are positive and statistically significant in most cases. The spousal age gap leads women to increase their allocation of housework through both the partner selection and intra-household bargaining effects. One compelling observation is that *Parents Gap of ages*Marital duration* exhibits a positive sign and statistical significance, while *Parents Gap of ages*Marriage* indicates a positive sign, but no statistical significance. These imply that respondents' parental age gaps lead women to increase their allocation of housework through intra-household bargaining, but not through their partner selection. We assume here that the wife older than her husband assumes a larger allocation of housework to compensate for her husband's disutility. This situation contributes to forming her daughter's identity to assume more housework as a consequence of bargaining with a younger husband. These results support *Hypotheses 1* to *4*. Consistent with our prediction, the coefficients of *Working mother*Marital duration* and *Working mother*Marriage* exhibit negative signs, although these are not statistically significant. Hence, working mothers had no substantial impact on their daughters' decreased housework allocation. One possible interpretation is that women's gender identity to prefer housework is sufficiently large to neutralize the effects of the mother's work status. In considering Tables 5 to 8, it can be posited that the mother's work status influences sons' housework allocation after marriage, but not daughters'.

Collectively, the results from Tables 5 to 8 support *Hypotheses 1 to 4*, proposed in Section 2. Our observations thus far allow us to derive the following conclusions: younger husbands experience disutility in their marriages to older wives, but compensate for this by assuming a larger allocation of his wife's housework as a consequence of intra-household bargaining. In contrast, gender identities lead wives with older husbands to compensate for her disutility by his larger earnings. Unfortunately, we cannot analyze spouses' earnings, as our dataset only includes the family's total earnings. Further, individual gender identities form through learning from parents' lifestyles, and thus, the spousal age gap has long-term effects not only on the couple's allocation of housework, but also on their children's allocation of housework after marriage.

5. Conclusion

Various works have studied how spousal age gaps relate to the allocation of housework.

However, research thus far has failed to scrutinize the effects of parents' age gaps. Individuals are fundamentally influenced by their parents' lifestyles, and form their own identities to determine their decision-making in various situations later in life. First, we use a novel dataset to compare the effects of spousal gaps between genders by considering gender identity. Further, we consider how parent characteristics, such as the parents' age gap and mother's work status, play a role in forming this identity, thus influencing the allocation of housework between spouses. One innovation in this paper involves its investigation of the intergenerational transmission and allocation of housework between the genders.

We originally collected individual-level data through monthly Internet surveys for 37 months. At the initial survey point, respondents were unmarried with the intent to marry their partner in the near future. We then tracked the same individuals after their marriage occurred to consider how the allocation of housework changed.

After controlling for individual- and time period-fixed effects, our key findings are as follows: (1) Women older than their partners tend to assume a larger amount of housework than in the pre-marriage period, and the spousal gap effect increases as the marriage duration increases. (2) Women with mothers older than their fathers tend to assume a larger allocation of housework as the marriage duration increases, (3) the age gap hardly affects men's allocation of housework, while men who had full-time working mothers at age 15 assume a larger allocation of housework as the marital duration increases.

This implies that for women, the spousal age gap influences not only the selection of a mate, but also the allocation of housework as a result of intra-household bargaining. We tested our hypotheses by first assuming that mothers older than fathers, as well as fathers with full-time working wives, assume a larger amount of housework. Regarding women, their identities that form from their parents' age gap only influenced the allocation of housework as an outcome of bargaining. Alternatively, men's identities as formed through having a working mother lead to his assuming a larger amount of housework.

This paper cannot directly address an endogeneity bias in partner selection, partially due to data limitations; however, valid instrumental variables should be used to control this. Otherwise, a quasi-experimental setting should be used to scrutinize the age-gap effects. These are remaining issues to be addressed in future studies.

