Trends in the Gender Gap in Time Use among Japanese Married Couples

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Gender inequality in the public spheres outside the household—such as education, the economy, and politics—are relatively easy to measure continuously using standardized indicators. By contrast, it is not easy to continuously monitor gender gaps in the private sphere of the household using standardized method. In this context, time-use data collected by diary surveys provides valuable resources that highlights gender disparities in the private sphere through the analysis of time allocation among the household members. Accordingly, this paper constructs dyadic data at the married-couple level using anonymized data from the *Survey on Time Use and Leisure Activities* (Statistics Bureau, Ministry of Internal Affairs and Communications) for the period 1991–2016 and depicts trends in disparities in paid and unpaid work time between spouses. The analysis revealed that the traditional gendered division of labor, represented by husbands' longer hours of paid work and the concentration of unpaid work on wives, was firmly maintained throughout the observation period. On the other hand, as a localized change, a gradual narrowing of the spousal gap in unpaid working time was observed. Furthermore, the analysis taking couples' educational attainment into consideration suggests the possibility that the trend toward narrowing gender differences in time use may be driven by highly educated couples. These findings may reflect the dual nature of gender gaps in Japan: the traditional division of labor between husbands and wives remains stable overall while exhibiting localized change.

I. Research problem

It would not be an exaggeration to say that issues involving gender equality/inequality constitute a major interdisciplinary field in social sciences. The Gender Gap Index, published annually by the World Economic Forum, is calculated by weighting scores in four key dimensions: educational attainment, economic participation and opportunity, political empowerment, and health and survival (World Economic Forum 2023). The first three

of these dimensions—educational attainment, economic participation and opportunity, and political empowerment—can be considered public spheres, where gender gaps, such as disparities in higher education enrollment rates, gender wage gaps, and gender imbalances among members of the Diet and cabinet ministers, are relatively easy to identify. One reason for this is that statistics for measuring these gender gaps are well established, at least in Japan. As a result, empirical studies on gender gaps in public sphere have been steadily accumulated.

On the other hand, are gender disparities in the private spheres—such as those between romantic partners, family members, and married couples—still being reproduced, or are these disparities diminishing over time? To consider this issue, one must begin with the question of how to measure gender disparities in the private spheres. What feminism and women's studies have traditionally addressed are power relationships in the private spheres, particularly oppression and violence against women (for example, domestic violence). Yet it is not hard to imagine the difficulty of adopting a quantitative approach to such phenomena. This is because researchers face methodological (and ethical) challenges in collecting accurate data from respondents on sensitive matters such as oppression and violence. In other words, compared with the public spheres, gender disparities in the private spheres are more difficult to measure based on standardized scales.[1]

However, one of the relatively well-established indicators of gender disparities in the private spheres is the gendered division of labor between men and women, especially between husbands and wives. Specifically, the extent to which men and women engage in unpaid work—such as housework, childcare, and nursing care within the household— has been a matter of concern. In other words, this is essentially an issue of time allocation—how much time men and women spend on unpaid work within the household and how much they spend in public spheres outside it.

This paper clarifies trends in spousal differences in time use, using Japanese time-use survey data.[2] One of the features of this paper is that it focuses not only on overall differences in time-use patterns between husbands and wives but also on educational differences between couples. The remainder of this paper is organized as follows. Section II provides an overview of the gender gaps elucidated in previous time-use research and clarifies the contributions of this paper. Section III explains the *Survey on Time Use and Leisure Activities* used in this paper, describes the process of constructing dyadic data at the married-couple level, and outlines the operationalization of variables. Section IV presents the analytical results, followed by the conclusion and discussion in Section V.

II. Gender gaps from the perspective of time use

1. Methods for collecting time-use data and international comparative research projects

Before reviewing existing research findings on gender differences in time use, it is important to note that there are two main methods for collecting time use data. The first method is called the diary method. In this method, respondents record what activities they engaged in during each time slot of the 24-hour day, divided into units of 10 or 15 minutes. Representative time use surveys in Japan that collect data using this method includes the *Survey on Time Use and Leisure Activities* which is used in this paper, and the NHK National Time Use Survey (NHK Broadcasting Culture Research Institute).[3]

The second method is the stylized method for measurement. In this method, respondents report the total frequency of each activity over a specified reference period (e.g., one day or one week). The frequency can be measured in units of time (minutes or hours) or using a Likert scale. Compared with the diary method, the stylized method reduces the burden on respondents, but it has been criticized for introducing substantially large systematic error (Kan 2008; Kan and Gershuny 2009; Kan and Pudney 2008).

