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What Happened to Wage Inequality in Japan during the Last 25 Years? Evidence from the FFL decomposition method*

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Abstract

Using comprehensive government statistics, we show the extent to which wage inequality among men and women has increased in Japan from 1989 to 2013, and the factors that are behind the changes using the Dinardo, Fortin and Lemieux (DFL) and Firpo, Fortin and Lemieux (FFL) decomposition methods. First, we find that the increase in the wage rate prevailed in all quantiles in both genders in the 1990s, and the real wage rate inequality was unchanged. Second, since the 2000s, the wage rate of the middle wage workers has been reduced more than that of any other group. Along with other developed countries, the decrease in wages of the middle class is observed even in Japan during the 2000s, although Japan is known for its solid middle class. Among women, the 90-50 gap increased while the 50-10 gap decreased, which resulted in the unchanged overall inequality for female workers. Finally, our exercise using the FFL decomposition method reveals the contemporaneous occurrence of the decrease in the return on general human capital of males and top females and the increase in the return of firm-specific human capital among male workers with a high wage rate. This suggests that Japanese firms undermined employee involvement and problem solving activities at the grassroots level, which is considered as one of the key elements of Japanese employment system. Moreover, our findings suggest that Japanese firms invest in just a few selected able workers, regardless of their age, because they no longer have enough reserves to invest in all of their employees.

JEL Classification: J11, J31, J82
Keywords: Inequality, Wage change, Quantile analysis, Firpo, Fortin, and Lemieux decomposition

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1 Introduction

Rising wage inequality is observed in many developed countries. By way of explanation, the development of wage inequality is said to be driven more or less by skill-biased technical change (SBTC) or the penetration of globalization. A large body of research examines changes in wage inequality and the factors that have played an important role in bringing about these changes (Card and DiNardo 2002).

In the first decade of the 2000s in the United States (US), wages at the bottom and the top of the wage distribution increased faster than wages in the middle. In contrast, in the 1970s and 1980s, wages in the bottom of the wage distribution increased by the smallest amount and the wages at the top of the distribution increased by the largest amount (Cahuc and Zylberberg 2014). Recently, wage polarization has been observed in many developed countries, including the US (Autor et al. 2003), Britain (Goos and Manning 2007), Germany (Dustmann et al. 2009), and other European countries (Goos et al. 2009, 2014). In addition to SBTC and globalization, the ongoing economic sluggishness has an effect on wage inequality (Lise et al. 2014, Yokoyama 2014, Kodama et al. 2015).

A growing number of studies in the literature have confirmed the increase in income (or household earnings) inequality in Japan (Lise et al. 2014, Tachibanaki 1998, Ohtake 2005, Tachibanaki 2005, Kambayashi et al. 2008, Ohtake 2008, Moriguchi and Saez 2008, Yamada and Kawaguchi 2015), although, according to Moriguchi (2010)'s analysis using a long-term time series of income tax statistics, Japan has been known for its solid middle class and relatively egalitarian society for much of the post-WWII era. However, there is controversy about how and when wage inequality has been expanding and the groups of people that are being affected because the subjects and data sources vary among the studies. Thus, we used a comprehensive government dataset that contains relatively long-term time series wage data from 1989 to 2013, which includes important events in the last 25 years: the post-bubble period in the 1990s, the structural change of the labor market in the late 1990s, the economic recovery in the early 2000s, and the period after the global financial crisis in 2008.

This paper aims to show the extent to which wage inequality among men and women increased in Japan between the 1990s and 2000s, to determine the factors that affected these changes, and to

identify the people that were most affected by them. To accomplish this, we employ a relatively new decomposition technique proposed by Firpo et al. (2007, 2010). This paper is the first paper that utilizes this technical method in the Japanese context, which can serve another contribution of our paper. The idea in the Firpo, Fortin, and Lemieux (FFL) decomposition method is to combine the DiNardo, Fortin, and Lemieux (DFL) decomposition method proposed by DiNardo et al. (1996) with the Oaxaca-Blinder decomposition method to make it possible to estimate the contribution that each covariate makes to each of the structure effects and composition effects when analyzing distributional change. This is possible by using the re-centered influence function (RIF) of Y as the dependent variable. In the first stage of the FFL, distributional changes in wages are divided into a distributional change due to changes in β, that is, a structural effect, and a distributional change due to changes in X, that is, a composition effect, using the reweighting method proposed by DiNardo et al. (1996). In the second stage, the two components are further divided into the contribution of each explanatory variable using novel RIF regressions. These regressions directly estimate the impact that the explanatory variables have on the distributional statistic of interest.

Driven by the prolonged economic stagnation since the 1990s, rapid changes in the labor market have had an impact on the wages of workers in Japan. These changes include an aging workforce, the rapid rise in the educational attainment of workers, the participation of women in the labor market, the increase in the number of part-time workers, the decrease in training cost of firms, and changes in the industrial structure. In 1989, workers under the age of 35 comprised 38% of the labor market; this proportion fell to 31% in 2013. On the other hand, workers over 55 comprised 9% of the labor market in 1989, and this proportion increased to 21% in 2013. Over the last 25 years, a substantial educational upgrading has occurred among workers. For example, the percentage of the total population that has a university level education, or higher, increased from 34% to 56% for males and from 15% to 47% for females. In 1990, 15.2% of the people in the labor market were part-time workers; this gradually increased to 26.9% in 2013. The percentage of training costs invested by firms to total labor costs (except for cash wage) was 2.4% in 1988, which decreased gradually to 1.6% in 2011.

It is important to compare male and female workers in the 1990s and the 2000s for two reasons. First, the great recession may have extensively changed the structure of the labor market during the last 25 years. Our data covers the following important events in Japan's prolonged stagnation:

the financial and real estate bubble at the end of 1980s, the Asian currency crisis in 1997, the IT bubble in the early 2000s, and the global finance crisis in 2008. We can observe the effects on wage inequality of the global finance crisis. Second, there are two heterogeneous labor markets in Japan. Even now, the gender inequality is greater and the gender wage gap is much larger in Japan than it is in other developed countries (Blau et al. 2010), although female participation in the labor market has increased, and wage inequality has decreased.

Our first result suggests that under a prolonged recession after the burst of the economic bubble in the late 1980s, the real hourly wage increased in all quantiles for both sexes in the 1990s. This was due to the reduction in the number of working hours brought about by the reduction in labor demand, as well as the implementation of the Act on Temporary Measures concerning the Promotion of Reduced Working Hours in 1992 and the amendment to the Labor Standard Laws in 1994, which, in principle, set working hours at 40 hours per week (Kawaguchi et al. 2008, Kambayashi and Kato 2016). However, the increase in wage rate prevailed in all quantiles in both sexes in the 1990s, which resulted in unchanged indices of inequality. In the large-scale movement of inequality in the 1990s and the 2000s, small-scale change of inequality is correlated with business cycle.

Second, in the 2000s, the number of part time workers increased even among male workers with low-to-medium wage rates and female workers with high-to-medium wage rates, which constitute the middle class of Japanese employees, and as a result, their wage rate dropped. This situation is similar to the pattern of the declining middle class observed in many developed countries (e.g., literature reviews in Goldin and Katz (2008), Acemoglu and Autor (2011, 2012)). While the traditional inequality measurement indices, such as the Gini coefficient, coefficient of variation (CV), and the 90-10 percentile gap do not fully illustrate the change of the wage distribution, the DFL and FFL decomposition methods show the decline of the middle class very clearly.