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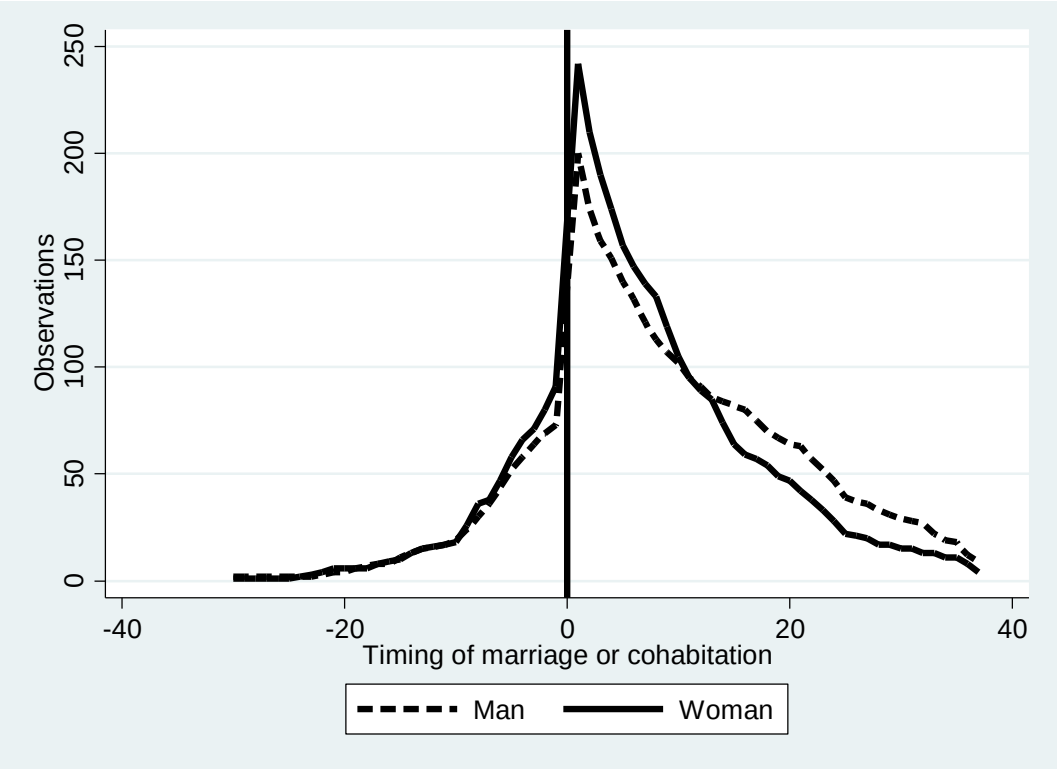

Fig. 1. Difference of observations according to the timing of marriage or cohabitation.

Note: On the horizontal line, marriage or cohabitation (the latter, if one is not yet married) begins at $t = 0$. The numbers on the x-axis indicate the months before and after the marriage event.