Of the two methods for collecting time use data described above, the diary method is regarded as the "gold

standard" in time use research, despite its drawbacks, such as imposing a heavy burden on respondents and requiring substantial space on questionnaires (Belli, Stafford, and Alwin 2009; Cornwell, Gershuny, and Sullivan 2019; Kan and Pudney 2008; Park 2023).[4] International time use research based on the diary method has largely relied on two major research projects. One is the Multinational Time Use Study (MTUS), launched in the 1980s by Jonathan Gershuny and Sally Jones. MTUS provides freely available data files, created by harmonizing sample surveys collected over the past 55 years in 30 countries, thereby facilitating international comparison of time use. The other international comparative research project is the Harmonised European Time Use Surveys (HETUS), led by Eurostat. HETUS has so far completed two waves: the first wave (HETUS 2000, round one) was conducted between 1998 to 2006 in 15 European countries, and the second wave (HETUS 2010, round two) was conducted between 2008 and 2015 in 18 countries. The third wave (HETUS 2020) is currently underway.

2. Gender differences in time use and gender revolution theory

What kinds of gender differences in time use have been documented in these international comparative research projects? First, in nearly all societies where time use data are available, women devote more time to unpaid work, while men devote more time to paid work. This pattern is hardly surprising; the issue of concern lies in its trend. Empirical evidence shows that gender differences in time use have gradually narrowed over time (Altintas and Sullivan 2016; Kan, Sullivan, and Gershuny 2011; Sullivan, Gershuny, and Robinson 2018).

In recent years, the theoretical framework most frequently referenced to explain and interpret trends in gender differences in time use is the "gender revolution (theory)" (Esping-Andersen and Billari 2015; Goldscheider, Bernhardt, and Lappegård 2015). This is a type of multi-equilibrium model. The first equilibrium is defined as a society characterized by the male breadwinner model based on gender division of labor, while the second equilibrium is defined as a more gender-equal society based on dual-earner couples. The gender revolution refers to the transition from the first equilibrium to the second, which is thought to be achieved in two phases. In the first phase of the revolution, gender equality advances in the public sphere (England 2010; England, Levine, and Mishel 2020). That is, as educational opportunities expand, more women enter the labor force, and dual-earner households become more prevalent. However, at this stage, a conflict arises between the social norms based on the traditional male breadwinner model, which is a characteristic of the first equilibrium, and these changes in women's behavior. As a result, family instability emerges, symbolized by trends such as delayed marriage, non-marriage, low fertility, and rising divorce rates. However, as the gender revolution enters its second phase, gender equality in the private sphere progresses. Specifically, men take on a greater share of unpaid work within the household, leading to gender equality in time use. According to the gender revolution theory, once society stabilizes in the second equilibrium, family stability is expected to follow, as marriage rates rise, divorce rates fall, and fertility recovers.[5]

One of the central elements of the gender revolution theory is the educational differences in family behaviors and their changes over time. Taking marriage as an example, in the early stage of the transition from the first equilibrium to the second equilibrium, the responsibility for unpaid work remains disproportionately borne by women in the private sphere, making the opportunity cost of marriage particularly high for highly educated women. As a result, women's educational attainment is negatively correlated with marriage rates. However, as the gender revolution advances and gender equality in the private spheres is achieved, the income-earning capacity of highly educated women begins to work to their advantage in the marriage market, while their opportunity cost of marriage decreases. Consequently, the correlation between women's educational attainment and marriage rates is expected to gradually shift from negative to positive.[6] Accordingly, when evaluating gender revolution theory, it is important to focus on the educational differences in the family phenomena under examination and their trends.

3. Time use and gender gaps in East Asia

Although extensive knowledge has been accumulated regarding trends in gender gaps in time use, much of it has been concentrated in Europe and North America. As noted earlier, this is because international comparative projects on time use research have been conducted mainly in these regions. For example, among East Asian countries, only South Korea is included in the MTUS (as of the time of writing of this paper, data from three time points—1999, 2004, and 2009—are available).

