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Abstract:

Using the nationwide household data, this study examines the changes in the Chinese urban income distributions from 1987 to 1996 and from 1996 to 2004, and investigates the causes of these changes. The Oaxaca-Blinder decomposition method is applied to decomposing the mean earnings increases, and the Firpo-Fortin-Lemieux method based upon a recentered influence function is used to decompose the changes in the income distribution and the inequality measures such as the variance and the 10-90 ratio. The decomposition results show that the wage structure effects such as the widened gender pay gap, the increasing return to college education, and the widened gap in the return to different industries, ownership, and regions, have contributed to most of the overall increases in income inequality. During the different time periods, 1987-1996 and 1996-2004, the impacts of these factors vary at the different points (e.g. the lower half or upper half) of distribution.

Key words: Earnings inequality, Unconditional Quantile Regressions, Earnings distribution, Decomposition

JEL code: J3

## 1. Introduction

In the past few decades, China has witnessed a notable increase in workers' earnings inequality. It is critical to both policy makers and academic researchers to find out the cause of rising earnings inequality in China. In the transition from the centrally planned system to the market system, income inequity typically rises as the result of the increasing return to education and labor market experiences and the widening wage disparity across different industries, occupations, and regions. Chinese policy makers are particularly concerned about the rising income inequality caused by the unreasonably high pay of employees in certain monopolistic industries.

The previous studies that have examined income inequality in China have provided good insight into the extent and cause of the rising income inequality. Since the rural and urban areas have different economic conditions and institutional background, the factors that contribute to the rural and urban income inequality are often discussed separately. Knight and Song (1991, 2003) found that the regional differences and the human capital factors such as the workers' education levels, work experiences, and occupation-specific skills are important contributors to the rising urban income inequality from 1988 to 1995; Meng (2004) suggested that the large-scale unemployment and the subsequent emergence of the very poor population contributed to the rising urban inequality during 1995-1999，the period known by the radical reform; Gustafsson and Li (2001) pointed out that the changing housing allocation and the increase in the number of retirees coupled with the changed benefits rules were also the important cause of the rising urban income inequality. As to the rural areas, the main causes of rising income inequality have been found to be

the regional differences, the capital input, non-agricultural incomes, as well as the farmers' education level (Wan, 2003; Wan and Zhou, 2005; Benjamin, Brandt, and Giles, 2005). The farmers' education level has increasingly become an important factor of rising rural income inequality (Wan and Zhou, 2005). In addition, several authors have examined the income gap between male and female workers (Gustafsson and Li, 2000; Liu et al, 2000; Maurer-Fazio et al, 1999, 2002; Meng, 1998a, 1998b; Wang and Cai, 2005; Ng 2007) and between the urban and rural areas (Liu, 2005; Dong, 2005; Sicular et al, 2007).

In reviewing the literature, we found that the aforementioned studies had focused on summery measures of income inequality such as Gini and Theil coefficient and employed the regression-based decomposition method. However recent development in the research of income inequality emphasizes estimating the entire wage distribution and decomposing the changes of the distribution. This distributional approach provides comprehensive information. It shows the earning dispersion of different income groups. It can answer questions such as whether earnings are more dispersed among the upper incomers or lower incomers, and whether the inequality is driven by the presence of the extreme high incomers (appeared as a long upper tail) or very low incomers (a long lower tail). Moreover, the distribution-based decomposition is more general than the decomposition of specific income inequality indexes. Once it is performed, the decomposition of a specific index follows immediately.

The previous studies adopting the distributional approach have developed

different specific procedures. Several popular ones include: a reweighting method, which essentially generates a counterfactual wage distribution (DiNardo, Fortin, and Lemieux, 1996; Lemieux, 2002; Firpo, Fortin and Lemieux, 2005); an alternative approach based on conditional quantile regressions and resampling (Machado and Mata, 2005; Autor, Katz, and Kearney, 2005; Melly, 2005, 2006); and another approach using semi-parametric hazard functions to obtain the conditional densities of wage (Donald, Green, and Paarsch, 2000). Most of these studies are based on the U.S. or European market-economy countries. Several researchers have applied these methods to the transition countries: Gangulin and Terrell (2006) examined the rising income inequality in Ukraine using the Lemieux method (Lemieux, 2002); Pham and Reilly (2006) applied the Machado-Marta quantile regression decomposition method to examine the gender pay gap in Vietnam. Nguyen, Albrecht, Vroman, and Westbrook (2006) also used the quantile regression method to examine the urban-rural income inequality in Vietnam. As far as we know, there are few studies that have adopted the distributional approach to examine income inequality in China.

Our study employs the urban household data provided by the National Bureau of Statistics of China (NBSC) for 1987, 1996, and 2004. We obtain kernel density estimates of earnings distribution and demonstrate the changes in the distribution over time. We adopt the Firpo-Fortin-Lemieux method (Firpo et al 2005) to decompose the changes in the earnings distribution from 1987 to 1996 and from 1996 to 2004. Our study makes two potential contributions to the literature: first and foremost, we adopt the distributional approach that has some evident advantages over the traditional

method. Second, we have more recent data. We examine the rising urban income inequality from 1996 to 2004 and compare to the 1987-1996 period. In addition, our data is nationwide whereas the urban data used by the previous studies typically cover only certain provinces.

The rest of paper is organized as follows: section 2 explains our empirical strategy; Section 3 describes the data source and the selection of the sample; Section 4 offers descriptive and estimation results. Finally, section 5 summarizes and concludes the paper.

## 2. Empirical strategy

Generally speaking, two kinds of factors could contribute to the changes in the income distribution in a country over time. On one hand, the changes in the composition of workers with different productivity characteristics could lead to the changes in the income distribution. For instance, as the proportion of skilled and highly educated worker increases in the labor force, the mean earnings will increase; the dispersion of earnings also tend to increase as the earnings dispersion is typically larger among the skilled and educated workers. This effect is known as “the labor force composition effect”. On the other hand, the changes in the wage structure characterized by the returns to various individual’s labor market characteristics such as return to education, experiences, industry or occupation-specific skills could also contribute to the changes in the income distribution. This effect is known as the “wage structure effect”. For instance, the increase in the return to education, experiences, and skills will increase the mean earnings of the labor force as well as the dispersion of

earnings.

Specific to China, various authors have documented the changes in Chinese urban labor market since the beginning of economic reform.[1] On one hand, the Chinese urban labor force has become much better educated and more aged; the industry and occupation composition of workers have also shifted over time; moreover, the increasingly more workers choose to work for private, foreign, or mixed-ownership companies than the state-owned enterprises or institutes. On the other hand, the Chinese labor market has witnessed a large increase in the return to workers' education, experiences, and certain industry or occupation specific skills. All these factors could have contributed to both the increase in the average income of workers and the income inequality. A critical question then is how to separate and quantify the effects of these various factors.

## 2.1 Oaxaca-Blinder Mean Decomposition

The classical Oaxaca-Blinder method is commonly used to decompose the changes in the mean earnings over time. Suppose that *t* and *s* are any two years. $\overline{Y}_t$ is the average earnings in year *t,* which can be written as $\overline{Y}_t = \overline{X}_t b_t$ with $\overline{X}_t$ being the average characteristics of workers and $b_t$ the return to various labor market characteristics in year *t*. Suppose that $\overline{Y}_t^a$ represents the counterfactual income where workers' characteristics stay the same as those of year *s,* while the return to labor market characteristics are at the year *t* level, i.e. $\overline{Y}_t^a = \overline{X}_s b_t$. Thus, the changes in the average earnings from year *s* to *t* can be decomposed as follows:

[1] See Knight and Song (1991, 2003) for a detailed explanation of the evolution of the labor market institution and labor force characteristics in Chinese urban labor market.

$$\overline{Y}_t - \overline{Y}_s = (\overline{Y}_t - \overline{Y}_t^a) + (\overline{Y}_t^a - \overline{Y}_s) = b_t(\overline{X}_t - \overline{X}_s) + \overline{X}_s(b_t - b_s) \quad (1)$$

where the first term in the right hand side of (1) indicates the changes in the mean earnings due to the changes in the workers' characteristics, known as the "composition effect", whereas the second term denotes those due to the changes in the return to workers' characteristics, known as the "wage structure effect".

