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The Effects of Minimum Wage on Wage Distribution in Urban China: Evidence from the CHIP Data*

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Abstract

Using data from the China Household Income Project, this study analyzes the effects of minimum wage policy on wage distribution in urban China from 1993 to 2013. Several major conclusions emerge from this research. First, with respect to the effects of the minimum wage on wages for low-wage groups: 1.) The results of the ordinary least squares (OLS) and quantile regression (QR) models show that the minimum wage affected both the average wage and the wage levels for low-wage groups during 1993–1995, 1998–2002, and 2007–2013, with the greatest effect during 1993-1995; 2.) The results using the Neumark, Schweitzer, and Wascher (2004) model indicate that the change in the minimum wage level affected changes in the wage level for low-wage groups during 1993-1995 and 1998-2002, with the greatest effect during 1993-1995; 3.) The results of the DID model indicate that even when heterogeneity problems are addressed, the minimum wage considerably affects the wage levels for low-wage groups during all three periods. Second, all estimation results indicate the presence of a spillover effect in 1993–1995, but not in 1998–2002 or 2007–2013.

Keywords: minimum wage policy, wage distribution, urban China

JEL classification: J31, J33, J38

I. Introduction

The rationale behind a minimum wage policy is to increase wage levels for low-income groups, to reduce poverty, and to narrow income inequalities between high-wage groups and low-wage groups. Implementation of a minimum wage is therefore an important labor policy in both the developing and developed countries.

In China, income inequality increased during the period of economic transition (Li, Sicular, and Gustafsson 2008; Li, Sato, Sicular et al. 2013). Accompanying the progress of the market reforms, the Chinese government promulgated its first minimum wage law in 1993—the Enterprise Minimum Wage Regulations. In principle, the minimum wage level was to be determined by the local governments (the provincial governments or the city governments) in consultation with union and company representatives. However, in reality, the provincial governments primarily determined the minimum wage levels. Hence, implementation of the minimum wage varied across regions. In 2004 the central government published a new minimum wage policy to enforce implementation throughout the country; thereafter, there was a substantial increase in the minimum wage level. Based on the new minimum wage policy, the minimum

wage level is adjusted once every one or two years, and the many factors to be considered in setting the minimum wage levels include local living costs, the consumer price index, social insurance (e.g., pensions and healthcare insurance), the housing provident fund for which individual workers are responsible, the average wage level, the level of economic development, and the employment situation in the local labor market. The minimum wage level is adjusted by the local governments; as a result, regional disparities still exist (Xing and Xu 2016). For example, the minimum wage level is higher in the Eastern regions as compared to the Western and Central regions, and the rise within the bands of the minimum wage levels differs across regions. Such regional disparities allow us to utilize a quasi-natural experiment model to estimate the effects of the minimum wage policy on the wage distribution.

There have been some empirical studies on the effects of the minimum wage on employment, wage gaps, and income inequality in the developed countries, but few empirical studies attempt to understand the effects of the minimum wage on wage distribution in China. In this study, we utilize data from the Chinese Household Income Project (CHIP) to provide empirical evidence. Specifically, this study attempts to answer the following questions. First,

does the minimum wage level affect the mean wage level, and does the effect of the minimum wage differ among different wage groups? Second, do changes in minimum wage levels affect changes in the wage distribution? Third, after addressing the heterogeneity problem,[1] does the minimum wage policy still affect the wage distribution?

This study uses micro survey data conducted during four periods (1995, 2002, 2007, and 2013). The survey periods are divided into three groups—the period during promulgation of the minimum wage (1993–1995), the period during implementation of the minimum wage (1998–2002), and the period during enforcement of the minimum wage (2007–2013). Because the minimum wage primarily affects low-income groups, we employ different models to analyze both average wages and the different wage percentiles. In addition, because both the 1995 CHIP and the 2002 CHIP contain retrospective data, income information for the previous five years is extrapolated. We utilized this information to build panel data and to perform a detailed analysis. Because we attempt to analyze the long-term effects of the minimum wage on wage distribution,

[1] It is generally accepted that a heterogeneity problem can occur in empirical studies, in which the estimated results may be different between various individuals or groups because of individual or group disparities. For example, the low-wage groups and in the high-wage groups have distinctive characteristics (e.g., education or skill levels are lower among low-wage workers than among high-wage workers), and the effect of the minimum wage on wage levels may therefore vary depending on the wage-level groups.

we therefore utilized the 1995 CHIP data. Since migrants are not included in the 1995 CHIP, urban workers with local urban registrations are the focus of the analysis.

This chapter is structured as follows. Section II, in a review of the literature on the effects of minimum wages on wage distribution, points out the main contribution of this study. Section III describes the analytical methods, including an introduction to the models (e.g., the ordinary least squares [OLS] model, the quantile regression [QR] model, the Neumark model, and the difference in differences [DID] model), the survey data, the utilization of national minimum wage data, and the setting of the variables, particularly the definition of wages and the treatment group. Section IV presents and interprets the results, compares these results based on the different empirical analytical methods, and provides an explanation for these results. The concluding section presents our main conclusions and suggests some policy implications.