In recent years, however, empirical studies on gender gaps in time use in East Asia have gradually increased. According to Park (2021), using data from the Korean Time Use Survey from 1999 to 2014, the time spent on childcare increased among both mothers and fathers in South Korea, with this trend particularly pronounced among highly educated parents. Furthermore, Park (2023), using data from the same survey up to 2019, found that: (1) gender differences in time use across five major domains—housework, work outside the home, family care, leisure, and self-care—have been gradually narrowing; (2) nevertheless, as of 2019, wives still engaged in much more housework than husbands; and (3) these trends toward gender equality were more pronounced among the highly educated. In China, the first large-scale time use survey, the National Time Use Survey, was conducted by the National Bureau of Statistics in 2008, followed by the second survey, though smaller in scales, was conducted in 2017. According to the results, the gender gap in unpaid work time widened during the period between the two surveys (Du, Wang, and Dong 2023).

These studies are valuable as country-specific case studies on gender gaps in time use in East Asia. On the other hand, Kan, et al. (2022) provide a comparative analysis of gender gaps in time use between East Asian countries, including Japan, and Western European countries. Kan and colleagues standardized the diary-based time use survey data collected in Taiwan, Japan, Beijing, China, and South Korea according to the MTUS specifications and compared these East Asian countries with 12 Western European countries selected from MTUS. The results show that gender gaps in paid and unpaid work time are not uniform across East Asia. Specifically, in Japan and South Korea, the gender differences in time use have been decreasing but at an extremely slow pace, which is similar to the trend in Southern Europe. By contrast, in Beijing and Taiwan, gender gaps in time use have been relatively small, but their narrowing trend has stagnated.

While Kan, et al. (2022) was pioneering in incorporating East Asian countries in comparative research on trends in gender differences in time use, their study also has several limitations. First, their analysis focused on men and women aged 20 to 59, encompassing individuals across a wide range of life stages. As a result, differences in time use between unmarried men and women and those between married men and women are not clearly distinguished. It is easy to imagine that life stages significantly affect time use, and indeed, even among studies focused on Japan, there are numerous examples supporting this hypothesis (Yagishita 2020a, 2020b; Fukuda 2007). The second limitation is that gender differences in time use are analyzed based on data at the individual level. Therefore, the analysis results do not allow conclusions such as "wives perform XX % of unpaid work while husbands perform the remaining YY %." To enable such interpretations, it is necessary to construct dyadic data at the married-couple level rather than at the individual level.

Based on the above, this paper aims to clarify the following two points using Japanese time use survey data: (1) describe the trends in gender differences in time use among married couples by constructing dyadic data at the married-couple level; and (2) clarify how such gender gaps vary by educational attainment.

III. Data and methods

1. Data

The following analysis uses anonymized data from the *Survey on Time Use and Leisure Activities* (hereafter, "STULA") conducted by the Statistic Bureau of the Ministry of Internal Affairs and Communications (1991,

1996, 2001, 2006, 2011, and 2016). This survey employs a two-stage stratified sampling design, with census districts as the primary sampling units and households as the secondary sampling units. Respondents report their activities in 15-minute intervals over two consecutive days during the survey period (October of each survey year). In other words, according to the classification of time-use data discussed in Section II, this corresponds to the diary method. Since the 2001 survey, two types of questionnaires have been used: "Questionnaire A," which is based on the pre-coded system with 20 activity categories, and "Questionnaire B," which is based on the after-coded system. Of these, this paper uses Questionnaire A.

The STULA has a multilevel data structure consisting of three levels. The first level is the household, the second level is the household member, and the third level is the survey date (first day or second day). In this structure, individuals are nested within households, and diaries are nested within individuals. Each household member constitutes two rows of records: the first row representing the first day, and the second row representing the second day of time use.

In order to construct dyadic data of married couples from data with such structure, it is necessary to identify the marital relationships within the same household. In the STULA, "relationship to the household head" is recorded for all household members. If there is only one married couple in the household, one household member other than the household head is assigned a "spouse" code, and dyadic data can be completed by matching this household member with the household head.

