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Abstract

In China, the demand for care work is increasing with the aging of the population. Care services are mainly provided by internal migrants and their wages are found to be particularly low among internal migrants. However, there are few articles that have examined disparities of potential care workers using nationally representative internal migrant data. In terms of the different types of disparities, there are two main forms: inequality and stratification. Inequality refers to variation in absolute levels, whereas stratification refers to segmentation of relative ranks. This paper measures how the stratification index of potential care workers among internal migrants has changed from 2011 to 2015. The results of a nonparametric stratification index (NSI) shows that income stratification between care/non-care work exhibits a declining trend. Decomposition analysis revealed that NSI in each year was apparent by between gender stratification rather than within gender stratification. Furthermore, counterfactual analysis shows that income stratification between care/non-care work would have risen even more than it actually did if care/non-care work differences in educational attainment had remained at their 2011 levels.

Keywords: stratification, inequality, elderly care, internal migration, occupation
JEL classification: J6, J4, I3,

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1 Introduction

1.1 Internal Migration and Elderly Care in China

In China, the demand for care work is increasing with the aging of the population. According to a new World Bank report (Glinskaya and Feng 2018), 26 percent of China's population is expected to be 65 or older, and about 8 percent will be 80 or older by 2050. To tackle this problem, China would require a balanced mix of services across home, community, and institutional settings that can best meet elderly people's preferences and needs. As Glinskaya and Feng (2018) states, China is experiencing one of the most rapid transitions to an aging society ever witnessed. Over the next 25 years, 14 percent of China's population will be over 65 years of age, up from 7 percent in 2002. This transition took 115 years for France, 45 years for England, and 69 years for the United States. This rapid aging poses various problems in informal care. Traditionally, families are the primary source of informal care for older Chinese relatives. However, changes in family structure, economic development and migration are making it difficult to access informal care for elderly people. These changes are similar to what the other developed countries have experienced.

As many aging societies have already experienced, the elderly care market needs more human resources as the population ages. Recruiting and maintaining care workers is an urgent issue in the elderly care policy. In China, the shortage of qualified and skilled labor in its current long-term care workforce is particularly acute. The China National Committee on Aging reports that about 80 percent of families seeking long-term care have unmet need. According to national research, the elder care industry needs 10 million care workers, of which a great majority would provide care in institutional care facilities. However, by 2015,

China only had roughly 1 million elder care workers and among them, merely 20,000 had received official training. These gaps have major implications for the quantity and quality of care provided, particularly because long-term care is labor-intensive in nature (Glinskaya and Feng 2018).

1.2 Stratification of Care Workers among Occupation in China

Most of the care workers are front-line workers who directly support the basic activities of daily life, such as eating, bathing, changing clothes, using toilets. On the other hand, the long-term care workers also include a group of licensed health professionals such as registered nurses, licensed practical/vocational nurses, social workers, physical therapists, occupational therapists, physician assistants/aides, and long-term care facility administrators, who often assume supervising or managerial responsibilities rather than providing direct, hands-on care (Stone and Harahan 2010). China is facing a shortage of low-skilled workers in all industries due to a decline in the overall working-age population and rapid urbanization and industrialization of the western and central regions (Glinskaya and Feng 2018).

Elderly care workers generally have a low socioeconomic status in China. Dong et al. (2017) also shows that care workers earn about 28 percent less than other domestic workers do in Shanghai. The reference wage set by the Shanghai Municipal Bureau of Labor in 2012 was RMB 2,200 for elderly care workers, compared to RMB 4,600 for child care workers. These studies shows that elderly care workers are the most disadvantaged subgroup of the domestic worker social class. That is, the rank of care workers in social stratification is considered to be low. However, there have been no papers that have actually examined the stratification of care workers using large-scale survey data.

Also, according to recent research by the Ministry of Civil Affairs on 2,158 elder care workers in approximately 120 care facilities across 15 provinces, these workers are mainly older females with low levels of education, mostly from rural areas, and highly mobile (MOCA 2012)[1]. MOCA (2012) suggests that care work is mainly supplied by internal migrants. China has witnessed substantial internal migration in recent decades. The latest population census shows that internal migrants in China numbered around 221 million in 2010, which accounts for one-sixth of the national population. Most internal migrants target urban areas, contributing to increasing levels of urbanization. In 2011, the population of urban residents in China surpassed the rural population for the first time in history. By the end of 2014, urban residents accounted for around 54.8 percent of the national population (Niu and Qi 2015).

Therefore, in order to evaluate the stratification of care workers in China, it is important to focus on internal migrant care workers. In this paper, we focus on the stratification of internal migrant care workers. It has been said that the economic stratification status of internal migrants and care workers are low, but few studies have examined how low they are. We clarify the degree of stratification of potential care workers among internal migrants compared with other occupations.

[1] According to MOCA (2012), the details are as follows. Around 83.5 percent of them were female. About 51 percent of them are in the 40-49 age group, and 28 percent in the 50 and older group. Very basic levels of education and training were required to qualify as elder care workers, with about 45.2 percent of them being junior middle school graduates. With respect to experience, 14.8 percent of these workers had less than one year of experience, while 25.9 percent had 1-2 years of experience.

