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A Cross-National Comparison of the Gender Gap in Time-Use: Reanalyzing Data from Japan and Six Western Countries*

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Abstract

A secondary analysis of comparable time-use data (arranged by the NHK Broadcasting Culture Research Institute; the survey dates vary from 1985 to 1990) from Japan, Canada, US, UK, Netherlands, Denmark, and Finland, is conducted by means of a new mathematical procedure to decompose time-use-by-sex arrays distinguishing between effects of marginal distribution and effects of equalization in lifestyle.

Let a and y denote unpaid housework time by women and by men respectively; x and b denote paid work time by women and by men. Let the marginals be denoted as follows: $F = a + x$; $M = b + y$; $T = F + M$; $U = a + y$. The index of sex-typed time-use, which is a variant of Yano Masakazu's *hubyoudou sisuu* [inequality scale], is defined as $d = T - 2(x + y)$. Because of the empirical constraint that women's and men's amount of labor (F and M) should balance with each other, d cannot exceed $C = T - 2|F - U|$; this C depends on the marginals and presents a structural constraint on individuals' option. The appropriate estimator of the prevalence of the gender-equal lifestyle is $E = (C - d)/C$, a coefficient standardized to be margin-free.

Finally a two-dimensional ($E \times C$) scatterplot of the seven countries is interpreted with the aid of a welfare state typology by Alan Siaroff (1994): (1) the gender equality in time-use (E) corresponds to the gender equality in the paid labor market; (2) in the Netherlands and in Japan the ceiling of sex-typed time-use (C) depends on the length of the standard paid working time, whereas among the other five countries, to which Siaroff referred as Protestant welfare states, C diverges according to the family welfare orientation.

Keywords: time budget, sexual division of labor, gender equality, comparative welfare state regime, maximum asymmetry

1 Introduction

1.1 The seven-country comparative research on gender differences in time-use

In the early 1990s, the NHK Broadcasting Culture Research Institute conducted comparative research on time-use data in Japan and Western countries. This research aimed at creating a data set to allow comparison for the seven countries in Table 1. This research analyzed differences in lifestyle among the countries in terms of the universal scale of time-use.

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This paper focuses on the research by Yano Masakazu [7: 156], who compared gender differences in time-use using this data. Yano mainly employed two indicators for the comparison: *inequality scale* (不平等指数) and *men's contribution to housework* (男性の家事協力度).

Yano's inequality scale determines differences in time spent respectively by men and women on eight categories of activities — necessary time, work and education, housework, travel, social participation and interaction, leisure activities, mass media, and relaxing. Yano's inequality scale D is defined as the sum of the absolute value of the sex difference of time-use for each category of activity,

$$D = \sum_{k=1}^8 |m_k - f_k|, \quad (1)$$

where m_k and f_k denote the time spent respectively by men and women for the activity k ($= 1, \dots, 8$). The inequality scale D indicates how much men and women's time-use patterns need to be moved to reach equality. Yano used this scale to measure how close each society was to reaching gender equality.

In Figure 1, the seven countries are plotted on Yano's inequality scale. Yano labeled Finland and Denmark as “relatively equal countries”, and Canada, the United States, and the United Kingdom as countries “in the middle”. In the Netherlands gender inequality in time-use was more substantial than the preceding countries. Inequality in Japan was even larger.

The other indicator used by Yano was men's contribution to housework. Which was defined as men's share of time for housework²⁾ of men and women in total. Based on comparison of this indicator, Yano found that men's contribution to housework in Japan was much lower than that in the Western countries.

1.2 Topics in this paper

In this paper we aim to continue Yano's research and to make methodological improvement. Yano's research method had two inadequacies.

First, the inequality scale was affected by the composition of time-use by activities. Since gender norms strongly differentiate the time spent on work and housework between men and women, great differences are brought between these two categories of activities. For the seven countries in Figure 1, 70–90 percent of the sex differences were produced by differences in work and housework [7: 156–157]. As a result, the inequality scale easily increases as the total hours of work and housework increase. The inequality scale is thus affected by the composition of time-use. We refer to these effects of the composition of time-use on the inequality scale as *compositional effects*.

We saw in Figure 1 that Finland and Denmark were close to gender equality. So why was the inequality for these countries low? Were they essentially equal because the sexual division of labor was weak? Or did compositional effects due to fewer hours of work and housework only lower the inequality? The first topic in this paper is, in order to answer questions like these, to clarify the influence of compositional effects and to create new indicators to distinguish between compositional effects and “essential” equalization.

