Changing Times of Women

— Another Look at Opportunity Costs of Unpaid Work through an Activity Rates Approach —*

FUJIWARA Masago

Contents

Summary

Activity rates in a single day have been relatively neglected data in time use studies. I have been focusing mainly on developing methods for analyzing them. In this paper, I apply my "activity rates approach" to the discussion of evaluation of unpaid work. Through my approach, I am going to point out some findings and problems concerning the opportunity cost assessment as one of methods for evaluation of unpaid work.

1. Introduction

The rising concern for evaluation of unpaid works starts from the time when the Fourth World Conference on Women held in Beijing presented its report in 1995 (United Nations 1995). The report recognized that women play a critical role in the family, and that women make a great con-

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tribution to the welfare of the family and to the development of society, which is still not recognized or considered in its full importance. Based on this recognition, the report recommends to assess and accurately reflect the total value of unremunerated work in satellite or other official accounts that are separate from, but consistent with, core national accounts. It is in this context that the importance of time-use statistics was highlighted in the conference, because no other statistics other than time use research can provide us with the hours of unremunerated work. Time-use statistics by themselves were expected to be more sensitive than before to the differences between women and men in remunerated and unremunerated work.

Prior to the report of the World Conference of Women in Beijing, various attempts have already been made for designing methods for assessing the total value of unpaid work in satellite accounts by time use researchers and economists. To date, while actually hours of unpaid work can be measured with some precision, there is no agreement on unique market wage rate that should be used to value these hours. The choice of the method for deterring wage rate has a significant bearing on the valuation.

There are several options available for the choice of an imputed market wage.[1] These can be grouped into two categories depending on their underlying assumption, namely opportunity cost approach and market replacement cost approach. The premise of the replacement cost method is that the time spent on unpaid activities can be valued at the hourly earnings of individuals who are engaged in similar activities in the market sector. The assumption behind this approach is that households save money by deciding to perform the activity themselves. The amount they save, hence the value to the household of doing the work, is the cost of purchasing the same services in the market or hiring someone else to perform the activity. This approach is further divided into two subcategories, specialist cost method and generalist (house keeper) cost method, depending on which services the household purchases.

In the opportunity cost method, paid market work and unpaid household work trade off against one another. The assumption is that time spent in one sector is seen to be at the expense of time spent in the other. The opportunity cost method to evaluate unpaid work is based on the premise that when an individual engages in unpaid work, paid work is foregone. As

is shown in the beginning of this paper, it is this opportunity cost approach that we are going to examine from the perspective of activity rate approach.

2. Analytical frame of reference

Let me describe a common personal history of women to begin with.

Single working women have ample time at their disposal. They can devote their considerable time to paid work. But, when they get married and choose to keep on working, they are forced to increase the time of unpaid work and decrease the time of paid work. And then, when married working women have to quit their jobs, namely, when they become full time wives, they come to accept much more unpaid work than before.

In any case, women have to sacrifice paid work time for unpaid work. It suggests to us that their opportunity costs of unpaid work can be assessed by the amount of paid work time that they have to give up. The opportunity cost of unpaid work can be considered to be the value that the same time would have produced in its best alternative use, namely, paid work.

My activity rates approach is such a method that sets down the changing periods of time of women in our analysis precisely and faithfully as they occur. We can expect some findings regarding the opportunity cost of unpaid work through my approach. Following my personal history of women, I set an analytical frame of reference, shown in Figure 1. We make use of three sheets of women activity rates data (single working women, married working women, and full time wives), and apply the activity rates approach to them. As is clear in the common history of

Figure 1　Analytical Frame of Reference — More Unpaid Work results less paid work —
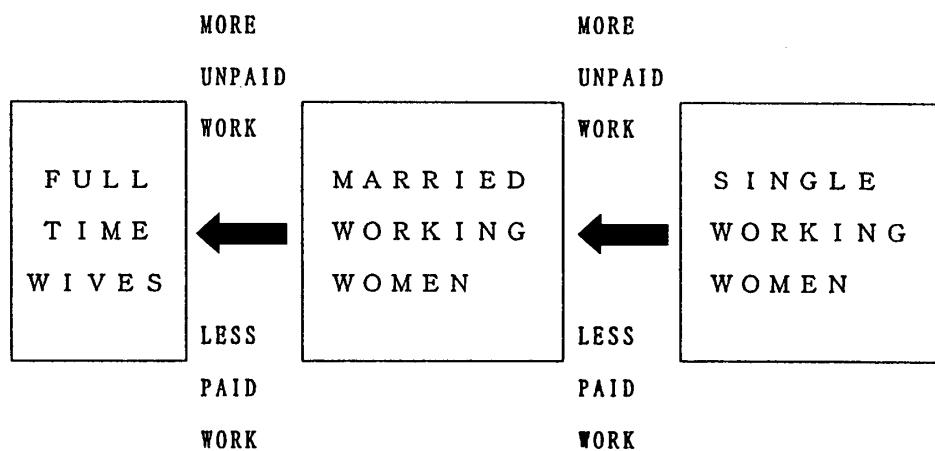
women shown above, as they pass from single working women through married working women to fulltime wives, they come to have less paid work and more unpaid work than the previous stage. My analysis will, of course, focus on the relation between paid and unpaid work,

    a.   from single working women to married working women,

    b.   from married working women to full time wives, and

    c.   from single working women to full time wives.

In the activity rates approach, we use (1) a matrix of activity rates of a single day and (2) letter graphs as a tool for analysis.

We use three kinds of matrices data, namely, single working women, married working women, and full time wives. The source is a 1996 survey on time and leisure activities by the Statistics Bureau of Japan.

3. Analytical procedures

In Figure 2, I show a matrix data of married working women and its letter graph as an example. The matrix has shape of 48 rows and 20 columns. The rows correspond to 48 thirty minutes time slots of a day, and the columns are 20 kinds of activities. The matrix is converted to a letter graph, as is shown in the right-hand of Figure 2. Take the last time slot as an example, the letter 'S' is typed 76 times to show the activity rate of 76%. As for the other activities, they are given symbols such as P, J, H, T, R, L, and O, each respectively representing the kind of activity. They are typed according to each activity rate shown. Each symbol shows that 2% of people is engaged in the activity for 30 minutes. This means that one letter is 0.6 minutes of average duration of activity per person of a day, through multiplying 2% by 30 minutes, and dividing it by 100%.

Let's look at Figure 3. The left-hand letter graph is the weekday time structure of married working women. The right-hand letter graph is that of full time house wives. At the bottom of the margin, we can see some notes. The symbol "J" means paid work. On the other hand, several activities of unpaid work are shown as follows. "H" is house keeping, "N" is nursing, "C" is child care, "B" is shopping, and "A" is social activities.

At the bottom margin of Figure 4, I make some rules for converting activities to symbols. This is made because we want to see the relative size of paid and unpaid work in time structures. I put "$" symbol on paid work.