2 Inequality and stratification

In this paper, we measure how the stratification index of potential care workers in the internal migrants has changed from 2011 to 2015 using national representative 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, 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 internal migrant potential care workers in China, we use China Migrants Dynamic Survey (CMDS) 2011-2015, which is based on the annual national representative survey of the migrant population conducted by the National Health Commission of PRC since 2009. CMDS has a sample size of around 200,000, drawn from 31 provinces (autonomous regions and municipalities). The sample size for each year is 128,000 (2011), 158,556 (2012), 198,795 (2013), 200,937 (2014), 206,000 (2015). The sampling was implemented by the stratified multistage probability proportional to size (PPS) method. In the first stage, towns/subdistricts were selected according to the PPS method. In the second

phase, villages/community groups were selected from these owns/subdistricts. At the third stage, individual participants were randomly sampled from these village/community groups.

The variables used in the analysis are as follows. We use monthly income as an outcome. We use gender and occupation as variables to examine the relationship with income in terms of stratification. Since CMDS can not identify the care worker as an occupation, we use a home helper as a potential care worker here. Thus, for occupations, dummy variables for potential care workers are created.

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, (2) decomposition of the overall NSI into pair-specific components, and (3) counterfactual trends using decomposition weights.

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:

$$NSI = \frac{\sum_{i=1}^{n_{\mathrm{M}}} \sum_{j=1}^{n_F} \left[1\left(r_{\mathrm{M}_i} > r_{\mathrm{F}}\right) - 1\left(r_{\mathrm{M}_i} < r_{\mathrm{F}}\right)\right]}{n_{\mathrm{M}} n_{\mathrm{F}}} \tag{1}$$

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

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 $\sum_{i=1}^{n_M} \sum_{j=1}^{n_{\mathrm{F}}} 1\left(r_{\mathrm{M}i} > r_{Fj}\right) = \sum_{i=1}^{n_{\mathrm{M}}} \sum_{j=1}^{n_{\mathrm{F}}} 1\left(r_{\mathrm{M}i} < r_{Fj}\right)$. 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:

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

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

Hence,

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

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,

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

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

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

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

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.

Finally, in the third stage of the analysis, we assess whether observed NSI changes are related to changes in the educational attainment of the workforce and broad shifts in employment patterns across industries. To evaluate the impact of changes in educational attainment, we adjust the weight for each respondent in occupational classification c, education level e, and

year t as follows:

$$w_{\text{cet}} = \frac{\pi_{2011}\left(E_i = e | C_i = c\right)}{\pi_t\left(E_i = e | C_i = c\right)} \tag{11}$$

where E_i denotes a respondent' s level of education and $\pi_t(E_i = e|C_i = c)$ denotes the proportion of respondents with education level e within occupational class c in year t. Reweighting the sample by w_{cet} transforms the class-specific educational distributions to be the same as those in 2011, but it does not alter the marginal distribution of respondents across classes in any year. Then we calculate NSI with the reweighted sample and can assess how much of the change in occupational class stratification can be attributed to class-specific changes in educational attainment. Same methods are used to evaluate the impact of industries.

4 Results from China Migrants Dynamic Survey 2011-2015

4.1 Trends in Occupational Class Stratification, 2011-2015

First, we will confirm the income and occupational class stratification. The occupation here is not limited to the care and non care workers but uses all occupations. This is to verify to what extent stratification occurs when adopting all occupation classifications compared to care work dummy indicator. Figure 2 shows the trends in occupational class stratification from 2011 to 2015. The horizontal axis in Figure 2 represents the survey year, and the vertical axis represents NSI for occupation. Figure 2 shows that occupational stratification have a declining trend in NSI. In 2011, NSI is 0.33 and the probability will be $(1 + 0.33)/2 = 0.67$ that the order of two individuals from different occupation groups agrees with the order of their occupation groups with a probability of 0.67. In 2015, this probability will be (1 +

$0.23)/2 = 0.62$.

[FIGURE 2 HERE]

To illuminate the distributional changes underlying these broad trends, table 1 shows the average percentile rank of incomes for each occupation. While the professional and managerial the average percentile rank are high, the average percentile rank of potential carer worker tends to lower (0.284 in 2011 and 0.328 in 2015). Furthermore, table 1 can explain why the NSI of occupations has declined. Occupational NSI has been decreased because of the decrease in average percentile rank of professional and management occupations and the rise in average percentile rank of sales, services, care workers occupations.

[TABLE 1 HERE]

Next we focus on potential care workers in China. Table 2 shows the difference in average income between care workers and non-care workers, ie, inequality. We confirm that the inequality is growing between care and non-care workers. Next, we check the trend of NSI (stratification). The horizontal axis in Figure 3 represents the survey year, and the vertical axis represents the non-care workers NSI. It can be seen from Figure 3 that non-care workers have a declining trend in NSI. In 2011, NSI is 0.47 and the probability will be $(1 + 0.47)/2 = 0.74$ that a randomly chosen male earns higher than a randomly chosen female with a probability of 0.74. In 2015, NSI is 0.35 and the probability will be $(1 + 0.35)/2 = 0.68$ that a randomly chosen male earns higher than a randomly chosen female with a probability of 0.68. That is, the difference in stratification between care-workers and non-care workers is getting smaller. From the above, we see that while inequality is increasing between care and non-care workers, stratification is decreasing.

[TABLE 2 HERE]

[FIGURE 3 HERE]

4.2 Decomposition of Trends in Gender Stratification

Then we decompose the overall level of NSI into a weighted average of occupational stratification between gender and occupational stratification within gender. Decomposition by gender is performed both for all occupational classifications and for care work indicator classifications.