A problem arises when there are two or more married couples within a household. Such cases can be broadly divided into two types, depending on the generation to which the household head belongs (Table 1). The first type is where the household head and their spouse belong to the middle generation (G2) (Cases 1a and 1b). In this type, if they live with the parents of either the husband or the wife, the marital relationship of the parents is identified in the G1 cell. Likewise, if they live with their child and the child's spouse, the marital relationship between the child and the spouse is observed in the G3 cell. The second type is when the household head and their spouse belong to the oldest generation (G1), their child and the child's spouse belong to G2, and their grandchild belongs to G3. In both types, the marital relationship of the household head's child and the child's spouse can be identified only when there is one "child" and one "child's spouse" in the household.[7] When there are two or more married couples in the child generation within the same household, it is impossible to determine which household members are married to each other. Since Table 1 lists all possible patterns of marital relationships, it is possible that, for a given household, cells outside the shaded area may not actually be observed.

The analysis sample was limited to married couples in which both spouses were aged 25 to 49.[8] When examining gender differences in time use—particularly in unpaid work time— one possible approach would be to focus on married couples with preschool-age children, who bear a heavy childcare burden. However, in this paper, the target population is defined more broadly as all married couples, including those without children and those with children of various ages. While analyses that limit or compare life stages are also important, given the limited knowledge about gender differences in time use when viewed at the married-couple level, this study prioritizes maximizing the coverage of married couples included in the analysis in order to draw an overall picture of differences in time use between husband and wife.

Table 1. Types of marital relationships based on the STULA

	First generation (G1)	Second generation (G2)	Third generation (G3)
Case 1a	Parents of the household head	Household head and spouse	Child and the child's spouse
Case 1b	Parents the household head's spouse		
Case 2	Household head and spouse	Child and the child's spouse	Grandchild

2. Variables

(1) Daily activities

This paper focuses on two types of activities: paid work time and unpaid work time.[9] As mentioned earlier, Questionnaire A in the STULA contains 20 pre-coded categories of activity. Among these, paid work time is defined as the total time spent on "work" and "commuting to school or work." Unpaid work time is defined as the total time spent on "housework," "caring or nursing," and "childcare." "Commuting to work or school" is included in paid work time to capture the total time commitment associated with paid work. Note that travel time arising from unpaid work—for example, travel from home or the workplace to a childcare facility—is not included because it is difficult to identify such time precisely from data.

When calculating the average daily time spent on each category of activity (in minutes), weights of 5/7 for the weekdays (Monday through Friday) and 2/7 for the weekends (Saturday and Sunday) are applied.[10]

(2) Educational attainment

The educational attainment of each spouse was categorized into two categories: "high school/junior high school" and "university/junior college/college of technology," without distinguishing between current enrollment and graduation. Combining the educational attainments of both spouses produces four patterns of educational pairing, designated as follows: (i) "high-education homogamy marriage" (both spouses: "university/junior college/college of technology"); (ii) "wife-hypogamy marriage" (wife: "university/junior college/college of technology"; husband: "high school/junior high school"); (iii) "wife-hypergamy marriage" (wife: "high school/junior high school"; husband: "university/junior college/college of technology"); and (iv) "low-education homogamy marriage" (both spouses: "high school/junior high school")

IV. Results

1. Changes over time in spousal differences in time use

First, it is useful to grasp the overall picture of changes in time use over time. Figure 1 compares the average daily time spent on paid work, unpaid work, and total work (a combination of the two) between husbands and wives. (Note that the average daily time spent on activities shown below is a weekly average weighted by weekdays and weekend, as mentioned earlier). What is immediately evident from Figure 1 is the gender gap in paid and unpaid work: husbands spend more time on paid work, while wives spend more time on unpaid work. This pattern reflects the traditional gendered division of labor and is not a new finding.

What, then, about changes over time in time use of husbands and wives?

First, although paid work time shows some fluctuations across survey years, a broad view spanning the 25-year period from 1991 to 2016 reveals little change for either spouse. Second, unpaid work time likewise shows little changes over time, but if anything, the time devoted to unpaid work tends to decrease for wives (306 minutes in 1991; 288 minutes in 2016) and increase for husbands (16.3 minutes in 1991; 36.5 minutes in 2016).

Finally, the right-hand panel of Figure 1 shows the total work time, which is the sum of paid and unpaid work time. In all survey years except for 1991, there is either no gender difference in the total work time or a tendency for husbands to have longer total work time than wives. For example, in 2016, husbands worked 21 minutes more per day than wives.

