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The 1.03 million yen ceiling and earnings inequality among married women in Japan

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Abstract

In this paper, we examine the impact of the `1.03 million yen ceiling,' a means-tested transfer scheme for secondary earners in Japan, on earnings inequality of married women. We find that the decline in earnings inequality among married women between 1993 and 2003 is attributable to the increase in the number of wives with low earnings and the decrease in the number of wives with zero earnings.

The analysis in Section 3 uses resampled microdata from the NSFIE made available through the Research Centre for Information and Statistics of Social Science, Institute of Economic Research, Hitotsubashi University. The resampled microdata cannot be released owing to the terms of usage of the data. This research was supported by Grants-in-Aid for Scientific Research from the Japan Society for Promotion of Science (Abe, C-17530188 and C-20530188; Oishi, C-19530198) and Health Labour Sciences Research Grant (Oishi). All remaining errors are our own.

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1 Introduction

Income taxes or other government policies sometimes create circumstances wherein individual earnings tend to concentrate at certain levels (bunching); Saez (2009) lists a number of such examples. In this paper, we focus on one such scheme in Japan: the 1.03 million yen ceiling.

The 1.03 million yen ceiling refers to the tendency that married women in Japan who work part time set their annual earnings close to 1.03 million yen. This phenomenon has attracted much attention in the literature (e.g., Nagase & Nawata (2005); Akabayashi (2006); Sakata & McKenzie (2006); Abe (2009a)). The concentration around this ceiling is owing to the discontinuities in the budget set, which are created by the income tax set-up, social security system and fringe benefit arrangements provided by the husband's employer.[1] In spite of much attention, however, the focus of previous studies has almost exclusively been on behavioral or efficiency aspects of the ceiling: the *distributional* consequences of the ceiling are not well known.

In this paper we provide a simple decomposition procedure to understand how the ceiling affects earnings inequality among married women, and apply it to Japanese microdata. The novel feature of our procedure is that it explicitly considers the concentration of married women's earnings around 1.03 million yen and measures its quantitative impacts on earnings inequality.

The 1.03 million yen ceiling is most relevant for married women who work part time. The number of women working under part-time status increased dramatically in the past two decades.[2] The earnings of those workers are generally lower than those of regular, full-time workers because (1) hourly wages of part-time workers are about 30 percent lower than those of full-time workers and (2) the 1.03 million yen ceiling provides incentives for married women to restrain their working hours so that their earnings do not exceed the threshold.

Empirical evidence shows that the earnings of married female part-timers are heavily concentrated slightly below 1.03 million yen (Akabayashi (2006); Abe (2009a)). Figure 1 illustrates the pattern of concentration from the microdata of the National Survey of Family Income and Expenditure (NSFIE).

[1] See Nagase & Nawata (2005), Akabayashi (2006), and Abe (2009a) for explanation and evidence.

[2] In fact, in Japan, the increase in labor force participation by women was in the form of part-time employment, and not of regular full-time employment (Abe (2009b)).

2 Earnings decomposition when the ceiling is present

In this section, we explain the framework for earnings decomposition taking into account the 1.03 million yen ceiling.

Let $\bar{y}$ be the mean earnings for married women, $V(y)$ be their variance and CV^2 be the square of the coefficient of variation ($CV^2 = V(y)/\bar{y}^2$).

We denote y_i as the earnings of individual (wife) i and θ is the threshold value around which the earnings are concentrated (i.e., 1.03 million yen). For the purpose of our analysis, wives are classified into one of the following four categories depending on their earnings level (notations in parentheses are the labels for each group): (1) zero earnings (Z), (2) earnings between 0 and θ (I_0), (3) earnings equal to θ (T) and (4) earnings over θ (I_1).