Figure 2　Shape of Data and their Convert to Letter Graph
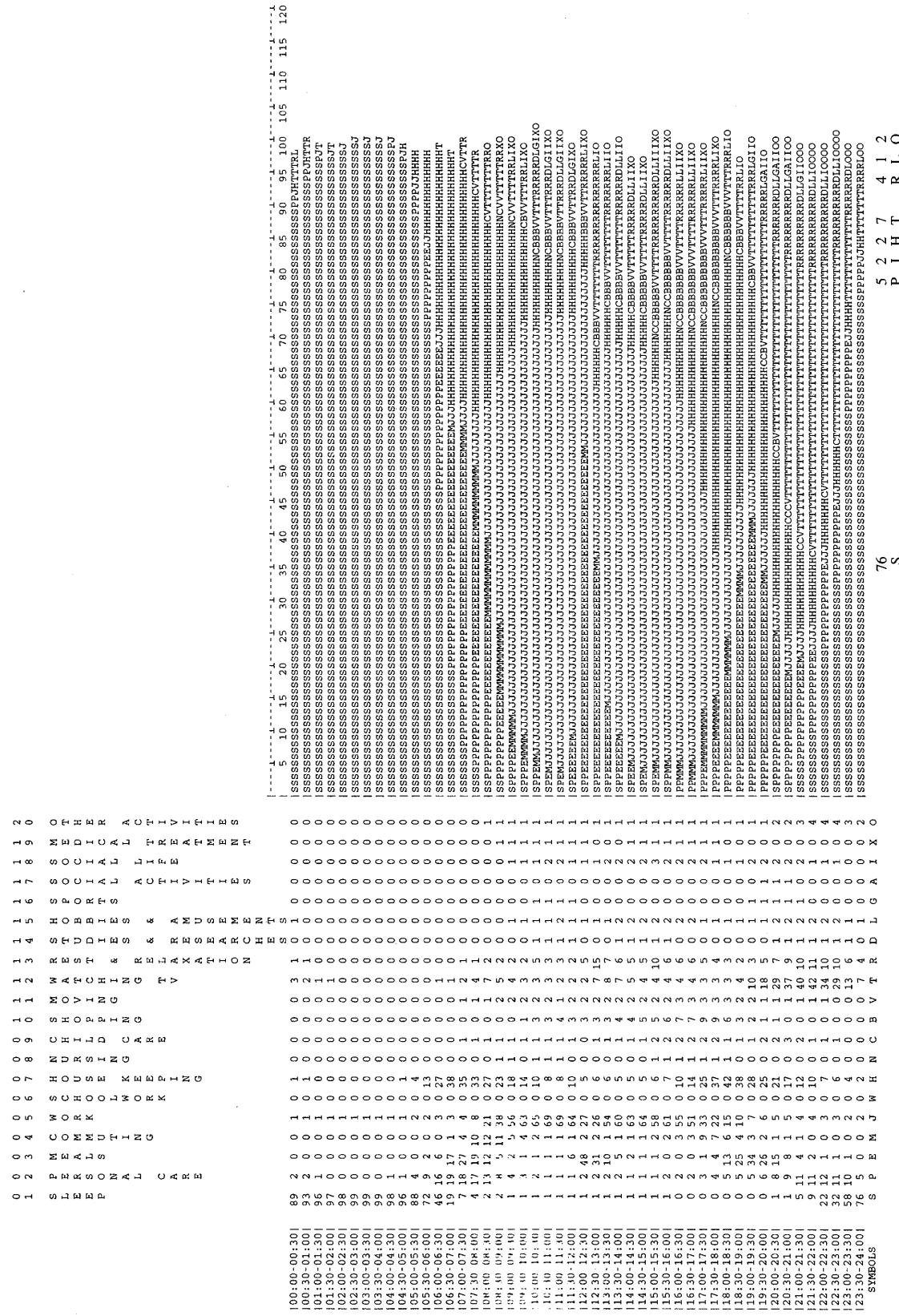
Figure 3 Time structure — Streams of activities —

Time structure of week day
of married working women

Time structure of week day
of full time wives

J : Work
H : House keeping
N : Nursing
C : Child care
B : Shopping
A : Social activities