Second, Yano’s use of the indicator of men’s contribution to housework also had a problem. Why was only men’s contribution to housework mentioned; why was women’s contribution to work not? According to the data for the seven countries, women’s time for work was rather long in Japan, accounting for more than 30 percent of the total work hours by both sexes (refer to Table 3). Women’s contribution to work in Japan was not much different from those of the Western countries. Nonetheless, Yano ignored women’s contribution to work and focused only men’s contribution to housework. This ferments the suspicion that Yano undeservedly displayed Japan’s degree of gender equality as lower by arbitrary selection of the indicator for comparison.

We will see that there are good reasons for measuring inequality with men’s contribution to housework, not with women’s contribution to work. This fact will become apparent as part of consideration of compositional effects relating to the inequality scale. This is the second topic in this paper.

Third, we will consider background factors causing gender differences in time-use. Using the argument of Siaroff [5], who developed welfare state typology with a focus on gender, we will make an explanation for lifestyles of men and women in each country and for institutional conditions that support such lifestyles.

2 The scale of sex-typed time-use

Yano’s inequality scale was originally calculated with eight major categories of activities. However, as we mentioned above, gender differences in time-use for two categories, “work” and “housework”, account for a major portion of gender inequality on Yano’s scale. Use of time based on sex roles—men for work, women for housework—is the major component of gender inequality. So we must focus on it to ascertain inequality.

We will accordingly modify the inequality scale to measure gender differences in work and housework. We write a 2×2 time-use-by-sex array as Table 2, with the two categories of sex (men and women) and the two categories of activities in focus here (work and housework). For mathematical formulation, we will use the symbols presented in Table 2, including symbols indicating the *marginals* such as the total time for men and women and the total time for work and housework.

Table 3 indicates the amount of time (in minutes) per week of women/men for housework/work³⁾ and the marginals calculated from them.

We are interested in the sexual division of labor, so try to measure the extent to which the use of time is concentrated in men’s work and women’s housework. For this purpose, we define a new scale of *sex-typed time-use* as

$$d = (a - y) + (b - x) = (a + b) - (x + y) = T - 2(x + y) . \quad (2)$$

This is an index totaling gender differences in the time spent on work and housework. This is a variant of Yano’s inequality scale (Equation 1). However, we simply total the difference without using absolute values. Our new scale thereby demonstrates the difference between time used in line with sex roles ($a + b$) and that used contrary to sex roles ($x + y$). If men and women spend the same

amount of time doing work and housework, d will be zero. It increases in accordance with men's time for housework and women's time for work decreasing.

Figure 2 displays the seven countries on the scale of sex-typed time-use. The arrangement of the countries on the scale is similar to that on Figure 1, although the scale is reduced in Figure 2. This is a natural result since gender differences in work and housework are the major component of Yano's inequality scale, as we mentioned in Section 1.2. Finland and Denmark have a small amount of sex-typed time-use; they will reach full equality with changes of about 22 hours per week. The United Kingdom, Canada, and the United States retain gender differences about 33 hours per week and are located in the middle of the seven countries. The Netherlands has more substantial inequality than the other countries with gender differences of about 41 hours per week. Japan has even more inequality with gender differences of about 53 hours per week.

3 Maximum asymmetry constraints

When men and women use time for work and housework with full equality, sex-typed time-use d will be zero. This provides a benchmark on one side to measure inequality. On the other side, we must give some considerations of what the maximum is.

In theory, when work and housework are distributed completely in accordance with sex roles, d is at its maximum. If all work is allotted to men while all housework is allotted to women ($x = y = 0$), sex-typed time-use d reaches its maximum T and cannot rise further. Thus the theoretical maximum for d is equal to T , the total time of housework and work.

However, there is another practical constraint for sex-typed time-use. This is the fact that the distribution allotting all of the work to men and all of the housework to women is actually difficult. As an example, imagine, in contrast to heavily reduced housework requiring 35 hours per week, the standard working hours are 70 hours per week. If all housework is allotted to women and all work to men, women will devote only a half of the hours of men's labor. As the spread of home electrical appliances and growth of market services are taking the place of housework, a society faithfully following sex roles must hold such imbalance between women's and men's labor. But there is no such overtly unequal society in actuality. If the load of housework is reduced, there will emerge surplus time for women, so they will migrate into work [Sechiyama: 8: 69]. Indeed, each country in Table 3 has the total time of work and housework balanced between men and women; there is only a difference of 40 minutes per day at most.

We can say, using the symbols in Table 2, even if the total times for housework (U) and work (P) vary, the total times of labor for men (M) and women (F) do not vary correspondingly. The balance between M and F must invariably be maintained; the hours of labor for men and women are distributed only within that constraint. In other words, marginals for the time-use-by-sex array are fixed.