Finally, our exercise using the FFL decomposition method reveals that the reduction in the return to potential years of experience contributed to reducing wage rates, especially among male workers and for all quantiles and female workers with a high wage rate, which implies a reduction in the importance of general human capital among these workers. In addition, the return of tenure contributed to decreasing wage rates among male workers with low-to-median wage rates and female workers in all quantiles, which also implies the decrease in the importance on firm-

specific human capital among these workers. These findings are consistent with the stylized fact that Japanese firms have been reducing training costs in 1990s and 2000s. This suggests that Japanese firms undermined employee involvement and problem solving activities at the grassroots level, which is considered one of the key elements of the Japanese employment system.[1] In contrast, we also find that an increase in the return in tenure on wage rates contributed to increasing wage rates among male workers earning high wage rates. This evidence implies that the importance of firm-specific human capital among male workers earning a high wage rate has increased, especially during the 2000s. Thus, this contemporaneous decrease in the return on general human capital of almost all workers and the increase in the return on firm-specific human capital among male workers with high wage rate suggest that Japanese firms invest in just a few able workers regardless of their ages because they no longer have enough money to invest in all employees.

The paper is organized as follows. In next section, we describe the FFL decomposition method. Section 3 provides a description of the data. Section 4 first explores how wage inequality can be observed for men and women separately and then considers the factors that change wage rate using the FFL decomposition method. The last section presents the conclusions of the study.

2 Methodology

In this paper, we employ the Firpo, Fortin, and Lemieux decomposition method to decompose the changes in wage rates (Firpo et al. 2007, 2010). In the FFL decomposition method, the total change in is divided into the composition and structural effects, and they are further decomposed into the contributions of each explanatory variable. In this sense, the Oaxaca-Blinder decomposition (OB) would be the counterpart of this method. However, two characteristics of the FFL decomposition differentiate it from the classic OB decomposition. First, in the FFL method, the recentered influence function (RIF) of Y, instead of Y, is used as the dependent variable, which enables us to examine distributional changes in ; this was possible only for the mean in the classic OB decomposition (Firpo et al. 2007, 2010). Since the RIF function is used as a dependent variable in the unconditional quantile regression (UQR), each regression in the UQR consists of a FFL decomposition.

[1] See Kambayashi and Kato (2016) for characteristics of the Japanese employment system.

Conceptually, the influence function (IF) represents the influence of increasing an individual observation on the distributional statistic, such as means, variances, quantiles, and Gini coefficients. For the τth quantile, the influence function $IF(Y;q_\tau,F_Y)$ is equal to $\{\tau - 1(Y \leq q_\tau)\}/f_Y(q_\tau)$. The IF gives us a way to explore how changes in the distribution of Y affect q_τ. The goal here is to compute the effect of changing X on quantiles. The process leading up to this goal is divided into two steps: [1] changes in $X \rightarrow$changes in the distribution of Y and [2] changes in the distribution of $Y \rightarrow$changes in q_τ. The IF only does step two. To connect steps one and two, we need to apply the Law of Iterated Expectations (LIE). To utilize the LIE, we need the recentered version of the IF, that is, the RIF, which is simply equal to $q_\tau + IF(Y; q_\tau, F_Y)$. The RIF has a very convenient feature in that its expectation is equal to its distributional statistics (in our case, q_τ):

$$q_\tau = E[RIF] = E_X(E[RIF/X]) \tag{1}$$

Then, using the LIE, the distributional statistic can also be expressed in terms of the expectations of the conditional RIF, that is, a function of X. Thus, by using the RIF, step one can be connected to step one. The details of this process can be found in work by Firpo et al. (2007, 2010).

3 Data

The micro data used in this study is from the Basic Survey on Wage Structures (BSWS), which is the most comprehensive wage survey in Japan, conducted every year by the Ministry of Health, Labour and Welfare. The BSWS excludes agriculture, forestry, fisheries, and public services. It covers private- and public-sector firms with ten or more employees, and private-sector establishments with five to nine employees. The establishments in the sample were randomly chosen in proportion to the size of the prefectures, industries, and the number of employees, using data from the Establishment and Enterprise Census (EEC), which includes all establishments in Japan. The sampling of the survey was done in two steps: first, a random sample of establishments was selected, and second, the establishments selected in the first step were requested to take a random sample of workers and to provide information on their payroll records. The data contain information on individual workers monthly pay in June, total bonus payments in the previous year, hours

worked, gender, age, length of employment, education, job title, and job type.

Table 1 reports descriptive statistics for each year by gender. Real wage rates increased during 1990s, but declined after 2000, and this is true for both genders. In addition, for both genders, age and part-ratio have been growing since 1990.[2] Years of tenure have been stable, while years of potential experience have been growing, especially for female workers. The size of the firm the average male worker is working for has not changed much during this period, while the firm size the average female worker is working for became larger during this period, and in 2013, the difference in firm size between males and females has become very small. The fraction of university graduates has increased drastically during the last 25 years.

The covariates include education years completed, years of potential experience and its square, years of tenure and its square, industry dummies, a part-timer dummy, and the logarithm of firm size. The RIF function of ln (Real Wage Rate) is regressed on these explanatory variables for each year, and as the classic OB decomposition, the change in coefficients and explanatory variables compared to those of 1989 is calculated for each year.[3]

As the dependent variables in the wage rate regressions are reported only by working people, there might be a selection bias. If there is a tendency for workers with specific unobserved characteristics to leave the labor market during a recession and the characteristics are correlated with some of the explanatory variables, the estimated coefficients will be biased. Thus, we treat an analysis of male workers as a comparison to that of female workers because the rate of leaving labor market is much smaller for male workers than it is for female workers. In addition to this, we also conducted an analysis that restricts the sample to full-time workers and obtained almost the same results. This result implies that the selection bias suggested above is not a serious problem here and that the results in the main analyses are thought to be robust.

[2]BSWS was redesigned in 2005. Before 2005, workers were classified into two categories: "regularly" and "temporarily" employed. Since 2005, workers have been classified into five categories, namely, "full-time employees without a stipulated contract period," "full-time employees with contract period stipulations," "non-full-time employees without a stipulated contract period," "non-full-time employees with contract period stipulations," and "temporary employees." Furthermore, the terminology regarding part-time workers changed at the same time. Therefore, changes in 2004 and 2005 are possibly affected by changes in the way workers are categorized. Our key result changes little even if we restrict our sample to full-time workers.

[3]Since information of the education level of part-timer cannot be obtained in BSWS, the average education level (twelve years) are used, which is the general way to handle this issue in BSWS. In the robustness check excluding part-timers from our sample, the results change little, which implies the way to handle the data-specific issue stated above did not yield any serious effects.

4 Empirical Results

In this section, we first confirm the changes in wage rate inequality by gender over the last 25 years, and in the latter part, we explore the reason why each inequality measure has changed using the DFL and FFL decomposition methods. We focus on the real wage rate as the price of labor in our paper.

Figure 1 shows various inequality indices of the wage rate from 1989 to 2013. The reference year is 1989, and all indices are set to 100 in 1989. Concerning the wage inequality for males, all indicators remain virtually unchanged in 1990s and then show a constant increasing trend thereafter. For females, on the other hand, the overall gap, such as the Gini coefficient, coefficient of variation (CV), and the 90-10 gap, remains unchanged; however, the 90-50 gap increased while the 50-10 gap decreased, which resulted in the unchanged overall inequality for female workers. These results will be examined in the following sections. Among men, almost all indices of inequality increase during economic downturns, after the economic bubble period in early 1990's, after the Asian currency crisis in the end of 1990's, after the IT bubble in the early 2000's, and after the global finance crisis in 2008, while those among women seem to be less sensitive to business cycle.