To summarize the above findings: First, the gendered division of labor—where husbands devote long hours to paid work outside home and wives bear most of unpaid work inside home—did not change substantially between 1991 and 2016. Second, when looking at the total work time combining paid and unpaid work time, the difference between husbands and wives has relatively diminished, and there is even a tendency for men to have longer total work time. Lastly, the most consistently observed sign of change over time is the narrowing gap in

unpaid work time between husbands and wives, although the pace of change has been slow.

2. Educational differences in time use between husbands and wives

The next point of view is how much the differences in time use between husbands and wives vary by educational attainment.

Figure 2 presents the data from Figure 1 broken down by the educational attainment of each spouse. Looking first at paid work time, there is almost no difference by the husband's educational attainment, whereas among

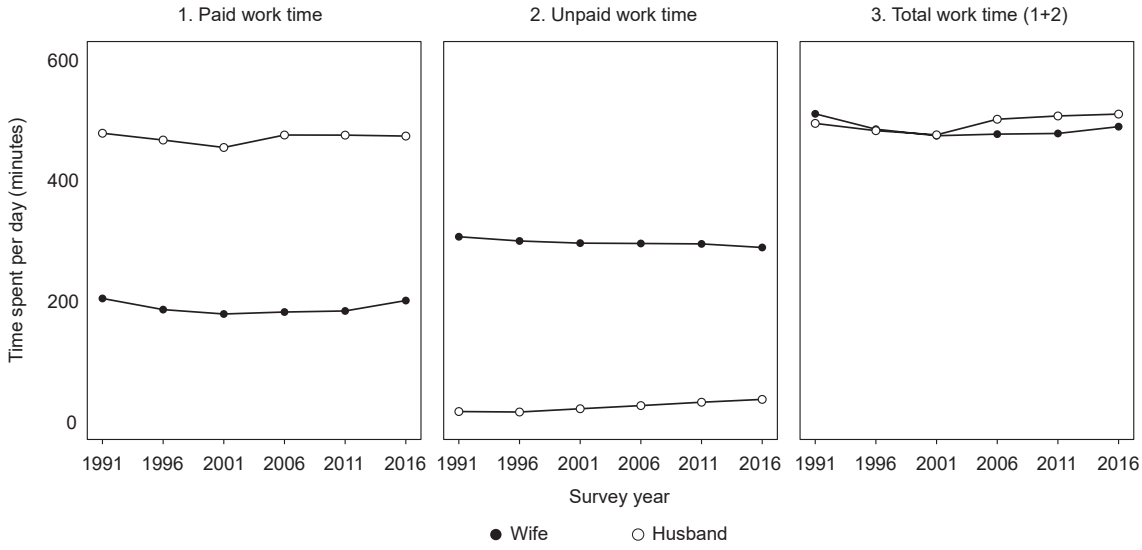


Figure 1. Paid work time, unpaid work time, and total work time per day by husbands and wives, by survey year