Suppose that as much housework as possible is distributed to women while as much work as possible is distributed to men, under fixed marginals of the time-use-by-sex array. Then the array achieves *maximum asymmetry* [Tanaka: 11: 21], which is a special case of "maximum association" for general cross-tables under fixed marginal distributions [Yasuda + Umino: 1: 20].

Even with fixed marginals, when the condition $F - U = M - P = 0$ happens to be satisfied, a fully sex-typed time-use is possible; female labor can be all allocated to housework and male labor can be all allocated to work. In that case, women's time for work (x) and men's time for housework (y) are both zero and the scale of sex-typed time-use (d) is heightened to the theoretical maximum T . Otherwise, however, surplus time will still appear even if labor of men and women is allocated as unequally as possible. Even at maximum asymmetry, surplus time of $|F-U|$ inflows into work by women (x) or housework by men (y), resulting $x + y = |F-U|$. Substituting this for Equation (2), we obtain the practical maximum for sex-typed time-use,

$$C = T - 2|F - U| = T - 2|M - P|, \quad (3)$$

to which we refer as the *ceiling* of sex-typed time-use. Note that $F-U = P-M$; we can therefore use either $|F-U|$ or $|M-P|$ compatibly.

According to the sign of $F-U$, Equation (3) can be divided into three cases:

$$C = \begin{cases} 2U + M - F & (\text{if } F > U) \\ T & (\text{if } F = U) \\ 2P + F - M & (\text{if } F < U) \end{cases} \quad (4)$$

Suppose the hours of labor for women and men to be proportional: $F = M = T/2$. This implies $2(F-U) = P-U$, so the sign of $F-U$ matches the sign of $P-U$. Therefore Equation (4) yields $C = 2U$ (if $P > U$), or $C = 2P$ (if $P < U$). Broadly speaking, the ceiling of sex-typed time-use is determined by the smaller value of either the time for work or the time for housework.

4 Anti-sex-typed time-use

The scale of sex-typed time-use defined in section 2 can be used to measure the distance from complete gender equality. Conversely, measuring the distance from maximum asymmetry is also possible. This is measuring how smaller the sex-typed time-use d is than its ceiling C . Thus we obtain another scale of gender equality, the scale of *anti-sex-typed time-use*:

$$e = C - d = 2(x + y - |F - U|). \quad (5)$$

We saw in Equation (2) that, as female work x or male housework y increases, sex-typed time-use d decreases. Such decrease can include a "forced" decrease due to the unbalance in the marginal distribution. Subtracting this unbalanced portion $|F-U|$ from $x + y$ tells us how distant the society is from maximum asymmetry.

Figure 3 shows sex-typed and anti-sex-typed time-use for each country. The gray area of the bar chart indicates sex-typed time-use while the white area indicates anti-sex-typed time-use. The total of them (i.e., the width of each bar) gives the ceiling of sex-typed time-use C . The seven countries are arranged in descending order of the amount of anti-sex-typed time-use.

Figure 3 gives a different impression from Figure 2. Finland and Denmark, which had a small amount of sex-typed time-use, is not high on the scale of anti-sex-typed time-use— respectively at

3276 minutes (about 55 hours) and 2744 minutes (about 46 hours). On the other hand, the United Kingdom has the largest amount of anti-sex-typed time-use (3556 minutes) followed by the United States (3472 minutes). Men and women in these two countries are deviating from the principle of the sexual division of labor at close to 60 hours per week.

As is apparent from Figure 3, anti-sex-typed time-use e is not simply a reverse of sex-typed time-use d . In some countries e and d are both low, while in other countries they are both high. This is owing to the difference in the ceiling of sex-typed time-use C , which provides a practical maximum for the scales. Of the seven countries, Denmark has a small C after Japan at 4109 minutes per week. On the other hand, the United Kingdom has the largest C at 5509 minutes, which is 1.34 times that for Denmark. In a country like Denmark, the distance between equality and maximum asymmetry is not great, so the two scales can both be small. On the other hand, in the United Kingdom and the United States where equality and maximum asymmetry are distant, even if there is a great amount of anti-sex-typed time-use, the amount of sex-typed time-use can also remain large.

As discussed in section 3, the ceiling of sex-typed time-use is approximately equal to twice the smaller of work or housework time. Based on Table 3, in countries besides the Netherlands the time for housework is less than the time for work. Therefore, for these countries, the width of the bar in Figure 3 is about twice the time for housework (for the Netherlands, it is about twice the time for work). For instance, between the United Kingdom and Denmark, there is a substantial difference in the width of the bar in Figure 3 because they hold different housework time.

However, anti-sex-typed time-use for the Netherlands is 2240 minutes (about 37 hours); that for Japan is 868 minutes (about 14 hours). For these countries, the relative positions on the scale e are not changed from those on the scale d .