The Figure 2 shows the DFL decomposition of the real wage rate by gender. The bold line and the dashed line indicate the actual wage-rate distribution in 1989 and 2013, respectively. The thin line represents the counterfactual distribution: more specifically, the wage rate distribution under the structure in 2013 with the same worker and firm attributes of 1989. As a feature of the distributions of male wage rates, there is little change between the distributions in 1989 and 2013. Concerning to the distribution of males, around the logarithmic value of 2.2, which corresponds to approximately 900 yen ($\approx$9 dollars since 1 dollar$\approx$100 yen) in the wage rate distribution, the difference of the two actual distributions is explained mainly by the difference between the actual and counterfactual distributions in 2013. In other words, we can see that for these low-to-medium wage rate earners, most of the change in distributions can be explained by changes in attributes.[4]

[4]We should keep in mind that BSWS changed the questionnaire in 2005. It might generate a slight discontinuity of 10 percentile of male between 2004 and 2005. This fact should be treated carefully, and this point will be discussed several times in this paper. However, we also did a subsample analysis using full-time workers and obtained similar results, which implies the robustness of the analyses in this paper. The result of the robustness check above is omitted because of the limited space, but it can be offered on request.

In contrast, for the distribution at the middle, further concentration in the middle would have occurred if the attributes of 1989 had been maintained. We can see that without the change in attributes, the 2013 distribution should have gathered more toward the center due to the structural effect captured by the difference between the blue fine and black bold solid lines. However, the actual 2013 distribution is relocated back to the original place due to the composition effects (that is, the difference between the blue fine solid line and the red dashed line). Thus, with working in the opposite directions. there is a possibility that the small change between the two distributions can be mistakenly understood as no change around that part. However, the figure actually does not indicate that there is no change in the attributes and structures, but the two effects worked in the opposite directions and offset each other.

In Figure 2 for female workers, on the other hand, the hight of the density at the mode became very high in 2013 compared to that in 1989, which indicates the reduction in the overall variance. Since, this change is explained as a whole by the difference between the actual distribution in 2013 and the counterfactual distribution in 2013 (counterfactual distribution with the attributes fixed to the ones in 1989), we can see that it is explained by the composition effects. By examining the changes in the distributions more closely, we can see that the difference in actual distributions of two years is mainly explained by the structural effects for low wage rate earners, while it is explained by the composition effects for high wage rate earners. Moreover, it shows that for high wage rate earners, the wage rate would have risen further if the attributes of 1989 had been fixed. Accordingly, as with the case of male workers, the overlapping of the actual distributions for two years does not indicate no change in attributes or structures, but the difference in the actual distributions is explained by the composition effects (difference between the fine solid line and the dotted line) and the structural effects (difference between the fine and bold solid lines) that work in opposite directions.

Next, based on this, a more detailed decomposition will be conducted by the FFL decomposition method. The upper left figure in Figure 3a shows that the wage rate for the 10th percentile of male workers started to increase from the early 1990s, and has been on a declining trend since 2000. According to the decomposition of these changes for the wage rate in the upper right figure, we can see that the increasing wage rate in the 1990s can be explained mainly by the structural effects, and most of these effects are explained by returns on education that are higher than those

in 1989. The declining trend of the wage rate in the 2000s can also be explained by the structural effects. This is caused by the decreased returns of potential years of experience and tenure that are consistent with the flattening of wage profiles (Hamaaki et al. 2012), and lowered returns of working for a large company (due to the smaller gap between large companies and small- and medium-sized companies). The composition effects had been rising until the first half of the 2000s. This can be explained by the increased supply of highly educated workers.

For the 50th percentile of male workers, logarithmic values of the wage rate from 1989 to 2013 are almost in a trapezoidal shape as shown in Figure 3b. The change is mostly explained by the composition effects, the increase in which is almost explained by an increase in the supply of higher education. Moreover, while the composition effects have consistently had a positive effect on the wage rate, the structural effects had a positive effect until the first several years of the 2000s but a negative effect thereafter. This is because the positive impact of the former is explained by the increased return on education, whereas the negative impact of the latter is explained by the decreased return to years of potential experience. As with the previous case, this result reflects the flattening of wage profiles.

While the changes in wage rates in the 50th percentile are in a clear trapezoidal shape, as Figure 3c shows, the wage rate for the 90th percentile has a higher value in 2013 than in 1989 as compared to the result of the 50th percentile; therefore, its decreasing trend in the 2000s is less than that for the 50th percentile. These changes are explained by large positive composition effects, and as with the previous case, the increase in educational attainment is the main factor, but longer tenures and changes in industrial structures have also had a positive effect. On the other hand, the structural effects have become more negative since the 2000s. This has been caused by the lowered returns on education and years of potential experience. Although higher returns on tenure and firm size contributed to increasing wage rates, the structural effects due to education and years of potential experience contributing to decreasing wage rates dominated these positive effects. In the interpretation of the Mincer-type wage function (Mincer 1974), the years of potential experience accumulated in the labor market are regarded as the "general human capital," while the tenure in a specific company could be interpreted as the "firm-specific human capital"(Hashimoto 1981, Hashimoto and Raisian 1985, Lazear 2009, Akabayashi 2012). In the context of general/firm-specific human capital, our results suggest that for these high wage rate earners, the firm-specific

human capital captured by the return on tenure has increased, while general human capital captured by the returns of years of potential experience (and probably educational attainment as well) have been decreasing.

According to the upper left figure in Figure 4a, which shows changes in the wage rate for the 10th percentile of female workers, the wage rate for the 10th percentile has been consistently rising. In particular, there was a large increase in the early 1990s, and the wage rate has been consistently increasing after that period. Almost 1/3 to 1/2 of the increase can be explained by the structural effects. Among the structural effects during the last 25 years, such as that of the increased return on education and the higher return on the number of years of potential experience, have mainly had an influence, which implies that the importance of general training for female low wage rate earners increased. In contrast, while the composition effects similarly have a large explanatory power mainly due to the educational upgrading of female workers. Moreover, an increase in the number of female workers working for large companies is also one of the explanatory factors.

As shown in Figure 4b, the wage rate of the 50th percentile increased until the middle of the 1990s, decreased steadily afterwards, and slightly increased recently. Its composition is explained by the composition effects in 2000s, while explained one half by each of the composition effects and the structural effects in 1990s. Concerning the decomposition of the composition effects, we can see that the increase in the wage rate is explained by factors such as educational upgrading and the increase in the number of female workers working for large companies in the mid-1990s when the wage rate increased. However, the rise in educational attainment and increase in the number of part-time workers are offsetting each other in the composition effects. In contrast, among the structural effects, the return on educational attainment has been increasing, especially in the 2000s and thereafter, and the return on firm size and tenure have contributed to the decrease in wage rates. These effects worked in opposite directions and have occurred simultaneously, but the effect due to education dominates the other effects. Moreover, the composition effects are on an increasing trend, because the return on education is increasing fast enough to exceed the negative effect of the increase in the number of part-time workers. This is consistent with the result of the DFL decomposition: the overlapping of actual distributions does not indicate no change, but actual distributions can be explained by the composition effects and structural effects that work in the opposite directions.

Finally, as far as the wage rate for the 90th percentile of female workers is concerned, the decline in wage rate was smaller than that in the median in the 2000s, and wage has been on an increasing trend as a whole since 1989. As shown in Figure 4c, the increase in wage is explained by the composition effects. As far as the decomposition to contributions of each factor are concerned, factors such as the rise in the educational attainment, longer tenure, an increase in the number of workers in higher wage industries, and an increase of the number of those working for large companies, have had positive effects. Among them, the rise in the educational attainment has had the largest effect. In contrast, the structural effects are negative as a whole. These are explained by the decreased return of the company size on the wage rate and the decreased return of years of potential experience. The former is explained as the reduced gap in wages between large companies and small- and medium-sized companies. While the return on education has increased, the negative effects mentioned above are larger, which results in the overall negative impact of the structural effects.