II. Literature Review

There have been some empirical studies[2]on the effects of a minimum wage on employment,[3] wage gaps, and income inequality[4] in the developed counties, but empirical studies on the effects of a minimum wage on wage distribution in China are rare.[5] To study the effects of a minimum wage on wage distribution, three types of analyses were conducted on the individual survey data.

The first analysis involved OLS and QR models to investigate the effects of the minimum wage on the average wage and on wage groups within different percentiles (Card and Krueger 1995a; Neumark, 2001; Gindling and Terrell 2005; Neumark, Cunningham, and Siga 2006; Hohberg and Lay 2015).

The second analysis, similar to that conducted by Neumark, Schweitzer, and Wascher (2004) (referred hereafter as the "Neumark model"), analyzes the effects of changes in the

[2] For a summary of the surveys on the effects of a minimum wage on employment and wages, see Brown (1999), Card and Krueger (1995a), Machin and Manning (1997), Neumark and Wascher (2008), and Boeri and van Ours (2013).

[3] With respect to the employment effects of the minimum wage in the 1980s, there was a negative significant but modest –1 percent to –3 percent employment effect (Brown, Curtis, and Andrew 1982). After the 1990s, using cross-section data, Deere, Murphy, and Welch (1995), Currie and Fallick (1996), Burkhauser, Couch, and Wittenburg (2000), and Neumark and Wascher (1992, 2000, 2004) came up results that are consistent with the standard model prediction of a negative employment effect. However, using panel data to conduct quasi-natural experiment studies, Card (1992a, 1992b), Katz and Krueger (1992), and Card and Krueger (1995a) have revealed that there are no unemployment effects. Similarly, there is no consensus on the effects of a minimum wage on employment.

[4] For empirical studies on the effects of a minimum wage on wage gaps and income inequality, see Card and Krueger (1995a), DiNardo, Fortin, Lemieux (1996) for the United States, and Robinson (2002, 2005) for the United Kingdom.

[5] For an empirical study on the effects of a minimum wage on gender wage gaps in urban China, see Li and Ma (2015).

minimum wage levels on changes in the wage levels by using a special model. This was done by comparing the minimum wage and the wage change rates from the prior year to the survey year ($\frac{W_{it} - W_{it\_1}}{W_{it\_1}}$, $\frac{MW_{it} - MW_{it\_1}}{MW_{it\_1}}$), in addition to comparing the ratios of the wage level to the minimum wage level in the prior year (w_{t_1} / MW_{t_1}). These variables and their interactions were utilized in the analysis.

The third analysis is a DID method to evaluate the effects of a minimum wage policy to address heterogeneity problems. These are caused by unobservable factors, which may influence whether the minimum wage policy plays a role in the various regions (Neumark, Cunningham, and Siga 2006; Dinkelman and Ranchhod 2012; Bhorat, Kanbur, and Stanwix 2014).

How does the minimum wage affect the wage distribution? Earlier studies have highlighted the spike and spillover effects. First, the spike effect appears when the minimum wage affects a group whose wages are below the minimum wage level or a group whose wages are slightly above the minimum wage (called the group with “wages around the minimum wage”). If there are no compliance problems, the spike effect should be visible when a minimum wage is implemented. Neumark and Wascher (1992), Card and Krueger (1995a, 1995b), Baker,

Benjamin, and Stanger (1999), and Lee (1999) have all pointed out that the spike effect of the minimum wage is visible in both the United States and the United Kingdom.

Second, a minimum wage may also affect groups with wages above the minimum wage level, which is referred to as the "spillover effect of the minimum wage" (Grossman 1983; Card and Krueger 1995a; Lee 1999; Neumark, Schweitzer, and Wascher 2004). Although previous studies using these models have focused on an estimation of the minimum wage effect on the wage distribution, particularly on the spillover effect of the minimum wage, the results of such empirical studies have not been consistent. For example, Lee (1999) found that a spillover effect did in fact exist, whereas Autor, Manning, and Smith (2010) found that such a spillover effect was not noticeable.

There are some hypotheses to explain the spillover effect of the minimum wage. For example, based on neoclassical economic theory, the skill substitution hypothesis proposes that implementation of a minimum wage policy increases labor costs for low-skilled workers, therefore firms might employ high-skilled workers rather than low-skilled workers. This will result in an increase in the wages of high-skilled workers due to the increased demand.