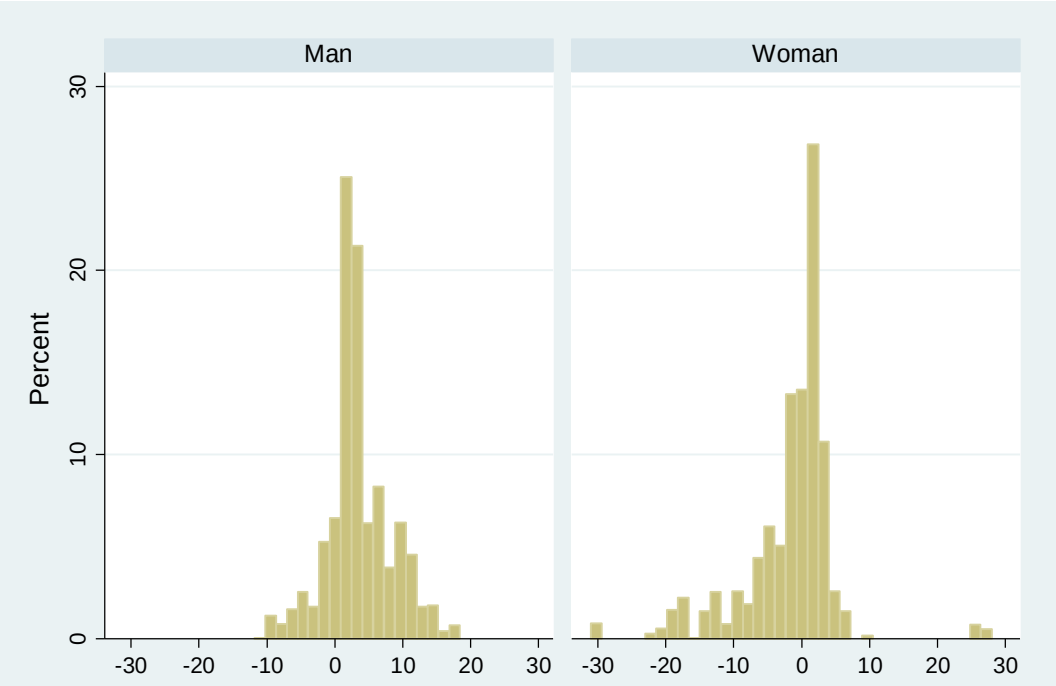

Fig. 2. Distribution of the age differences between respondents and their partners.

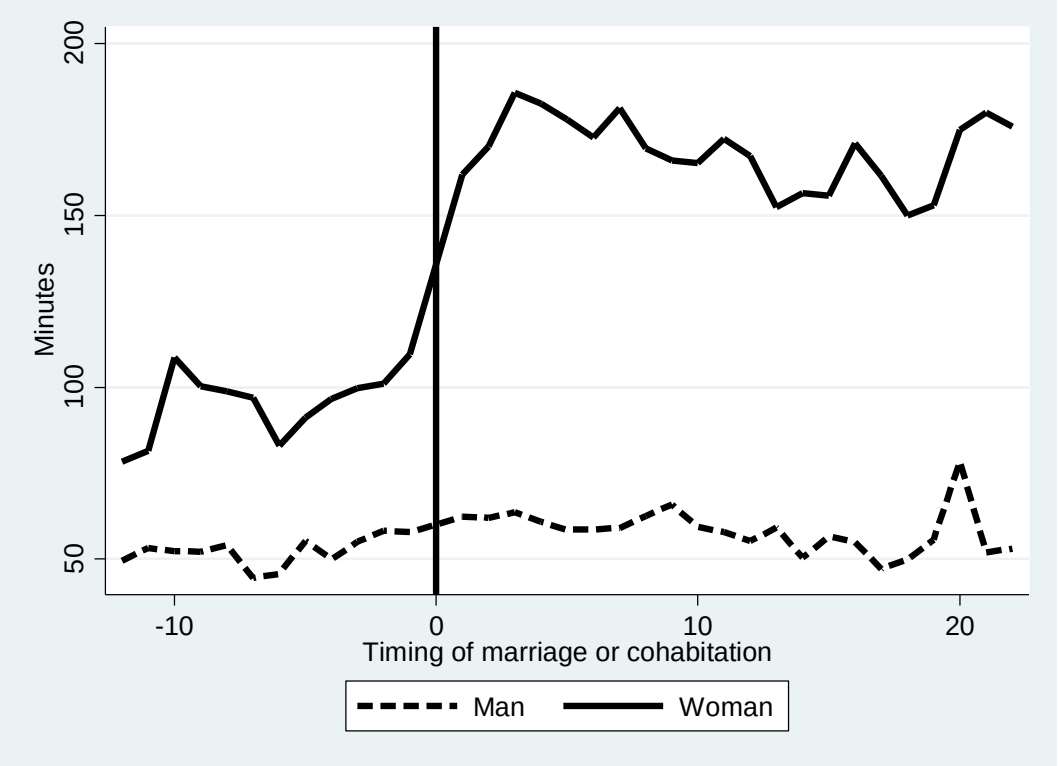

Fig. 3. Dynamic effect of marriage or cohabitation on housework hours (the minutes for housework in a weekday).
Note: On the horizontal line, marriage or cohabitation (the latter, if one is not yet married) begins at $t = 0$.