—— Paid work
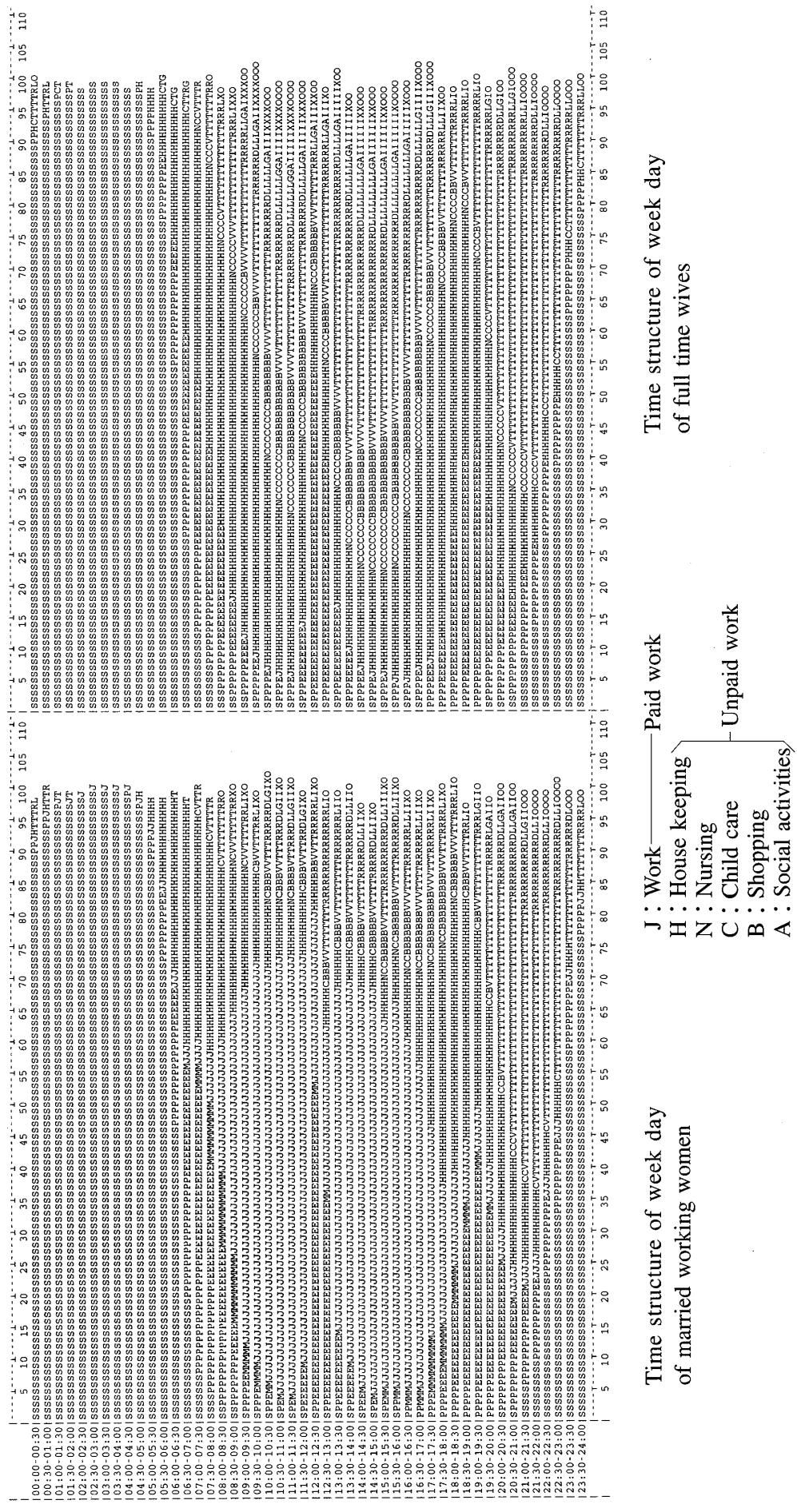
—— Unpaid work

Figure 4 Paid and Unpaid work in Time Structure

Time structure of week day
of married working women

Time structure of week day
of full time wives

Convert of letters to another symbol

J : Work ⎱
H : House keeping ⎰ Paid work ⟹ $
N : Nursing
C : Child care ⎱
B : Shopping ⎰ Unpaid work ⟹ ☐
A : Social activities ⎰
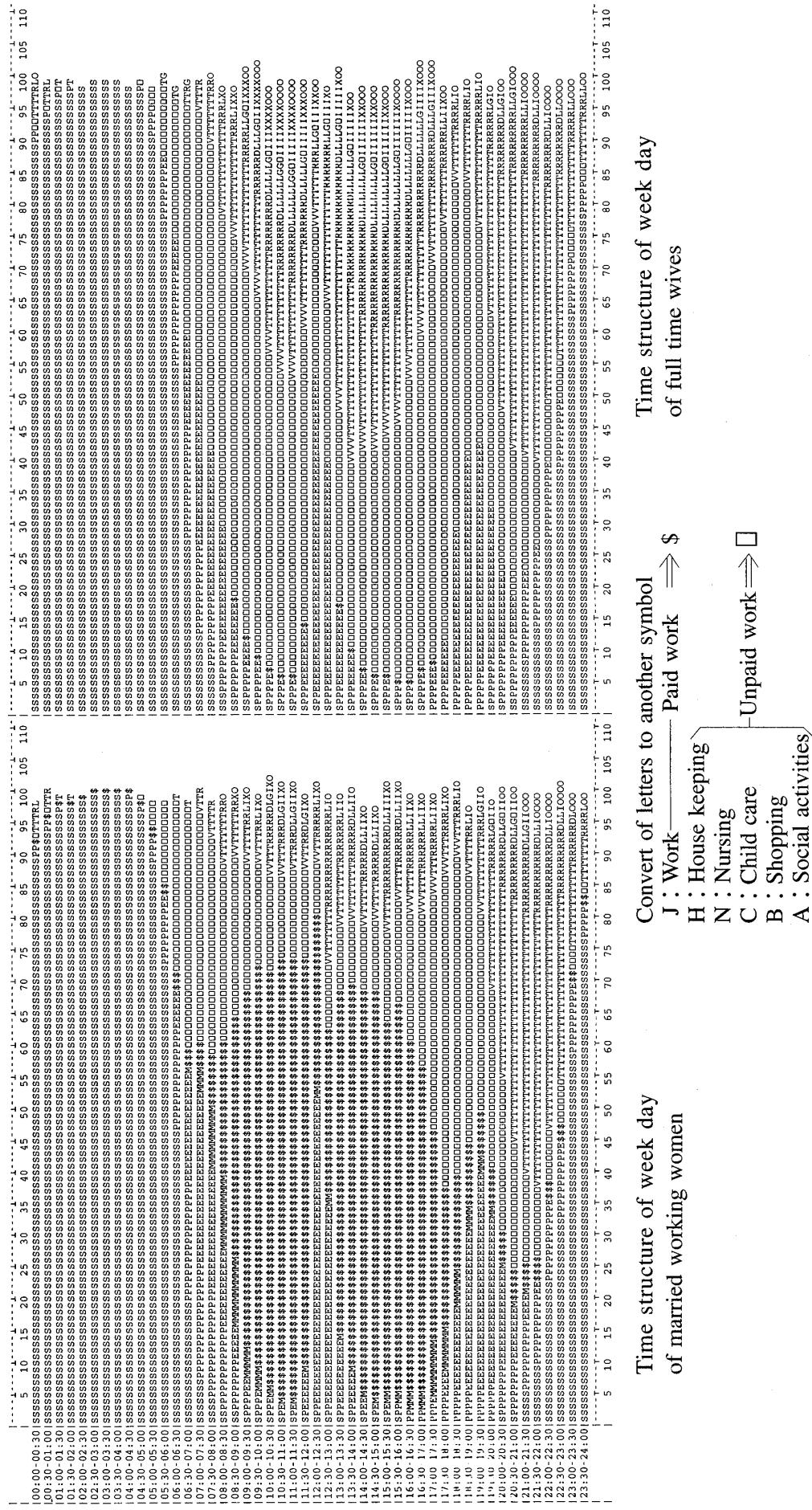
Technical Notes

Table A-1 Matrix A (System A)

	M	E	J
t1	3	7	5
t2	4	8	3
t3	3	8	4
t4	5	9	1

Figure A-1 Letter graph of Matrix A

```
         0       5      1 0      1 5
T I M E  |----T----T----T
17:00-17:15 MMME E E E E E J J J J J
17:15-17:15 MMMME E E E E E E J J J
17:30-17:45 MMME E E E E E E J J J J
%     17:45-18:00 MMMMME E E E E E E E J
```
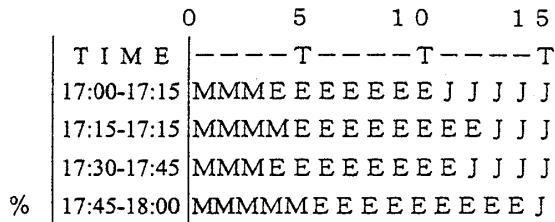
Table A-2 Matrix B (System B)

	M	E	J
t1	7	5	3
t2	5	7	3
t3	4	9	2
t4	2	11	2

Figure A-2 Letter graph of Matrix B

```
         0       5      1 0      1 5
T I M E  |----T----T----T
17:00-17:15 MMMMMMME E E E J J J
17:15-17:15 MMMME E E E E E J J J
17:30-17:45 MMMME E E E E E E J J
%     17:45-18:00 MME E E E E E E E E J J
```
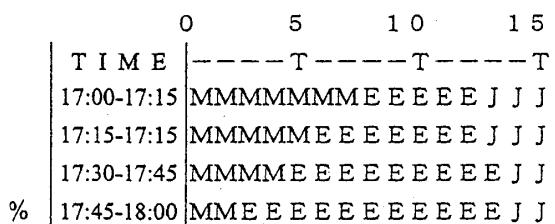
Table A-3 Minimum Matrix

	M	E	J
t1	3	5	3
t2	4	7	3
t3	3	8	2
t4	2	9	1

Figure A-3 Letter graph of Minimum matrix

```
         0       5      1 0      1 5
T I M E  |----T----T----T
17:00-17:15 MMME E E E J J J
17:15-17:15 MMMME E E E E E J J J
17:30-17:45 MMME E E E E E E J J
%     17:45-18:00 MME E E E E E E E J
```
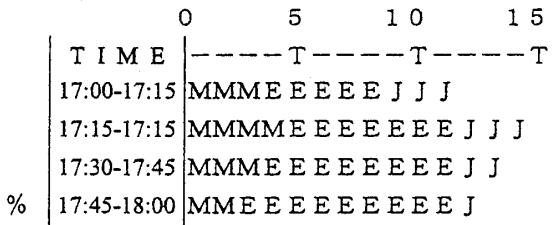
Table A-4 Difference matrix of System A

	M	E	J
t1	0	2	2
t2	0	1	0
t3	0	0	2
t4	3	0	0

Figure A-4 Letter graph of difference matrix

```
         0       5      1 0      1 5
T I M E  |----T----T----T
17:00-17:15 E E J J
17:15-17:15 E
17:30-17:45 J J
%     17:45-18:00 MMM
```
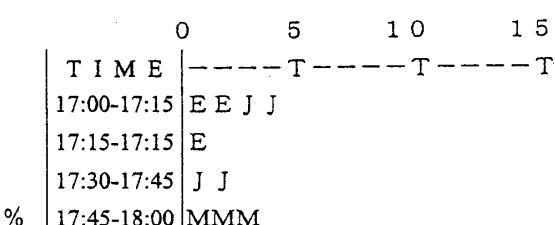
Table A-5 Difference matrix of System B

	M	E	J
t1	4	0	0
t2	1	0	0
t3	1	1	0
t4	0	2	1

Figure A-5 Letter graph of difference matrix

```
         0       5      1 0      1 5
T I M E  |----T----T----T
17:00-17:15 MMMM
17:15-17:15 M
17:30-17:45 M E
%     17:45-18:00 E E J
```
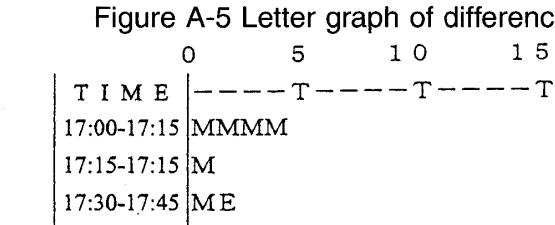
And, I give rectangular box " ☐ " to unpaid work such as H, N , C, B, and A.