The variance of wives' earnings, $V(y)$, is decomposed as follows:

$$\begin{aligned} V(y) &= \frac{1}{N}\Big[\sum_{i\in Z}(0-\bar{y})^2 + \sum_{i\in I_0}(y_i-\bar{y})^2 + \sum_{i\in T}(\theta-\bar{y})^2 + \sum_{i\in I_1}(y_i-\bar{y})^2\Big] \\ &= \frac{1}{N}\Big[\sum_{i\in Z}(\bar{y})^2 + \sum_{i\in I_0}\{(y_i-\bar{y_0})^2 + (\bar{y_0}-\bar{y})^2\} \\ &+ \sum_{i\in T}(\theta-\bar{y})^2 + \sum_{i\in I_1}\{(y_i-\bar{y_1})^2 + (\bar{y_1}-\bar{y})^2\}\Big], \end{aligned} \tag{1}$$

where $\bar{y_0}$ is the mean earnings of wives in group I_0, and $\bar{y_1}$ is the mean earnings of wives in group I_1.

Dividing $V(y)$ in Eq. (1) by $\bar{y}^2$ and simplifying yields the following expression for CV^2, which is the sum of the between-group term and the within-group term:

$$\begin{aligned} CV^2(y) = &\Big\{\frac{n_Z}{N} + \frac{n_{I0}}{N}\frac{(\bar{y_0}-\bar{y})^2}{\bar{y}^2} + \frac{n_\theta}{N}\frac{(\theta-\bar{y})^2}{\bar{y}^2} + \frac{n_{I1}}{N}\frac{(\bar{y_1}-\bar{y})^2}{\bar{y}^2}\Big\} \\ &+ \Big\{\frac{n_{I0}}{N}\frac{V(y_i \mid i\in I_0)}{\bar{y}^2} + \frac{n_{I1}}{N}\frac{V(y_i \mid i\in I_1)}{\bar{y}^2}\Big\}. \end{aligned} \tag{2}$$

The first line of Eq. (2) is the between-group component; it is the sum of the squared deviations of the group means from the population mean, weighted by the population share of each group. The second line is the sum of the within-group variances for the groups I_0 and I_1. Workers in groups I_0 and I_1 choose working

hours as an interior solution.[3] For non-workers and those with earnings equal to θ, earnings are equal for everyone within the group, and thus, the within-group variance is zero.[4]

The decomposition of Eq. (2) implies the following: (1) a decrease in the number of wives with zero earnings (i.e., decrease in n_Z/N) reduces CV^2 and (2) CV^2 is the sum of six terms, where each term is the product of the population share and the square of the deviation of the group mean from $\overline{y}$ (the within-group variance). The decomposition of CV^2 in Eq. (2) is summarized in Table 1.

3 Empirical analysis

The data used for our empirical analysis is the microdata from the NSFIE[5] for the years 1994 and 2004. The NSFIE is a nationally representative survey in Japan that collects information on household earnings. We apply the above procedure to wage-salary earnings data for married women. The earnings figures are annual earnings in the previous year of the survey (1993 and 2003). The sample is restricted to women married to male household-heads aged 25-59 years; the sample size is 31,166 for 1994 and 24,434 for 2004. The threshold value is set at 0.9 million yen to separate I_0 and T, and at 1.3 million yen to separate T and I_1. This selection is made because women who intend to limit their annual earnings are likely to keep their earnings between 0.9 and 1.3 million yen.[6] The decomposition results are reported in Table 2.

In the 2003 sample, 53 percent of the women had no wage-salary earnings, 16 percent had positive earnings below 0.9 million yen, 11 percent had earnings around 1.03 million and the remaining 20 percent had earnings over 1.3 million. The concentration around the threshold (the T group) is remarkable: 23 percent of married women with positive wage-salary earnings are in this very narrow range, for which the within-group variance (divided by $\overline{y}$) is only 0.013 (as compared to

[3]On the other hand, zero earnings and threshold earnings are corner solutions in the optimization problem for labor supply of married women.

[4]However, in the empirical analysis below we assume that individuals with earnings around θ are in the T category, and as such, the variance of earnings for group T is not zero but is still very small.

[5]The NSFIE has been conducted by the Statistics Bureau, Ministry of Internal Affairs and Communications for every five years since 1959.

[6]We choose 1.3 million yen for the upper bound earnings for the T group because dependant spouse are exempted from paying social security contributions as long as their earnings are below 1.3 million yen. This rule is explained in detail in Akabayashi (2006).

4.73 for the I_1 group, which is 342 times larger). The mean is 0.92 million, which is close to the earnings threshold θ.