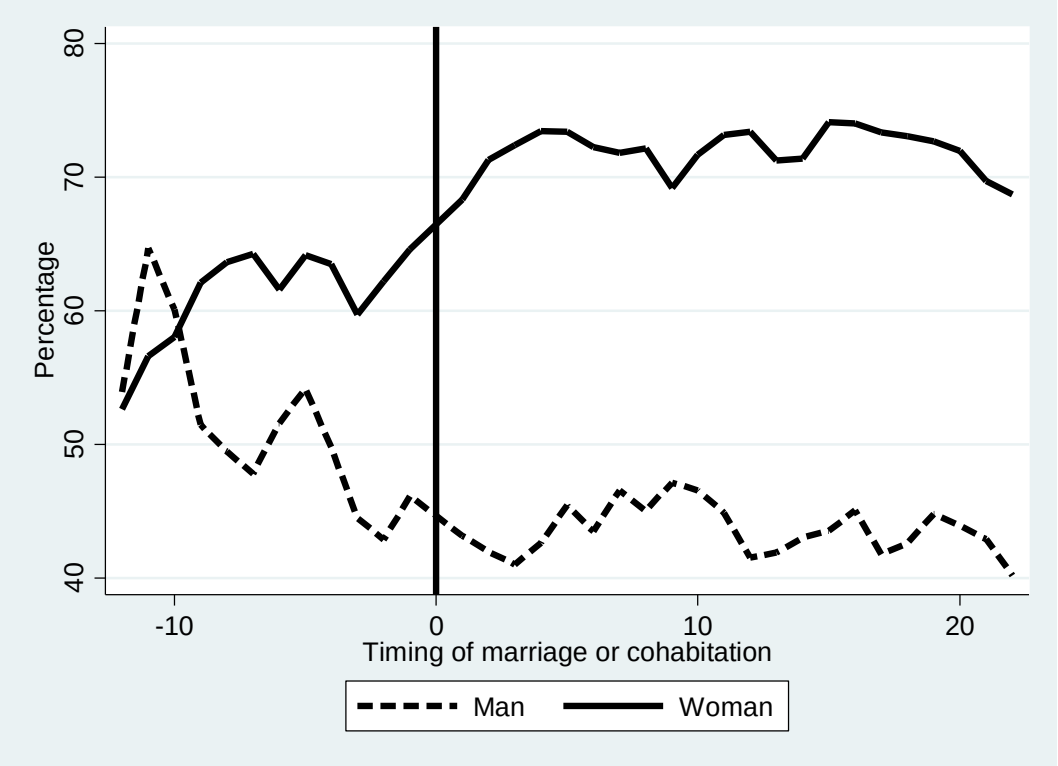

Fig. 4. Rate of allocation for housework within a household (percentage of housework).

Table 1. Basic statistics of variables used in the estimation and mean values for males and females

Variables	Definition	Males	Females
Housework hours	Respondent's housework minutes per day	59.7	135.7
Allocation of housework	Respondent's share of housework within a household (%).	38.8	71.0
Marital duration	Months passed after the marriage or cohabitation	9.46	7.68
Age	Ages	33.3	30.4
Gap of ages	(Respondent's age – Partner's age)	3.57	−1.31
Parents' age gap	Respondent father's (or mother's) age – Respondent mother's (father's) age	2.77	−3.03
Partner parents' age gap	Partner father's (or mother's) age – Partner mother's (or father's) age	2.53	−1.79
Working mother	This assumes a value of one if the respondent's mother worked when the respondent was 15 years old, and zero otherwise.	0.31	0.32
Married	A value of one of the respondent is currently married or cohabitating with one's partner, and zero otherwise.	0.82	0.80
Pregnancy period	A value of one if the respondent (or partner) is pregnant, and zero otherwise.	0.10	0.09
Children	Number of children	0.24	0.07

Notes: The parents' age gap is calculated by the "father's age − mother's age" when the respondent is male, while this is the "mother's age − father's age" when the respondent is woman. We use information about the respondent's share of six housework categories ("cooking," "clearing dishes from the table," "cleaning and sweeping," "washing," "shopping," and "taking out the garbage") to calculate the respondents' share of housework as a whole.