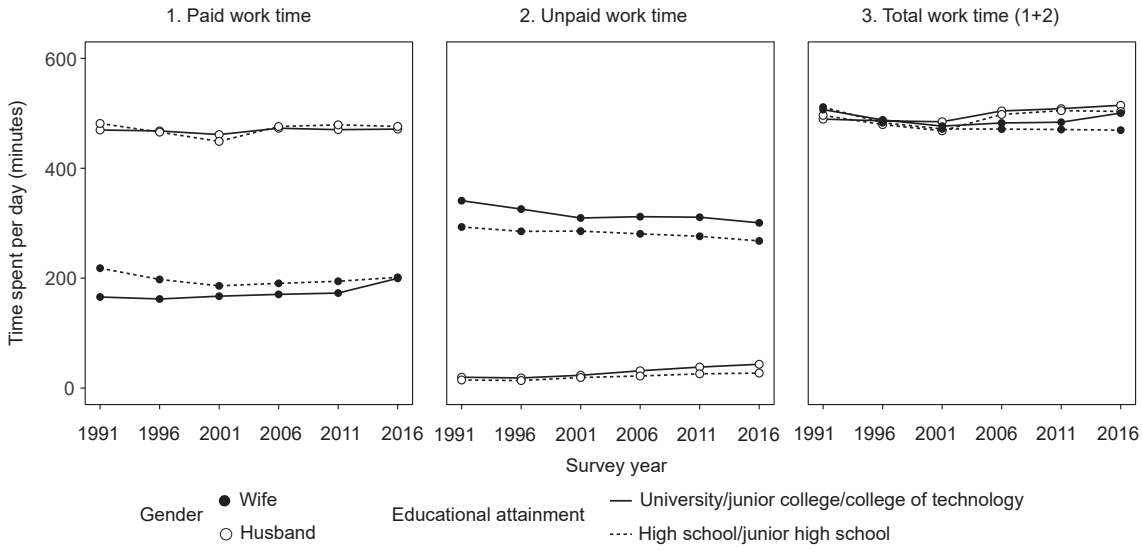


Figure 2. Paid work time, unpaid work time, and total work time per day by husbands and wives, by survey year and educational attainment

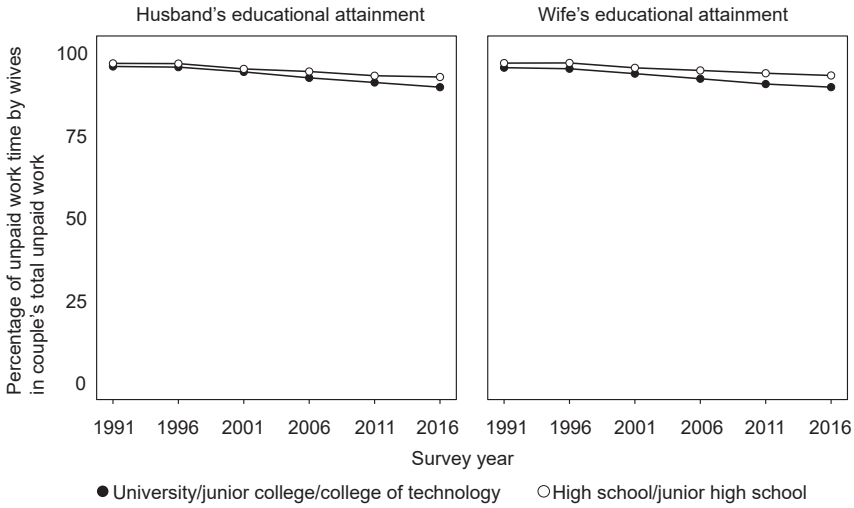


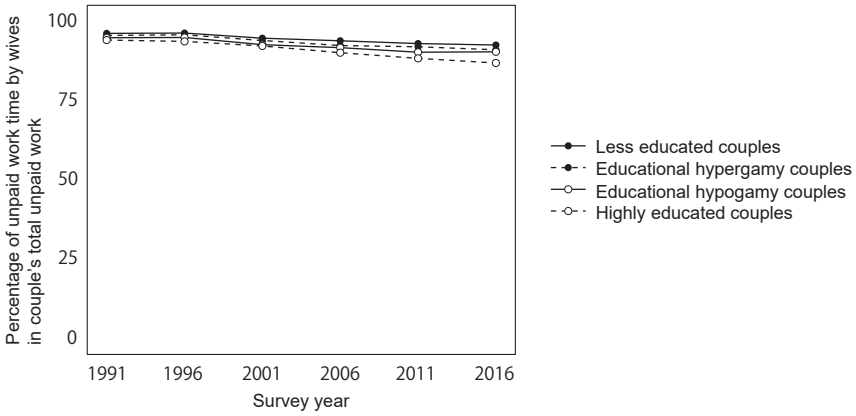
Figure 3. Percentage of unpaid work time by wives in total couple's unpaid work time, by educational attainment of each spouse

wives, the educational differences show a narrowing trend. In 1991, wives with "high school/junior high school" education spent more time in paid work than those with higher educational attainment, but by 2016 this difference had disappeared. By contrast, changes in the educational difference in unpaid work time are more pronounced among men (husbands). In 1991, there was little difference in unpaid work time by the husband's education, but since then, the increase in unpaid work time has been relatively larger among the highly educated, gradually making the educational difference more apparent. Although it is difficult to identify a consistent trend in total work time, as of 2016, the gender gap in total work time is smaller among the highly educated couples than among their less educated counterparts.

The analysis thus far has described the overall trends in the average time-use patterns of married couples and educational differences therein. However, the analysis above does not fully take advantage of the characteristics of dyadic data. Therefore, the following analysis focuses on unpaid work time to calculate wife's share of couple's total unpaid work time. For example, if a couple's unpaid work time consists of 200 minutes by wife and 50 minutes by husband on a given day, wife's contribution is 200 / (200+50) = 0.8 (80%). Note that this statistical measure is not calculated from couple's average unpaid work time, but rather from the (weighted) average of the ratios of couple's unpaid work time from each diary.