In both years, the major components of CV^2 are as follows: (1) the between-group component for zero earnings (group Z, row c) that is equal to the population share of group Z, (2) the between-group component for earnings over θ (group I_1, row c) and (3) the within-group component for group I_1 (row e). The other components are quite small as compared to these three. Of the three components above, the largest is the between-group component for group I_1, which accounts for more than half of CV^2. Therefore, the primary source of inequality in married women's earnings is that high earners (wives with earnings above θ; approximately 20 percent of married women) earn much more than the overall average ($\overline{y}$). The second largest source of inequality is the within-group variance for group I_1, which accounts for approximately 30 percent of CV^2.

The notable changes between 1993 and 2003 are summarized as follows. Inequality in the earnings of married women declined with CV^2 decreasing from 3.42 in 1993 to 3.17 in 2003 (a decline of 0.25). The component that contributed most to this decline is the fall in the between-group components: the between-group component of the Z group fell by 0.055 and that of the I_1 group fell by 0.208. The contribution of the other components is negligible. In both years, the proportion of high earners (group I_1) remained the same at approximately 20 percent. On the other hand, the proportion of wives with positive earnings below 1.3 million yen increased by 6 percent and those with zero earnings decreased by 5 percent. This shift from zero earnings to low positive earnings reduces the proportion of zero earnings (n_Z/N), and increases the mean earnings ($\overline{y}$), which is the main source of falling inequality over this period.

Even though the 1.03 million yen ceiling is likely to constrain earnings growth, inequality nonetheless fell between 1993 and 2003. The shift from zero earnings to low positive earnings is rational in the presence of the ceiling, and that is precisely how the earnings inequality decreased between 1993 and 2003.[7] It is worth noting that the weight of high earners fell during this period. One might have thought that since the ceiling restrains earnings, the disparity between high earners and others would widen. However, this effect was negligible. The result is in line with Cancian & Reed (1998), who report that earnings inequality among married women fell between 1979 and 1989 in the United States (Cancian & Reed (1998), Table 1).[8]

[7]It is important to note that we are not making a counterfactual comparison of earnings distribution in the presence and absence of the threshold.

[8]Reed & Cancian (2001) report that earnings inequality among *all* women fell continuously

4 Conclusion

This paper presents a framework for decomposing the earnings inequality for married women in Japan that explicitly considers the concentration of earnings around 1.03 million yen, and applies it to Japanese household data.

We find that earnings inequality of married women in Japan consists of three major components: (1) the difference between the mean earnings of high earners (top 20 percent) and the overall mean, (2) the large within-group variance of high earners and (3) the proportion of wives with zero-earnings (more than 50 percent). Earnings inequality among married women fell between 1993 and 2003, and the decline is attributable to the increase in the number of wives with low earnings and the decrease in the number of wives with zero earnings.

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from 1969 to 1999 and attribute this change to the rising labor force participation of women.

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Table 1: Decomposition of CV^2

Group	Z	I_0	T	I_1
Income range	$y_i = 0$	$0 < y_i < \theta$	$y_i = \theta$	$y_i > \theta$
(a) Population	n_Z/N	n_{I0}/N	n_θ/N	n_{I1}/N
(b) Between	1	$(\overline{y_0} - \overline{y})^2/\overline{y^2}$	$(\theta - \overline{y})^2/\overline{y^2}$	$(\overline{y_1} - \overline{y})^2/\overline{y^2}$
(c) Total(Between) ((a) × (b))	n_Z/N	$(n_{I0}/N)(\overline{y_0} - \overline{y})^2/\overline{y^2}$	$(n_\theta/N)(\theta - \overline{y})^2/\overline{y^2}$	$(n_{I1}/N)(\overline{y_1} - \overline{y})^2/\overline{y^2}$
(d) Within	-	$V(y_{i0})/\overline{y^2}$	-	$V(y_{i1})/\overline{y^2}$
(e) Total(Within) ((a) × (d))	-	$(n_{I0}/N)\{V(y_{i0})/\overline{y^2}\}$	-	$(n_{I1}/N)\{V(y_{i1})/\overline{y^2}\}$