However, the substitution effect is greater for workers closer to the low-skilled group (e.g., the middle-wage group) (Pettengill 1981). In addition, the monopoly model reveals that when a monopoly firm increases the wage level for the low-wage group, the wage gap between the low-wage group and the middle- or high-wage group should decrease. A firm might increase the wage levels for groups not affected by the minimum wage to increase motivation. Furthermore, the efficiency wage hypothesis explains why firms increase the wage levels for groups that are not covered by minimum wage regulations. However, the labor cost constraint hypothesis proposes that when labor costs are constant and a minimum wage is implemented, the increase in labor costs for the low-wage group might result in a decline in firm profits over the short term, so firms will not increase wage levels for groups that are not covered by the minimum wage. If the effects of the labor cost constraint hypothesis outweigh the effects of the skill substitution hypothesis, the monopoly hypothesis, and the efficient wage hypothesis, the spillover effect does not appear. This issue requires an empirical examination because of the complexity of predicting a spillover effect based on economic theory.

In considering the empirical studies with respect to China, Jia and Zhang (2013) utilized the Neumark model to analyze the minimum wage spillover effects in China using 1997–2009 data from the CHNS (Chinese Health and Nutrition Survey). They found that the spillover effect of an increase in the minimum wage can reach 1.00~1.25 times the minimum wage level for the male and female wage distributions. Di and Han (2015), utilizing the OLS, QR, and DID models to analyze the effects of the minimum wage on the income of Chinese urban residents using 1996–2010 data from the CHNS, reveal that when the minimum wage level increases by 1 percent, the average wage will increase by 0.281~0.899 percent, and this effect will be mainly concentrated in the low-income group. Moreover, based on the results of a DID analysis, they point out that a minimum wage provides protection, especially for the elderly and the low-skilled laborers. Wang and Tang (2014) utilized the 2003–2006 Migrant Household Survey conducted by the Research Center of Rural Economy (RCRE) to analyze the effect of the minimum wage on the wage distribution based on the Neumark model. They found that an increase in the minimum wage has a positive lagged effect on the increase in the wage level of the group with the lowest income, but this effect is not significant for the group with wages near the minimum wage level.

In addition, based on the OLS model, Ma, Zhang, and Zhu (2012) utilized Chinese manufacturing firm-level data and city-level minimum wage data from 1997 to 2007 to analyze the effects of the minimum wage on average firm wages. They found that if the minimum wage increases by 10 percent, the average wages in firms will increase by 0.4–0.5 percent.

The main contributions of this study are as follows: First, previous studies utilized only one or two types of analytical methods. However, here we utilized three such methods, as summarized above. This allowed us to analyze the effect of the minimum wage on the wage distribution from different perspectives and to provide more detailed evidence for the China case. Second, although Wang and Tan (2014) utilized the Neumark model to investigate the minimum wage effect on wage distribution among migrants, local urban residents have not been subject to an empirical study based on the Neumark model. This study is intended to compensate for this shortcoming. Third, this is the first time that 1995–2013 CHIP data have been employed for an empirical study on this issue. We can compare these results with the previous studies using the CHNS data and the RCRE data. Moreover, analysis using the latest survey data—CHIP 2013—provides us with the most up-to-date information on the effects of the minimum wage on wage

distribution. Fourth, by considering the changes in the minimum wage policy by periods, we can analyze the effects of the minimum wage policy for three different periods—the minimum wage promulgation period (1993–1995), the minimum wage implementation period (1998–2002), and the minimum wage enforcement period (2007–2013). This reveals the disparities in the minimum wage effects on wage distribution that may be due to differences in government enforcement behavior.

III. Methodology and Data

A. Models

1.) Models for the effects of the minimum wage on average wages and on different percentile wage groups

The first analysis involves using OLS and QR models to determine the effects of the minimum wage on average wages and on different percentile wage groups. The wage function using the OLS model is represented by Equation (1).

$$\ln W_{ijt} = a_t + \beta_1 \ln MW_{jt} + \beta_2 X_{ijt} + \varepsilon_{ijt} \qquad (1)$$

In Equation (1), i represents individual workers, t represents periods, and j represents regions. $\ln W$ is the logarithmic value of the wage, $\ln MW$ is the logarithmic value of the minimum wage, X is the other variables affecting wages (such as education and work experience as a proxy for human capital, gender, occupation, industry, and public sector dummies), a is a constant, ε is an error term, and β_1, β_2 represent the estimated coefficients of the variables. The coefficients of $\ln MW$ (β_1) reveal the effects of the minimum wage level on the average wage.

To determine the effects of the minimum wage on the wages of different percentile wage groups, we use the QR model (Koenker and Baset 1978), which can be expressed as:

$$\min\left[\sum_{h_1:\ln W_{ijt} \geq \beta H_{ijt}} \theta\left|\ln W_{ijt} - \beta H_{ijt}\right| + \sum_{h_o:\ln W_{ijt} < \beta H_{ijt}} (1-\theta)\left|\ln W_{ijt} - \beta(\theta) H_{ijt}\right|\right] \qquad (2)$$

$$\rho_\theta \in (0,1)$$

In Equation (2), i represents individual workers and θ represents the percentile of wages (1st percentile is expressed as 1th). The equation's other variables are the same as those in Equation (1). $\rho_\theta(.)$ is a selection function for the different wage percentiles. H includes $\ln MW$ and X as presented in Equation (1). The QR model is designed for estimation using the optimal

method, which minimizes the two error terms in Equation (2). The coefficients of $\ln MW$ reveal the effect of the minimum wage on wages of different percentile wage groups.