Based on the results of the decomposition analyses, we again focus on wage inequality. The results, shown in Figure 5, reveal that wage rates of the 50th percentile of both sexes declined. This fact implies that along with other developed countries, wage decrease of the middle class is observed even in Japan during the 2000s, although Japan has traditionally been known for its solid middle class. More specifically, the wage rate for the 10th percentile of male workers has been decreasing during the 2000s, mainly due to the decreased returns of years of potential experience and tenure that are consistent with the flattening of wage profiles. For the 50th percentile, the wage rate has also decreased mainly due to the lower returns of years of potential experience. On the other hand, the wage rate of the 90th percentile has decreased less than that of the 50th percentile in the 2000s. The structural effects have become more negative during the 2000s because of the lowered returns on education and years of potential experience. In the composition effects, an increase in the number of workers with a high educational background has been observed, and thus the increase in supply contributed to the lowered returns on education. Consequently, the inequality among male workers became larger.

In contrast, the wage rate rose for the 10th percentile of female workers constantly, because of higher educational attainment. It decreased slightly for the 50th percentile in the 2000s, which was due to the increase in the number of part-time workers, decrease in returns of long tenure

represented by the flattening of wage profiles, and lower returns of company size due to the reduced wage gap between large companies and small- and medium-sized companies. For the 90th percentile, the wage is on a slight increasing trend due to the positive impact of the composition effects, including educational upgrading, longer tenures, changes in industrial structures for high wage rate earners, and larger company sizes. In sum, since there was a decrease in the wage rate for workers in the 50th percentile and an increase for those in the 10th and 90th percentiles, the lower half of the distribution shows reduced inequality and the upper half shows expanded inequality.

5 Conclusion

Using comprehensive government statistics, we focus on the extent to which wage inequality among men and women has increased in Japan from 1989 to 2013, and the factors that are behind the changes using the DFL and FFL decomposition methods. In this paper, we decompose the real wage rate change into composition and structural effects, and further decompose them into the contribution of changes in each demographic characteristics, such as workers' academic attainment, potential years of experience, and tenure. First, we find that under a prolonged recession after the burst of the economic bubble in the late 1980s, the real hourly wage increased in all quantiles for both sexes in the 1990s. This is mainly because of the reduction in the number of working hours brought about by the reduction of labor demand, and the implementation of the Act on Temporary Measures concerning the Promotion of Reduced Working Hours in 1992 and the amendment of the Labor Standard Laws in 1994. However, since the increase in wage rate prevailed in all quantiles for both sexes in the 1990s, indices of inequality were unchanged. Though, in the large scheme of things, wage inequality stay unchanged in the 1990s and increased in the 2000s, we can observe small pro-cyclical change in inequality. Our finding suggests that business cycle affects wage equality, especially among male. The relationship between business cycle and inequality among women is much weaker.

Second, in the 2000s, the number of part time workers increased among male workers with low-to-medium wage rates and female workers with high-to-medium wage rates, who constitute middle class of Japanese employees, and their wage rate dropped. The decrease of middle class observed in Japan is in tandem with a similar trend in many developed countries. Although the traditional

inequality measurement indices, such as the Gini coefficient, coefficient of variation (CV), and the 90-10 percentile gap do not fully illustrate the change in the distribution, our analysis using the DFL and FFL decomposition methods point to the decrease of wage rates in the middle class.

Finally, our exercise using the FFL decomposition method reveals the reduction in an importance of general human capital captured by years of potential experience among almost all workers. Furthermore, the significance of firm-specific human capital, captured by the return in tenure, for male workers with a low-to-medium wage rate and female workers of all quantiles decreased. These findings are consistent with the stylized facts that Japanese firms have been reducing training costs in 1990s and 2000s. This suggests that Japanese firms are undermining employee involvement and problem solving activities at the grassroots level, which is considered one of the key elements of Japanese employment system. Moreover, the contemporaneous occurrence of the decrease in the return on general human capital of almost every worker and the increase in the return to firm-specific human capital among male works with high wage rate suggests that Japanese firms invest in just a few selected able workers, regardless of their age because they no longer have enough reserve to invest in all their employees. These trends can be said to be very stable because even during the global financial crisis. Finding this fact is one of our contribution thats can be possible by using a relatively long data 1989-2013.

What is the trend in the wage gap likely to look like in the future? The return to tenure on wage rate is on an increasing trend for high wage-rate earners as their skill becomes more firm-specific, though the number of workers earning a high wage rate is decreasing. At the same time, since workers that are highly educated are becoming concentrated at the 90th percentile of male workers and decrease in returns to education (that is just about to occur) is likely to accelerate, the wage rate for the 90th percentile of male workers could decrease further. In sum, whether the wage rate for the 90th percentile male workers will increase or not depends on the degree of the saturation of higher education and the evaluation of its firm-specific skills. For female workers, if the trend of educational upgrading reaches its peak earlier for high wage rate earners, the wages of the 90th percentile may not increase as fast as it has been increasing so far. Additionally, similar to the trend in wages of male workers, the decrease in the return to years of potential experience, which is closely related to general human capital, is expected to become larger. Consequently,

wage inequality among women is expected to reduce in the short- to medium-term.[5]

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[5] As in Lise et al. (2014), we need to be very careful to the 2005 change of BSWS dataset. However, as shown in Lise et al. (2014), the effect of this change is relatively small for log hourly wages. In addition, we conducted additional analyses that create the two different reference years: 1989 and 2005, but this did not affect our main findings. A robustness check without part-time workers also maintained the current main findings.

