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Wage Stratification between Care Workers and Non-care Workers in Japan: Evidence from 2001-2017[*]

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Abstract

When examining wage disparities, there are two fundamental concepts that must be differentiated: inequality and stratification. Inequality refers to variation in absolute levels, whereas stratification refers to the segmentation of populations into relative ranks. Although there have been several studies on the wages of care workers, many of them focused on inequality. In other words, the wage level of care workers remains mostly unknown. This paper aims to measure how the stratification index of care workers in Japan has changed from 2001 to 2017. The results of nonparametric stratification index (NSI) show little change in overall wage stratification between care workers and non-care workers. However, focusing on the within-gender NSI, the results show that while there is no major change in NSI for males, NSI for females is gradually rising. This indicates that the stratification between care workers and non-care workers is progressing especially for females. Decomposition analysis revealed that the overall NSI in each year was mainly caused by between-gender stratification rather than within-gender stratification.

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1 Introduction

The founding of mandatory public long-term care insurance (LTCI) heightened demand for and attention towards care-related work. Care is a term for activities in fields that cannot be systemized in modern society, which has been visualized as "care work" mainly by feminists. In other words, care, which has been recognized as a domestic work or obligation, became wildly known as "labor" or "services" by LTCI which professes to carry out the "socialization of care". On the other hand, difficulties facing care work were brought to light, and issues such as "early turnover" and "burnout" were exposed.

Since the establishment of LTCI, the number of elderly individuals in need of care has been ever-increasing at the same time as the chronic shortage of care workers; this shortage of human resources is considered to be the biggest problem with respect to current care work (The Japan Institute for Labour Policy and Training 2014). Taking a close look at the jobs-to-applicants ratio in the care work, which indicates the balance of supply and demand in the care work market, the ratio was 2.31 in 2008 (the ratio for all professions was 0.88), 1.74 in 2012 (all professions was 0.80), and 2.91 in June of 2016 (all professions was 1.14). As these numbers show, the jobs-to-applicants ratio of the care work is fluctuating at a twice or greater ratio than that of all professions (Ministry of Health, Labour and Welfare "Statistics on job/employment placement services"). Among those with nursing care work licenses, who are expected to comprise the core of the care work, the ratio of those who attend up working as caregivers has remained on the same level for the last 10 years at around 55%, which shows that only half of license holders are engaging in the nursing care field. (Ministry of Health, Labour and Welfare, 2014). Under these circumstances, including the backdrop of a rapidly aging society in the future, the demand for human resources in care work will increase, with

an estimated approximately 2.37 to 2.49 million people needed for care services in 2025; a much higher number than the 1.49 million in 2012 with an estimate of a shortage of 300 to 400 thousand human resources (Ministry of Health, Labour and Welfare 2014). As the Japan Institute for Labour Policy and Training (2014) pointed out, there are two major solutions to tackle this problem. That is, the first is to increase the number of workers engaged in the care work, and the second is to prevent the flow of human resources in care work due to retirement or transition to other occupations and industries.

The measure that the government had taken so far to tackle the issue of care worker shortage was the latter described above[1]. Since around 2005, the shortage of care workers, and the high turnover rates and high early turnover rates have been serious problems. The revision of the long-term care fee in 2009 was the first positive revision since the establishment of LTCI in 2000. Furthermore, in October of 2009, the subsidy for improvement of the benefits of the care staff (SIBCS) was introduced with a two and a half year limitation. In 2012, SIBCS was established as a measure to convert to long-term care fee, which led to the establishment of the "improvement additions for care staff treatment". These measures, while raising the average wages of care workers, have had little effect on declining turnover rates (Okubo 2018).

Thus, Japan's LTCI has always been plagued by the shortage of care workers and low wages have been pointed out as the main cause of the shortage of care workers. However, most research on wages of care workers focused on inequality. That is, there is no research that analyzed the wages of care workers using the indicators of the stratification described

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[1]In recent years, with regard to the 1st measure, active discussion is being conducted with respect to receiving overseas workers. The Ministry of Health, Labour and Welfare established the "Review meeting for the outline of overseas care workers acceptance (Gaikokujin-Kaigojinzai-Ukeire no Arikatanikansuru Kentokai)" in October of 2014, and its reports were compiled in October of 2016.

later. In this paper, we clarify the long-term trend of the wage stratification of the care work.

2   Inequality and stratification

In this paper, we measure how the stratification index of care workers in Japan has changed from 2001 to 2017 using census data. Stratification and inequality are among the oldest, most central, and most intensely debated concepts in sociology (e.g., Blau and Duncan 1967; Erikson and Goldthorpe 1992), and these are representative indicators of the disparity. What are the differences between inequality and stratification? Zhou and Wodtke (2019) summarize these differences as follows. Inequality refers to the extent to which a valued resource is distributed unevenly across individuals or between population subgroups. Stratification, by contrast, refers to the extent to which population subgroups occupy separate hierarchical layers within an overall distribution of resources (Lasswell 1965; Yitzhaki and Lerman 1991; Zhou 2012). The distinction between inequality and stratification parallels the distinction between variation and segmentation and the associated distinction between levels and ranks. Inequality refers to variation in absolute levels, whereas stratification refers to segmentation of relative ranks (Zhou 2012). To illustrate this difference, let us look at Figure 1.

[FIGURE 1 HERE]

Figure 1 shows two hypothetical populations. Two populations, A and B, are composed of male and female workers. In population A, the average annual income of male is 5 million yen, and that of female is 4.5 million yen, indicating that there is no major inequality. On the other hand, there is almost no overlap in the distribution of the average annual income of male and female. That is, even when high-income female and low-income male are compared,

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the latter has a higher average annual income than the former, which means that it is a society in which stratification by gender is progressing (high). In population B, the average annual income of male is 5 million yen, and that of female is 2 million yen, indicating that there is major inequality. However, the distribution of the average annual income of male and female has a large variance, and the overlapping area is large. That is, when comparing high-income female and low-income male, the latter is often lower than the former, which means that it is a society in which stratification by gender has not progressed. Differences between inequality and stratification are also differences between variation and segmentation. To better understand this difference, it is important to consider the differences between levels and ranks (Zhou 2012). To assess the magnitude of the variation (inequality), the researcher must obtain the absolute level of all individual observations. In contrast, only ranks are needed to assess the degree of segmentation (stratification).