2.) The Neumark model on the effects of changes in the minimum wage on wage- level changes throughout the wage distribution

Although the effect of the minimum wage on wage distribution can be estimated by the OLS and QR models, it is also necessary to provide evidence whether the minimum wage-level change affects the wage-level change for different groups based on how their wages compare to the minimum wage level (e.g., the group with wages lower than the minimum wage, the group with wages equal to the minimum wage, and the group with wages higher than the minimum wage). Specifically, if the minimum wage level increases 1 percent from the prior year ($t_1$year) to the survey year (t year), how much does the wage level increase for the group with wages lower than the minimum wage or for the group with wages higher than the minimum wage?

Neumark, Schweitzer, and Wascher (2004) established an econometric model to analyze this question. This model is primarily used to show the effects of the change in the minimum

wage level on changes in the wage level throughout the wage distribution (called the "contemporaneous effects") in the United States, which is expressed as follows:

$$\frac{W_{it} - W_{it\_1}}{W_{it\_1}} = a + \sum_j \beta_{1j} \frac{MW_t - MW_{t\_1}}{MW_{t\_1}} * R\ (W_{it\_1}, MW_t)$$

$$+ \sum_j \beta_{2j} R(W_{it\_1}, MW_t)$$

$$+ \sum_j \beta_{3j} R(W_{it\_1}, MW_t) * \frac{W_{it\_1}}{MW_{t\_1}}$$

$$+ \beta_{4j} X_{ijt} + \beta_5 District_{it} + \beta_6 Year_{ij} * District_i + v_{ijt} \qquad (2)$$

In Equation (2), i represents individual workers, j denotes the region (province in this case), t and t_1 denote the survey year and the prior survey year. *District* is the district dummy variable (Eastern, Central, or Western). *District* and *Year* controls for some omitted variables, including the effects of the region-specific business cycle and the macroeconomic circumstances on the local labor market. v is a random error term. R denotes a set of dummy variables that describe the level of t_1 wage relative to the t_1 minimum wage level. We will provide more detailed explanations in the following sections. Panel data will be utilized for the analysis.

3.) DID analysis of the effects of a minimum wage on wages

It is difficult to prove the influence of a minimum wage on wages because the direction of causality goes in both directions. For example, the policy mandates that each locality's minimum wage should be set with reference to the average local wage level; in other words, the local minimum wage is a function of the local average wage. Although the effects of the minimum wage on wages can be estimated by the OLS model, the QR model, and the Neumark models, these analyses (the OLS, QR, and Neumark models) show that the two variables are correlated, but they do not control for the fact that there is causality in both directions, so they cannot tell us if the minimum wage in fact affects wages or vice versa. To consider this problem and to identify the "real" effect of a minimum wage on wages, a DID method, which is frequently used in policy evaluations, can be applied. It is represented as follows:

$$\ln W_{ij} = a + \gamma_1 Year_{ij} + \gamma_2 Treat_{ij} + \gamma_3 DID_{ij} + \gamma_4 X_{ij} + u_{ij} \qquad (3)$$

In Equation (3), i stands for the individual, j represents the categories of regions, *Year* represents the minimum wage-level adjustment years, *Treat* is a dummy variable that identifies the treatment group (Table 13.1), and *DID* is the interaction of *Year* and *Treat* that is utilized as the DID item. X represents other variables affecting wages, a is the constant term, v is the error

term, and γ represents the estimated coefficient for each variable. If γ_3 is statistically significant, then implementation of a minimum wage affects the wage level. If γ_3 has a positive value, then the level of the minimum wage will increase and the wage level will increase, and vice versa.

B. Data

The CHIP 1995, 2002, 2007, and 2013 survey datasets are utilized for our analysis. These datasets are from the four CHIP surveys conducted by the Economic Institutes of CASS (Chinese Academy of Social Science) and Beijing Normal University in 1996, 2003, 2008 and 2014. Because this study focuses on the minimum wage effect on wage distribution for urban residents, the CHIP survey data for urban residents are utilized in the analysis. Using retrospective survey data on individual incomes in CHIP 1995 and CHIP 2002, and survey data in CHIP 2007 and CHIP 2013, we can differentiate the years before and after the minimum wage adjustment to construct the treatment and control groups.

Because there are design similarities in the questionnaire, we can use the same information in the analysis for all three periods—the minimum wage promulgation period (1993–1995), the

minimum wage performance period (1998–2002), and the minimum wage enforcement period (2007–2013).