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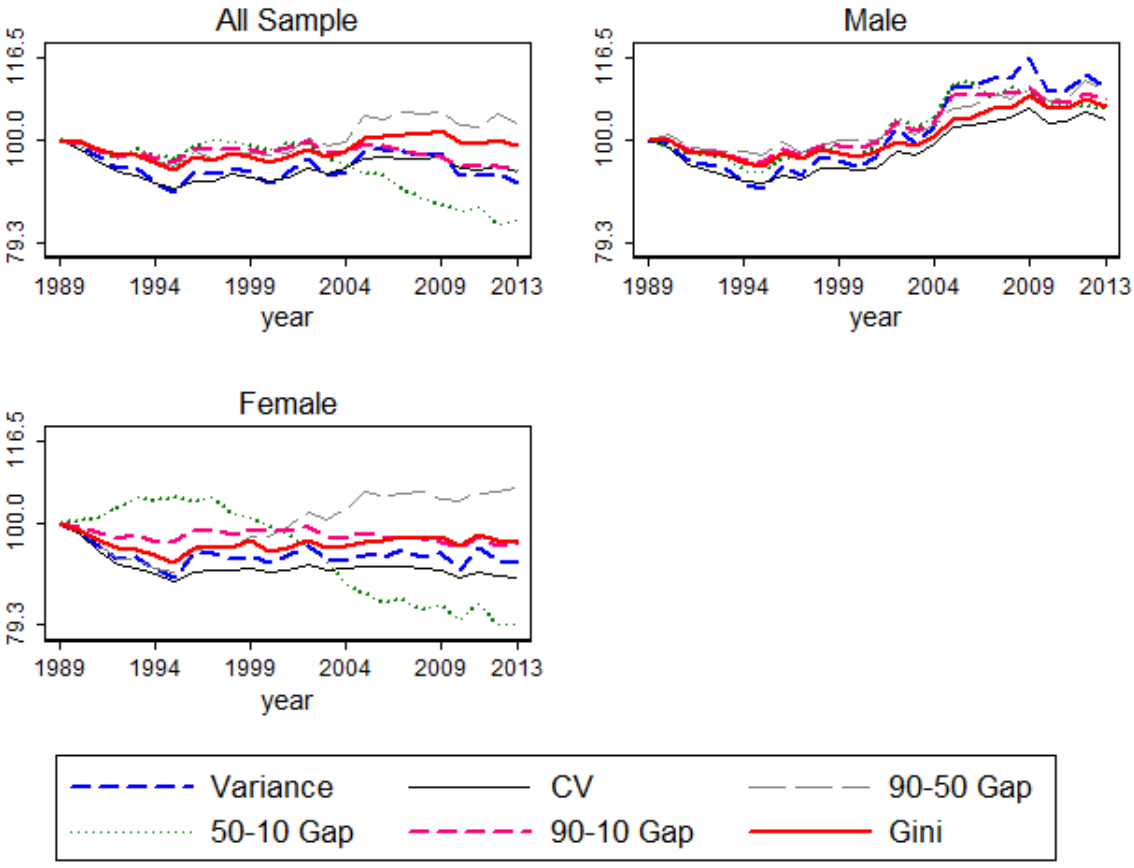
Table 1: Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	1989		2000		2013	
	Male	Female	Male	Female	Male	Female
Real Wage Rates (100 yen)	22.738	12.196	26.557	14.784	23.208	13.852
	(15.719)	(12.584)	(19.522)	(10.684)	(16.519)	(9.750)
Monthly Pay (100 yen)	3248.568	1670.044	3550.474	1893.370	3104.570	1640.717
	(1385.026)	(874.197)	(1506.537)	(1009.361)	(1700.736)	(1119.849)
Bonus (100 yen)	11509.869	4777.659	11748.905	5074.100	7880.968	2874.671
	(10054.002)	(5375.116)	(9901.804)	(5877.525)	(9456.892)	(5222.729)
Scheduled Hours (per month)	175.514	167.501	162.963	149.247	151.544	125.322
	(28.220)	(35.670)	(24.658)	(36.645)	(38.182)	(48.731)
Overtime (per month)	19.521	6.834	14.275	6.102	12.664	5.159
	(23.932)	(11.307)	(20.556)	(11.720)	(19.322)	(11.305)
Age	39.592	37.587	40.821	39.141	42.719	42.117
	(11.710)	(12.922)	(12.192)	(12.964)	(13.489)	(14.013)
Part-timer	0.012	0.184	0.029	0.274	0.118	0.432
	(0.110)	(0.387)	(0.167)	(0.446)	(0.322)	(0.495)
Non-Regular or/and Part-Timer	0.022	0.202	0.036	0.292	0.132	0.458
	(0.147)	(0.402)	(0.187)	(0.455)	(0.338)	(0.498)
Tenure	12.531	6.714	13.816	7.892	12.308	7.587
	(10.122)	(7.140)	(11.146)	(8.035)	(11.324)	(8.216)
Potential Experience	21.424	19.781	21.873	20.625	23.419	23.396
	(12.566)	(13.706)	(12.877)	(13.664)	(13.857)	(14.469)
Firm Size	1532.567	1062.848	1535.621	1256.769	1479.978	1576.998
	(1978.173)	(1727.409)	(1930.894)	(1792.937)	(1893.456)	(1970.380)
Education Dummies						
Junior High School Graduates	0.236	0.237	0.108	0.091	0.043	0.029
High School Graduates	0.526	0.569	0.528	0.530	0.500	0.487
Two-year College Graduates	0.039	0.154	0.077	0.267	0.101	0.258
University Graduates	0.200	0.041	0.287	0.112	0.356	0.226
Observations	826535	439304	832849	425778	761023	536448

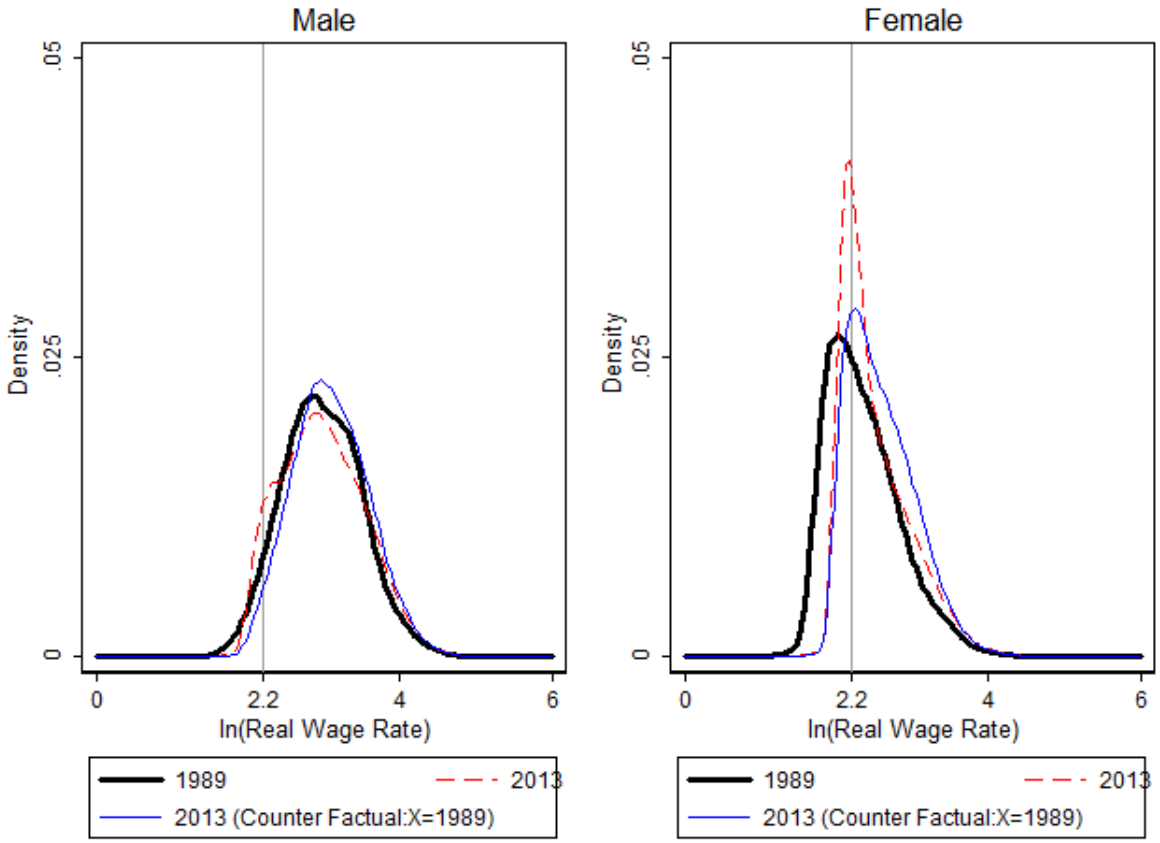
Note: The hourly wage rates, monthly pay, and bonus are deflated by CPI (CPI in 2010=100).