3 Data and Methods

3.1 Data and Variables

To illustrate the stratification index of care workers in Japan, we use Basic Survey on Wage Structure (BSWS) 2001-2017, which is census data on wages conducted by the Ministry of Health, Labour and Welfare. BSWS aims at obtaining a clear picture of the wage structure of employees in major industries i.e., wage distribution by type of employment, type of work, occupation, sex, age, school career, length of service and occupational career, etc. BSWS grasps the wage payment amount and working hours at the individual level by extracting the establishments by probability and by extracting the permanent workers working at each

establishment. Of the 70,000 to 80,000 establishments that have been extracted from all over the country, 1.5 to 1.6 million workers are extracted as probabilities. With regard to these workers, the amount of salary to be paid regularly in June from the wage register of the establishment, the predetermined and non-scheduled working hours, and the bonus amount for the last year are transcribed.

The variables used in the analysis are as follows. We use a scheduled monthly wage as an outcome. We use three occupations of care managers, home helpers, and care staff at the facility as a dummy variable for care work. We use data from 2001 and onwards, as care workers will appear after 2001 in occupational classification. The analysis target is limited to general workers excluding part-time workers among regular workers.

3.2   Methods

There were various indicators of inequality, such as the Gini coefficient, Theil index, Atkinson index, but indicators related to the stratification have hardly been studied except for Itzhaki and Lerman's index (Itzhaki and Lerman 1991). In the following, we introduce nonparametric stratification index (NSI) proposed by Zhou (2012). Below we explain NSI according to Zhou (2012).

NSI captures the overall extent of stratification for the population with a value between 0 and 1. More important, it is fully nonparametric and thus independent of the distribution of levels. We introduce the following three points, (1) definition and properties of NSI, and (2) decomposition of the overall NSI into pair-specific components.

We start introducing a new index from the case of two groups. Let y_i be the income of the ith man and y_j the income of the jth woman and suppose a population that consists of

n_M male and n_F female. First, we order all the subjects (including male and female) from the lowest to the highest in terms of income and use r_{M_i} and r_{F_i}) to denote the ranks of the ith male and of the jth female. Then, we calculate the average ranks both for men and women and denote them R_M and R_F. For convenience, we assume $R_M > R_F$ on average. We measure NSI between male and female by the following quantity:

$$NSI \;=\; \frac{\sum_{i=1}^{n_M} \sum_{j=1}^{n_F} \left[1\left(r_{M_i} > r_F\right) - 1\left(r_{M_i} < r_F\right)\right]}{n_M n_F} \tag{1}$$

$$=\; P\left(Y_i > Y_j | C_i > C_j\right) - P\left(Y_i < Y_j | C_i > C_j\right) \tag{2}$$

Y_i and C_i denote the income and occupational class of the ith respondent, respectively; $C_i > C_j$ indicates that members of occupational class C_i have a higher average percentile rank in the income distribution than members of occupational class C_j. It takes 0 if $\sum_{i=1}^{n_M} \sum_{j=1}^{n_F} 1\left(r_{Mi} > r_{Fj}\right) = \sum_{i=1}^{n_M} \sum_{j=1}^{n_F} 1\left(r_{Mi} < r_{Fj}\right)$. This is the case there is no differences between male and female in their relative positions. On the other hand, if male have higher rank than female in all pairs, NSI takes 1. If we denote by P_a the probability that the order of two individuals from different groups agrees with the order of their groups, then we get following equation:

$$NSI \;=\; \frac{\sum_{s,t,i,j} 1\left(r_{si} > r_{tj}\right) 1\left(R_s > R_t\right)}{\sum_{s,t,i,j} 1\left(R_s > R_t\right)} - \frac{\sum_{s,t,i,j} 1\left(r_{si} < r_{tj}\right) 1\left(R_s > R_t\right)}{\sum_{s,t,i,j} 1\left(R_s > R_t\right)} \tag{3}$$

$$=\; P_a - \left(1 - P_a\right) = 2P_a - 1 \tag{4}$$

Hence,

$$P_a = \frac{1}{2}\left(1 + NSI\right) \tag{5}$$

This converted indicator is intuitive and easy to understand. That is, if NSI=0.3, P_a will be $(1 + 0.3)/2 = 0.65$ that a randomly chosen male earns higher than a randomly chosen female with a probability of 0.65. The index defined previously gauges the overall extent of stratification pertaining to a given grouping scheme.

NSI can also be expressed as a weighted average of pair-specific components. The decomposition into a weighted average of 2 components given grouping scheme can be expressed as follows:

$$\pi_b NSI_b^g + \pi_w NSI_w^g \tag{6}$$

where,

$$\pi_b \quad = \quad P\left(G_i \neq G_j | C_i > C_j\right) \tag{7}$$

$$NSI_b^g \quad = \quad P\left(Y_i > Y_j | C_i > C_j, G_i = G_j\right) - P\left(Y_i < Y_j | C_i > C_j, G_i = G_j\right) \tag{8}$$

$$\pi_w \quad = \quad P\left(G_i = G_j | C_i > C_j\right) \tag{9}$$

$$NSI_w^g \quad = \quad P\left(Y_i > Y_j | C_i > C_j, G_i = G_j\right) - P\left(Y_i < Y_j | C_i > C_j, G_i = G_j\right) \tag{10}$$

π_b is the proportion of pairwise comparisons between groups (G_i and G_j) occurring between different gender. NSI_b^g is the level of gender stratification occurring between groups. π_w is the proportion of pairwise comparisons between groups occurring within gender. NSI_b^g is the level of gender stratification occurring within groups. All these values can be calculated from the data.

Next, we show that inequality can also be decomposed into within and between components. The inequality as a mean difference is,

$$E[Y|C=1] - E[Y|C=0] \tag{11}$$

This equation can be decomposed as,

$$
\begin{aligned}
= &\ Pr[G=1|C=1] \times E[Y|C=1, G=1] \\
+ &\ Pr[G=0|C=1] \times E[Y|C=1, G=0] \\
- &\ Pr[G=1|C=0] \times E[Y|C=0, G=1] \\
- &\ Pr[G=0|C=0] \times E[Y|C=0, G=0]
\end{aligned} \tag{12}
$$

The above equation can be rewritten as follows.

$$
\begin{aligned}
&\{Pr[G=1|C=0] + Pr[G=0|C=0]\} \times Pr[G=1|C=1] \times E[Y|C=1, G=1] \\
+ &\{Pr[G=1|C=0] + Pr[G=0|C=0]\} \times Pr[G=0|C=1] \times E[Y|C=1, G=0] \\
- &\{Pr[G=1|C=1] + Pr[G=0|C=1]\} \times Pr[G=1|C=0] \times E[Y|C=0, G=1] \\
- &\{Pr[G=1|C=1] + Pr[G=0|C=1]\} \times Pr[G=0|C=0] \times E[Y|C=0, G=0]
\end{aligned} \tag{13}
$$

$$
\begin{aligned}
= &\ Pr[G=1|C=0] \times Pr[G=1|C=1] \times \{E[Y|C=1, G=1] - E[Y|C=0, G=1]\} \\
+ &\ Pr[G=0|C=0] \times Pr[G=0|C=1] \times \{E[Y|C=1, G=0] - E[Y|C=0, G=0]\} \\
+ &\ Pr[G=0|C=0] \times Pr[G=1|C=1] \times \{E[Y|C=1, G=1] - E[Y|C=0, G=0]\} \\
+ &\ Pr[G=1|C=0] \times Pr[G=0|C=1] \times \{E[Y|C=1, G=0] - E[Y|C=0, G=1]\}
\end{aligned} \tag{14}
$$

In this equation, the first and second terms are the within component, and the third and fourth are the between component. Moreover, the above equation can be additionally rewritten as follows.