5 Coefficient of gender equality and its meaning

5.1 Coefficient of gender equality

The scales of sex-typed and anti-sex-typed time-use both include the compositional effects (see Section 1.2). The practical range for the scales is determined by the ceiling of sex-typed time-use. Eliminating the compositional effects, we create a new coefficient to indicate a position between complete equality and maximum asymmetry. Divide the anti-sex-typed time-use by the ceiling, and obtain

$$E = \frac{e}{C} = \frac{2(x + y - |F - U|)}{T - 2|F - U|}, \quad (6)$$

to which we refer as the *coefficient of gender equality*⁴⁾. This coefficient is zero with maximum asymmetry and is one with full equality. It is thus standardized so that the range of variation is constant. It can therefore be regarded as measuring the strength of the sexual division of labor, independently of the compositional effects.

Figure 4 displays the coefficient of gender equality for the seven countries. The clear clusters we found with sex-typed time-use (Figure 2) disappear. The five countries besides Japan and the

Netherlands are clustered together mostly from 0.6 to 0.7. In particular, Denmark and the United Kingdom, between which there was quite a difference in the amount of sex-typed time-use, are quite close, so there is almost no difference.

When looking in far more detail, there is a difference in the coefficient of gender equality between Finland and Canada on the order of 0.11. Thus, even among these five countries there is truly a variation from a relatively equal country to a relatively unequal country. But there is no clear clusters exist as found in Yano's research with the inequality scale.

5.2 Men's contribution to housework and coefficient of gender equality

In data for the seven countries (Table 3), there are only small differences in total time for work and housework between men and women. Thus, we have approximately $F = M = T/2$. Therefore approximately $F - U = (P - U)/2 = x - y$. Combining this and Equation (6), we obtain a simple approximation: if $F > U$ then $E = 2y/U$, or if $F < U$ then $E = 2x/P$. As per Table 3, in the six countries besides the Netherlands, $F > U$, so $2y/U$ gives an approximation of the coefficient of gender equality.

This $2y/U$ is nothing more than Yano's "men's contribution to housework" [7: 159–161] doubled. In the six countries besides the Netherlands, men's contribution to housework provides a simple approximation for the coefficient of gender equality. With regard to these countries, we can speak of Yano's determination using this index as employing an appropriate measure.

For the Netherlands, however, men's contribution to housework was not an appropriate approximation for the coefficient of gender equality. This is because in the Netherlands the time for housework surpassed women's total time ($F < U$). Accordingly we must focus on women's contribution to work x/P , instead of men's contribution to housework y/U .

6 Discussion

6.1 Institutional conditions and lifestyles

In comparative research on gender differences in time-use, you must make a distinction between two factors: (1) compositional effects that are brought by increase or decrease of times for work and housework, and (2) the extent of equalization of distribution of work and housework between men and women. The former is expressed by the ceiling of sex-typed time-use C (Equation 3), while the latter is expressed by the coefficient of gender equality E (Equation 6). Use in combination with C and E leads us to a comprehensive view of the gender differences in time-use in a society. As simple approximations, the time for housework and men's contribution to housework can be used in countries where the time for work is greater than the time for housework, while the time for work and women's contribution to work can be used in countries where the time for housework is greater (Section 5.2).

In each society, the maximum asymmetry is prescribed by such institutional conditions as the demands for work/housework and the extent to which resources to save labor are available. The possible choices for the individual are provided depending on these conditions.

The coefficient of gender equality is given by an accumulation of what individuals chosen from possible choices. For example, a married couple under given institutional conditions can adopt a lifestyle respecting sex roles to the extent possible or conversely adopt a lifestyle with reversed sex roles to the extent possible. The coefficient of gender equality demonstrates what sort of lifestyle most people are adopting on average.

Using these two indicators, we plot the seven countries on a C - E coordinate plane in Figure 5. This figure has the coefficient of gender equality as the horizontal axis and the ceiling of sex-typed time-use as the vertical axis.

The five countries of the United Kingdom, the United States, Canada, Finland, and Denmark are clustered with a coefficient of gender equality (E) on the order of 0.6–0.7, but there is a variation with the ceiling of sex-typed time-use (C). The Netherlands has a lower E than these countries, with a moderate value of C . Japan has low values for both of the indicators and is positioned in the bottom left.

6.2 Types of welfare states and equality between the sexes

What does differentiate the countries? Of course, only a disparity in time-use is apparent with the data we examined, so there is no certainty of being able to strictly identify the causes of the disparity. Here, the author will speak hypothetically about what can be said with a key of Siaroff's welfare state typology [5]. This is research that constructed types of institutions and policies of welfare states from the perspective of gender equality using data from 23 OECD countries. These 23 countries include all of the seven countries cited in this paper. In addition, the data produced is from the 1980s, so it temporally overlaps the data in this paper as well. Thus, Siaroff's research provides a useful basis for the positioning of our results in a broader context.