Figure 4 shows the NSI in Figure 2 decomposed into within and between gender. This result shows that NSI between gender is higher than within gender. Occupational classes are not highly stratified within gender. Furthermore, the between gender component slightly increased from 2012 to 2014. By contrast, the within-gender component slightly decreased from 2012 to 2015.

[FIGURE 4 HERE]

Figure 5 shows the result of decomposition when using the care worker dummy variable as an occupation indicator.This result shows that NSI between gender is higher than within gender. This result is the same as using all occupation classifications (Figure 4). In other words, care workers occupational classes are not highly stratified internally by gender. Because the decomposition accords more weight to the between rather than the within gender component (π_b^g for both genders). Although the NSI tends to decline overall, the within and between weights do not appear to change.

[FIGURE 5 HERE]

4.3 Sources of Rising Stratification between Occupational Classes

Based on this decomposition, we construct "counterfactual trends" by fixing either NSI_b^g or NSI_w^g at its baseline level to assess whether observed changes in occupational stratification occurred primarily by the changes of educational attainment. We evaluate that income stratification between care/non-care workers has descended because of educational attainment change. Figure 6 evaluates the influence of education on occupational stratification. The results in figure 6 indicate that income stratification between care/non-care work would have risen even more than it actually did if care/non-care work differences in educational attainment had remained at their 2011 levels. This pattern suggests that care/non-care work differences in educational attainment declined, rather than increased, from 2011 to 2015..

[FIGURE 6 HERE]

On the other hand, figure 7 shows the results when using 7 occupation classifications[2]. Figure 7 shows different results from figure 6. That is, the results shows that income stratification among occupational classes would have declined even more than it actually did if occupational class differences in educational attainment had remained at their 2011 levels. However, these differences are slight. The reason for this is that the span of data may be short, so it will be necessary to examine longer-term data in the future.

[2]Since there are many occupation classifications of the original data, there is a cell that can not calculate the weight. Therefore, they are classified into the following seven: (i) professionals, administrators, officials and technicians, (ii) routine non-manual employees, higher grade (administration and commerce), (iii) routine non-manual employees, lower grade (sales and services), (iv) skilled manual workers, (v) semi-skilled and unskilled manual workers (not in agriculture). (vi) agricultural and other workers in primary production, (vii) unemployed.

[FIGURE 7 HERE]

5 Conclusion

This paper measure how the stratification index of care work and occupational classes in the internal migrants has changed from 2011 to 2015 in China. 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, (2) decomposition of the overall NSI into pair-specific components, and (3) counterfactual trends using decomposition weights.

The results of nonparametric stratification index shows that occupational stratification have a declining trend compared to 2011. Decomposition analysis revealed that NSI in each year was mainly caused by between gender stratification rather than within gender stratification. Furthermore, counterfactual analysis shows that income stratification between care/non-care work would have risen even more than it actually did if care/non-care work differences in educational attainment had remained at their 2011 levels.

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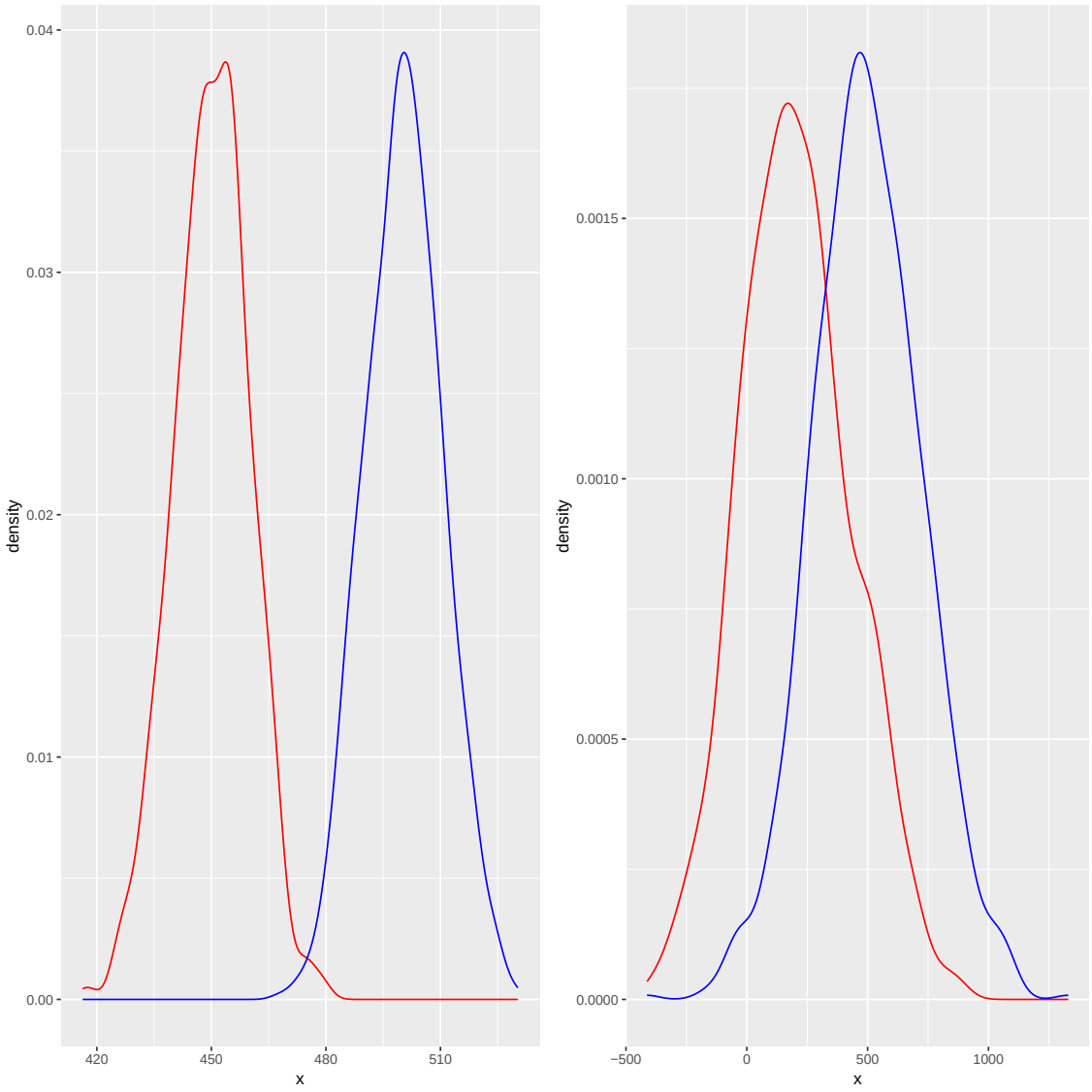