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$$E[Y|C = 1] - E[Y|C = 0]$$

$$= \{Pr[G = 1|C = 0]Pr[G = 1|C = 1] + Pr[G = 0|C = 0]Pr[G = 0|C = 1]\} \times INE_w^g$$

$$+ \{Pr[G = 0|C = 0]Pr[G = 1|C = 1] + Pr[G = 1|C = 0] \times Pr[G = 0|C = 1]\} \times INE_b^g$$

$$(15)$$

where,

$$INE_w^g = \frac{Pr[G=1|C=0]Pr[G=1|C=1]}{Pr[G=1|C=0]Pr[G=1|C=1] + Pr[G=0|C=0]Pr[G=0|C=1]} \times \{E[Y|C = 1, G = 1] - E[Y|C = 0, G = 1]\}$$

$$+ \frac{Pr[G=0|C=0]Pr[G=0|C=1]}{Pr[G=1|C=0]Pr[G=1|C=1] + Pr[G=0|C=0]Pr[G=0|C=1]} \times \{E[Y|C = 1, G = 0] - E[Y|C = 0, G = 0]\}$$

$$(16)$$

$$INE_b^g = \frac{Pr[G=0|C=0]Pr[G=1|C=1]}{Pr[G=0|C=0]Pr[G=1|C=1] + Pr[G=1|C=0]Pr[G=0|C=1]} \times \{E[Y|C = 1, G = 1] - E[Y|C = 0, G = 0]\}$$

$$+ \frac{Pr[G=1|C=0]Pr[G=0|C=1]}{Pr[G=0|C=0]Pr[G=1|C=1] + Pr[G=1|C=0]Pr[G=0|C=1]} \times \{E[Y|C = 1, G = 0] - E[Y|C = 0, G = 1]\}$$

$$(17)$$

INE_w^g is the level of gender inequality occurring within groups. INE_b^g is the level of gender inequality occurring between groups. Similar to the stratification decomposition, all these values can be calculated from the data.

4   Wage Stratification in Care Work: 2001-2017

4.1   Long-term Trends of Stratification in Care Work

First, we will confirm the wage and care work stratification. Figure 2 shows the trends in wage stratification between care and non-care workers from 2001 to 2017. The horizontal

axis in Figure 2 represents the survey year, and the vertical axis represents NSI for non-care work. In 2001, NSI is 0.48 and the probability will be $(1 + 0.48)/2 = 0.74$ that a randomly chosen non-care worker earns higher than a randomly chosen care worker with a probability of 0.74. In 2017, the probability will be $(1 + 0.45)/2 = 0.72$ that a randomly chosen non-care worker earns higher than a randomly chosen care worker with a probability of 0.72. Looking at these trends, we confirm that there is little change in overall wage stratification between care workers and non-care workers.

[FIGURE 2 HERE]

Figure 3 shows the trends in wage inequality between care and non-care workers from 2001 to 2017. The horizontal axis in Figure 3 represents the survey year, and the vertical axis represents parameter estimates when regressing wages (hundred YEN) on non-care work dummy variable. Although this parameter is parametric, it indicates the inequality of the mean value. The mean difference in average wages was 123,000 yen in 2001, but the difference is about 113,000 yen in 2017. In other words, the inequality between care workers and non-care workers has shrunk by about 8% ((12300 - 113000) / 123000) in the last 16 years. From the above, although there was no major change in the stratification, there was a significant change in the inequality.

[FIGURE 3 HERE]

Next, we compare care and non-care work disparities with other variables to find out the magnitude of the stratifiaction and inequality indicator. Here, we will compare gender and employment status as an example. Figure 4 and Figure 5 shows the trends in wage stratification and inequality between gender from 1997 to 2017. In 1997, NSI is 0.61 and the probability

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will be $(1 + 0.61)/2 = 0.81$ that a randomly chosen male earns higher than a randomly chosen female with a probability of 0.81. In 2017, the probability will be $(1 + 0.43)/2 = 0.72$. This value 0.72 is almost the same as NSI for non-care worker in previous analysis, and we see that the stratification between care and non-care workers is almost equal to the stratification between gender. Figure 5 shows that the mean difference in average wages was 150,000 yen in 1997, but the difference is about 105,000 yen in 2017. The inequality between gender has shrunk by about 30% in the last 20 years. The degree of reduction in inequality between gender is greater than that in care and non-care workers.

[FIGURE 4 HERE]

[FIGURE 5 HERE]

Then, we compare employment status with care work. We clarify stratification and inequality in employment status and created a dummy variable with 1 as a regular employee with no fixed term and 0 as the others. Figure 6 and figure 7 shows the trends in wage stratification and inequality between employment status from 2004 to 2017. In 2004, NSI is about 0.6 and the probability will be $(1 + 0.6)/2 = 0.8$ that a randomly chosen regular worker earns higher than a randomly chosen non-regular worker with a probability of 0.8. In 2017, the probability will be $(1 + 0.56)/2 = 0.78$. This NSI 0.78 is slightly greater than NSI for non-care worker in previous analysis. Figure 7 shows that the mean difference in average wages was 118,000 yen in 2004, but the difference is about 103,000 yen in 2017. The inequality among employment status has shrunk by about 13% in the last 13 years. The degree of reduction in inequality among employment status is greater than that in care and non-care workers.

[FIGURE 6 HERE]

[FIGURE 7 HERE]

4.2   Decomposition of Wage Stratification and Inequality Trends

Then we decompose the overall level of NSI into a weighted average of wage stratification between and within gender. This analysis can clarify how the overall NSI occurs within and between gender. Decomposition by gender is performed for all care and non-care workers.