Before proceeding to the explanation of Figure 5, we explain how to calculate original matrices and how to draw their letter graphs by taking a simple case (See Technical Notes).

Matrix A and Matrix B have the shape of 4 rows and 3 columns in common. We show their letter graph on the right-hand side (See Table A-1 and Figure A-1, and Table A-2 and Figure A-2). We can see the "Minimum Matrix" in Table A-3. The "Minimum Matrix" is defined as a matrix that is comprised of lesser elements in pairs of matrices. The elements written in gothic fonts in Matrix A are figures that are smaller than those of Matrix B. It is the same with the gothic elements in Matrix B. The minimum matrix of Table A-3 is comprised of such smaller elements between matrices. The minimum matrix means that some percentages of people of each system are engaged in same activities in each time slot.

And then, we have to introduce another new concept, the "difference matrix". This is a matrix that is made by extracting a minimum matrix from the original matrix such as matrix A or matrix B. This is shown in Table A-4 and Table A-5. The difference matrix means that some percentages of people of each system are engaged in different activities in each time slot.

Figure 5 shows the structural change in times from married working women to full time wives. When some full time wives keep the same activities even after they quit their jobs, it is reflected in minimum matrix data. And when other full time wives change their activities after quitting their jobs, it is reflected in difference matrices.

The changed parts of both sides of Figure 5 are drawn by the difference matrix of married working women and full time wives. On the other hand, the unchanged part is drawn by the minimum matrix.

The changed part of full time wives can be regarded as their newly acquired life style of full time wives, as compared with married working women. In the same way, the changed part of married working women is related to their typical life style, as compared with full-time house wives. To put it another way, the changed part of full time wives is their new life style, after they quit their jobs as married working women. The changed

Figure 5　Changed and Unchanged Parts of Time Structure from married working women to full time wives
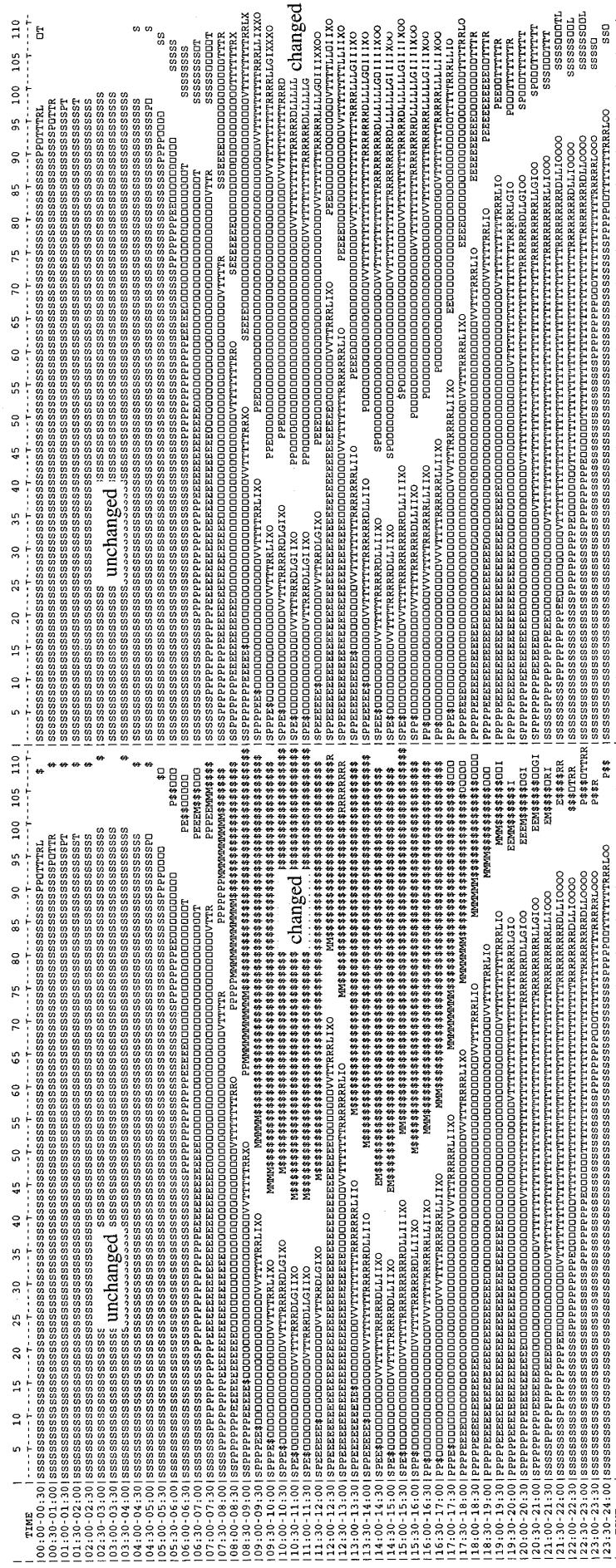
Time structure of week day
of married working women

Time structure of week day
of full time wives

Figure 6　Size of Change of Time Structure from marrird working women to full time wives

AVERAGE=27.3

SINGLE WORKING WOMEN ― 21.7 →
MARRIED WORKING WOMEN ― 27.4 →
FULL TIME WIVES
46.2

TIME	value
00:00-00:30	* 2.1
00:30-01:00	* 1.6
01:00-01:30	* 1.2
01:30-02:00	* 1.0
02:00-02:30	* .7
02:30-03:00	* .6
03:00-03:30	* .6
03:30-04:00	* .8
04:00-04:30	* 1.1
04:30-05:00	* 1.4
05:00-05:30	* 3.0
05:30-06:00	* 6.6
06:00-06:30	* 10.5
06:30-07:00	* 11.2
07:00-07:30	* 12.3
07:30-08:00	* 23.9
08:00-08:30	* 37.7
08:30-09:00	* 50.1
09:00-09:30	* 59.9
09:30-10:00	* 65.0
10:00-10:30	* 65.7
10:30-11:00	* 68.7
11:00-11:30	* 68.6
11:30-12:00	* 64.0
12:00-12:30	* 29.8
12:30-13:00	* 35.7
13:00-13:30	* 54.4
13:30-14:00	* 59.6
14:00-14:30	* 63.8
14:30-15:00	* 64.4
15:00-15:30	* 58.6
15:30-16:00	* 60.9
16:00-16:30	* 57.1
16:30-17:00	* 53.1
17:00-17:30	* 43.6
17:30-18:00	* 34.4
18:00-18:30	* 24.6
18:30-19:00	* 17.5
19:00-19:30	* 12.7
19:30-20:00	* 12.3
20:00-20:30	* 13.2
20:30-21:00	* 11.9
21:00-21:30	* 9.8
21:30-22:00	* 8.5
22:00-22:30	* 9.0
22:30-23:00	* 8.7
23:00-23:30	* 6.0
23:30-24:00	* 3.5
TIME	

5　10　15　20　25　30　35　40　45　50　55　60　65　70　75　80　85　90　95　100 %

part of married working women is the old life style that full time wives gave up.

Figure 6 shows the size of change from married women to full time wives at every time slot. We can find big changes occurring in office hours. The average size of change is 27.4%. In this connection, in the case of single working women becoming married working women, big changes appear early in the morning and evening (See Figure 13.). It is because married working women have to prepare breakfast and dinner for their families. The average size of change is 21.7% , as is shown at the right margin of Figure 6. As for the case of single working women going to full time wives, it is 46.2%, as is shown Figure 6 and Figure 13.

These findings, especially relevant to changes occurring in time slots, can be obtained only by activity rates approach.