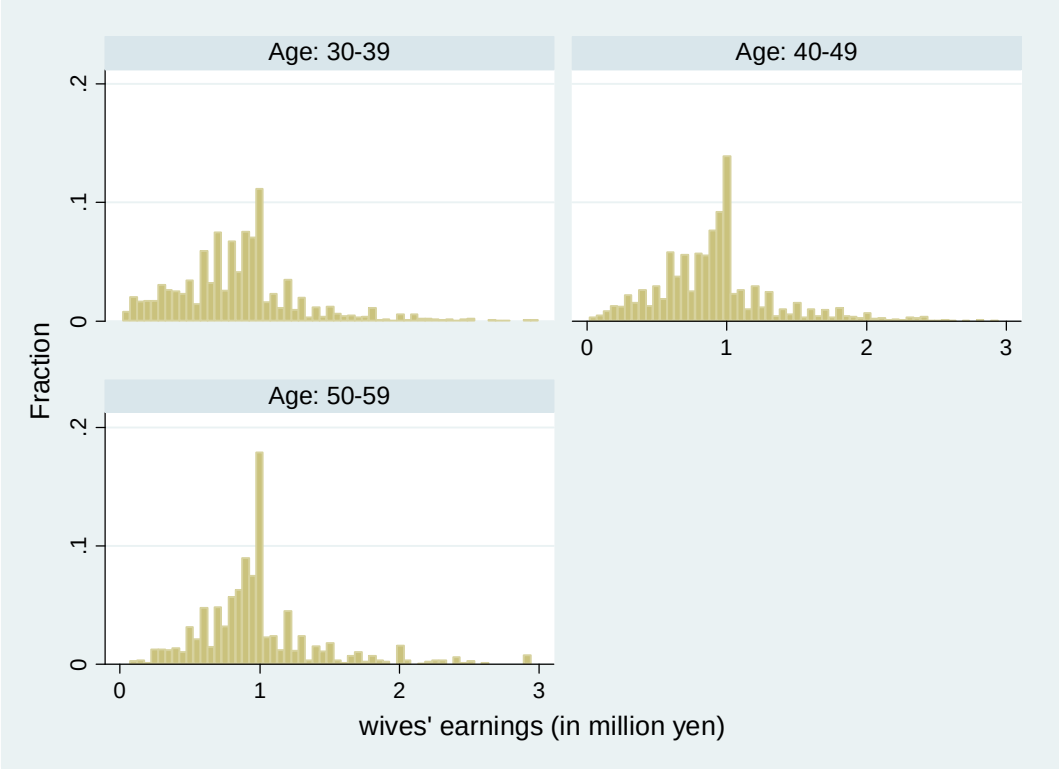
Note: y_{ij} $(j = 0, 1)$ represents the earnings of the i-th individual belonging to group I_j.

Table 2. Decomposition results for married women's earnings

Year	1993				2003			
Group	Z	I_0	T	I_1	Z	I_0	T	I_1
	$y_i=0$	$0<y_i\leq 0.9$	$0.9<y_i\leq 1.3$	$y_i>1.3$	$y_i=0$	$0<y_i\leq 0.9$	$0.9<y_i\leq 1.3$	$y_i>1.3$
(a) Population	0.5887	0.1348	0.0751	0.2014	0.5341	0.1583	0.1082	0.1995
(b) Between	1	0.0831	0.0398	9.2539	1	0.1253	0.0203	8.2993
(c)Total, Between	0.5887	0.0112	0.0030	1.8635	0.5341	0.0198	0.0022	1.6555
(d) Within	0	0.0712	0.0165	4.6934	0	0.0688	0.0138	4.7302
(e) Total, Within	0	0.0096	0.0012	0.9452	0	0.0109	0.0015	0.9436
CV^2	3.4224				3.1675			

Note: Earnings figures are in million yen.
Source: Authors' calculation from the micro data of the NSFIE (1994 and 2004).

Figure 1. Earnings distribution of married women working part time, by age group



Source: Figure 2 of Abe (2009a). The sample is from the resampled data of NSFIE (2004).
Note: The figures are drawn from the sample of married women working part time. Individuals with earnings over 3 million yen are excluded. The proportion of earnings over 3 million yen is less than 1.4 percent for each of the three age groups. Observations are weighted by the sampling weight. The number of observations are 1363 for age 30-39, 2136 for age 40-49, and 520 for age 50-59.