Figure 1: The distinction between inequality and stratification

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

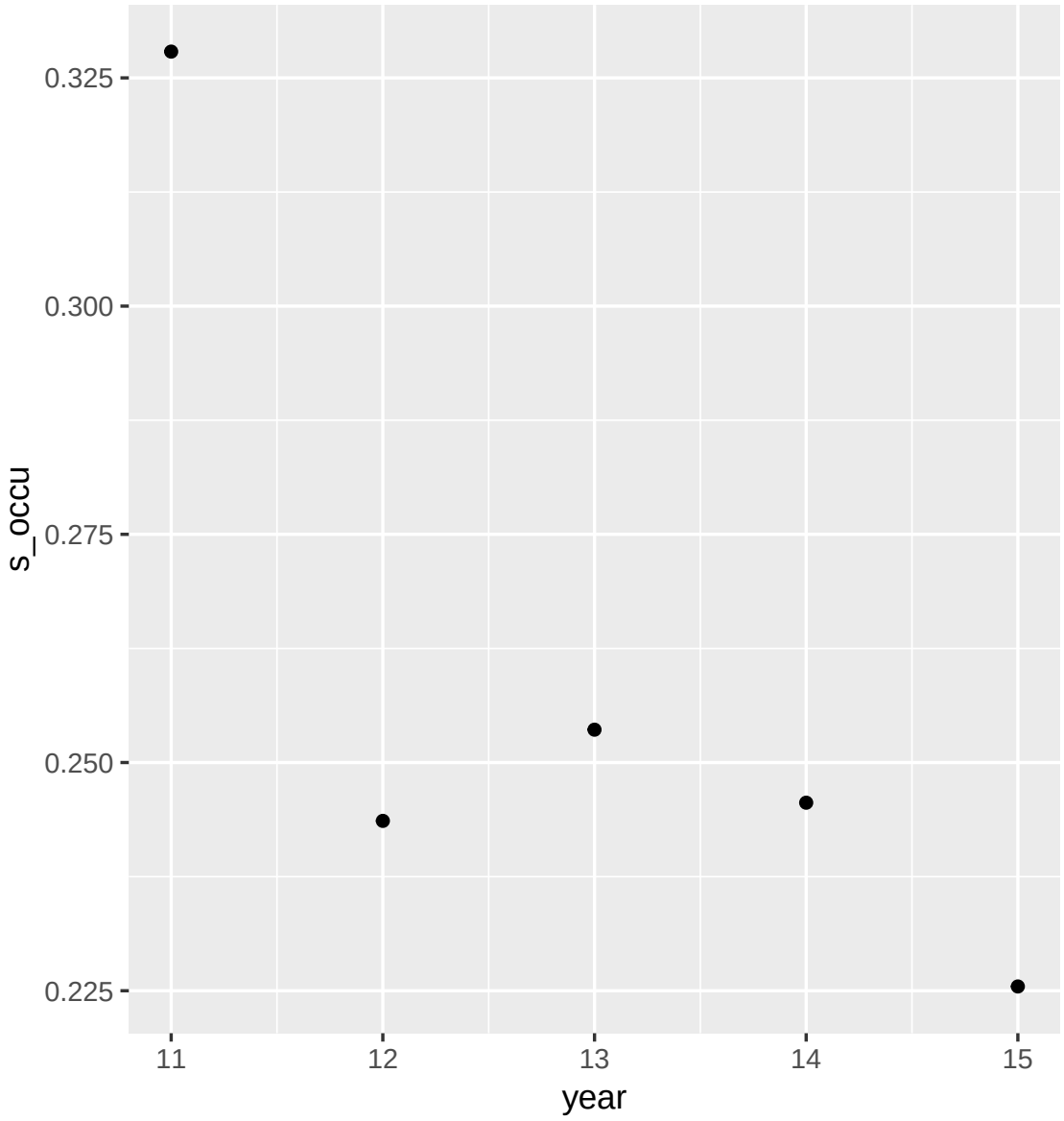

Figure 2: Trends in Occupational Class Stratification from 2011-2015

Table 1: Trends in Occupational Class Stratification from 2011-2015

Occupation	NSI Percentile Rank				
	2011	2012	2013	2014	2015
10:Manager	0.717	0.683	0.631	0.637	0.701
20:Professional	0.652	0.618	0.618	0.626	0.614
30:Civil servant	0.602	0.580	0.538	0.523	0.555
41:Company management	0.450	0.586	0.573	0.562	0.576
42:Sales	0.405	0.504	0.492	0.487	0.483
43:Eating and drinking services	0.350	0.441	0.430	0.436	0.472
44:Housekeeping and care work	0.284	0.357	0.329	0.356	0.328
45:Cleaner	0.182	0.206	0.198	0.208	0.186
46:Private police guard	0.331	0.316	0.307	0.322	0.294
47:Interior repair	0.604	0.596	0.618	0.613	0.589
40,48:Services	0.383	0.430	0.424	0.434	0.447
50:Agriculture	0.387	0.348	0.346	0.327	0.300
61:Manufacturing	0.509	0.481	0.493	0.502	0.462
62:Transport	0.641	0.613	0.638	0.630	0.608
63:Construction and architect	0.604	0.572	0.617	0.600	0.563
64:Others	-	0.497	0.515	0.521	0.495
70:Unemployed	0.360	0.314	0.333	0.325	0.334

Table 2: Average income inequality between care and non-care workers

Average Monthly Income (YUAN)					
	2011	2012	2013	2014	2015
Non-Care Worker	2363.73	3123.96	3265.46	3746.65	4259.73
Care Worker	1642.43	2184.99	2334.98	2741.42	2851.81
Differences between Non- and Care Worker	721.3	938.97	930.48	1005.23	1407.89