Figure 3 shows wife's share of couples' unpaid work time, broken down by the educational attainment of each spouse. Two points should be noted here. First, regardless of the educational attainments of couples, wives overwhelmingly bear the vast majority of unpaid work. However, the second finding is that educational differences in wives' share of unpaid work are gradually emerging, albeit very slowly. For example, in 1991, wives in couples where wife's educational attainment was "high school/junior high school" performed 96.8% of unpaid work, whereas in couples where the wife's educational attainment was "university/junior college/college of technology" was 95.4%—virtually the same level. By 2016, however, wife's share of unpaid work was 93.0% for couples where wife's educational attainment is "high school/junior high school" and 89.5% for couples where the wife's educational attainment is "university/junior college/college of technology," indicating a slight decline in the share of unpaid work borne by highly educated wives.

Figure 4 shows the proportion of unpaid work performed by wives by educational pairings. The trends observed here are almost identical to those in Figure 3. First, in all survey years and all educational pairings, the proportion of unpaid work performed by wives did not fall below 85%, indicating that the majority of care work



Note: The categories of educational combinations of couples are defined as follows.
[Highly educated couples] Both spouses: "university/junior college/college of technology", [Educational hypogamy couples] Wife: "university/junior college/college of technology"; husband: "high school/junior high school", [Educational hypergamy couple] Wife: "high school/junior high school"; husband: "university/junior college/college of technology", [Less educated couple] Both spouses: "high school/junior high school"

Figure 4. Percentage of unpaid work time by wives in total couple's unpaid work time, by combination of educational attainments of both spouses

within the household is concentrated on wives. Second, the gender gaps between spouses vary by educational pairings. Specifically, the gaps rank in ascending order as follows: highly educated couples, educational hypogamy couples, educational hypergamy couples, and less educated couples. Moreover, compared with other educational pairings, highly educated couples recently show a clearer trend of declining wife's share of unpaid work. For example, between 1991 and 2016, the wife's share of unpaid work among less educated couples decreased only slightly from 96.2% to 92.5%, whereas among highly educated couples, it dropped more sharply from 94.1% to 86.8%.

V. Conclusion and discussion

This paper constructed dyadic data of married couples using anonymized data from the Survey on Time Use and Leisure Activities conducted from 1991 to 2016 and described trends in gender gaps in paid and unpaid work time between spouses. The findings can be summarized as follows.

The first finding is the stability of the traditional gender division of labor between spouses and its localized changes. The gender division of labor, characterized by husbands' longer hours of paid work and the concentration of unpaid work on wives, remained firmly in place throughout the 25-year observation period. Inaba (2011), who discussed changes in Japanese families based on the analysis of the National Family Research of Japan from 1998 to 2008, pointed to the stability of the gender division of labor in families consisting of married couples and their children. This paper, using time-use data, also reached a similar conclusion. On the other hand, as a localized change, there has been a very gradual narrowing trend in the gender gap in unpaid work time between spouses. This result is consistent with the analysis by Kan, et al. (2022) of the STULA, which also covered unmarried individuals. Even when limiting the analysis target to the married couples, the pace of narrowing in the gender gap in time allocation of unpaid work does not differ greatly.

The second finding is that highly educated couples may drive the narrowing of gender gap in time use. Specifically, when the combinations of spouses' educational attainments are considered, as shown in Figure 4, it

becomes clear that the share of unpaid work performed by wives has been decreased relatively faster among highly educated couples than among other couples. This pattern is consistent with the predictions of the gender revolution theory.

It is important to note the limitations of this study and the remaining issues. First, differences in spousal time use by the presence of children or life stage (the age of the youngest child) have not been taken account. Second, the spousal division of labor may differ by their employment status, particularly the wife's status (full-time employment, part-time employment, or not employed). Although this paper aimed at depicting overall changes in spousal time-use patterns over time, future research should deepen the analysis by classifying couples into subgroups based on the covariates mentioned above.