Figure 8 shows the NSI decomposed into within and between gender. This result shows that NSI between gender is higher than within gender. Furthermore, the between gender component slightly decreased from 2001 to 2017. By contrast, the within-gender component increased in the last 15 years. The results show two findings. First, Care works are not highly stratified within gender but between gender. Second, NSI for between gender is decreasing while within gender is rising. In order to examine the second point in detail, Figure 9 plots the NSI for male and gemale, with blue indicating male and red indicating female NSI. The analysis show that female's NSI is rising but men's NSI is decreasing, and the rise in within gender NSI shown in Figure 8 is mainly caused by the rise in female's NSI.

[FIGURE 8 HERE]

[FIGURE 9 HERE]

Similar to decomposition of NSI, we then decompose inequality into between and within components. In figure 10, we see that inequality is in the same trend as stratification. That is, the result shows that inequality between gender is greater than within gender. The between mean difference in average wages was 150,000 yen in 2001, but the difference is about 130,000 yen in 2017. The inequality between gender has shrunk by about 13% in the last 16 years.

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In the same way, we see that the inequality within gender has risen to 13% in the last 13 years. Although there was no major change in between gender NSI, we see that there was a significant change in between gender in inequality. Moreover, figure 11 shows that the inequality between care/non-care work of male has not changed, but the inequality of female has increased. This inequality trend is similar to the NSI trend.

[FIGURE 10 HERE]

[FIGURE 11 HERE]

5   Conclusion

This paper aims to measure how the stratification index of care workers in Japan has changed from 2001 to 2017. Referring to approach for disparities, there are two concepts: inequality and stratification. Inequality refers to variation in absolute levels, whereas stratification refers to segmentation of relative ranks. We analyse the following three points, (1) NSI of occupational classes, and (2) decomposition of the overall NSI into pair-specific components.

The results of nonparametric stratification index (NSI) shows that there is little change in overall wage stratification between care workers and non-care workers. Decomposition analysis revealed that the overall NSI in each year was mainly caused by between gender stratification rather than within gender stratification. However, focusing on the within gender NSI, the results show that while there is no major change in NSI for male, NSI for female is gradually rising. This indicates that the stratification between care workers and non-care workers is progressing especially in female. In inequality, although the magnitude varies between stratification and inequality, the results shows the same trend as NSI.

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     Classes in the United States." *Social Forces* 97(3): 945-972.
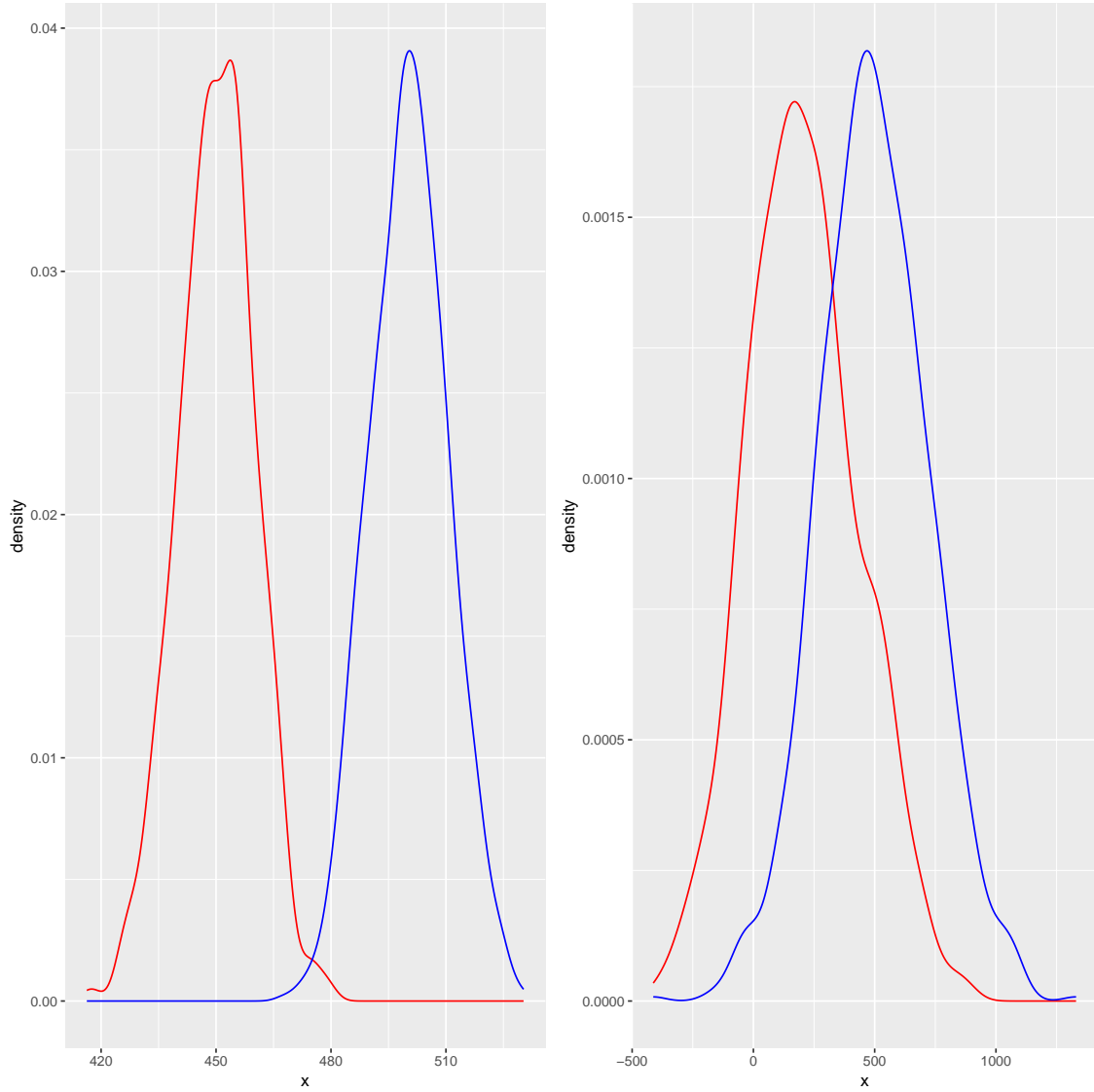
Figure 1: The distinction between inequality and stratification