Table 2. Correlation matrix between the spousal and parental age gaps

	Age Gap with Partner	Parents' Age Gap	Partner Parents' Age Gap
Age gap with partner	1	0.24***	0.34***
Parents' age gap		1	0.46***
Partner parents' age gap			1

Note: The parents' age gap is calculated as the "(father's age − mother's age)" when the respondent is male, while this is calculated as the "(mother's age − father's age)" when the respondent is female. *** indicates significance at the 1% level.

Table 3. Comparison of housework hours across groups

Men's Sample	Before marriage or cohabitation (a)	After marriage or cohabitation (b)	Difference (b) – (a)
Age>Partner's Age	50	79	29
Age=Partner's Age	36	49	13
Age<Partner's Age	44	47	3
Women's Sample			
Age > Partner's Age	74	161	87
Age = Partner's Age	63	137	74
Age < Partner's Age	92	142	50

Note: The numerals here are the minutes per day.

Table 4. Comparison of housework allocations across groups

Men's Sample	Before Marriage or Cohabitation (a)	After Marriage or Cohabitation (b)	Difference (b) – (a)
Age > Partner's Age	46	45	− 1
Age = Partner's Age	51	43	− 8
Age < Partner's Age	63	35	− 18
Women's Sample			
Age > Partner's Age	61	77	16
Age = Partner's Age	64	69	5
Age < Partner's Age	61	71	10

Note: The numerals here are percentages (%).

Table 5. Determinants of housework hours (fixed-effects model): Men's sample

	(1)	(2)	(3)	(4)	(5)	(6)
Gap of Age	−0.42	−0.33	−0.36	−0.45	−0.39	−0.42
*Married	(−0.51)	(−0.42)	(−0.44)	(−0.54)	(−0.48)	(−0.49)
Gap of Age				0.01	0.01	0.01
* Marital duration				(0.41)	(0.42)	(0.48)
Married	2.51	2.97	3.78	2.04	2.31	4.33
	(0.58)	(0.66)	(0.96)	(0.51)	(0.55)	(1.23)
Marital duration				−0.27	−0.27	−0.42
				(−0.98)	(−0.92)	(−1.36)
	Parents' Effect					
Parents' age gap	0.67	0.79		1.24	1.36	
* Married	(0.56)	(0.73)		(1.06)	(1.27)	
Partner parents' age gap	0.44		0.61	0.35		0.76
* Married	(0.70)		(1.32)	(0.58)		(1.59)
Parents' age gap				−0.07**	−0.07***	
*Marital duration				(−2.41)	(−2.77)	
Partner parents' age gap				−0.01		−0.03
* Marital duration				(−0.30)		(−1.65)
Working mother	7.41	6.55	8.54	4.61	4.08	4.82
*Married-	(0.88)	(0.77)	(1.01)	(0.54)	(0.47)	(0.57)
Working mother				0.45**	0.44**	0.49**
* Marital duration				(2.47)	(2.47)	(2.58)
	Control					
Pregnancy period	4.42	4.26	4.64	3.62	3.73	4.51
	(1.35)	(1.32)	(1.42)	(1.06)	(1.13)	(1.34)
Children	13.2***	12.1***	13.4***	12.1***	11.4***	13.0***
	(3.72)	(3.69)	(3.76)	(3.04)	(3.12)	(3.24)
Ages	−4.41	−4.35	−4.33	−4.24	−4.19	−4.19
	(−1.67)	(−1.59)	(−1.64)	(−1.61)	(−1.55)	(−1.55)
Observations	2879	2923	2885	2879	2923	2885
Number of Individuals	155	158	156	155	158	156
R-square	0.03	0.03	0.03	0.03	0.03	0.03