The CHIP surveys cover representative regions in China, including Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Guangdong, Henan, Hubei, Sichuan, Yunnan, and Gansu in 1995, Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Guangdong, Henan, Hubei, Sichuan, Chongqing, Yunnan, and Gansu in 2002, Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Guangdong, Henan, Hubei, Sichuan, Chongqing, Yunnan, Gansu, Shanghai, Zhejiang, Fujian, and Hunan in 2007, and Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Guangdong, Henan, Hubei, Sichuan, Chongqing, Yunnan, Gansu, Shandong, and Hunan in 2013.[6] Utilizing information on entire regions (e.g., provinces or municipalities), we merge the regional minimum wage levels based on the Chinese National Minimum Wage Databases (CNMWD) with the CHIP survey data to construct a new dataset—including the individual-level data and the regional-level minimum wage data for our

[6] There may be a representativeness bias when we make a master sample by consolidating the data from each region. Therefore, weights can be used as an adjustment. However, weights are not used in this chapter, first, because the CHIP is applied by the National Bureau of Statistics (NBS) according to a national survey sample. It is a stratified multiple stage sample in which the consolidating error in the master sample arising from the difference in the sample number in the regions is predicted to be very small. Second, according to calculations by Li and Song (2013), the population census data in 2000 and the 1 percent population census data against the CHIP 2002 and the CHIP 2007 are used as the weight. The adjusted results are the same as the results without the adjustment. Moreover, no weights are available for the CHIP 1995. For more details, see Li and Song (2013, note 1).

analysis. We utilize a subset of regions that are covered by each of the survey years in the analysis by periods.

The wage is defined as the total earnings from work (called "the total wage").[7] It comprises the basic wage, bonus, cash subsidies, and in-kind (goods) subsidies. The CHIP income and wage variables are utilized. The unit of analysis is the individual wage. The 1995 CPI is utilized as a standard to adjust the nominal monthly wage and the nominal monthly minimum wage in every year. [8]

The units of observations in this chapter's analyses are employees; the self-employed and the unemployed and not included. In light of the retirement system in the state-owned sector, the sample is restricted to those between the ages of 16 and 60.

In the wage function, the explained variable is the logarithm of the monthly wage, and the explanatory variables are the variables likely to affect the wage, such as years of schooling years,

[7] According to the Enterprise Minimum Wage Regulations published in 1993, the main content of the minimum wage consists of total earnings from work (except for overtime subsidies, any job risk subsidies, and social security subsidies). We cannot distinguish the detailed subsidy items from the CHIP survey data. We also conducted an analysis using the basic wage. The results are similar to the results using the total wage. Therefore, in this chapter we show the results using the total wages.

[8] We use the logarithm of the monthly wage as the explanatory variable for two reasons. First, the CHIP 2008 only has monthly wage information; therefore, we calculated the monthly wage using the CHIP 1995, the CHIP 2002, and the CHIP 2013. Second, the minimum wage level for a regular worker in each region is based on the monthly wage. The sample of workers who are urban residents in the CHIP is

years of experience,[9] a public-sector dummy,[10] an occupation dummy,[11] an industrial dummy,[12] a district dummy (the Eastern, Central, and Western regions), and the year dummy variables.

The analysis based on the DID model requires construction of the appropriate DID items (see Equation [2]). As described above, we obtained the regional maximum values of the minimum wage levels based on the CNMWD. The CPI in 1995 is utilized as the standard to adjust the nominal monthly minimum wage in every year. We utilized information about the minimum wage levels in the prior survey year and in the current survey year to create the control and treatment groups. Specifically, the treatment group is the group in which the minimum wage level has increased from the prior survey year to the survey year; the control group is the group in which the minimum wage level has not changed from the prior survey year to the survey year (or has only increased a little from the prior survey year to the survey year), and it is closest to

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dominated by regular workers, so we use the corresponding logarithm of the monthly wage as the explanatory variable in the wage function.

[9] Experience years = age – 6 years of schooling.

[10] It is equal to 1 if the individual is working in a government organization, public organization (s*hiye danwei*), or a state-owned enterprise; otherwise it is equal to 0.

[11] It is equal to 1 if the individual is a blue-collar worker (such as a manual worker); otherwise it is equal to 0.

[12] It is equal to 1 if the individual is working in the manufacturing industry; otherwise it is equal to 0.

the target group's region.[13] The smallest geographic distance can provide a nearly similar macroeconomic and labor market situation for the treatment and control groups, which is necessary for a quasi-natural experiment analysis. We construct the DID items based on the information for the regions, as shown in Table 13.1.