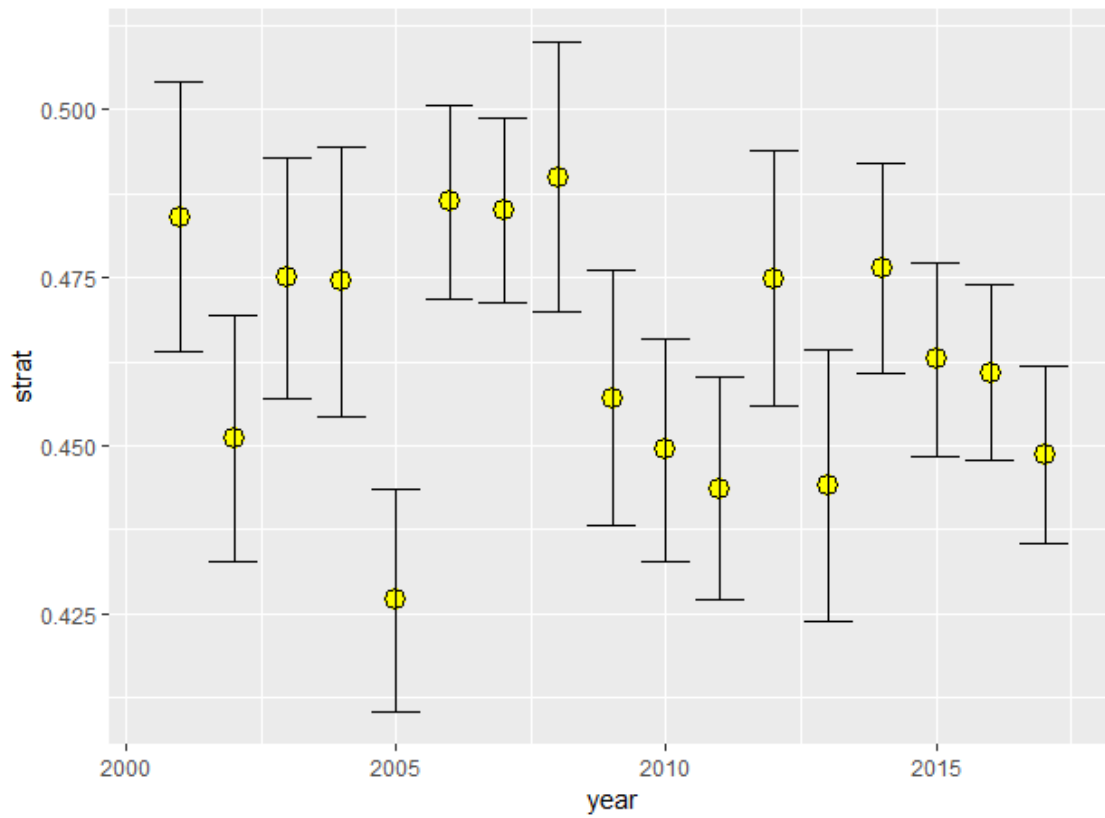Note: The left figure shows Population A and the right figure shows Population B

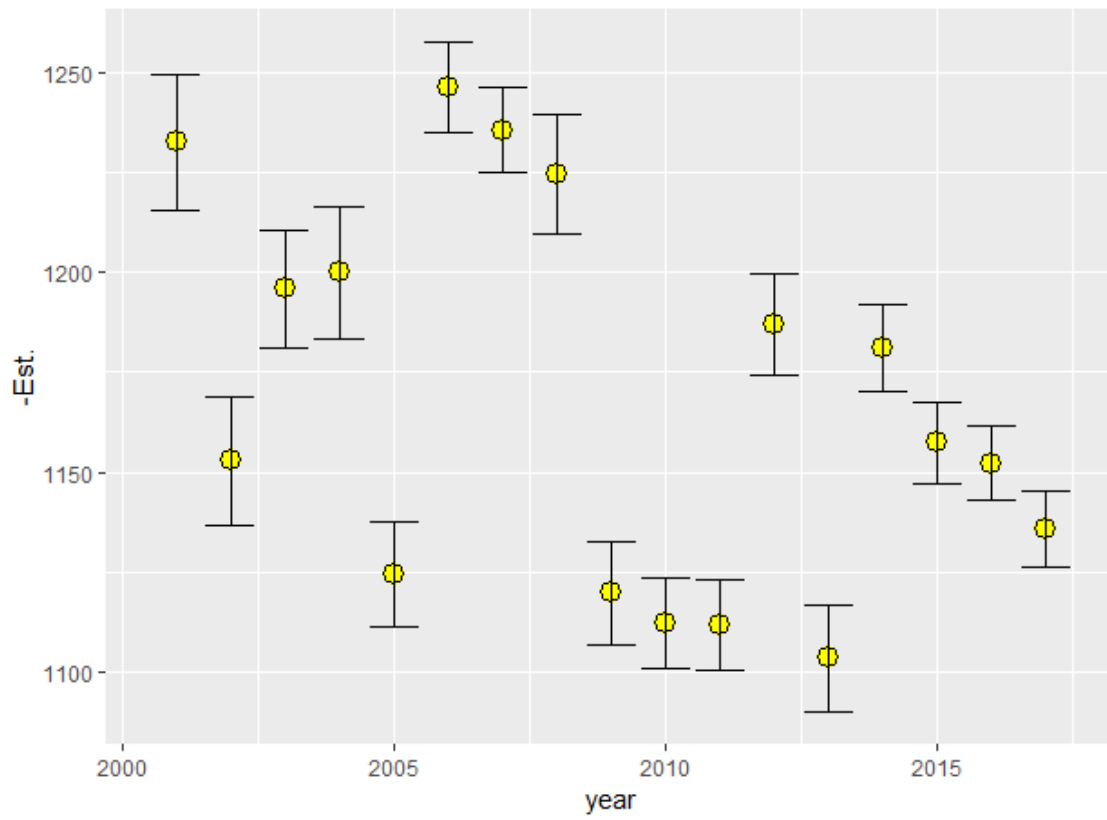Figure 2: Overall Wage Stratification between Care and Non-care Work