Figure 1: Changes in Inequality (1989-2013)



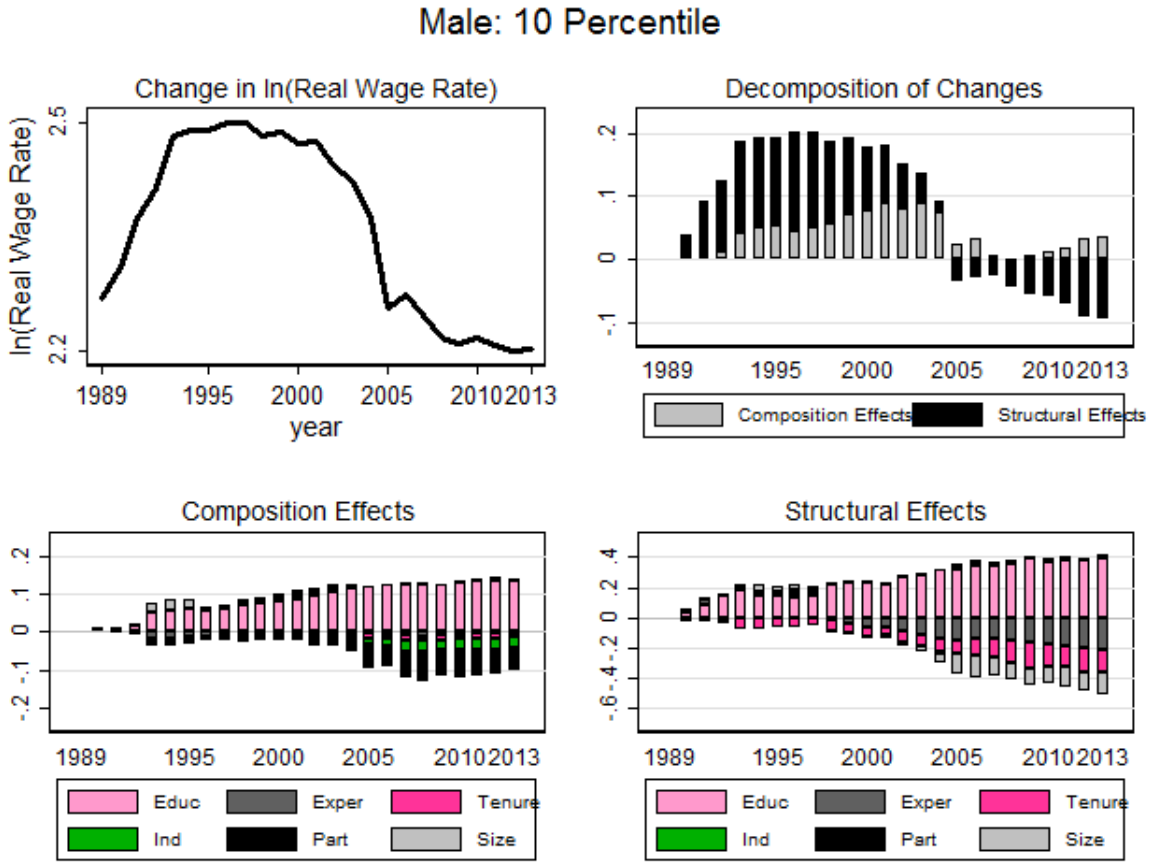
Note: Except for Gini coefficient, ln(Real Wage Rate) is used to calculate each index. Log is not taken for Gini coefficient.

Figure 2: DFL Decomposition of ln(Real Wage Rate) by Gender



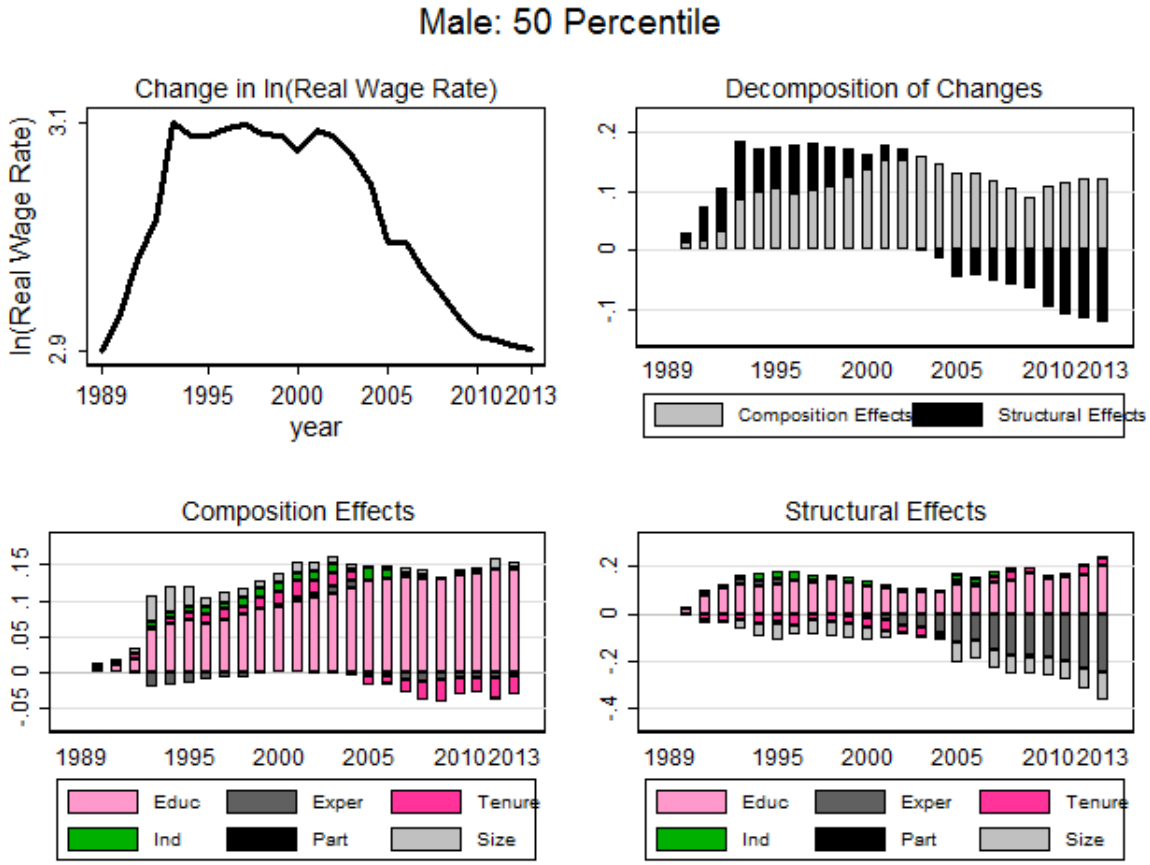
Note: ln(Real Wage Rate) is used to each distribution.

Figure 3a: FFL Decomposition of ln(Real Wage Rate)



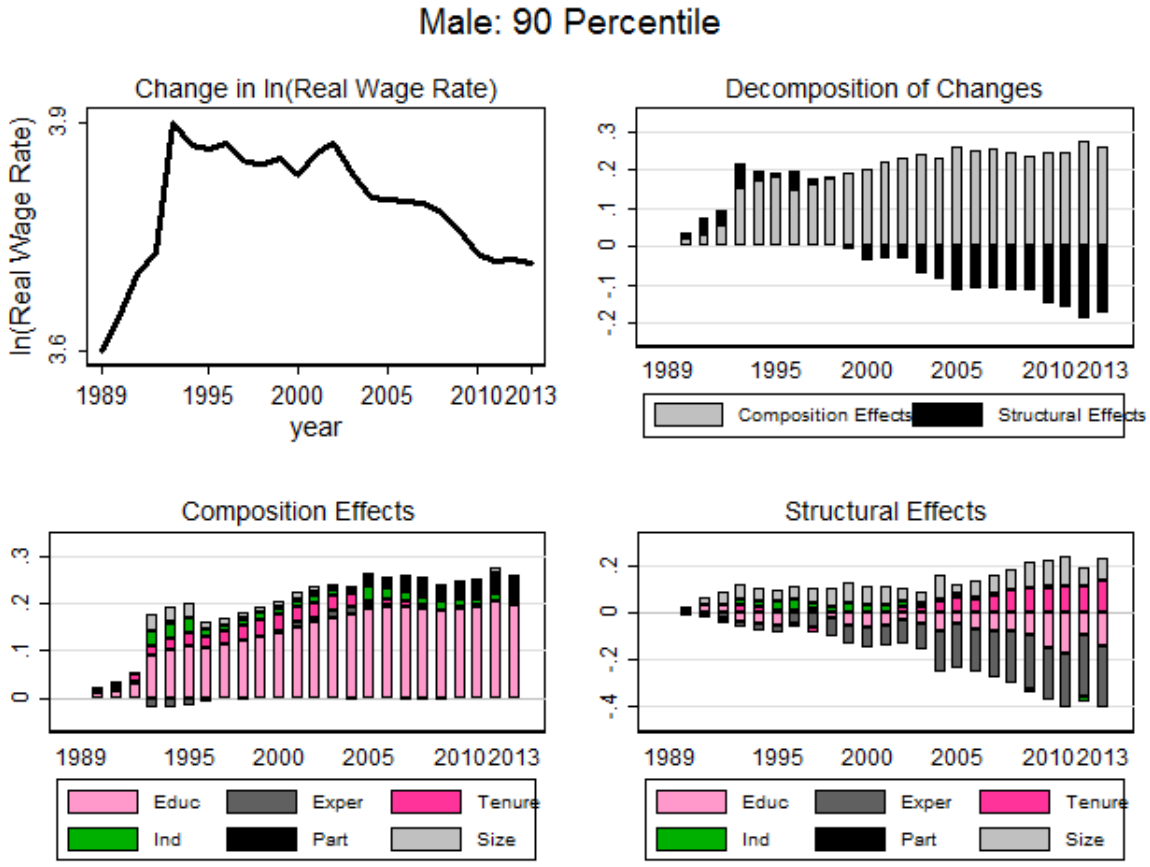
Note: Three of the four tables except the first one are created by FFL decomposition. No reweighting is applied here. Standard errors clustered at an establishment level are used.