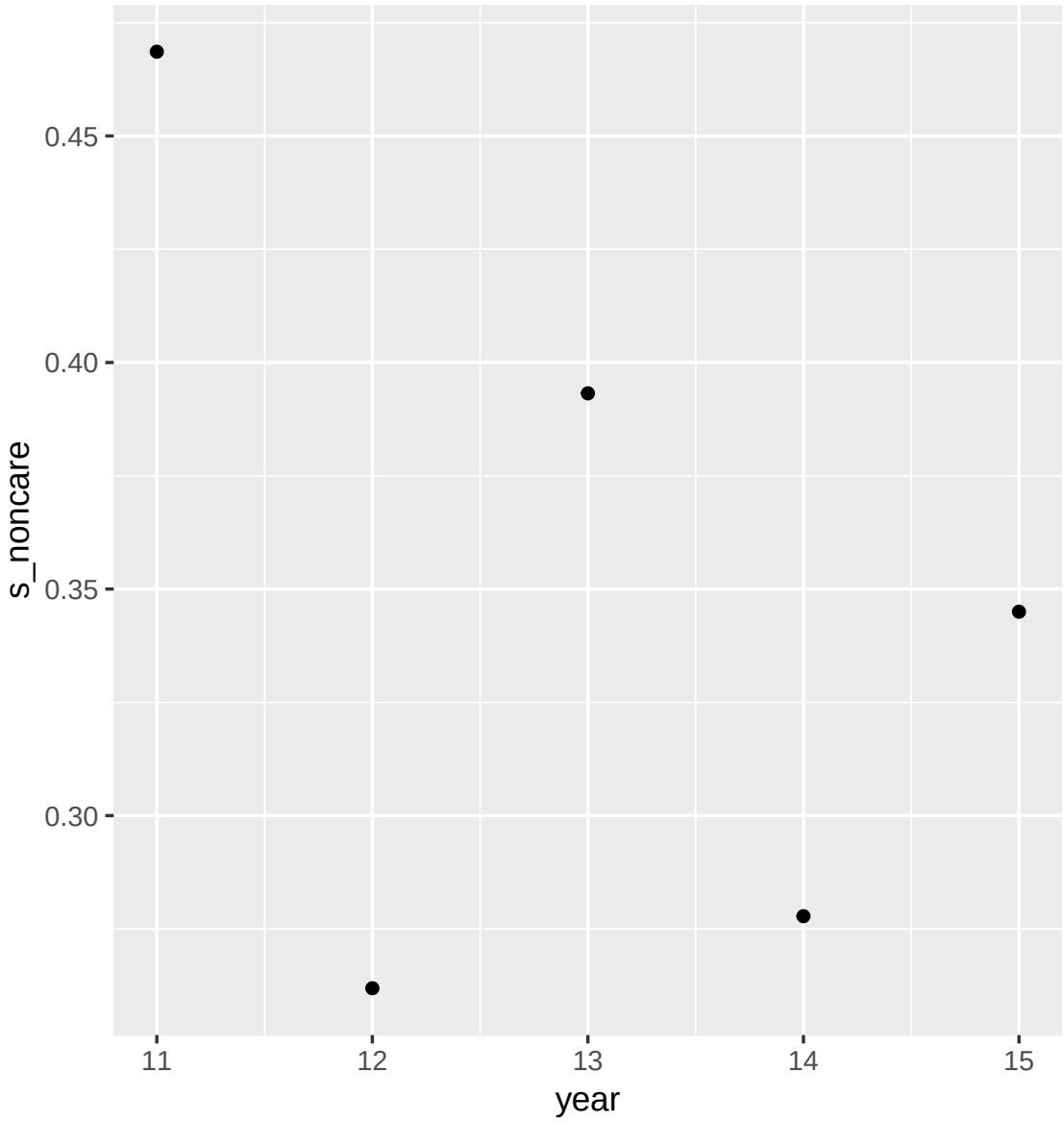

Figure 3: Trends in Care Worker's Class Stratification from 2011 to 2015