Note: The married-cohabitating, time period, job status, and individual dummies are included in all estimations, although their results are not reported. The numbers in parentheses are *t*-values, based on robust standard errors clustered by age. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6. Determinants of housework hours (fixed-effects model): Women's sample

	(1)	(2)	(3)	(4)	(5)	(6)
Gap of Age	2.56***	2.99***	2.50***	2.37***	2.36***	2.39***
*Married	(3.32)	(4.06)	(3.31)	(3.04)	(2.77)	(3.19)
Gap of Age				0.01	0.07	0.01
* Marital duration				(0.28)	(0.94)	(0.29)
Married	109.5***	105.9***	98.4***	102.9***	98.9***	96.8***
	(7.02)	(6.90)	(8.32)	(7.53)	(6.94)	(8.88)
Marital duration				−0.46	−0.61	−1.51**
				(−0.39)	(−0.51)	(−2.30)
			Parents' Effect			
Parents' age gap	3.28	3.90		1.95	2.67	
* Married	(1.26)	(1.66)		(0.84)	(1.18)	
Partner parents' age gap	1.80		2.06	1.76		1.84
* Married	(0.52)		(0.60)	(0.54)		(0.56)
Parents' age gap				0.16	0.13	
*Marital duration				(0.93)	(0.76)	
Partner parents' age gap				0.01		0.01
* Marital duration				(0.08)		(0.20)
Working mother	−2.85	1.16	5.33	−8.80	−6.60	−4.09
*Married-	(−0.16)	(0.06)	(0.30)	(−0.47)	(−0.35)	(−0.21)
Working mother				0.57	0.74	1.09
* Marital duration				(0.62)	(0.90)	(1.54)
			Control			
Pregnancy period	14.3*	8.91	12.4	17.7**	11.3	14.9*
	(1.75)	(1.14)	(1.46)	(2.38)	(1.54)	(1.75)
Children	41.1*	44.9**	40.5*	45.0**	47.1**	43.1**
	(1.91)	(2.15)	(1.81)	(2.24)	(2.41)	(2.01)
Ages	1.13	−1.32	1.24	1.39	−0.92	1.51
	(0.18)	(−0.19)	(0.20)	(0.23)	(−0.13)	(0.25)
Observations	2579	2745	2579	2579	2745	2579
Number of Individuals	163	175	163	163	175	163
R-square	0.27	0.28	0.27	0.27	0.28	0.27

Note: The married-cohabitating, time period, job status, and individual dummies are included in all estimations, although their results are not reported. The numbers in parentheses are *t*-values, based on robust standard errors clustered by age. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Determinants of housework allocation (fixed-effects model): Men's sample