Siaroff reduced the data for the 23 countries to two dimensions. The first dimension reflected the female-to-male ratio of the expected rewards for paid work, called "female work desirability"⁵⁾. The second reflected the extent to which family welfare policies had expanded, called "family welfare orientation"⁶⁾. After distributing the 23 countries into four clusters with the assortment of the highs and lows of these two dimensions, Siaroff sought conditions common to all of the countries in each cluster. Siaroff finally characterized the four clusters by the three conditions of religion, political system, and experience with female political mobilization.

- Protestant social democratic states: Female work desirability and family welfare orientation are both high (Nordic states)
- Protestant liberal states: Female work desirability is high but family welfare orientation is low (Anglo-Saxon states)
- Advanced⁷⁾ Christian democratic states: Female work desirability is low but family welfare orientation is high (central European states)
- Late female mobilization⁸⁾ states: Female work desirability and family welfare orientation are both low (Greece, Ireland, Italy, Japan, Portugal, Spain, and Switzerland)

Can Siaroff's types, which are based on such political and institutional factors as the labor market conditions and use of the national budget, explain gender differences in time-use among the

seven countries? Figure 5 also includes both the two-dimensional scores used by Siaroff and the types finally obtained. Discussion can proceed based on these data.

First, we investigate the coefficient of gender equality on the horizontal axis. For all of the five countries where the coefficient of gender equality exceeds 0.6, the female work desirability is greater than 55; that is, the gender disparity in paid work is relatively small. However, the Netherlands and Japan, where the coefficient of gender equality is low, have low female work desirability respectively at 34 and 30. Equality in time-use thus corresponds to equality in the labor market. This can be understood with an economic model [Blau + Ferber + Winkler: 4: 214] where sex disparity in the labor market is a major factor causing the sexual division of labor in household. If the positions of men and women in the labor market are equalized, a gender-equal lifestyle can easily spread in household as well. In contrast, if the disparity in the labor market is substantial, adoption of a lifestyle in line with the sexual division of labor is rational; so equalization in household will not proceed.

Next, what about the ceiling of sex-typed time-use on the vertical axis? With regard to the five countries where the coefficient of gender equality is high, there is a corresponding relationship between the ceiling of sex-typed time-use and Siaroff's family welfare orientation. The United Kingdom, the United States, and Canada, where the family welfare orientation is low, are at the top, while Finland and Denmark, where the family welfare orientation is high, are at the bottom. We can interpret these results in accordance with Siaroff's typology. In Protestant social democratic states, expanded family welfare measures reduce the load of housework in household. In fact, when returning to Table 3, the time for housework for men and women in total in Finland and Denmark is less than 2400 minutes a week (i.e., less than 20 hours per person), and is relatively small. In contrast, in Protestant liberal states the load of housework is substantial because family welfare measures are kept to a minimum. In terms of the lifestyle that people adopt, all of these five countries have achieved a high level of gender equality. But there is quite a difference in the ceiling of sex-typed time-use depending on differences in welfare policies. As a result, relatively large gender differences in time-use remain in the liberal states; in contrast, the social democratic states are closer to equality (Figure 1).

However, this simple explanation does not hold with regard to the ceiling of sex-typed time-use for the Netherlands and Japan. The Netherlands occupies a mid-range position with regard to family welfare orientation and the ceiling of sex-typed time-use is also in the middle. Thus at a glance this gives the impression that there is a clear corresponding relationship. However, as Siaroff stated, in advanced Christian democratic states including the Netherlands, there is a strong norm to emphasize family, so family welfare measures are not having an effect of reducing housework in household [5: 96]. In fact, the time for housework for the Netherlands is 2912 minutes a week (Table 3), the highest of the seven countries. One thus cannot say that housework is being reduced by family welfare measures. Moreover, when turning to Japan, the fact that family welfare orientation and the ceiling of sex-typed time-use do not correspond is even clearer. Japan's family welfare orientation is extremely low and is the lowest of the 23 countries analyzed by Siaroff [5: 92]. Nonetheless, compared to Protestant liberal states where family welfare measures are similarly not expanding, Japan's ceiling of sex-typed time-use is quite small. That is, the Netherlands and Japan constitute exceptions for the simple explanation where reduction in the

ceiling of sex-typed time-use will occur only if the growth in family welfare reduces the load of housework. We must find another explanation.