Despite these limitations, the findings of this paper can be summarized as follows: gender gap in time use among Japanese couples reflects a coexistence of reproduction (stability) and transformation. The gender role structure in which household unpaid work was heavily concentrated on women (wives) persisted strongly over the quarter-century from 1991 to 2016. On the other hand, there were signs of change: wives reduced their unpaid work time, while husbands devoted more time to unpaid work. Such changes were particularly pronounced among the highly educated. Whether to emphasize either of the two aspects of Japanese couples' time use—stability and change— is likely to be a point of debate among scholars. To the eyes of radical advocates seeking the swift achievement of gender equality, the findings of this analysis may appear as an "incomplete gender revolution" (Esping-Andersen 2009). Conversely, those who view slow but steady progress toward gender equality more positively may perceive in the spousal division of labor in the private sphere, something akin to the "quiet revolution" that Goldin (2006) described as the final stage of the historical transformation of women's careers in the United States. This paper does not adopt either position; rather, it underscores the importance of continuously monitoring gender disparities in the private sphere using time-use survey data. The STULA used in this paper is an extremely valuable public statistical survey, which is one of the largest-scale time use surveys in the world and has a long history. Looking ahead, such public statistics on time use are expected to play an even greater role in illuminating issues of gender inequality in the private sphere.

Additional remark: The anonymous data from the *Survey on Time Use and Leisure Activities* (MIC) was obtained from the National Statistics Center through the application for use in accordance with the Statistics Act. Assistance was provided by Dr. SHIRAKAWA Kiyomi (Rissho University) in filing the application. The analysis results presented here were independently prepared and processed by the author and differ from the official statistics compiled and published by the MIC.

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Notes

1. It should be noted that the author does not intend to claim that there is a lack of quantitative studies on gender disparities in the private sphere. In sociology, Blood and Wolfe's (1960) classic study on power relations between husband and wife is well known. In economics, the "collective model," proposed as an antithesis to the "unitary model" that treats the household as a single decision-making body, emphasizes unequal resource allocation within the household and intrahousehold bargaining power.
2. In recent years, research on the division of roles in same-sex or LGBTQ+ couples has also been conducted (e.g., van der Vleuten, Jaspers, and van der Lippe, 2021), but this paper focuses solely on heterosexual marital relationships.
3. For details on the survey design of the "NHK National Time Use Survey" and its history, see Sanya (2015).
4. In an experiment by Gershuny et al. (2020), 148 participants wore wearable cameras and wristbands. The collected image data and physical activity data (e.g., sleep data) were compared with diary data. The results demonstrated that the time-use diary data are reliable when compared with such objective data.
5. The idea that the imbalance in gender equality between the public and private spheres leads to low fertility has already been proposed by McDonald (2000) (although, as Fukuda (2023) points out, McDonald emphasizes gender equity rather than gender equality). Since then, numerous studies have been conducted to formulate and demonstrate the relationship between gender regimes and fertility

(Anderson and Kohler 2015; Castiglioni and Dalla Zuanna 2009; Goldscheider, Bernhardt, and Lappegård 2015).

6. For empirical research on temporal changes in the educational gradients in first marriage rates in Japan, see Fukuda, Raymo, and Yoda (2020) for details.
7. There were some cases where there was one "child" and one "child's spouse" in the household, and both were of the same sex. In such cases, dyadic data of married couples were not created for the child generation. Possible explanations include: (1) same-sex couples; (2) the household head has two married children, and both of the children live separately from their spouses (e.g., the household heads has two sons who live separately due to work, and only their wives live together in the household); and (3) data cleaning errors. However, Case (2) is considered extremely rare. As for the STULA, there is no relationship code for "grandchild's spouse," so marital relationships in the grandchild generation cannot be identified.
8. The number of couples by survey year (after listwise deletion) is as follows:
   1991: 29,094; 1996: 25,945; 2001: 14,497;
   2006: 12,653; 2011: 11,765; 2016: 10,734.
9. To deepen the understanding of gender differences in time use, other activity categories such as leisure time and sleep time are also important. However, due to space constraints, gender differences in these areas will be discussed in a separate paper.
10. In the Survey on Time Use and Leisure Activities, the two survey days assigned to respondents are not evenly distributed; most commonly, they include a Friday, Saturday, or Sunday (for details on the sample design, see Kurihara and Sakata 2014). Therefore, if data are aggregated without applying weekday weights, weekend time-use patterns are disproportionately reflected.

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