## 2.2 RIF Decomposition Method

By analogy, the Oaxaca-Blinder type of decomposition may be applied to the entire earning distribution or the measures of income dispersion such as variance, the 10-90 ratio, or the Gini coefficient. However, the specific procedure such as (1) does not work for decomposing the entire distribution or statistics other than mean. Consequently, many authors have developed alternative methods to overcome this difficulty. Some popular methods include: a reweighting technique (DiNardo, Fortin, and Lemieux, 1996; Lemieux, 2002; Firpo, Fortin and Lemieux, 2005); the approach of conditional quantile regression and resampling (Machado and Mata, 2005; Autor, Katz, and Kearney, 2005; Melly, 2005, 2006); and the approach based on semi-parametric hazard functions to obtain the conditional densities of wage (Donald, Green, and Paarsch, 2000). We adopt the decomposition method from Firpo, Fortin and Lemieux (2005). This method consists of two steps.

### 2.2.1 The First Step of Firpo-Fortin-Lemieux (FFL) Method

The first step resembles DiNardo et al (1996) that decompose the overall changes in the earnings distribution from year *s* to *t* to those changes due to differences in the workers' characteristics and in the return to these characteristics. Specifically, let

$\nu(Y)$ be a quantile of earning distribution *Y*. To decompose the changes in the earnings from *s* to *t* at a quantile, $\nu(Y_t)-\nu(Y_s)$, into the two components mentioned before, we produce a counterfactual wage $Y_c$, which represents the (log) earnings that workers could have earned in year *t* had they had the same characteristics as year s. Having done that, the overall difference $\nu(Y_t)-\nu(Y_s)$ can be decomposed into:

$$\nu(Y_t)-\nu(Y_s)=[\nu(Y_t)-\nu(Y_c)]+[\nu(Y_c)-\nu(Y_s)], \quad (2)$$

where $\nu(Y_t)-\nu(Y_c)$ represents the "composition effect" and $\nu(Y_c)-\nu(Y_s)$ represents the "wage structure effect". The counterfactual wage $Y_c$ can be obtained by reweighting. We define the reweighting factor as

$$\psi_i=\left[(1-p(X_i))/p(X_i)\right]\times\left[p/(1-p)\right], \quad (3)$$

where $p(X)$ is "the probability of a worker being in year *t* given individual attributes *X*" and *p* denotes the proportion of year-*t* workers in the joint sample of year *s* and *t*. Then the reweighted data $\psi Y_t$ can be regarded as realizations from the counterfactual wage distribution of $Y_c$. In practice, $p(X)$, which may be regarded as the "propensity score", can be estimated by the usual logit/probit model.

2.2.2 The Second Step of FFL Method

In the second step, the "composition effect" and the "wage structure effect" are further decomposed to the contribution of each individual covariate, as it is usually done with the Oaxaca-Blinder composition. We note that the Machado-Marta approach can also be used for the same purpose. Nevertheless their method entails multiple resamplings and hence is computationally intensive.

The core of the Firpo-Fortin-Lemieux (FFL) method is the Recentered Influence

function. FFL show that one can obtain the average effects of the explanatory variables on an earning quantile by running a regression with the original response (earnings) replaced by the recentered influence function (RIF). Particularly, the RIF for a quantile $q_\tau$ has the form:

$$RIF(Y;q_\tau) = q_\tau + \frac{\tau - I(Y \le q_\tau)}{f_Y(q_\tau)}, \tag{4}$$

where $f_Y$ is the marginal density function of *Y*, and $I(\cdot)$ an indicator function. FFL demonstrate that if the RIF-regression $E\left[RIF(Y;q_\tau)\,|\,X\right]$ is well modeled by the familiar linear regression model

$$E\left[RIF(Y;q_\tau)\,|\,X\right] = X\beta, \tag{5}$$

then the loadings (coefficients) represent the mean marginal effects of the explanatory variables on the earning quantiles.

Since the true $RIF(Y;q_\tau)$ is unobservable, we use its sample analogy $\widehat{RIF}(Y;\hat{q}_\tau)$ in (5). Replacing the unknown quantities by the corresponding estimators, we obtain:

$$\widehat{RIF}(Y;\hat{q}_\tau) = \hat{q}_\tau + \frac{\tau - I(Y \le \hat{q}_\tau)}{\widehat{f_Y}(\hat{q}_\tau)}, \tag{6}$$

where $\hat{q}_\tau$ is the $\tau$th sample quantile, and $\widehat{f_Y}$ the kernel density estimator. After further averaging out, one can show that $\beta$ gives the average effect of the explanatory variables on the earnings, as one usually desires.

For each year, using the RIF-projection method (5), we estimate the contribution of each explanatory variable to the unconditional quantiles of earnings, which permits the further decomposition of the contribution of each *X* variable to the two effects.

Specifically, we take the expectation on both sides of (5) to yield

$$q_\tau(Y_k) = E(X_k)\beta_k, k = t, s, c \tag{7}$$

where the subscripts *t, s, c* represents year *t*, *s* and the counterfactual respectively. (7) is estimated by

$$\hat{q}_\tau(Y_k) = \overline{X}_k \hat{\beta}_k, k = t, s, c, \tag{8}$$

from which it follows the decomposition of the changes of earnings at quantile $\tau$ from year *s* to *t* attributable to a specific *X* variable as following:

$$\hat{q}_\tau(Y_t) - \hat{q}_\tau(Y_s) = \overline{X}_t(\hat{\beta}_t - \hat{\beta}_c) + (\overline{X}_t \hat{\beta}_c - \overline{X}_s \hat{\beta}_s). \tag{9}$$

## 3. Data

We use the Urban Household Survey (UHS) data collected by the NBSC.[2] NBSC initiated the survey in 1986 and conducted it in each successive year. These data are used by the NBSC to generate statistics and reports to the Chinese government on income and expenditure. Hence a lot of effort was spent to ensure the accuracy of the data. The survey employs the stratified method to sample households. The households consist of both city or town residents and farmer migrants who had lived in the city or town for half a year or longer. Each year half of the households are rotated out and replaced by new households, so that the sample was renewed every two years. The data was collected through individual diaries. Each individual in the surveyed households was asked to keep a record of daily cash or non-cash income and consumption. These records are reported to NBSC each quarter and compiled into

[2] The same national data are also used by the recent papers by Meng and Gregory (2007) and Ng (2007). Gustafsson and Li (2001), Knight and Song (2003) and Meng (2004) used the urban household data collected by Chinese Academy of Social Science (CASS) consisting of a sub-sample from the NBSC's sample. The CASS data cover only certain provinces.

annual data.

We use the annual data from 1987, 1996, and 2004. For each year, the data set contains individual basic information such as age, the highest level of education attained, the ownership type of the employer, industry and occupation, and individual annual labor income including both cash and non-cashed earnings.[3] Ideally, the hourly wage rate should be used to examine income inequality rather than earnings because earnings are affected by hours of work which is subject to the individual choice. However, NBSC UHS did not ask for information on hours of work until 2002. As a result, we could not calculate the hourly wage rate by dividing the total earnings by the number of hours of work. Hence, we use yearly earnings as a proxy of pay. For the purpose of comparison over time, earnings in 1996 and 2004 are converted into real values at 1987 price using the consumer price index.