Let us proceed to the next step. Figure 7 is made by turning around the letter graph of full time wives, so that we can easily compare the changed part of married working women with that of full time wives.

We can put away the unchanged part of both married working women and full time wives from Figure 7, and place time slots table in the center of a pair of the changed part of graph to obtain Figure 8. Looking at Figure 8, we can get a bird's eye view on the size and content of change, which include all kinds of activities.

In Figure 9, I extract symbols of activities other than paid and unpaid works from Figure 8, so that we can observe only the relation of paid work and unpaid work.

In Figure 10, I bring in scattered letters to the time slots table. The right-hand letter graph is unpaid work that full time wives get, after they quit jobs. The left-hand letter graph means paid work that full time wives have to give up. From the perspective of activity rates approach, this paid work can be regarded as the opportunity costs of unpaid work. Opportunity cost per unpaid work at each time slot can be obtained by dividing the number of dollar symbol unit ($) by that of rectangular box (□). We find the opportunity costs early in the afternoon relatively higher than those of other hours, as is shown at the right side of Figure 10.

Figure 7   Toward the Comarison Between Changed Parts

Time structure of week day
of married working women
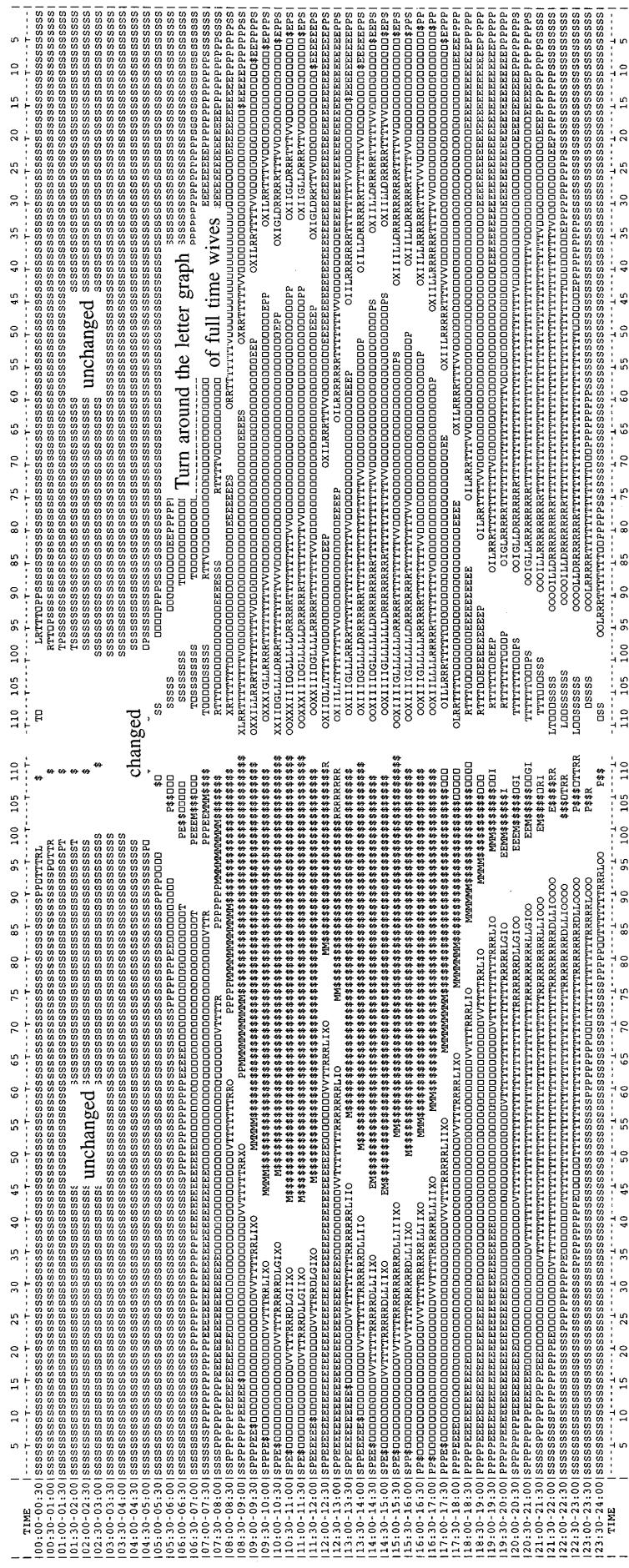
Time structure of week day
of full time wives

Figure 8   Changed Parts of Structure Involving All Kinds of Activities
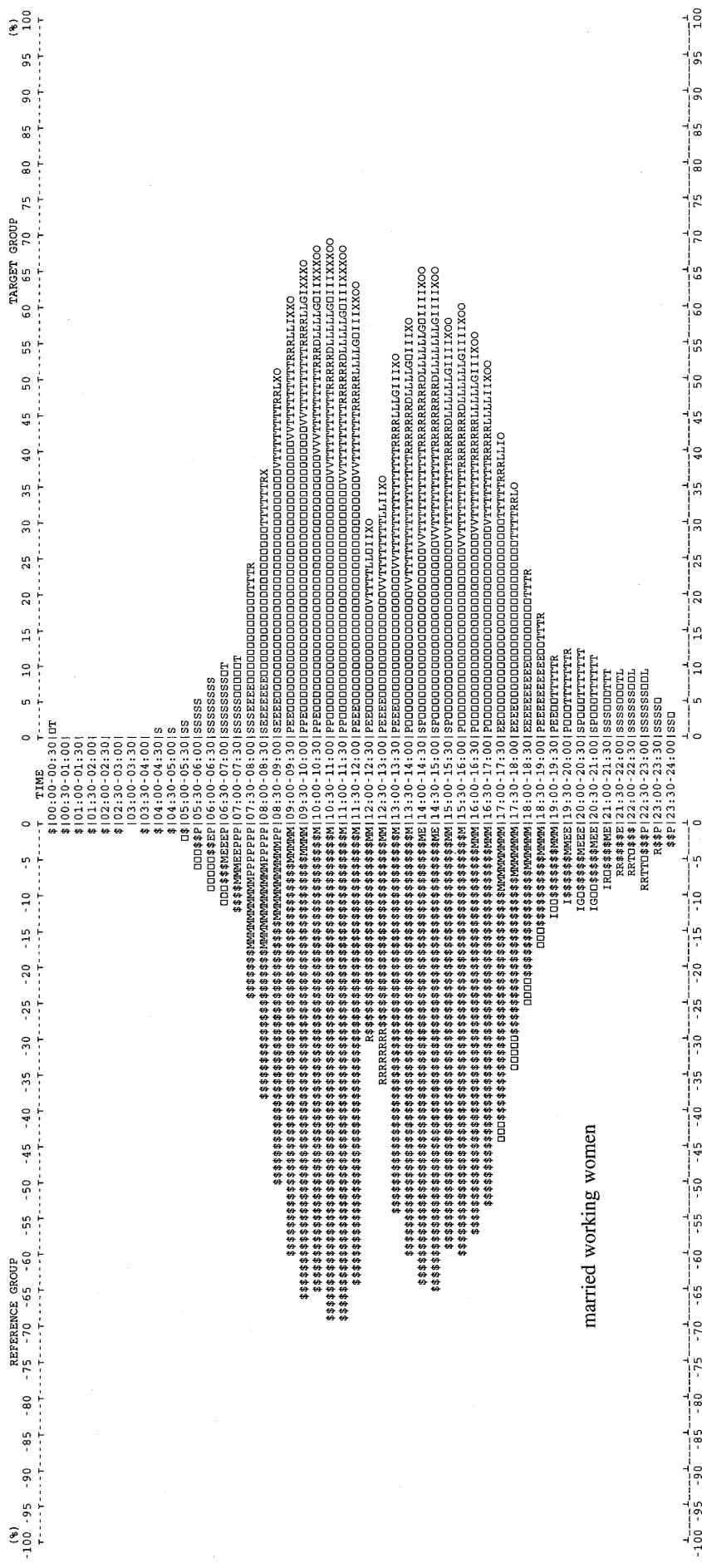
married working women