Figure 3b: FFL Decomposition of ln(Real Wage Rate)



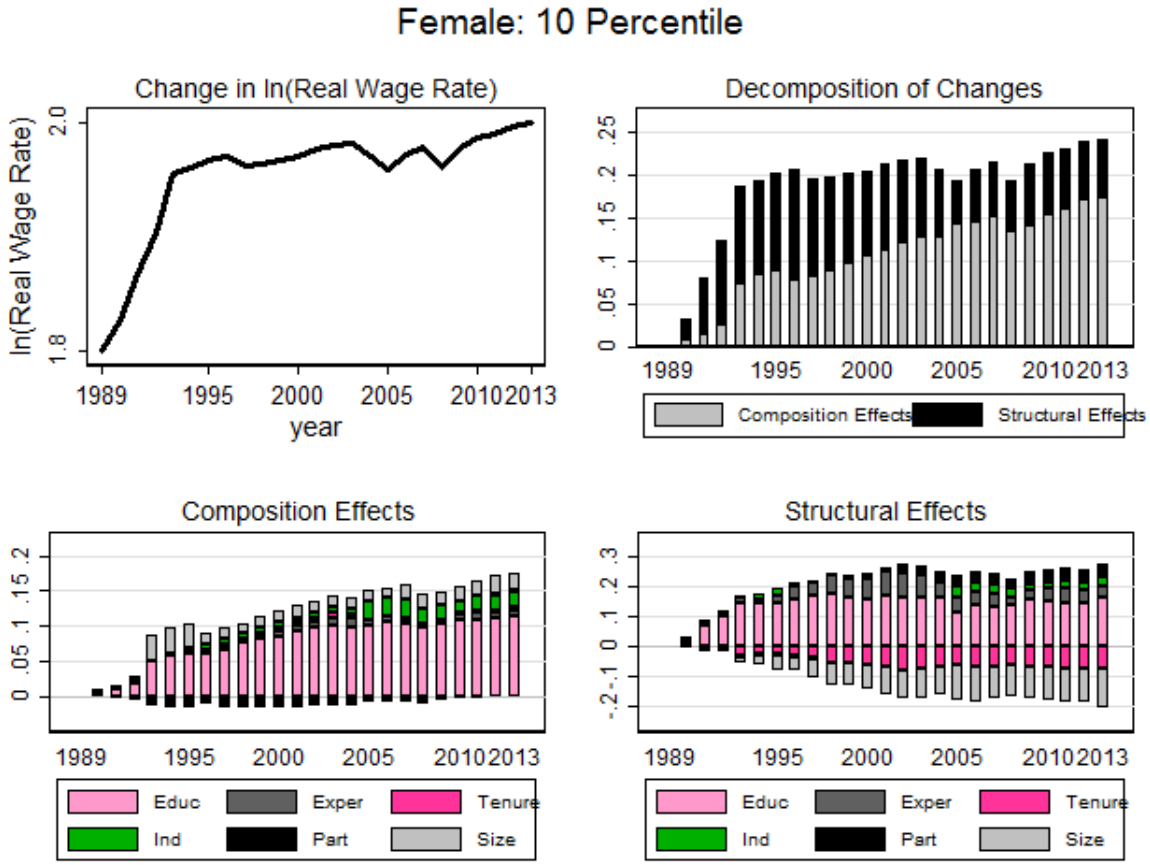
Note: The same notes as Figure 3a apply.

Figure 3c: FFL Decomposition of ln(Real Wage Rate)



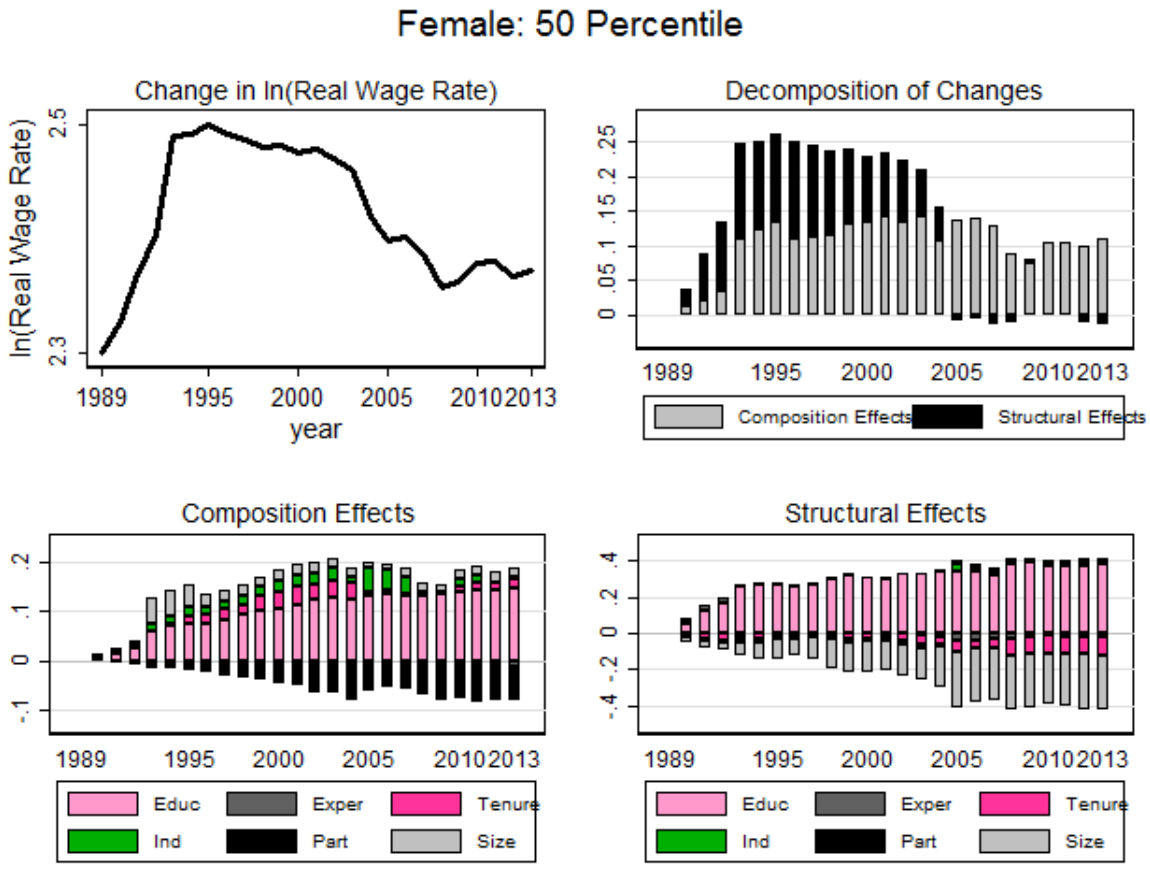
Note: The same notes as Figure 3a apply.