6.3 Time for work and the ceiling of sex-typed time-use

The key to unraveling the mystery is in the time for work. When looking closely at Table 3, it is apparent that time of labor for the Netherlands and Japan are poles apart. The Netherlands has the greatest time for housework of the seven countries although the time for work is conversely the smallest of the seven countries; and the total time for work and housework is also the smallest. In contrast, Japan has a small time for housework after Denmark although the time for work is the greatest of the seven countries; and the total time for work and housework is also the greatest.

The time for housework for the Netherlands is certainly long. However, the time for work is instead extremely short.⁹⁾ It is the only country among the seven countries with a time for work that is less than the time for housework. In the other countries, the time for housework is short, so female labor flows into work. Conversely, in the Netherlands, the time for work is short, so male labor flows into housework. Remember our consideration in Section 3 that, if the time for work is short, what prescribes the ceiling of sex-typed time-use is not the time for housework but the time for work. In the Netherlands, in spite of the heavy load for housework, the distance to gender equality can be reduced by the broad reduction of the load for work.

On the other hand, the time for housework is short in Japan. As described in Section 6.2, this is not due to government family welfare measures. Regardless of meager family welfare measures, the load of housework in Japan is reduced. Housework is probably being reduced by means like rationalization, laborsaving, and outsourcing.

This may be related to the fact that Japan's time for paid work is extremely long. One can easily imagine the great need to reduce the load of housework because of the heavy load of paid work. Japanese people have made efforts to meet demands for paid work with tenuous support through family welfare. They have reduced housework without recourse to the government.

Anyway, the ceiling of sex-typed time-use is at the same extent respectively for Netherlands-Finland and Japan-Denmark. In terms of compositional effects, the Netherlands and Japan have provided conditions that can surely achieve the same extent of equality as Finland and Denmark. Nonetheless, there is the substantial inequality in these countries, entirely due to the essentially minimal deviation from the principle of the sexual division of labor—due to the slight participation in work by women in the Netherlands¹⁰⁾, and due to the slight participation in housework by men in Japan.

Notes

1) The age range of survey subjects was originally varied among the countries. This was adjusted to ages 20–59 for comparison. The Western data were drawn from the Multinational Longitudinal Time Budget Archive (MLTBA). Today these data are archived by the Multinational Time Use Study (MTUS) project; see the MTUS website (<http://www.iser.essex.ac.uk/mtus/>) and Gershuny et al [13]. The Japanese data, originally from a 1990 survey by NHK [3], had recorded simultaneous activities respectively, which differed from survey methods used in the Western countries. To make the Japanese data comparable with the Western ones, recoding was conducted [6: 11].

- 2) In actuality, this analysis was based not on the entire time for housework, but on the time for each subcategory of housework [Yano: 7: 159–161].
- 3) Yano used the total time for “work” and “education”. In this paper, we use the time for “work” only, which we obtained through subtracting the time for “education”. Although NHK [6: 77] wrote the time for “work” in a day for Japanese women as 3 hours and 19 minutes, the correct time was 3 hours and 49 minutes (in e-mail from Yano Masakazu on 2000-10-16).
- 4) The coefficient of gender equality E resembles the “coefficient of openness” [2: 18] proposed by Yasuda for research of social mobility: $Y = (x + y - |F - U|) / (PF / T + UM / T - |F - U|)$. These coefficients both yield zero with maximum asymmetry under a given marginal distribution. However, the difference is that E yields one when the time of work/housework is exactly equal for men and women; in contrast, Y yields one at the independency under a given marginal distribution. If $F = M$ then $E = Y$. But the gap between the two will appear if the difference between F and M is large. In the data for the seven countries, approximately $F = M$ for all countries; the gap between E and Y is 0.006 at most. Even if we use Y instead of E , the distribution of the seven countries does not change much from that in Figure 4. See Tanaka [12: 14–27] for examples using the coefficient of openness Y as a measure of the sexual division of labor.
- 5) *Female work desirability* was defined as the product of the following two indexes: (1) the average (with a weight of 1:4) between the male-to-female ratio of unemployment rate and the female-to-male ratio of employment rate (for the population aged 15–64); (2) the average (with a weight of 2:1:1) for the three female-to-male ratios of industrial wage ratios, of the number of college and university students, and of the number of managerial workers [5: 83–90, 100]. Although the original index was in a range of zero to one, we make it multiplied by 100 to standardize the range into 0–100.
- 6) *Family welfare orientation* was defined as the average of the following four items (all evaluated in a five-point scale): social security spending, family welfare spending (in share of GDP), public childcare program, and maternal/childcare leave [5: 90–92, 100]. The final score was in a range of one to five and the value increases as with expanded welfare policies. We make it subtracted by 1 and then multiplied by 25 to standardize the range into 0–100.
- 7) The word “advanced” here means developed economically [5: 96].
- 8) The criterion was women’s suffrage to have been acquired after 1945 [5: 98].
- 9) This trend has gained further strength today due to the policies to promote part-time employment after the 1990s [Visser + Hemerijck: 10: 43].
- 10) The high rate of female part-time workers in the Netherlands is well known. In 1985, when the employment rate for women was 42%, more than half of employed women had working hours of less than 35 hours a week [9: 194].