Figure 9   Extracting Paid and Unpaid Works from the Changed Parts of Structure
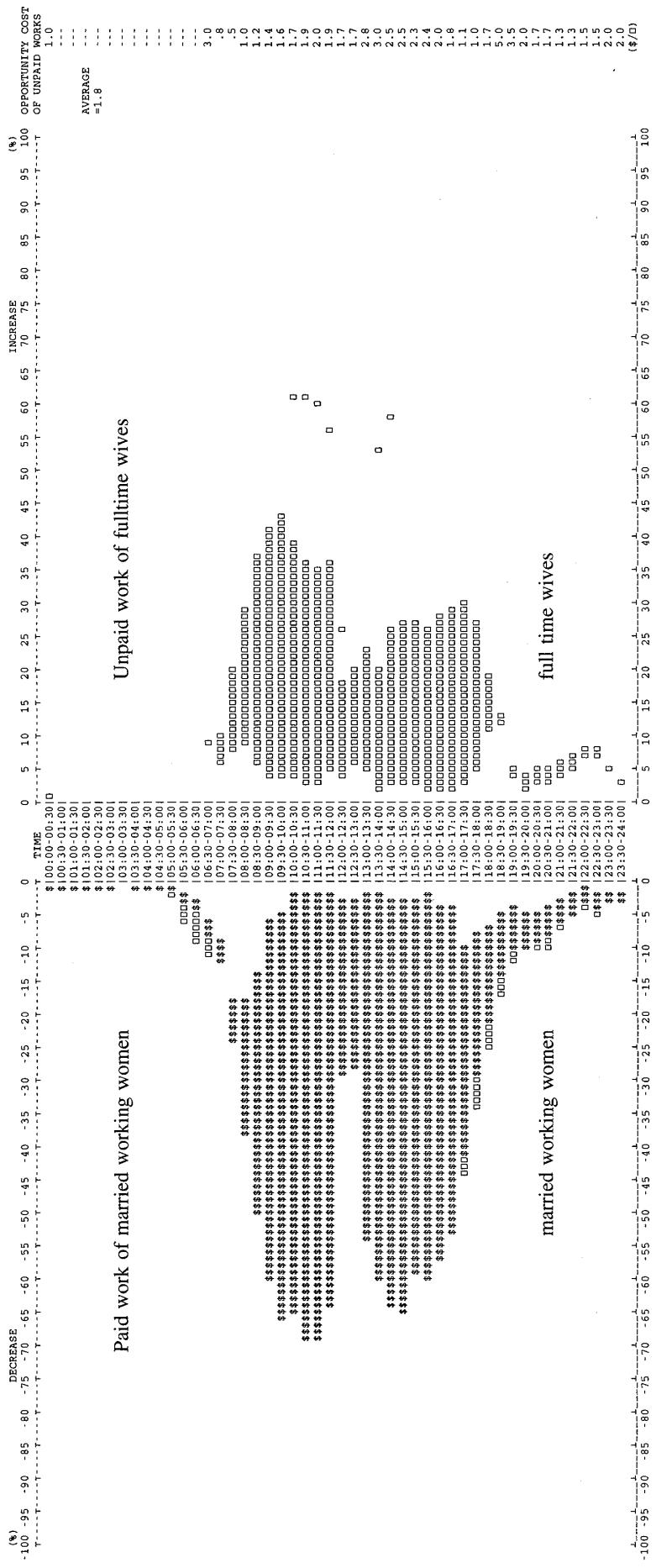
Figure 10 Centering Letter Graphs for Better Comparisons

Paid work of married working women

Unpaid work of fulltime wives

OPPORTUNITY COST OF UNPAID WORKS

AVERAGE
=1.8
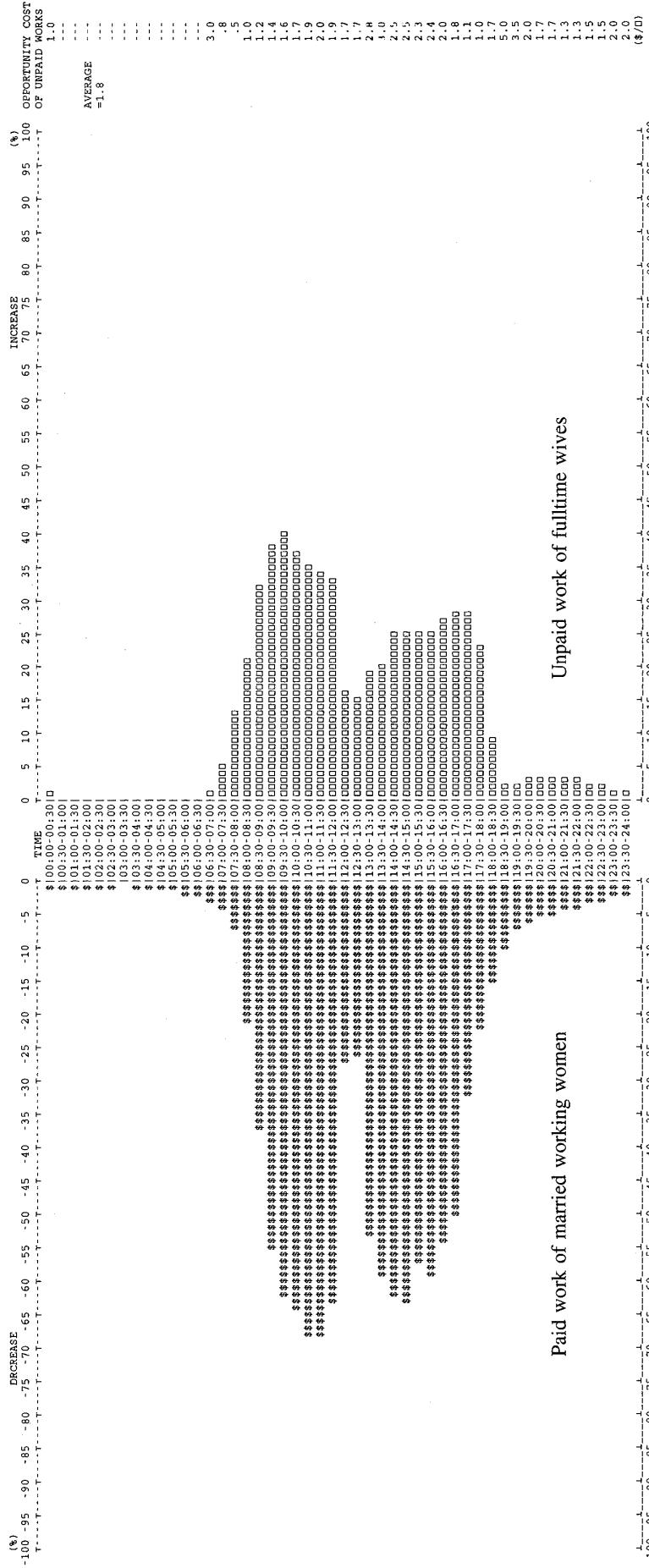
Figure 11   Squaring letter Graphs for Best Comparisons