For the purpose of our study, we create two samples:

*Sample 1*

We include all adult individuals aged 16 or above that have reported a positive total income. The total income is composed of earnings (labor income), capital income such as interests, dividends or real estate rental income, and transfer income. For the majority working population, earnings are the major income source. We use sample 1 to demonstrate the dispersion of income among all adult individuals in the urban area including those unemployed or out of the labor force. The sample 1 contains 27,789 observations in 1987, 37,914 in 1996, and 111,417 in 2004.

*Sample 2*

[3] Non-cash earnings such as benefits are converted to the cash value by NBSC.

Since we are also to investigate the wage structure and decompose the increases in earnings inequality subsequently, we construct sample 2 that includes only working population and focus on their earnings. Several selection criteria are imposed on the sample: first, we limit the sample to those aged between 16 and 65, i.e. the working population by the typical international standard. In China, the official retirement age is 60 for men and 55 for women. However, statistics show that many retired Chinese men and women in their late 50s and early 60s were still working.[4] We include these individuals in the sample. Second, we select those who are working and report positive earnings. Enrolled students, home stayers, the disabled or impaired who were out of the labor force permanently, and the unemployed are excluded from the sample due to missing earning data. Finally, individuals with missing values of occupation, industry and employer's ownership type are excluded. The result is a sample of 27,456 observations in 1987, 30,593 in 1996 and 73,024 in 2004.

## 4. Results

### 4.1 Description of Income Dispersion

The key result is the kernel density estimates of income distribution for 1987, 1996, and 2004. We calculated the kernel estimates for both the total income including all adult individuals and earnings for workers only. Since there are the unemployed, retired, or disabled individuals who tend to have a very low income, we expect that the distribution of total income including these out-of-work individuals is more dispersed than the distribution of earnings for workers. Figure 1 shows clearly

[4] Our calculation based on 2004 data shows that 18.2 percent of men aged between 60-65 and 8.6 percent of women between age 55 and 65 were still working.

that the average income of individuals and the dispersion of income both have increased from 1987, 1996, to 2004. Also, a long lower tail appeared in 1996 and 2004, and the lower half of income distribution became more dispersed than the upper half. The distribution of earnings resembles the distribution of total income, which is understandable since earnings are the major source of income for most individuals. However, the distribution of total income did appear to be wider than the earning distribution. Table 1 shows measures of the central tendency and dispersion of income. Our results are comparable to those reported by the previous studies. Table 1 also demonstrates that the bottom half of distribution was more dispersed than the top half as the 10-50 ratio was larger than the 50-90 ratio and it also increased faster than the latter.

4.2 Earnings Function and Decomposition of Mean Earnings Increases

As we explained before, the changes in the average and dispersion of income are potentially driven by the changes in the workforce's labor market characteristics as well as the return to these characteristics. Table 2 shows that workers' characteristics have indeed changed notably from 1987 to 2004. The percentage of male workers has increased over time. The workforce has also become more aged and better educated. There was a large increase in the fraction of workers with the college or above education and a decrease in the percentage with the junior high or below degree. The industry and occupation composition of workforce has also changed dramatically. Mainly, the percentage of workers working in the manufacturing industry and the production occupation has declined considerably, while those working in the service

industry and occupation have risen instead. Table 2 also shows a decline in the proportion of workers working for state-owned enterprises or institutes and an increase in those working for domestic private companies, foreign companies, joint ventures, and other kinds of mixed-ownership companies. It also appears that the percentage of workers working in the eastern provinces has increased while those working in the central and west have declined from 1987 to 2004.

Table 3 documents the OLS estimates of Mincer-type earning functions. These estimates present a picture of the changes in the wage structure in the Chinese urban labor market. In 1987, return to age increased monotonically with the age group. This can be attributed to the influence of the seniority-based compensation system from the centrally planned economy. In 1996 and 2004, as the reform was deepened and the influence from the old regime weakened, the return to age started to become curvilinear, first increasing with age, reaching the highest level around age 46-55, then declining above 55. The gender pay gap has increased considerably from 1987 to 2004. This can be seen from the coefficient estimates of gender dummy. Return to education has also risen immensely: in 1987, college graduates on average made a 4 percent higher pay than high school graduates, and 6 percent higher than those with only a junior high or below degree; by 2004, college graduates' average earnings were 22 percent higher than high school graduates and 37 percent higher than the junior high or below graduates. Employees working in the village or town collectively owned enterprises, domestic private companies, foreign companies, joint ventures, or other mixed-ownership companies, on average, had a lower pay than

those working for the state-owned enterprises or institutes. Table 3 also shows that the differences in the average return to various industries and occupations were relatively small in 1987 and became much larger in 1996 and 2004. Moreover, manufacturing and construction were among the high paid industries in 1987 and became the low paid ones by 2004. By contrast, finance, insurance, real estate, service, and transportation and communication industries became the most high-paid industries in 2004. This is consistent with the general impression that employees working in the state monopolistic industries tend to have a higher pay. By 2004, with all else controlled for, the regional differences in the average earnings have also risen evidently. Workers in the eastern provinces received a much higher pay than those in the central and west.

Based on the OLS estimates, we can decompose the increase in the mean earnings to one component due to the changes in the workers' characteristics ($Xs$) and the other due to the changes in the wage structure ($\beta s$ in the OLS regression). The decomposition is shown in equation (1). We conduct the decomposition for the 1987-1996 and 1996-2004 periods. The results are reported in Table 4. As can be seen, the mean earnings increased faster in the 1996-2004 period than the 1987-1996 period. For both periods, the "wage structure effect" accounted for a much larger proportion of the overall changes than the "composition effect". The rest of Table 4 shows the contribution of each specific variable to the "wage structure effect" and the "labor force composition" effect of mean earnings increases. These estimates should be interpreted as the relative contribution of the group to the base group (the omitted

one). For example, the increase in the percentage of male workers in the labor force and the higher return to males (i.e. the widened gender pay gap) both have contributed to the increase in the mean earnings of workers. The former is the male's composition effect and the latter the wage structure effect. In case of gender, the wage structure effect is greater than the composition effect.

4.3 Decomposition of the Changes in the Earning Distribution

Figure 2-4 document the results of the decomposition of the changes in the earnings distributions using the reweighting technique as in the first step of FFL method. The decomposition for the 1987-1996 period is shown in Figure 2. The counterfactual distribution was the hypothetical earnings distribution in 1996 had the workers' characteristics (*Xs*) remained the same as 1987. Thus, the differences between the 1996 actual distribution and the counterfactual represent the changes in the earning distributions due to the labor force composition effect. The differences between the 1987 distribution and the 1996 counterfactual are due to the wage structure effect. Figure 2 shows that the wage structure effect accounts for most of the changes in the earnings distribution from 1987 to 1996. The same result is also found for the later period, 1996-2004.

4.4 Influence Function Estimates and Decomposition

The second step of FFL method includes the unconditional quantile estimation and the decomposition based on it. These results are shown in Table 5 and Table 6. The estimates of only selected quantiles, specifically the $10^{th}$, $50^{th}$, and $90^{th}$ quantile, are reported. These estimates provide more information about the wage structure than the

OLS estimates. They show the wage determination and structure at the different income levels. For example, the older employees aged 46-55 and 56-65 had a much higher earning than the younger age groups at the $90^{th}$ quantile but not at the $10^{th}$ quantile. Males had a much higher earning than females especially among the high earners in 1987. This pattern has changed in 1996 and 2004 as the gender pay gap became wider among the lower earners. We also find that the higher return to college education was more evident among the upper incomers than the lower incomers. Another interesting result is, on average, employees working for the private, foreign, or other mixed-ownership companies had a lower earning than those working for the state-owned, but at the upper quantiles they had a much higher earning than those state employees. This finding is related to the different compensation practices of the state and non-state sectors. The state-owned enterprises tend to have a more equalitarian compensation structure and pay low-skilled workers more than the market wage and high-skilled workers less.