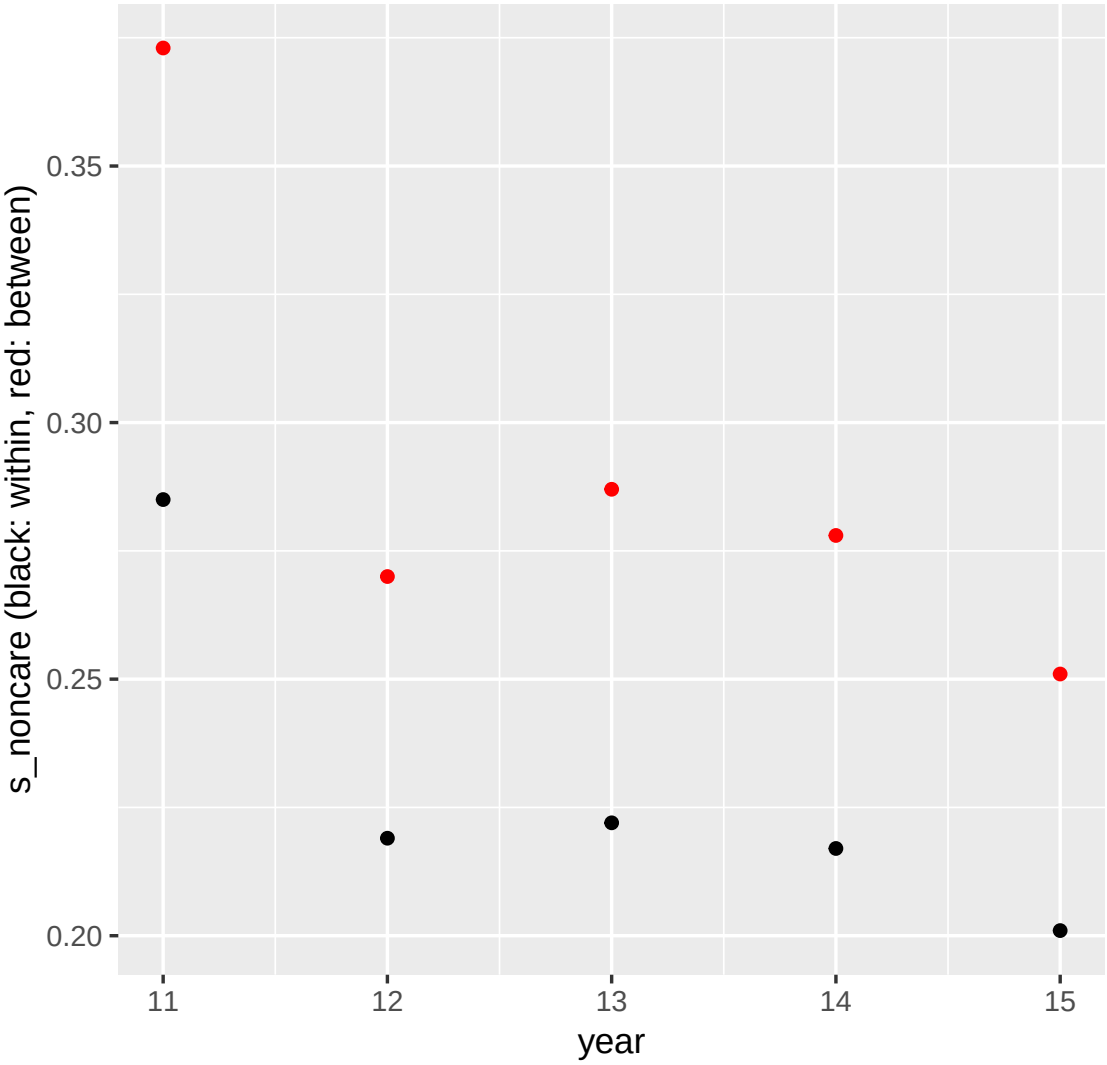

Figure 4: A Decomposition of Trends in Occupation and Gender Stratification from 2011 to 2015