Paid work of married working women

Unpaid work of fulltime wives

OPPORTUNITY COST
OF UNPAID WORKS

AVERAGE
= 1.8

TOTAL= 600

TOTAL= 1096

Figure 12   Oportunity Costs of Unpaid Works

FROM SINGLE WORKING WOMEN
TO MARRIED WORKING WOMEN
$: 302 □ : 627 □=0.5 $

FROM MARRIED WORKING WOMEN
TO FULL-TIME HOUSE WIVES
$:1096 □:600   □=1.8 $

FROM SINGLE WORKING WOMEN
TO FULL-TIME HOUSE WIVES
$:1393 □:1218   □=1.1 $
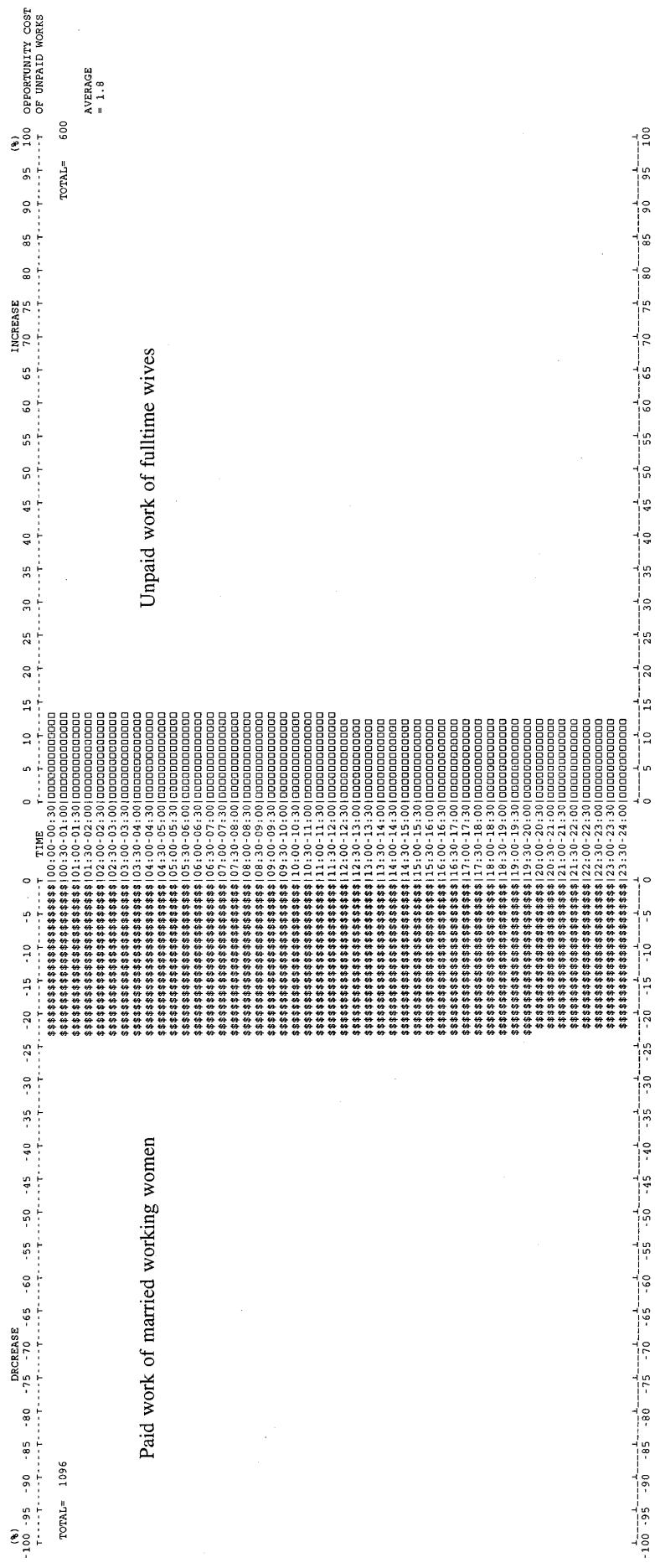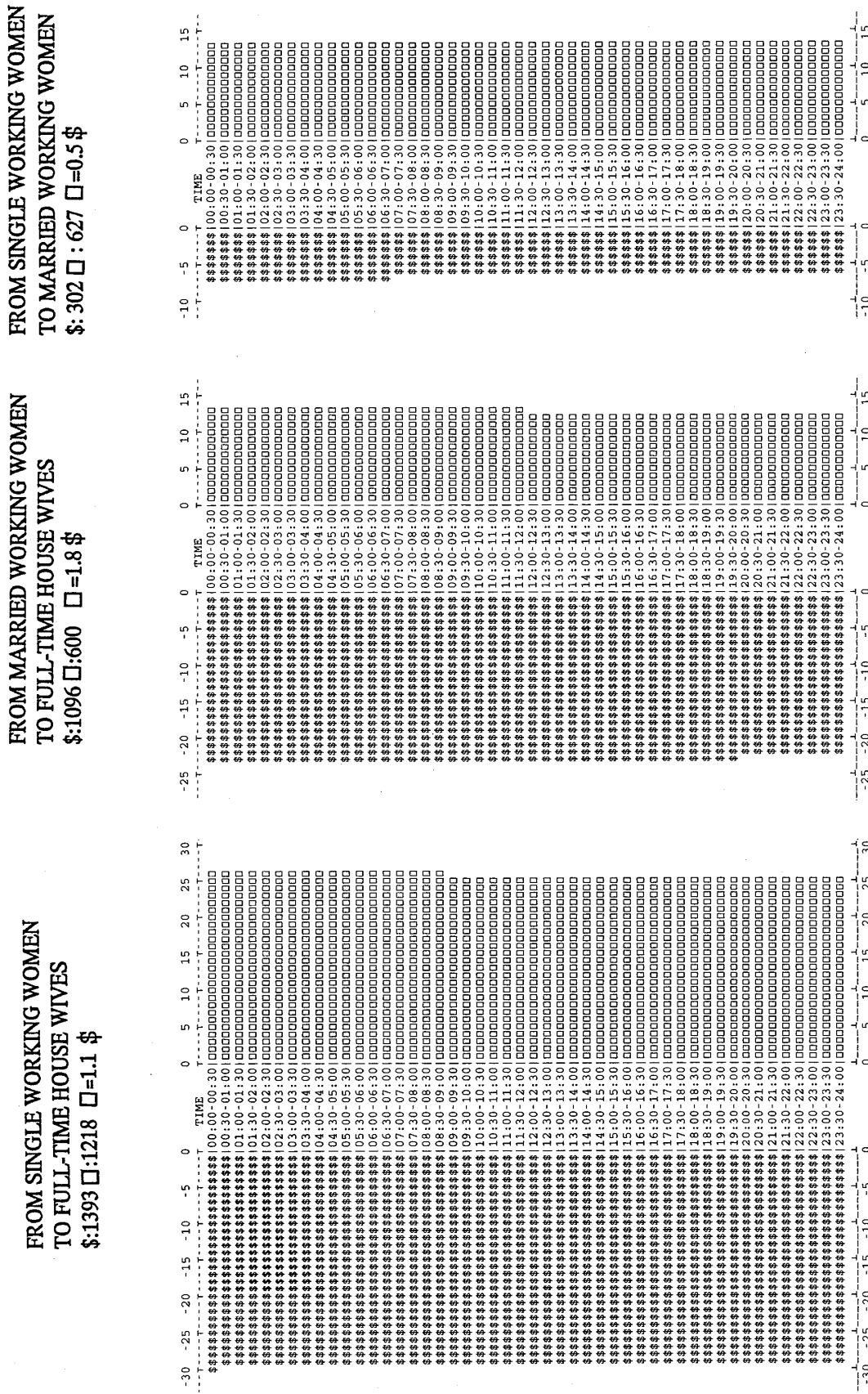
In Figure 11, I try to arrange the scattered letters of Figure 10 into a square form, like when we judge the winner in playing Go. Although we lose information of every time slot, we can find how much married working women sacrifice their paid work for unpaid work overall. 1096 units of paid work are sacrificed for 600 units of unpaid work. In sum, one unit of unpaid work time is approximately 1.8 units of paid work time, as is shown at the right side of Figure 11. In other words, when fulltime wives are engaged in unpaid work for 1 hour, they lose 1.8 hour of paid work.