Table 6 shows the decomposition results for the variance of earnings, the 10-50 ratio, the 50-90 ratio, and the 10-90 ratio. We find that the wage structure effect contributes to most of the overall increase in the income dispersion. All of the factors including age, gender, education, ownership of the employer, industry, occupation and region are important but have a different impact on the increased earnings dispersion. During the 1987-1996 period, return to age increased the overall variance and particularly that of the low earners; The rising return to education and the increasingly different return to various industries and ownership have caused the overall increase

in the income dispersion but the effect is larger on the lower quantiles; by contrast, the occupation and regional factors contribute more to the income dispersion among high earners. For the 1996-2004 period, return to age equalizes the pay especially for the lower incomers; the gender pay gap, on the other hand, contributes more to the income dispersion of low earners than the high earners; the diverging returns to the different education levels, ownership, and industries lead to an increased income dispersion especially for the upper incomers; in contrast, the return to different occupations and regions contributes to the increased dispersion of income through the entire distribution.

## 5. Conclusion

In this paper, we utilize the household data to examine the changes in the Chinese urban income distributions from 1987 to 1996 and 1996 to 2004 and investigate the cause of these changes. The Oaxaca-Blinder decomposition is applied to decomposing the mean earnings increases, while the Firpo-Fortin-Lemieux method based upon a recentered influence function is used to decompose the increases in income inequality such as variance and the 10-90 ratio.

The Chinese urban labor force has experienced important changes from 1987 to 2004. They have become much better educated and more aged. Their industry and occupation composition has also changed, and there has been a shift in the major employment from the state-owned enterprises and institutes to the private, foreign, other mixed-ownership companies. In the meanwhile, the wage structure has also evolved in the Chinese urban labor market, featuring the large increases in the return

to college education, work experiences, and certain occupations or industries.

The decomposition results show that the wage structure effects such as the widened gender pay gap, the increasing return to college education, and the widened gap in the return to different industries, ownership, and regions, have made a large contribution to the increases in the average earnings and the earnings inequality. Moreover, during the different time periods, 1987-1996 and 1996-2004, these effects concentrate on the different parts (the low half or upper half) of income distribution.

Our study adopts the distributional approach and hence is able to provide a more comprehensive picture of the income dispersion in the urban areas and investigate the causes of rising inequality using the decomposition method. This constitutes our main contribution to the literature. However, due to data limitations, we are not able to look into the extent of unreported “grey income” and the impact on the income distribution, which are the questions of great importance to Chinese policy makers and economists. This issue is left for future research.

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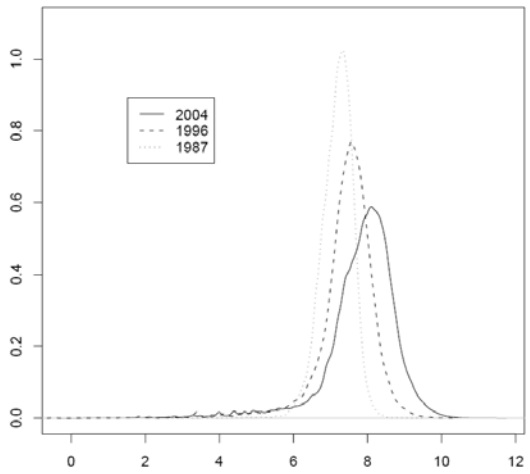
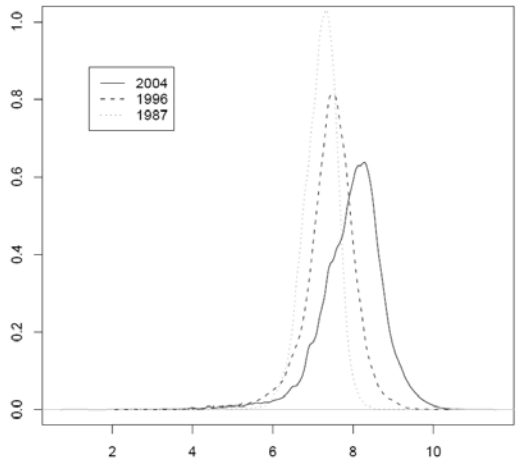
Figure 1: Kernel Density Estimation of Income Distribution 1987, 1996, 2004