[Table 13.1 about here]

IV. Descriptive Statistics Results

A. Variable Distributions during the Three Periods

Table 13.2 shows sample statistical descriptions for the three periods. First, the proportion of workers with wages below the minimum wage level ($0 < w_{t-1} / MW_t \le 0.05$, $0.5 < w_{t-1} / MW_t \le 1$) in year t-1 (the year prior to the survey year) is greater for Panel A (1993–1995) than for Panel B (1998–2002). For example, the proportion of workers with wages below half of the minimum wage level ($0 < w_{t-1} / MW_t \le 0.5$) is 2.2 percent for 1993–1995 and 1.5 percent for 1998–2002;

[13] In the 2007–2013 dataset, because there is no region in which the minimum wage level was not adjusted from 2007 to 2013, the treatment group is the group in which the increase rate of the minimum wage (MW) ((MWt-MWt-1)/MWt-1) is greatest from 2007 to 2013; the control group is the group in which the increase rate of the minimum wage is smaller from 2007 to 2013, and is relatively closer to the treatment group region. Specifically, the increase rate of the minimum wage is 2.99 in Hernan (the control group), 0.58 in Hubei (treatment group 1), and 0.45 in Jiangsu (treatment group 2).

the proportion of workers with wages between half of the minimum wage level and one time the minimum wage level ($0.5 < w_{t-1} / MW_t \leq 1$) is 11.2 percent for 1993–1995 and 6.2 percent for 1998–2002.

Second, the proportion of workers with wages around the minimum wage level ($1.05 < w_{t-1} / MW_t \leq 1.05$, $1.1 < w_{t-1} / MW_t \leq 1.2$, $1.2 < w_{t-1} / MW_t \leq 1.3$, $1.3 < w_{t-1} / MW_t \leq 1.5$) in year t-1 year is greater in Panel A (1993–1995) than in Panel B (1998–2002). For example, the proportion of workers with wages between 1.01 and 1.05 times the minimum wage level ($1.01 < w_{t-1} / MW_t \leq 1.05$) is 1.6 percent for the 1993–1995 period and 0.9 percent for the 1998–2002 period.

Third, the proportion of workers with wages much higher than the minimum wage level (more than two times the minimum wage level) in year t-1 is smaller for 1993–1995 than for 1998–2002. For example, the proportion of workers with wages between three and four times the minimum wage level ($3 < w_{t-1} / MW_t \leq 4$) is 13.1 percent for the 1993–1995 period and 17.4 percent for the 1998–2002 period.

These results show that the proportion of workers with wages below the minimum wage level is greater when the Chinese government first imposed the minimum wage system. However, the proportion became smaller from the 1993–1995 period to the 1998–2002 period. These results indicate that the effects of the minimum wage on wages differ depending on the period.

[Table 13.2 about here]

B. The Distributions of the Ratios of the Wages to the Minimum Wage (w/MW) by Groups

Considering that the individual characteristics are perhaps different among the different wage distributions, we calculated the distribution of the ratios of the wages to the minimum wage (w/MW) by gender, age, occupation, low and high skills (blue-collar or white-collar worker groups), and industry (manufacturing or non-manufacturing) groups. The results are shown in Table 13.3 where w represents the wage in the year prior to the survey year (t-1) and MW represents the highest minimum wage level in the survey year (t). The main results of the

proportions for the low-wage group (the group with wages in year t-1 below the minimum wage level in year t) and the high-wage group (the group with wages in year t-1 more than three times the minimum wage level in year t) are as the follows:.

First, the proportion of workers with wages below the minimum wage level ($0 < w/MW \leq 0.05$, $0.5 < w/MW \leq 1$) is greater for females than for males in the 1993–1995 and the 1998–2002 periods. For example, the proportion of workers with wages below one-half of the minimum wage level ($0 < w/MW \leq 0.05$) is larger for females than for males in the 1993–1995 period and the 1998–2002 period greater (1.7 percent and 0.8 percent, respectively). Similarly, the proportion of workers with wages between one-half and one times the minimum wage level ($0.5 < w/MW \leq 1$) is greater for females than for males in the 1993–1995 and the 1998–2002 period (9.3 percent and 5.8 percent, respectively). The proportion of workers with wages more than five times the minimum wage level is greater for males than for females. For example, the proportion of workers with wages between five and six times the minimum wage level ($5 < w/MW \leq 6$) is greater for males than for females in the 1993–1995 and the 1998–2002 periods (2.1 percent and 2.3 percent, respectively).

Second, the proportion of workers with wages below the minimum wage level ($0 < w/MW \leq 0.05$, $0.5 < w/MW \leq 1$) is greater for the younger group than for the middle-aged and elderly groups during the two periods. For example, the proportion of workers with wages below one-half the minimum wage level ($0 < w/MW \leq 0.05$) is 9.0 percent for the 16–24 age group, 1.8 percent for the 25–40 age group, and 2.2 percent for the 50–60 group during the 1993–1995 period. Similarly, the proportion of workers with wages between one-half and one time the minimum wage level ($0.5 < w/MW \leq 1$) is 6.8 percent for the 16–24 age group and 1.2 percent for the 25–40 and the 50–60 groups during the 1998–2002 period. However, the proportion of workers with wages more than five times the minimum wage level is greater for the 16–24 age group than for the 25–49 and the 50–60 age groups during both periods.