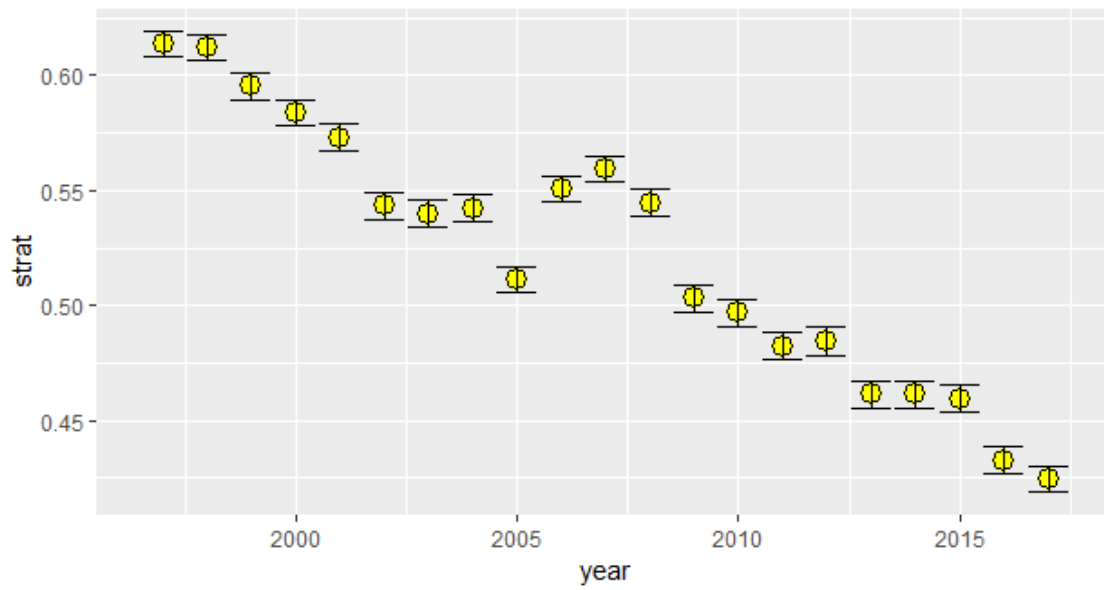Figure 3: Overall Wage Inequality between Care and Non-care Work
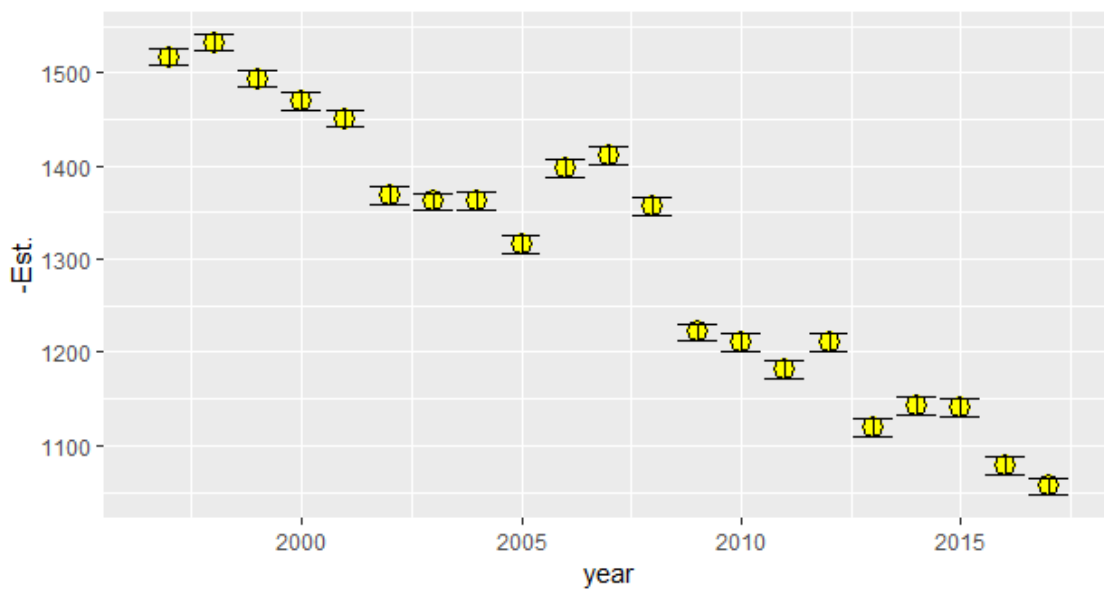
Figure 4: Overall Wage Stratification between Gender

Figure 5: Overall Wage Inequality between Gender
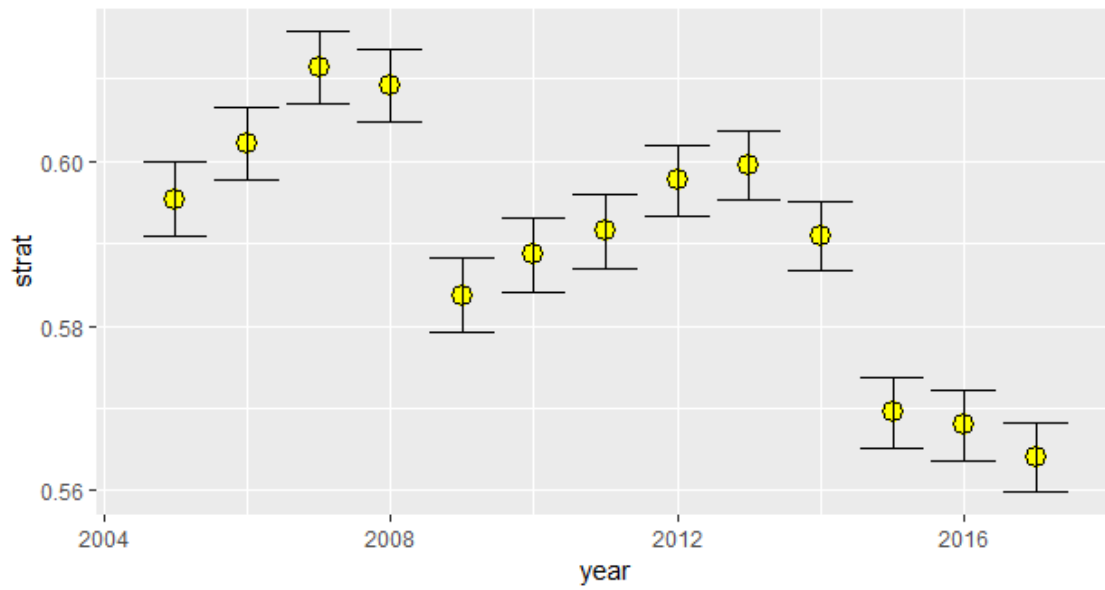
Figure 6: Overall Wage Stratification between Employment Status
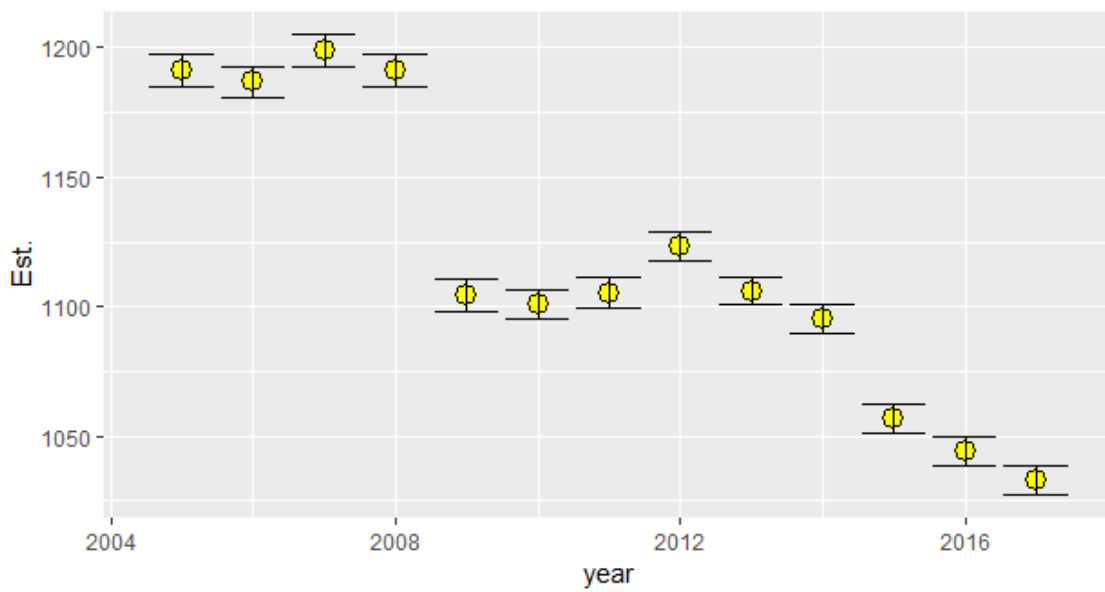
Figure 7: Overall Wage Inequality between Employment Status