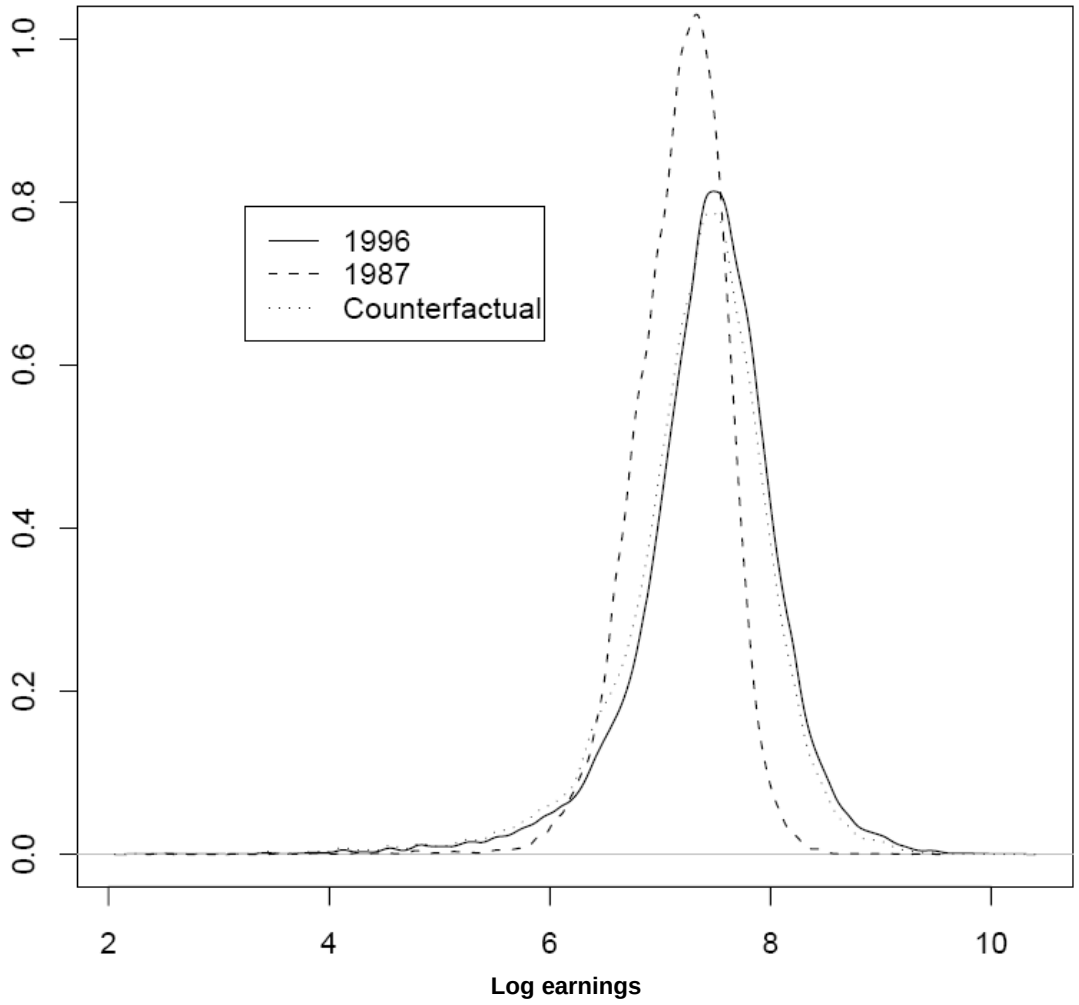

Sample 1: Log total income




Sample 2: Log earnings

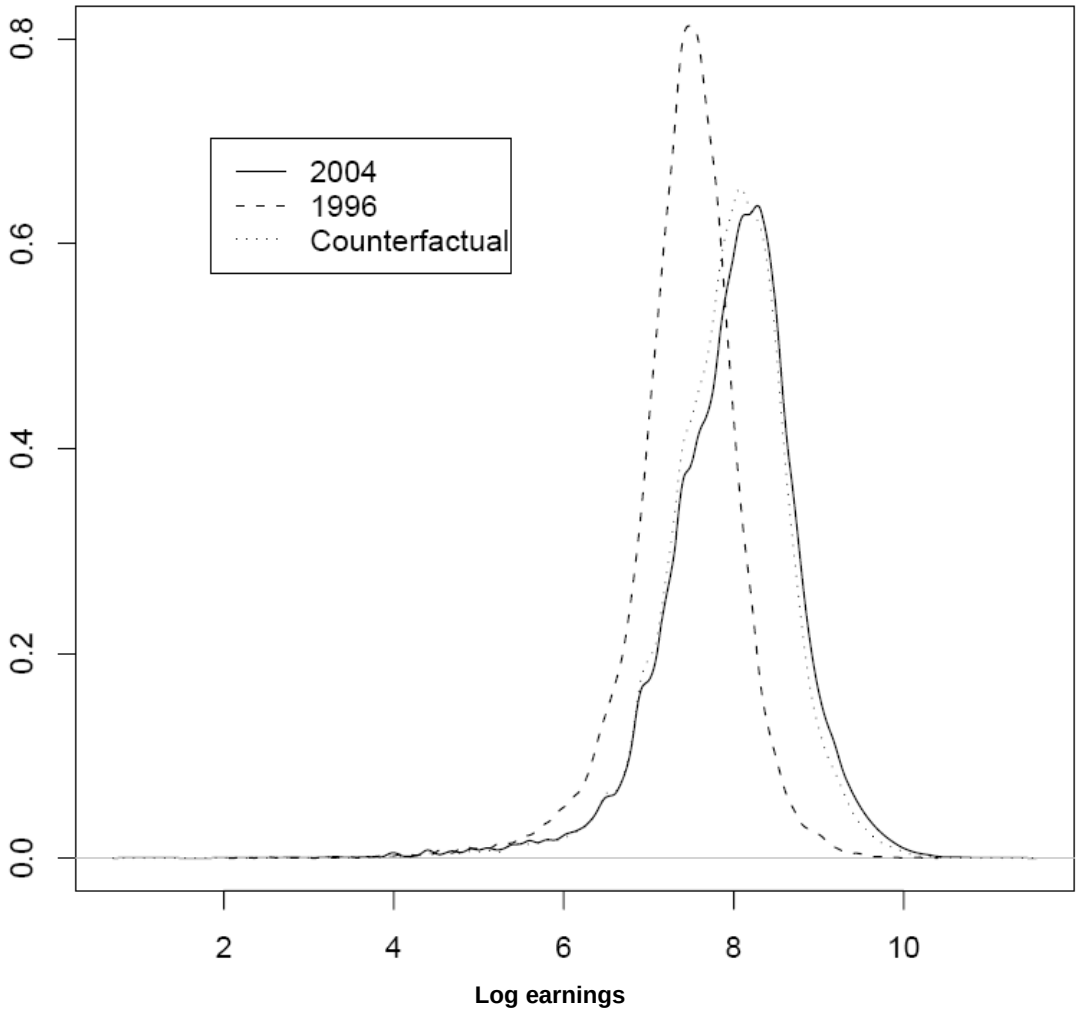
Note: Total income and earnings are at 1987 price. Sample 1 includes all adult individuals aged 16 and above with the total income greater than zero; Sample 2 includes only the working population aged 16-65 with positive earnings.

Figure 2: Decomposition of the Changes in the Earnings Distribution from 1987 to 1996



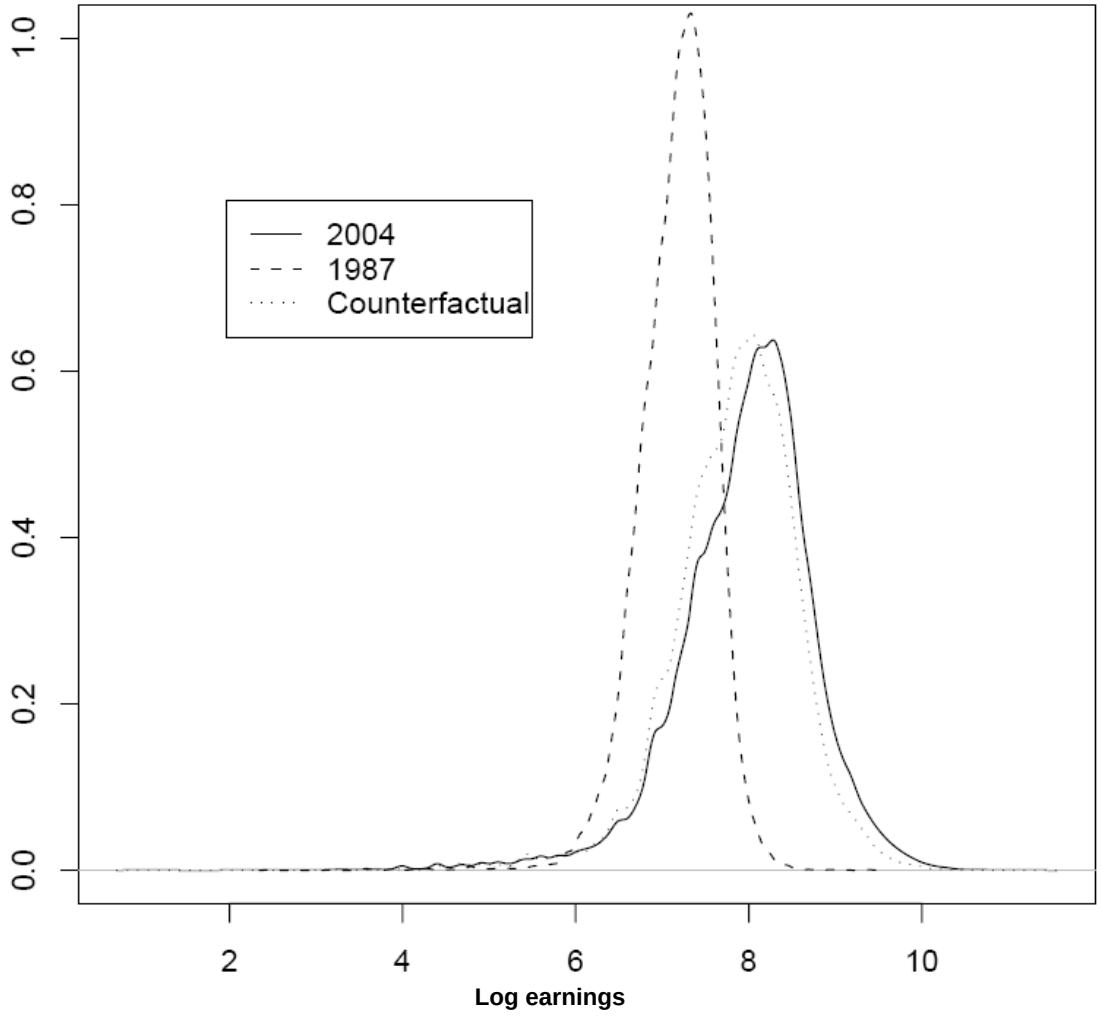

Note: The counterfactual assumes the 1987's workers' characteristics and 1996's wage structure. The differences between the 1996's distribution and the counterfactual are due to the change in the labor force composition; those between the counterfactual and 1987's distribution are due to the change in the wage structure.