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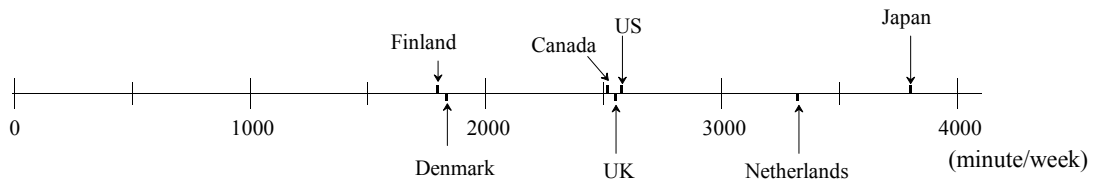
Table 1. Outline of the seven-country data

Country	Survey date	Survey method	Data source
Japan	1990 Oct.	Time diary	Survey by NHK
Canada	1986 Oct.–Nov.	Telephone survey	MLTBA
US*	1985 Jan.–June	Time diary	MLTBA
UK	1987 July	Time diary	MLTBA
Netherlands	1985 Jan.–Dec.	Time diary	MLTBA
Denmark	1987 Feb.	Telephone survey	MLTBA
Finland	1987 Jan.–Dec.	Time diary	MLTBA

NHK [6: 12]. Ages were adjusted to the range of 20–59.

*: Survey of cities with a population of 750,000 or more.

MLTBA: Multinational Longitudinal Time Budget Archive. See Note (1).



Calculated from Yano [7: 156].

Figure 1. Distribution of the countries on Yano's inequality scale

Table 2. Time-use-by-sex array

	Housework	Work	Total
Women	a	x	F
Men	y	b	M
Total	U	P	T

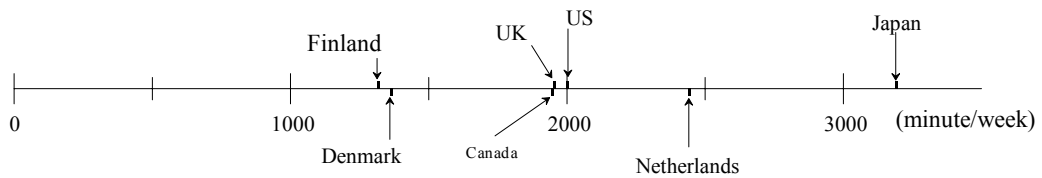
$$F = a + x, \quad U = a + y, \quad M = b + y, \quad P = b + x,$$

$$T = F + M = U + P = a + b + x + y.$$

Table 3. Women's and men's time for housework and work (minute/week)

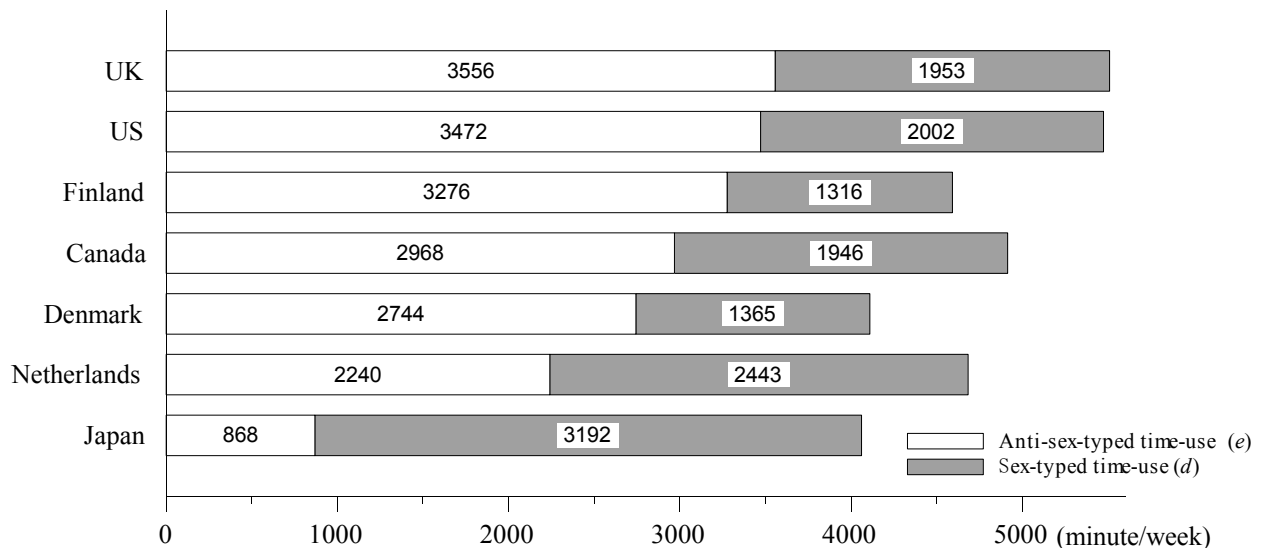
Country	Housework		Work		House-work (U)	Work (P)	Total (T)	Women (F)	Men (M)
	Women (a)	Men (y)	Women (x)	Men (b)					
Japan	1967	217	1603	3045	2184	4648	6832	3570	3262
Canada	1743	742	1344	2289	2485	3633	6118	3087	3031
US	1806	868	1351	2415	2674	3766	6440	3157	3283
UK	1897	889	966	1911	2786	2877	5663	2863	2800
Netherlands	2051	861	560	1813	2912	2373	5285	2611	2674
Denmark	1337	686	1414	2128	2023	3542	5565	2751	2814
Finland	1519	819	1484	2100	2338	3584	5922	3003	2919