Third, the proportion of workers with wages below the minimum wage level ($0 < w/MW \leq 0.05$, $0.5 < w/MW \leq 1$) is greater for the low-skilled group than for the high-skilled group during the two periods. For example, the proportion of workers with wages below one-half the minimum wage level ($0 < w/MW \leq 0.05$) is 3.1 percent for the low-skilled group and 1.3 percent for the high-skilled group during the 1993–1995 period. Similarly, it is 2.2

percent for the low-skilled group and 0.9 percent for the high-skilled group during the 1998–2002 period. The proportion of workers with wages between one-half and one time the minimum wage level ($0.5 < w/MW \leq 1$) is 18.0 percent for the low-skilled group and 3.2 percent for the high-skilled group during the 1993–1995 period; it is 10.7 percent for the low-skilled group and 2.5 percent for the high-skilled group during the 1998–2002 period.

Fourth, the proportion of workers with wages below the minimum wage level is smaller for the public-sector group than for the private-sector group during the two periods. For example, the proportion of workers with wages below one-half of the minimum wage level ($0 < w/MW \leq 0.5$) is 1.7 percent for the public-sector group and 3.5 percent for the private-sector group during the 1993–1995 period. Similarly, it is 1.2 percent for the public- sector group and 2.1 percent for the private-sector group during the 1998–2002 period. The proportion of workers in the public-sector group with wages between one-half and one time the minimum wage level ($0.5 < w/MW \leq 1$) is 9.4 percent for the public-sector group and 16.3 percent for the private-sector group during the 1993–1995 period; it is 4.2 percent for the public-sector group and 10.3 percent for the private-sector group during the 1998–2002 period. However, the proportion of

workers with wages more than two times the minimum wage level is greater for the public-sector group than for the private-sector group during both periods.

Fifth, the proportion of workers with wages below the minimum wage level is smaller for the blue-collar-worker group than for the white-collar-worker group during the two periods. For example, the proportion of workers with wages between one-half and one times the minimum wage level ($0.5 < w/MW \leq 1$) is 15.9 percent for the blue-collar-worker group and 8.8 percent for the white-collar-worker group during the 1993–1995 period; it is 7.6 percent for the blue-collar-worker group and 5.8 percent for the white-collar-worker group during the 1998–2002 period. The proportion of workers with wages more than two times the minimum wage level is greater for the blue-collar-group group than for the white-collar-worker group during both periods.

Sixth, the proportion of workers with wages below the minimum wage level and greatly higher than the minimum wage level is smaller for the manufacturing-worker group than for the non-manufacturing-worker group during the two periods. For example, the proportion of workers with wages below one-half the minimum wage level ($0 < w/MW \leq 0.5$) is 1.2 percent for the

manufacturing-worker group and 3.2 percent for the non-manufacturing- worker group during the 1993–1995 period; it is 1.1 percent for the manufacturing-worker group and 1.7 percent for the non-manufacturing-worker group during the 1998–2002 period. In addition, the proportion of workers with wages more than four times the minimum wage level is smaller for the non-manufacturing-worker group during both periods. For example, the proportion of workers with wages between four and five times the minimum wage level is 3.0 percent for the manufacturing-worker group and 4.9 percent for the non-manufacturing- worker group during the 1993–1995 period; it is 5.6 percent for the manufacturing-worker group and 9.1 percent for the non-manufacturing-worker group during the 1998–2002 period.

The results show that the proportion of workers with wages below or around the minimum wage levels is greater for female, younger, low-skilled, blue-collar-worker groups, and for workers in the private sector and in the non-manufacturing industries. Thus, it can be assumed that the effect of a minimum wage should be greater for these low-wage groups.

[Table 13.3 about here]

C. Minimum Wage Levels and Kernel Density Estimates of the Wage Distributions

With respect to the effect of the minimum wage on the wage distribution, it has been pointed out in previous studies that there exists a spike effect for the group with wages below or around the minimum wage level. Does such a spike effect exist in China? We calculated the monthly wage distributions using kernel density estimates for the three periods. The results are shown in Figure 13.1.

The proportion of groups around the maximum values of the minimum wage level, particularly the group with wages just a little more than the maximum values of the minimum wage level, shows relatively greater convexity on Kernel density curves in 1994, 1998, and 2013. These estimated results seem to indicate that such spike effects also exist in China.

[Figure 13.1 about here]

V. Results of the Econometric Analysis

A. Estimated Results of the Minimum Wage Effects on Wages Using the OLS and QR Models

Table 13.4 and Figure 13.2 show the results of the wage function using the OLS and QR models. We observe the effect of the minimum wage on wages by the estimated coefficient of the minimum wage logarithmic value.