Figure 3: Decomposition of the Changes in the Earnings Distribution from 1996 to 2004




Note: The counterfactual assumes the 1996's workers' characteristics and 2004's wage structure. The differences between the 2004's distribution and the counterfactual are due to the change in the labor force composition; those between the counterfactual and 1996's distribution are due to the change in the wage structure.

Figure 4: Decomposition of the Changes in the Earnings Distribution from 1987 to 2004




Note: The counterfactual assumes the 1987's workers' characteristics and 2004's wage structure. The differences between the 2004's distribution and the counterfactual are due to the change in the labor force composition; those between the counterfactual and 1987's distribution are due to the change in the wage structure.

Table 1: Description of the Mean and Dispersion of Income in 1987, 1996, 2004

| | *Sample 1: Total Income* | | | *Sample 2: Earnings* | | |
|---|---|---|---|---|---|---|
| | 1987 | 1996 | 2004 | 1987 | 1996 | 2004 |
| mean | 1312.91 | 2126.46 | 3546.12 | 1424.99 | 2000.08 | 3757.26 |
| median | 1366.48 | 1868.39 | 2917.38 | 1368.00 | 1759.97 | 3152.95 |
| Gini | 0.219 | 0.325 | 0.391 | 0.218 | 0.310 | 0.370 |
| Theil | 0.079 | 0.189 | 0.272 | 0.078 | 0.171 | 0.241 |
| Log variance | 0.189 | 0.658 | 0.929 | 0.185 | 0.418 | 0.619 |
| 10-90 ratio | 2.78 | 4.65 | 6.68 | 2.77 | 4.24 | 5.86 |
| 10-50 ratio | 1.79 | 2.40 | 2.99 | 1.78 | 2.22 | 2.73 |
| 50-90 ratio | 1.56 | 1.94 | 2.24 | 1.55 | 1.91 | 2.14 |

Note: Total income and earnings are at 1987 price. Sample 1 includes all adult individuals aged 16 and above with the total income greater than zero; Sample 2 includes only the working population aged 16-65 with positive earnings.

Table 2: The Characteristics of Workers in 1987, 1996, 2004

| | **1987** | **1996** | **2004** |
|---|---|---|---|
| Male | 51.86 | 52.16 | 54.74 |
| Age 16-25 | 17.24 | 10.17 | 5.39 |
| Age 26-35 | 26.58 | 25.91 | 23.18 |
| Age 36-45 | 32.14 | 39.55 | 37.75 |
| Age 46-55 | 20.01 | 19.63 | 28.77 |
| Age 56-65 | 4.03 | 4.74 | 4.90 |
| | *100%* | *100%* | *100%* |
| College | 10.47 | 21.15 | 34.35 |
| High School | 35.15 | 44.06 | 41.29 |
| Junior High & Below | 54.37 | 34.8 | 24.36 |
| | *100%* | *100%* | *100%* |
| Manufacturing | 41.71 | 38.24 | 23.21 |
| Construction | 3.61 | 3.13 | 2.98 |
| Transportation & communication | 6.04 | 5.79 | 8.89 |
| Wholesale, retail, food & boarding | 14.06 | 14.93 | 13.48 |
| Education, cultural, health care, sports | 2.39 | 4.36 | 10.44 |
| Science, research, technical service | 11.85 | 12.3 | 12.37 |
| Personal & private service | 2.16 | 2.57 | 2.81 |
| Finance, insurance & real estate | 1.93 | 2.38 | 5.21 |
| Government | 11.09 | 13.61 | 13.98 |
| Other | 5.16 | 2.69 | 6.62 |
| | *100%* | *100%* | *100%* |
| Professional & Technical | 16.06 | 23.08 | 20.07 |
| Managerial | 8.6 | 7.47 | 4.87 |
| Clerical | 20.91 | 21.92 | 30.39 |
| Sales | 6.95 | 7.01 | 6.06 |
| Service | 5.61 | 4.37 | 12.25 |
| Production and manual workers | 41.86 | 36.15 | 26.37 |
| | *100%* | *100%* | *100%* |
| State-owned | 77.19 | 79.58 | 66.34 |
| Collective | 20.85 | 13.44 | 6.77 |
| Private or self-employed | 1.02 | 2.71 | 9.39 |
| Foreign or Joint venture | 0.95 | 4.27 | 17.49 |
| | *100%* | *100%* | *100%* |
| East | 40.78 | 42.76 | 48.96 |
| Central | 34.3 | 35.53 | 31.55 |
| West | 24.92 | 21.7 | 19.49 |
| | *100%* | *100%* | *100%* |
| Number of Observations | 27456 | 30593 | 73024 |

Table 3: OLS Estimates of Earnings Function 1987, 1996, and 2004

| | 1987 | 1996 | 2004 |
|---|---|---|---|
| Constant | 7.134*** (0.011) | 7.212*** (0.014) | 7.710*** (0.011) |
| Age 16-25 | -0.461*** (0.007) | -0.556*** (0.012) | -0.403*** (0.012) |
| Age 26-35 | -0.126*** (0.006) | -0.170*** (0.008) | -0.118*** (0.007) |
| Age 46-55 | 0.094*** (0.006) | 0.023* (0.009) | 0.019** (0.006) |
| Age 56-65 | 0.117*** (0.011) | -0.233*** (0.016) | -0.055*** (0.012) |
| Male | 0.093*** (0.005) | 0.159*** (0.007) | 0.196*** (0.005) |
| College | 0.038*** (0.008) | 0.079*** (0.009) | 0.222*** (0.006) |
| Junior High & Below | -0.025*** (0.005) | -0.093*** (0.008) | -0.154*** (0.007) |
| Private, foreign or joint venture | -0.120*** (0.016) | -0.088*** (0.014) | -0.282*** (0.006) |
| Collective | -0.147*** (0.016) | -0.264*** (0.010) | -0.242*** (0.010) |
| Manufacturing | 0.060*** (0.008) | 0.046*** (0.012) | -0.058*** (0.01) |
| Construction | 0.102*** (0.013) | 0.066** (0.021) | -0.074*** (0.016) |
| Transportation & communication | 0.090*** (0.011) | 0.209*** (0.017) | 0.090*** (0.011) |
| Wholesale, retail, food & boarding | 0.008 (0.01) | 0.023 (0.014) | -0.096*** (0.011) |
| Education, cultural, health care, sports | 0.007 (0.016) | 0.043* (0.018) | -0.150*** (0.011) |
| Science, research, technical service | 0.006 (0.009) | 0.085*** (0.013) | 0.051*** (0.011) |
| Personal & private service | 0.095*** (0.016) | 0.062** (0.022) | 0.132*** (0.017) |
| Finance, insurance & real estate | 0.048** (0.017) | 0.250*** (0.023) | 0.071*** (0.013) |
| Other | 0.014 (0.012) | -0.128*** (0.022) | 0.116*** (0.012) |
| Professional & Technical | 0.108*** (0.008) | 0.161*** (0.011) | 0.272*** (0.009) |
| Managerial | 0.154*** (0.009) | 0.242*** (0.015) | 0.309*** (0.014) |
| Clerical | 0.052*** (0.007) | 0.099*** (0.010) | 0.196*** (0.008) |
| Sales | -0.013 (0.011) | -0.027 (0.017) | -0.160*** (0.014) |
| Service | -0.045*** (0.011) | -0.010 (0.017) | -0.141*** (0.01) |
| East | 0.109*** (0.005) | 0.356*** (0.007) | 0.316*** (0.006) |
| West | 0.023*** (0.006) | 0.047*** (0.009) | 0.046*** (0.007) |
| Adjusted $R^2$ | 0.333 | 0.249 | 0.281 |