Minutes for average day in the week [NHK: 6: 76–77] multiplied by 7. See Table 1 and Note (3).



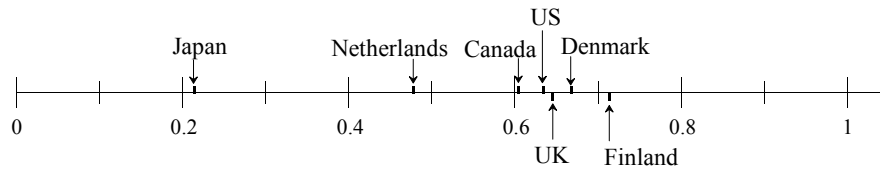
Calculated from Table 3 and Equation (2).
The precise values are in Figure 3.

Figure 2. Distribution of the countries on the scale of sex-typed time-use



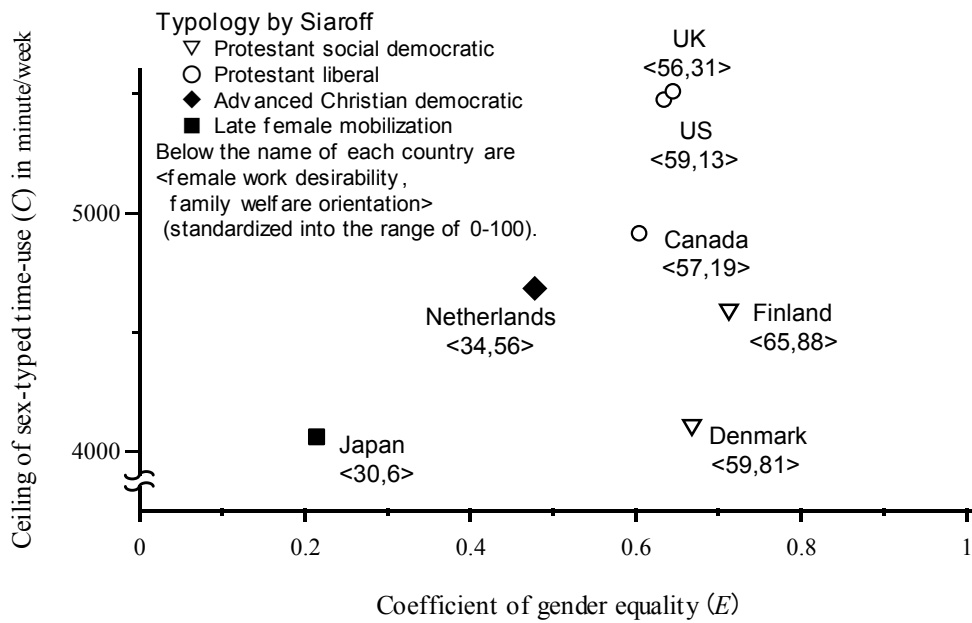
Calculated from Table 3 and Equations (2) (5).

Figure 3. Sex-typed and anti-sex-typed time-use



Calculated from Table 3 and Equation (6).

Figure 4. Distribution of the countries by the coefficient of gender equality



See Notes (5) (6), Equations (3) (6), and Siaroff [5: 89–98].

Figure 5. Types of welfare states, the coefficient of gender equality, and the ceiling of sex-typed time-use