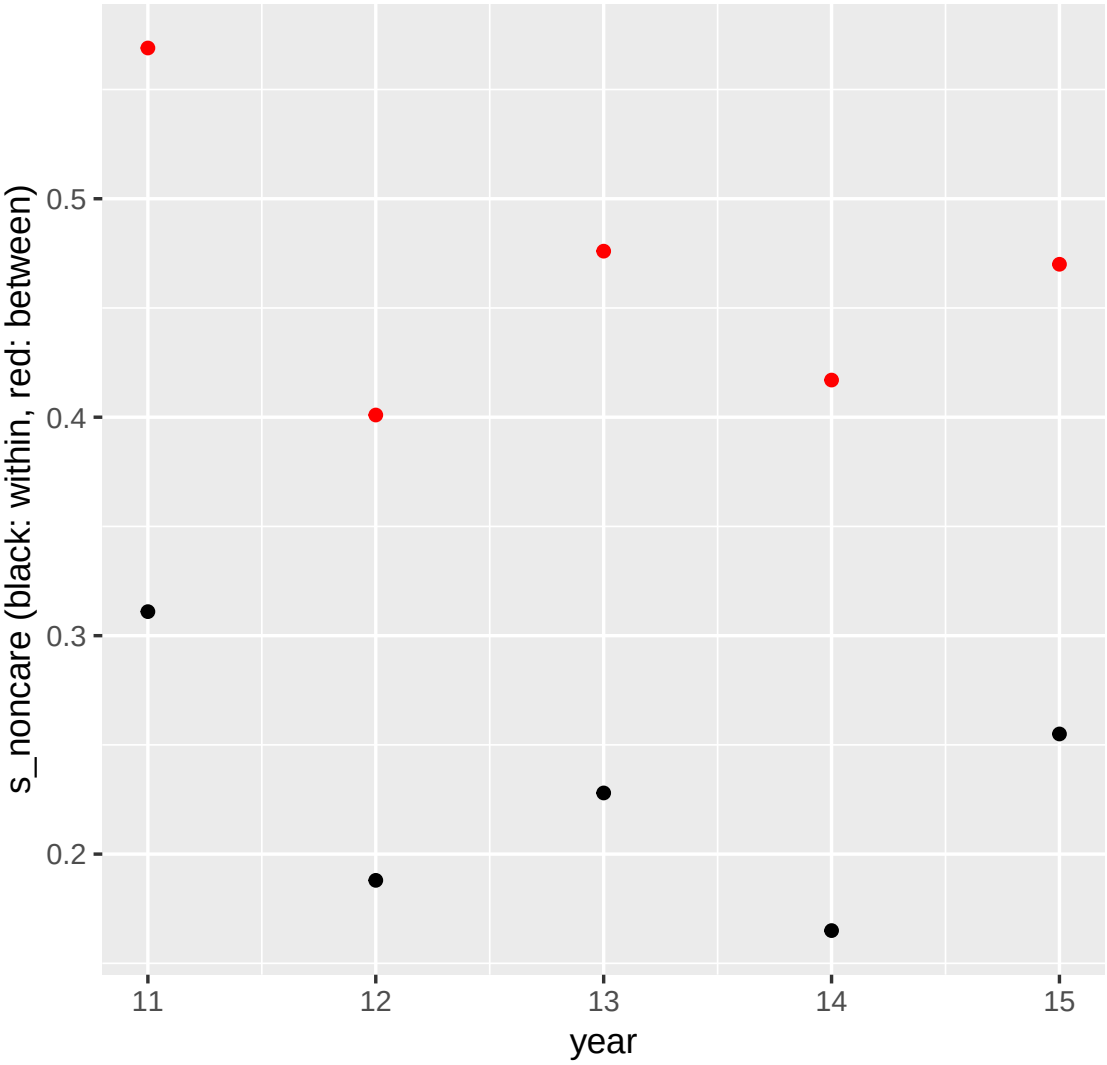

Figure 5: A Decomposition of Trends in Care Work and Gender Stratification from 2011 to 2015