Note: "***" P-value<0.001; "**" P-value<0.01; "*" P-value<0.05

Table 4: Decomposition of the Increase in the Mean Wage

| | 1987-1996 | | 1996-2004 | |
|---|---|---|---|---|
| | *Overall Changes(=0.240)* | | *Overall Changes(=*0.550) | |
| | *Composition Effect (=0.098)* | *Wage Structure Effect (=0.142)* | *Composition Effect (=0.062)* | *Wage Structure Effect (=0.488)* |
| Constant | -0.041 | 0.118 | -0.076 | 0.574 |
| Age 16-25 | 0.045 | -0.022 | 0.023 | 0.012 |
| Age 26-35 | 0.005 | -0.015 | 0.005 | 0.012 |
| Age 36-45 | - | - | - | - |
| Age 46-55 | -0.003 | -0.012 | 0.001 | 0.0004 |
| Age 56-65 | -0.009 | -0.007 | -0.002 | 0.010 |
| Male | 0.009 | 0.025 | 0.007 | 0.017 |
| College | 0.009 | 0.004 | 0.035 | 0.025 |
| High School | - | - | - | - |
| Junior High & Below | 0.014 | -0.032 | 0.007 | -0.013 |
| Private, foreign or joint venture | -0.003 | -0.001 | -0.058 | -0.011 |
| Collective | 0.014 | -0.019 | 0.015 | 0.004 |
| State-owned | - | - | - | - |
| Manufacturing | 0.002 | -0.026 | 0.046 | -0.077 |
| Construction | 0.002 | -0.003 | 0.003 | -0.007 |
| Transportation & communication | 0.007 | 0.005 | 0.005 | -0.009 |
| Wholesale, retail, food & boarding | 0.002 | -0.005 | 0.007 | -0.024 |
| Education, cultural, health care, sports | 0.005 | -0.001 | -0.011 | -0.007 |
| Science, research, technical service | 0.001 | 0.005 | 0.001 | -0.006 |
| Personal & private service | 0.002 | -0.002 | 0.001 | 0.001 |
| Finance, insurance & real estate | 0.005 | 0.003 | 0.003 | -0.005 |
| Other | 0.002 | -0.009 | 0.005 | 0.006 |
| Government and NRO | - | - | - | - |
| Professional & Technical | 0.011 | 0.009 | 0.002 | 0.015 |
| Managerial | -0.002 | 0.007 | -0.004 | 0.001 |
| Clerical | 0.001 | 0.009 | 0.028 | 0.010 |
| Sales | 0.000 | -0.001 | 0.000 | -0.007 |
| Service | -0.002 | 0.004 | -0.012 | -0.005 |
| Production and Manual workers | - | - | - | - |
| East | 0.009 | 0.099 | 0.034 | -0.032 |
| Central | - | - | - | - |
| West | -0.003 | 0.007 | -0.003 | 0.002 |

Table 5: Unconditional Quantile Estimates, 1987, 1996, 2004

| | 1987 | | | 1996 | | |
|---|---|---|---|---|---|---|
| | 10th | 50th | 90th | 10th | 50th | 90th |
| Constant | 6.704*** (0.017) | 7.158*** (0.018) | 7.189*** (0.036) | 6.613*** (0.038) | 7.290*** (0.014) | 7.728*** (0.023) |
| Age 16-25 | -0.641*** (0.011) | -0.619*** (0.012) | -0.296*** (0.023) | -1.223*** (0.03) | -0.374*** (0.011) | -0.212*** (0.018) |
| Age 26-35 | -0.075*** (0.009) | -0.247*** (0.01) | -0.173*** (0.019) | -0.229*** (0.022) | -0.176*** (0.008) | -0.102*** (0.013) |
| Age 46-55 | -0.010 (0.01) | 0.157*** (0.011) | 0.400*** (0.021) | -0.110*** (0.023) | 0.067*** (0.009) | 0.075*** (0.014) |
| Age 56-65 | -0.065*** (0.019) | 0.172*** (0.02) | 0.661*** (0.039) | -0.751*** (0.043) | -0.069*** (0.016) | -0.015 (0.026) |
| Male | 0.068*** (0.007) | 0.133*** (0.008) | 0.194*** (0.016) | 0.289*** (0.018) | 0.118*** (0.007) | 0.121*** (0.011) |
| College | 0.005 (0.013) | 0.053*** (0.014) | 0.241*** (0.028) | 0.022 (0.024) | 0.081*** (0.009) | 0.108*** (0.015) |
| Junior High & Below | -0.031*** (0.008) | -0.011 (0.009) | -0.089*** (0.018) | -0.170*** (0.021) | -0.064*** (0.008) | -0.073*** (0.013) |
| Private, foreign or joint venture | -0.344*** (0.026) | -0.138*** (0.028) | 0.272*** (0.055) | -0.568*** (0.036) | -0.072*** (0.014) | 0.246*** (0.022) |
| Collective | -0.180*** (0.009) | -0.208*** (0.010) | -0.145*** (0.019) | -0.488*** (0.026) | -0.235*** (0.010) | -0.145*** (0.016) |
| Manufacturing | 0.039** (0.014) | 0.072*** (0.014) | 0.244*** (0.028) | 0.021 (0.03) | 0.033** (0.012) | 0.105*** (0.019) |
| Construction | 0.038 (0.022) | 0.086*** (0.023) | 0.468*** (0.046) | -0.036 (0.054) | 0.083*** (0.021) | 0.202*** (0.033) |
| Transportation & communication | 0.019 (0.018) | 0.089*** (0.019) | 0.405*** (0.038) | 0.133** (0.043) | 0.163*** (0.016) | 0.358*** (0.027) |
| Wholesale, retail, food & boarding | -0.011 (0.017) | -0.021 (0.018) | 0.183*** (0.035) | -0.050 (0.037) | 0.008 (0.014) | 0.129*** (0.023) |
| Education, cultural, health care, sports | -0.010 (0.026) | -0.011 (0.028) | 0.143** (0.055) | -0.148** (0.048) | 0.056** (0.018) | 0.225*** (0.03) |
| Science, research, technical service | 0.005 (0.016) | 0.003 (0.017) | 0.104** (0.033) | 0.049 (0.035) | 0.082*** (0.013) | 0.11*** (0.022) |
| Personal & private service | 0.025 (0.026) | 0.120*** (0.028) | 0.466*** (0.055) | -0.0004 (0.057) | 0.041 (0.022) | 0.144*** (0.035) |
| Finance, insurance & real estate | 0.050 (0.027) | -0.017 (0.029) | 0.301*** (0.057) | 0.184** (0.059) | 0.236*** (0.022) | 0.343*** (0.036) |
| Other | -0.073*** (0.020) | 0.032 (0.021) | 0.352*** (0.041) | -0.327*** (0.057) | -0.092*** (0.022) | -0.005 (0.035) |
| Professional & Technical | 0.097*** (0.014) | 0.177*** (0.015) | 0.130*** (0.029) | 0.346*** (0.029) | 0.125*** (0.011) | 0.079*** (0.018) |
| Managerial | 0.081*** (0.015) | 0.253*** (0.016) | 0.421*** (0.032) | 0.353*** (0.039) | 0.215*** (0.015) | 0.196*** (0.024) |
| Clerical | 0.094*** (0.011) | 0.079*** (0.012) | 0.012 (0.023) | 0.233*** (0.027) | 0.055*** (0.01) | 0.064*** (0.016) |
| Sales | -0.002 (0.019) | 0.002 (0.020) | -0.015 (0.039) | 0.008 (0.044) | -0.034* (0.017) | -0.049 (0.027) |
| Service | -0.086*** (0.017) | -0.029 (0.018) | -0.036 (0.036) | -0.041 (0.045) | 0.023 (0.017) | -0.012 (0.028) |
| East | 0.088*** (0.008) | 0.150*** (0.009) | 0.258*** (0.017) | 0.316*** (0.019) | 0.305*** (0.007) | 0.474*** (0.012) |
| West | 0.015 (0.009) | 0.005 (0.010) | 0.119*** (0.019) | 0.082*** (0.023) | 0.039*** (0.009) | -0.005 (0.014) |
| Adjusted $R^2$ | 0.193 | 0.253 | 0.108 | 0.131 | 0.190 | 0.106 |