Figure 4a: FFL Decomposition of ln(Real Wage Rate)



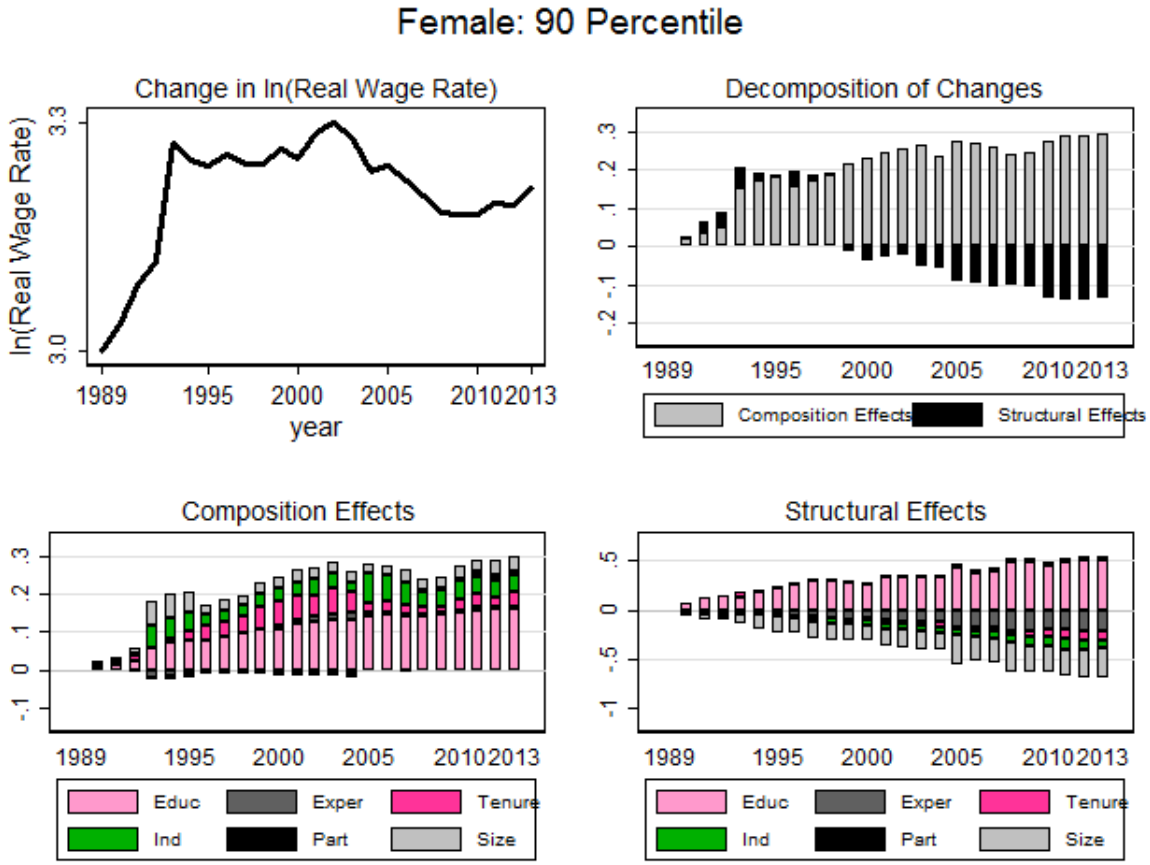
Note: The same notes as Figure 3a apply.

Figure 4b: FFL Decomposition of ln(Real Wage Rate)



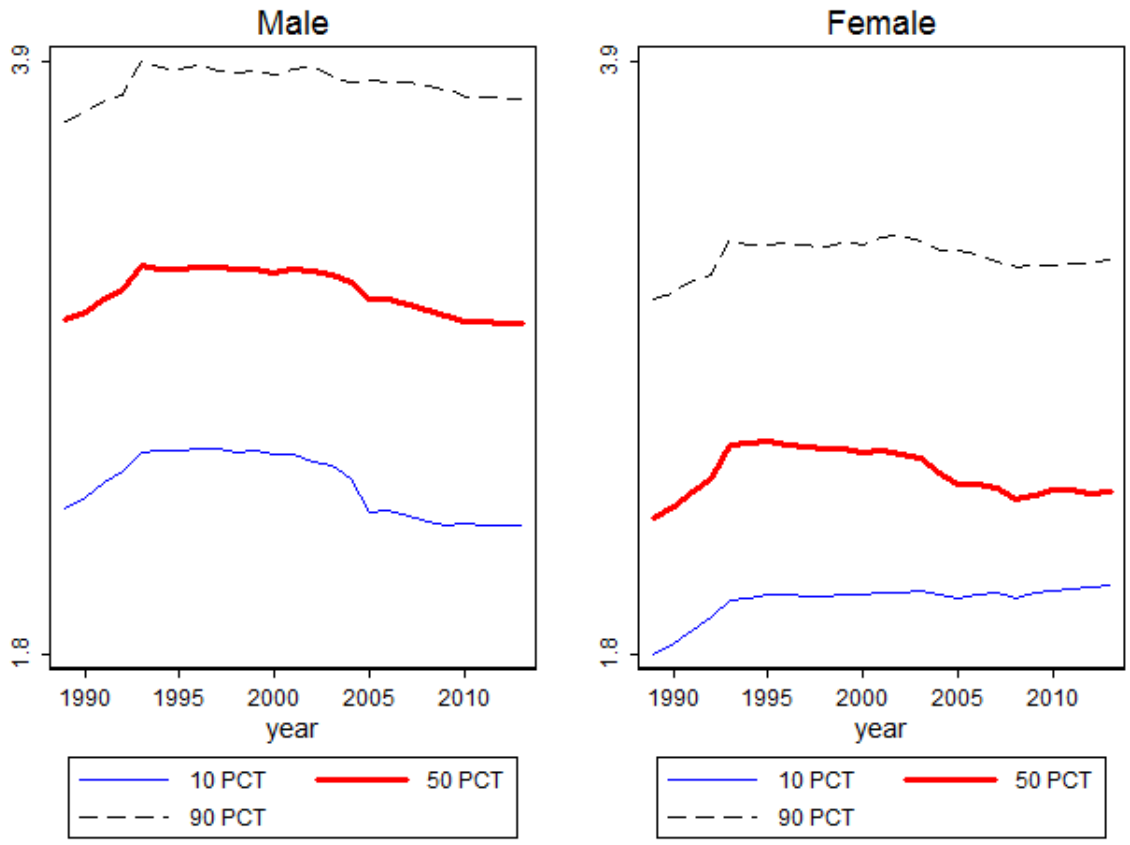
Note: The same notes as Figure 3a apply.

Figure 4c: FFL Decomposition of ln(Real Wage Rate)



Note: The same notes as Figure 3a apply.

Figure 5: Changes in ln(Real Wage Rate) by Percentile and Gender



Note: Real wage rates at the 25th, 50th, and 75th quantiles are reported.