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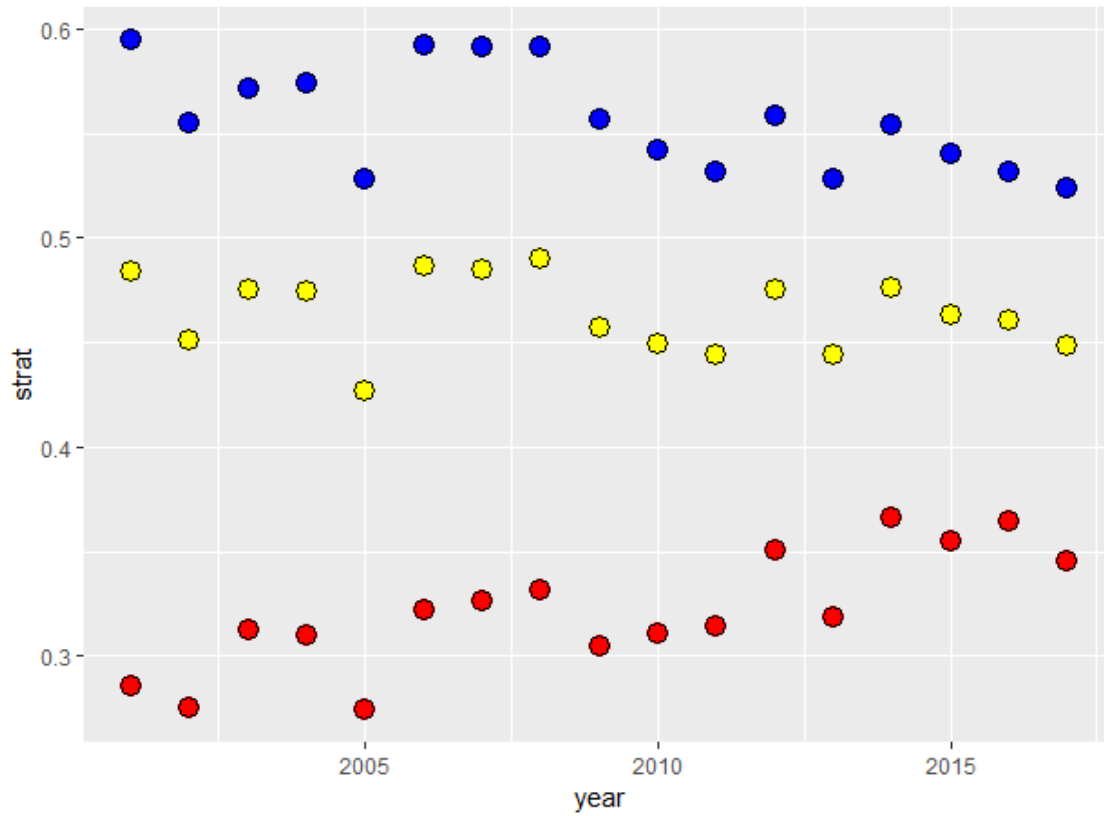
Figure 8: Decomposition of Trends in Care Work and Gender Stratification

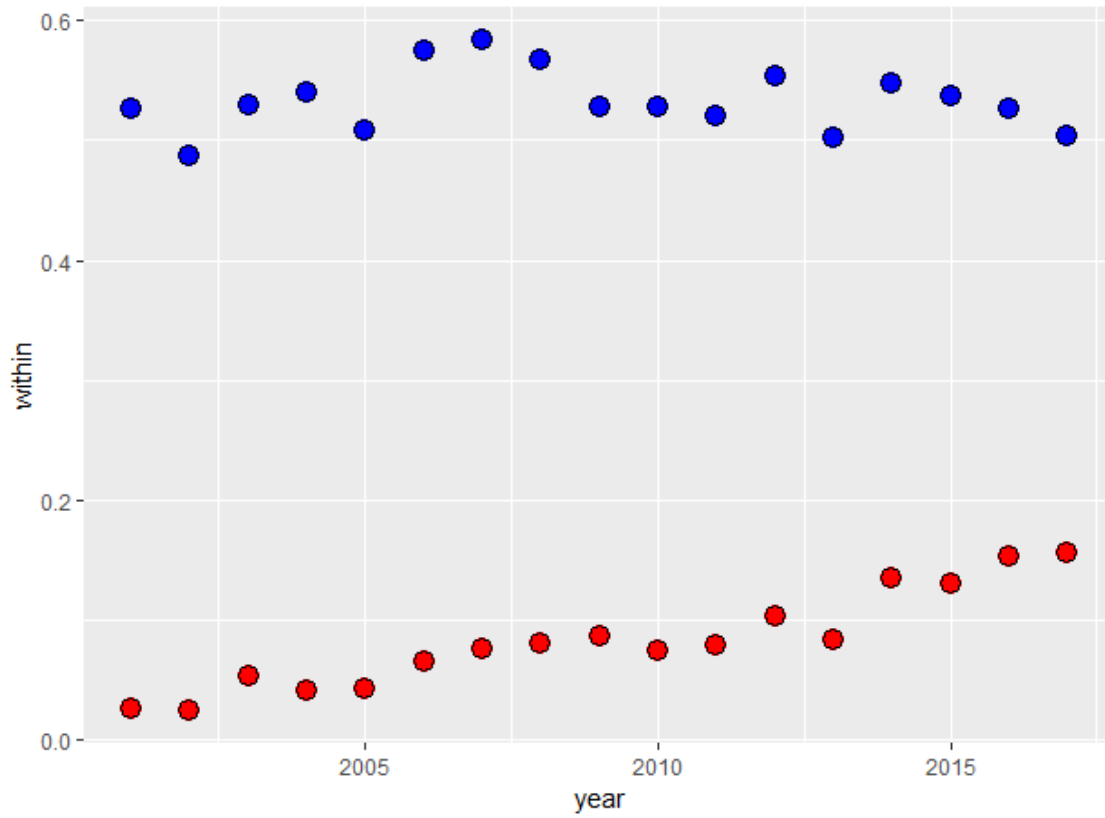Note: Yellow, blue, and red dots indicate the overall, between and within gender NSI.