Note: "***" P-value<0.001; "**" P-value<0.01; "*" P-value<0.05

Table 5- Continued:

| | 2004 | | |
|---|---|---|---|
| | 10th | 50th | 90th |
| Constant | 6.880*** (0.026) | 7.878*** (0.012) | 8.263*** (0.020) |
| Age 16-25 | -0.590*** (0.027) | -0.360*** (0.012) | -0.270*** (0.018) |
| Age 26-35 | -0.112*** (0.015) | -0.128*** (0.007) | -0.097*** (0.010) |
| Age 46-55 | 0.001 (0.015) | 0.023*** (0.007) | 0.028** (0.010) |
| Age 56-65 | -0.241*** (0.028) | -0.044*** (0.013) | 0.075*** (0.019) |
| Male | 0.271*** (0.012) | 0.200*** (0.006) | 0.157*** (0.008) |
| College | 0.136*** (0.015) | 0.224*** (0.007) | 0.282*** (0.01) |
| Junior High & Below | -0.267*** (0.016) | -0.129*** (0.007) | -0.082*** (0.01) |
| Private, foreign or joint venture | -0.474*** (0.015) | -0.223*** (0.007) | -0.054*** (0.010) |
| Collective | -0.257*** (0.024) | -0.296*** (0.011) | -0.134*** (0.016) |
| Manufacturing | 0.059** (0.022) | -0.183*** (0.010) | -0.021 (0.015) |
| Construction | -0.039 (0.038) | -0.145*** (0.017) | -0.012 (0.026) |
| Transportation & communication | 0.134*** (0.026) | 0.04*** (0.012) | 0.152*** (0.018) |
| Wholesale, retail, food & boarding | -0.102*** (0.026) | -0.129*** (0.012) | 0.028 (0.018) |
| Education, cultural, health care, sports | -0.222*** (0.025) | -0.183*** (0.011) | -0.033 (0.017) |
| Science, research, technical service | 0.024 (0.025) | 0.043*** (0.011) | 0.102*** (0.017) |
| Personal & private service | 0.069 (0.039) | 0.111*** (0.018) | 0.220*** (0.026) |
| Finance, insurance & real estate | 0.080** (0.030) | -0.020 (0.014) | 0.190*** (0.020) |
| Other | 0.130*** (0.029) | 0.048*** (0.013) | 0.214*** (0.019) |
| Professional & Technical | 0.302*** (0.021) | 0.265*** (0.009) | 0.237*** (0.014) |
| Managerial | 0.279*** (0.032) | 0.301*** (0.014) | 0.315*** (0.021) |
| Clerical | 0.282*** (0.018) | 0.173*** (0.008) | 0.131*** (0.012) |
| Sales | -0.234*** (0.032) | -0.124*** (0.015) | -0.048* (0.022) |
| Service | -0.226*** (0.023) | -0.141*** (0.010) | -0.060*** (0.015) |
| East | 0.260*** (0.013) | 0.224*** (0.006) | 0.485*** (0.009) |
| West | 0.014 (0.017) | 0.054*** (0.008) | 0.026* (0.011) |
| Adjusted $R^2$ | 0.102 | 0.238 | 0.108 |

Note: "***" P-value<0.001; "**" P-value<0.01; "*" P-value<0.05

Table 6: Decomposition of the Changes in Income Dispersion

| | 1987-1996 | | | | 1996-2004 | | | |
|---|---|---|---|---|---|---|---|---|
| | Variance | 10-50 | 50-90 | 10-90 | Variance | 10-50 | 50-90 | 10-90 |
| *Overall Changes* | *0.233* | *0.217* | *0.200* | *0.416* | *0.201* | *0.208* | *0.117* | *0.325* |
| *Composition Effect* | *-0.044* | *-0.094* | *-0.002* | *-0.095* | *0.087* | *0.068* | *0.020* | *0.088* |
| Age | -0.061 | -0.098 | -0.023 | -0.121 | -0.043 | -0.029 | -0.020 | -0.049 |
| Gender | 0.005 | 0.003 | 0.009 | 0.012 | 0.038 | 0.025 | 0.017 | 0.042 |
| Education | -0.020 | -0.030 | -0.003 | -0.034 | 0.021 | 0.017 | 0.003 | 0.021 |
| Ownership of employers | 0.014 | 0.0003 | 0.009 | 0.010 | 0.068 | 0.027 | 0.028 | 0.055 |
| Industry | -0.003 | -0.009 | 0.009 | -0.001 | 0.018 | 0.023 | -0.004 | 0.020 |
| Occupation | 0.012 | 0.0003 | 0.006 | 0.006 | 0.047 | 0.064 | 0.008 | 0.072 |
| Region | 0.047 | 0.021 | 0.034 | 0.055 | 0.001 | 0.001 | 0.051 | 0.052 |
| Constant | -0.037 | 0.020 | -0.042 | -0.023 | -0.063 | -0.061 | -0.064 | -0.125 |
| *Wage Structure Effect* | *0.277* | *0.311* | *0.201* | *0.512* | *0.115* | *0.139* | *0.097* | *0.236* |
| Age | 0.106 | 0.192 | -0.036 | 0.156 | -0.041 | -0.114 | 0.0003 | -0.114 |
| Gender | -0.040 | -0.097 | -0.001 | -0.098 | 0.005 | 0.026 | -0.042 | -0.016 |
| Education | 0.036 | 0.059 | 0.020 | 0.079 | 0.005 | -0.003 | 0.025 | 0.023 |
| Ownership of employers | 0.013 | 0.046 | 0.003 | 0.049 | 0.005 | -0.029 | 0.009 | -0.020 |
| Industry | 0.035 | 0.041 | 0.006 | 0.046 | -0.027 | -0.138 | 0.045 | -0.092 |
| Occupation | -0.055 | -0.101 | 0.004 | -0.097 | -0.005 | 0.014 | 0.001 | 0.015 |
| Region | -0.059 | -0.030 | 0.015 | -0.014 | 0.019 | 0.003 | 0.009 | 0.011 |
| Constant | 0.243 | 0.199 | 0.195 | 0.394 | 0.154 | 0.382 | 0.065 | 0.447 |

Note: The omitted group is the female aged 36-45 with the high school education working in the public sector (owned by the state) as production and manual workers in the central areas. The “Age”, “Education”, “Ownership”, “Industry”, “Occupation”, and “Region” effects are the sum of the effects of the dummy variables under each group.