4. Findings

In Figure 12, I juxtapose the results of three cases, single working women becoming full time wives, married working women becoming full-time wives, and single working women becoming married working women. According to this result, we can get the following findings.

(1) The opportunity cost of unpaid work varies among cases.

(2) The highest opportunity cost shows 1.8 paid work time per 1 unpaid work time in the case of married working women becoming fulltime wives. (1 unpaid work time is 0.6 minutes average duration of activity per person of a single day.)

(3) The lowest opportunity cost is 0.5 paid work time per 1 unpaid work time in the case of single working women to married working women.

(4) In the case of single working women becoming full time wives, the opportunity cost of unpaid work time is almost equal to paid work time, namely, 1.1 paid work time per 1 unpaid work time.

In addition, looking at Figure 13, we can point out the following findings.

(5) The structural change has unique features along time slots among three different life cases.

(6) The changing times of single working women when they became married working women increase early in the morning and evening compared to single working women. It reflects that married working women get up and go home earlier in the morning and evening, because they have to prepare for breakfast and dinner.

(7) The changing times of married working women when they become

Figure 13　Structural Change among three Life Cases

a. from single working women
to married working women

b. from married working women
to full time wives

c. from single working women
to full time wives
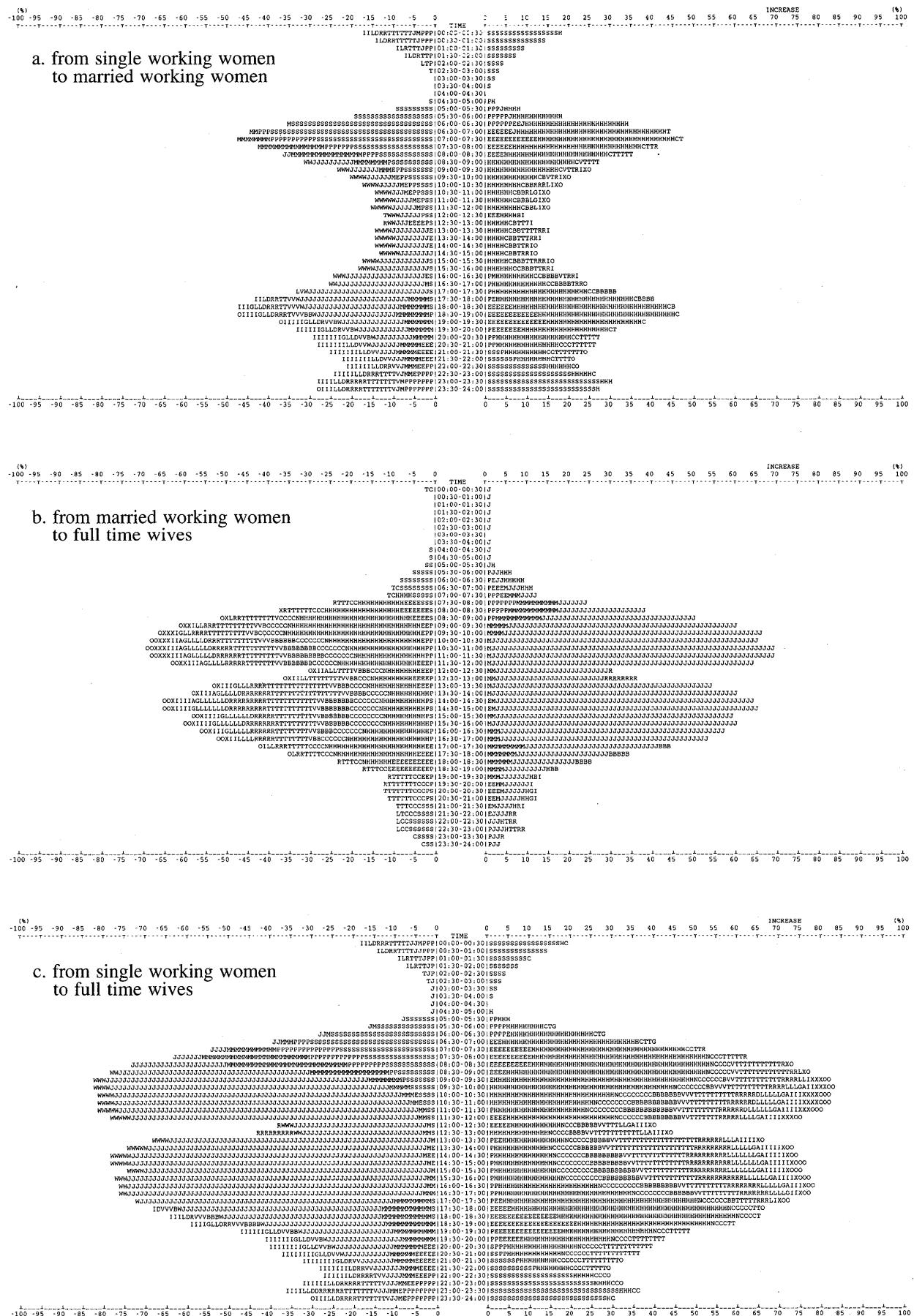
full time wives increase in office hours. This is because they quit their jobs totally during the day times.

(8) The changing times of single working women when they become full time wives increase not only early in the morning and evening, but also in office hours. In sum, we can find two kinds of change in both (6) and (7) occurring at the same time in this case.

Through looking at Figure 7 to Figure 11, we can get the following finding.

(9) According to our activity rates approach, the opportunity cost of unpaid work can be measured by paid work, as far as both ("□" and "$") are within the 'changed' parts of time structure.

5. Implications for future research

In closing this paper, I present some implications for the discussions of evaluation of unpaid work from the perspective of activity rates approach.

As is known, the total evaluation of unpaid work is made as follows.

Total evaluation of unpaid work in a year

= Hours of unpaid work per person in a year×

Evaluation of unpaid work per hour×population

The finding listed in (9) above implies that we do not necessarily use whole hours of unpaid work of women as a basis for evaluation of unpaid work, because we consider that only the unpaid work time in the changed part of time structure can be evaluated by paid work time. On the contrary, in ordinary opportunity cost assessment of unpaid work, whole hours of unpaid work of a day are used as basic data for their evaluation. Therefore, our opportunity cost assessment is expected to show much lower amount of total evaluation of unpaid work than the ordinary one.

As is shown in this paper, my activity rates approach enables us to follow the definition of 'opportunity cost' as much as possible, and evaluate the unpaid work. From the perspective of activity rates approach, ordinary opportunity cost assessment of unpaid work seems to be made on a theoretically false premise, and offends common sense.[2] Common sense suggests that we do not necessarily have monetary opportunity costs regarding the unpaid work made late at night, because we have rare job opportunity at such a time, apart from self-employed and home-based persons.

Acknowledgements

Notes

1) As for the outline of valuation of methods, Hamrad (2003) is useful. The explanation here depends on her paper very much.

2) This is the reason why I prefer market replacement approach to opportunity cost approach, especially generalist (house keeper) cost method, because of the simplicity of evaluation and reality of premise.

References

Hamrad, Maika 2003 *Measuring and Valuating Households' Unpaid Work in Canada, 1992 and 1998*. Paper presented at the Expert Group Meeting on "Integrating the Value of Household Production into National Accounts: International Cases and Domestic Implications", Korean Women's Development Institute, Seoul

United Nations. 1995 *Report of the Fourth World Conference on Women* (Beijing, 1995) Retrieved April 2, 2003 from Http: http://www.un.org/documents/ga/conf177/aconf177-20en.htm.

Key words : Evaluation of Unpaid Work, Time Use Study, Activity Rates Approach, Paid Work, Unpaid Work, Opportunity Cost Approach, Replacement Cost Approach

(FUJIWARA Masago)