Figure 9: Within Gender Wage Stratification

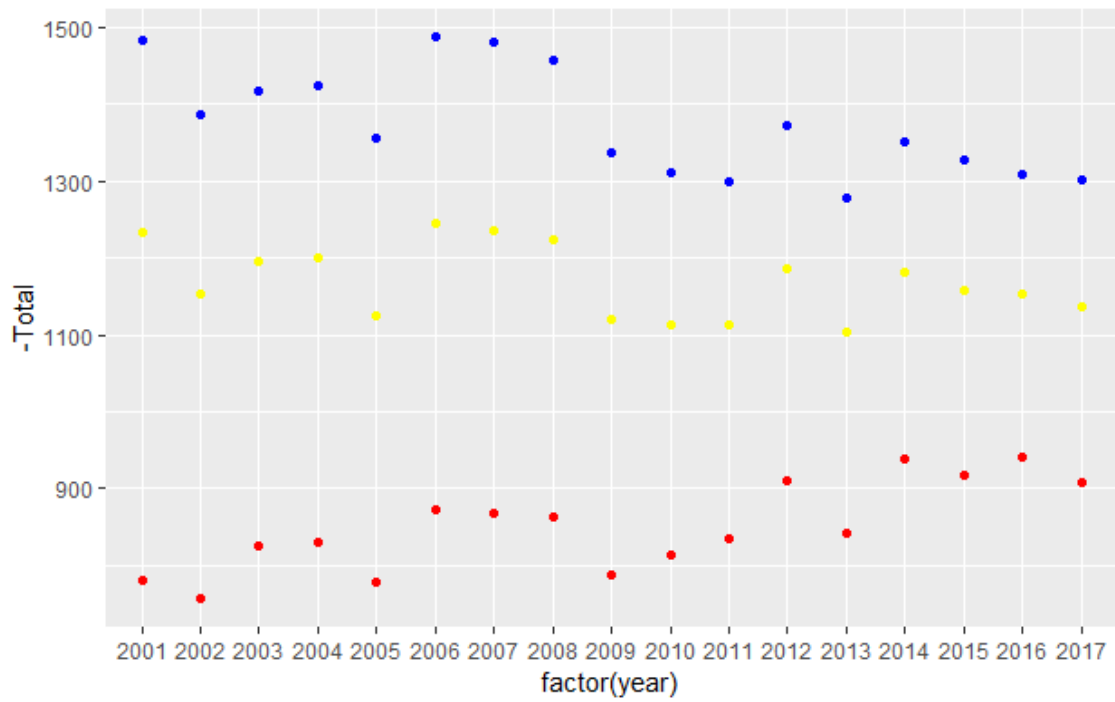Note: Blue and red dots indicate male and female NSI.

Figure 10: Decomposition of Trends in Care Work and Gender Inequality

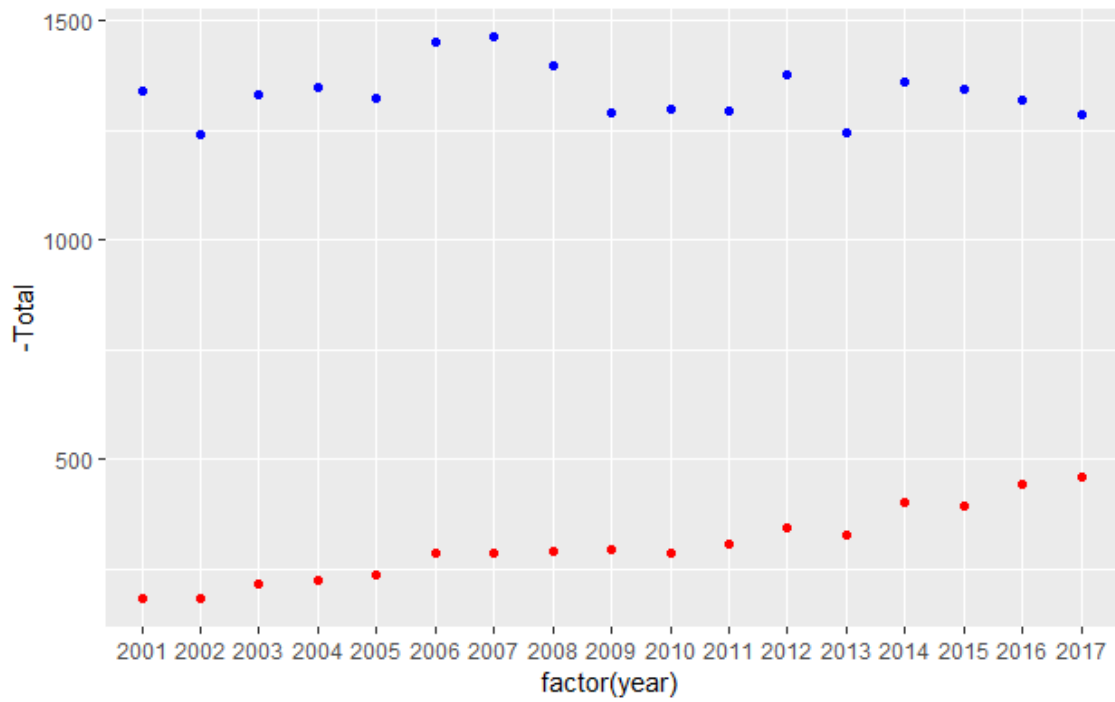Note: Yellow, blue, and red dots indicate the overall, between and within gender inequality.

Figure 11: Within Gender Wage Inequality

Note: Blue and red dots indicate male and female inequality.