	(1)	(2)	(3)	(4)	(5)	(6)
Gap of Age	−0.08	−0.01	−0.09	−0.43	0.02	−0.06
*Married	(−0.21)	(−0.01)	(−0.22)	(−0.11)	(0.06)	(−0.25)
Gap of Age				−0.001	−0.001	−0.001
* Marital duration				(−0.13)	(−0.12)	(−0.05)
Married	−15.7***	−14.9***	−15.7***	−16.5***	−15.9***	−16.0***
	(−3.57)	(−3.65)	(−3.94)	(−2.87)	(−2.98)	(−2.94)
Marital duration				−0.23	−0.24	−0.30
				(−0.43)	(−0.43)	(−0.57)
	Parents' Effect					
Parents' age gap	0.05	0.17		0.30	0.42	
* Married	(0.12)	(0.40)		(0.63)	(0.91)	
Partner parents' age gap	0.45		0.49	0.39		0.53
* Married	(0.68)		(0.78)	(0.62)		(0.85)
Parents' age gap				−0.03	−0.03	
*Marital duration				(−1.59)	(−1.69)	
Partner parents' age gap				−0.01		−0.01
* Marital duration				(−0.06)		(−0.63)
Working mother	8.33*	7.50	8.53*	7.29	6.58	7.10
*Married-	(1.84)	(1.56)	(1.87)	(1.62)	(1.41)	(1.54)
Working mother				0.19*	0.19	0.21*
* Marital duration				(1.75)	(1.64)	(1.93)
	Control					
Pregnancy period	2.88	2.57	2.95	2.49	2.28	2.84
	(1.48)	(1.35)	(1.49)	(1.29)	(1.21)	(1.43)
Children	4.06**	3.88**	4.09**	3.86**	3.81**	4.20**
	(2.45)	(2.51)	(2.50)	(2.43)	(2.57)	(2.55)
Ages	−3.26**	−3.25**	−3.24**	−3.14**	−3.12**	−3.14**
	(−2.66)	(−2.74)	(−2.68)	(−2.49)	(−2.54)	(−2.47)
Observations	2881	2925	2887	2881	2925	2887
Number of Individuals	155	158	156	155	158	156
R-square	0.06	0.06	0.06	0.06	0.06	0.06

Note: The married-cohabitating, time period, job status, and individual dummies are included in all estimations, although their results are not reported. The numbers in parentheses are *t*-values, based on robust standard errors clustered by age. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Determinants of housework allocation (fixed-effects model): Women's sample

	(1)	(2)	(3)	(4)	(5)	(6)
Gap of Age	0.40***	0.57**	0.38***	0.30**	0.40*	0.30**
*Married	(2.87)	(2.72)	(2.88)	(2.19)	(1.95)	(2.10)
Gap of Age				0.01*	0.02***	0.01
* Marital duration				(1.88)	(2.72)	(1.52)
Married	13.9***	13.0***	11.7***	10.8***	10.0***	10.2***
	(7.39)	(7.47)	(5.58)	(5.30)	(5.02)	(4.50)
Marital duration				0.12	0.13	−0.22
				(0.62)	(0.73)	(−0.99)
			Parents' Effect			
Parents' age gap	0.64	0.74**		0.26	0.46	
* Married	(1.47)	(2.16)		(0.58)	(1.21)	
Partner parents' age gap	0.77***		0.82***	0.92**		0.91**
* Married	(3.11)		(3.48)	(2.01)		(2.05)
Parents' age gap				0.06***	0.04**	
*Marital duration				(2.91)	(2.46)	
Partner parents' age gap				−0.02		−0.01
* Marital duration				(−0.49)		(−0.42)
Working mother	−2.21	−1.65	−0.61	−0.01	−0.01	0.68
*Married-	(−0.73)	(−0.69)	(−0.23)	(−0.00)	(−0.00)	(0.18)
Working mother				−0.38	−0.31	−0.20
* Marital duration				(−1.69)	(−1.46)	(−1.04)
			Control			
Pregnancy period	−5.02***	−5.50***	−5.38***	−4.49***	−5.35***	−5.32***
	(−3.74)	(−4.87)	(−3.40)	(−3.11)	(−4.68)	(−3.23)
Children	−1.45	−0.50	−1.67	−0.79	−0.54	−1.41
	(−1.02)	(−0.32)	(−1.18)	(−0.50)	(−0.34)	(−0.83)
Ages	0.32	−0.10	0.05	0.13	0.03	0.16
	(0.02)	(−0.07)	(0.03)	(0.08)	(0.02)	(0.09)
Observations	2581	2747	2581	2581	2747	2581
Number of Individuals	163	175	163	163	175	163
R-square	0.06	0.07	0.06	0.06	0.07	0.06

Note: The married-cohabitating, time period, job status, and individual dummies are included in all estimations, although their results are not reported. The numbers in parentheses are *t*-values, based on robust standard errors clustered by age. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.