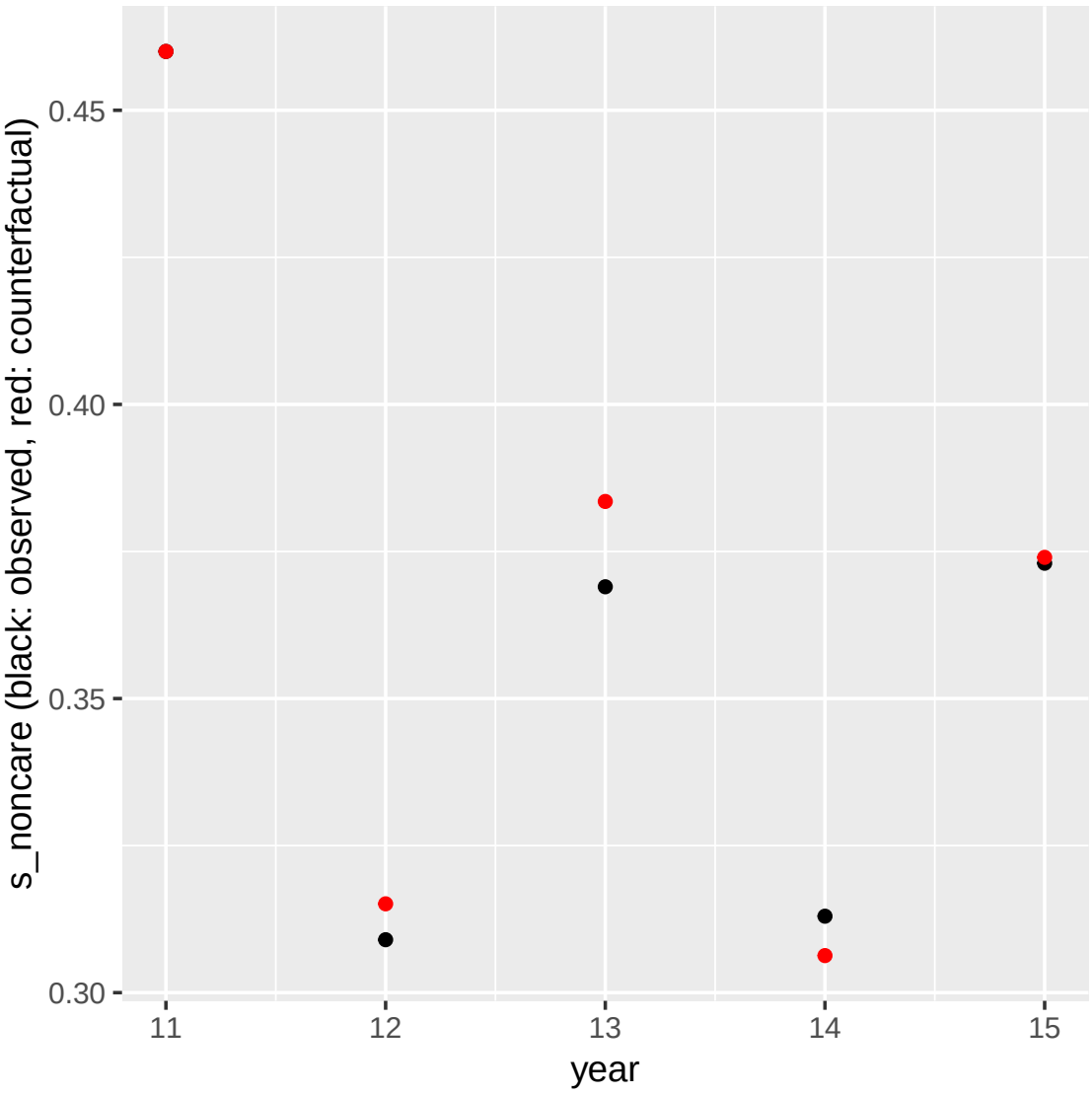

Figure 6: Counterfactual trends in care work stratification from 2011 to 2015

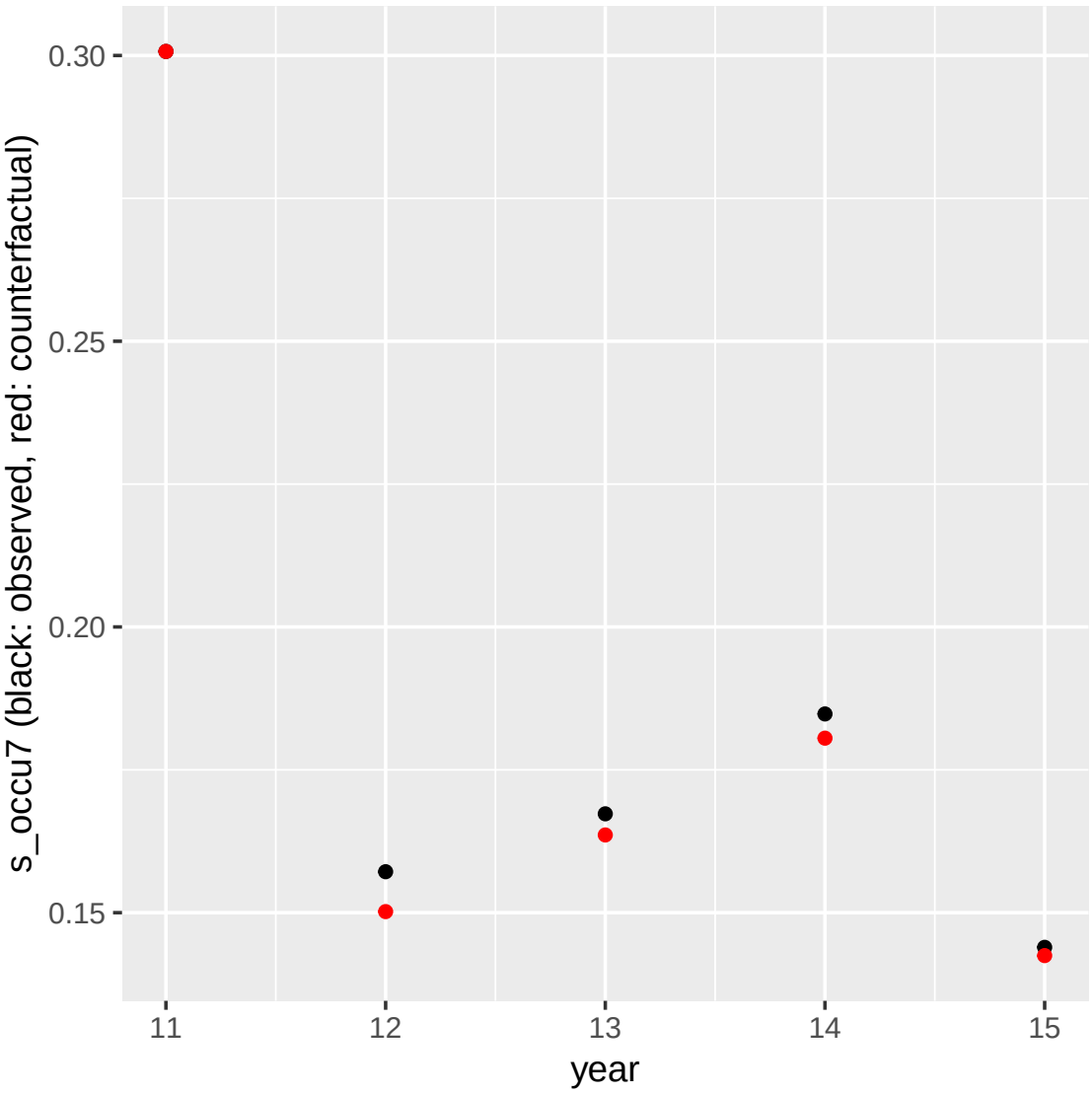

Figure 7: Counterfactual trends in seven occupation stratification from 2011 to 2015