[Table 13.4 about here]

[Figure 13.2 about here]

First, the estimated coefficients of the minimum wage logarithmic values based on the OLS model are 0.759, 0.883, and 0.882, which are statistically significant at the 1 percent level during each period. When the minimum wage level increases by 1 percent, the average wage will increase by 0.759 percent, 0.883 percent, and 0.882 percent respectively during each period. These results are consistent with those of Di and Han (2015), who use 1996~2010 data from the CHNS.

Second, the estimated coefficient of the minimum wage logarithmic values for the lowest wage group (the 1st percentile wage group) is higher than that for the middle- and high-wage groups during the 1993–1995 period; the estimated coefficients of the minimum wage logarithmic values for the low-wage group (the 1st, 5th, and 10th percentile wage groups) are

higher than that for the middle-wage group during the 1998–2002 period; a similar phenomenon is observed for the 2007–2013 period. Moreover, comparing the coefficients of the minimum wage logarithmic values for the low-, middle-, and high-wage groups during each period shows that the effect of the minimum wage on the low-wage group is greater during the 2007–2013 period than during the 1993–1995 or the 1998–2002 periods (see Figure 13.2). Comparing the minimum wage policy during the first and the implementation periods, the effects of the minimum wage on the low-wage group are increasing, which may be the result of government enforcement of the minimum wage since 2004.

Third, the estimated coefficients for the minimum wage logarithmic values are also higher for the high-wage group (the 80^{th} and 90^{th} percentile wage groups) than for the middle-wage groups during the 1993–1995 and 1998–2002 periods. These results are consistent with the findings by Di and Han (2015). However, these results might not indicate a causal relation of the minimum wage effect on the high-wage group. For example, it is possible that in a high minimum wage region (e.g., the Eastern region), the wage levels for the high-wage group increased more than those for the middle-wage group due to unobservable factors or factors that

cannot be estimated (e.g., regional unobservable factors that might affect the design of the minimum wage level). We analyze the regional heterogeneity problem in Section V.C.

B. Estimated Results of the Effects of the Minimum Wage on Wages Using the Neumark Model

Next, the Neumark model is utilized to analyze the effects of the change in the minimum wage level on the change in the wage level throughout the wage distributions compared to the minimum wage level. The results from Equation (2) are shown in Table 13.5.

First, when other conditions (gender, education, work experience, occupation, industry, work sector, district, and year special effects) are held constant, the estimated change coefficients on the minimum wage logarithmic values are all statistically significant for the lowest wage groups ($0 < w/MW \leq 0.05$) during the 1993–1995 and the 1998–2002 periods and for the low-wage groups ($0.5 < w/MW \leq 1$) during the 1993-1995 period. Moreover, the coefficient values are higher for the 1993-1995 period, indicating that the minimum wage effect on the low-wage group is greater during the minimum wage promulgation period than during the rest of the

implementation period. These results are consistent with the results in Figure 13.2 based on the QR model.

[Table 13.5 about here]

Second, the estimated change coefficients of the minimum wage logarithmic values are also statistically significant for groups with wages around the minimum wage during 1993–1995. However, the estimated change coefficients of the minimum wage logarithmic values are not statistically significant for the middle- and high-wage groups (e.g., the groups with wages more than three times the minimum wage) in both the 1993-1995 and the 1998-2002 periods. These results are almost consistent with the results in Figure 13.2, and demonstrate the existence of spillover effects for groups with wages around the minimum wage during 1993–1995. However, the spillover effects are not visible for the middle-wage groups during 1998–2002.

C. DID Analysis Results of the Effects of the Minimum Wage on the Wage Distribution

Although the estimation results in Tables 13.3 and Table 13.4 show the effects of the minimum wage level and the minimum wage-level changes on the wage distributions, the heterogeneity problems between districts implementing the minimum wage and districts not implementing the

minimum wage are not considered in the above estimates. Therefore, we utilized the DID method to evaluate the effects of the minimum wage on the wage distribution after addressing the heterogeneity problems. The estimated coefficients of the DID variables are summarized in Table 13.1, Table 13.2, and Table 13.3. The estimations used the two types of treatment-control groups shown in Table 13.1, expressed as Estimation 1 and Estimation 2.

First, using information for two years (1994 and 1995), the results show that the coefficients for the DID variables are statistically significant for all percentile wage groups; however, the values for the low-wage groups (the 1st and 5th percentiles) are highest in both Estimation 1 and Estimation 2. This indicates that even though the minimum wage affects the entire wage distribution, the minimum wage effect is greatest for the low-wage groups during the promulgation period (1993–1995).

Second, there are several estimation results for 1998–2002: 1.) Using information for 1999 and 2000, the results show that although the coefficients for the DID variables are not statistically significant for groups with wages above the 5th percentile, they are positive and statistically significant at the 10 percent level for the lowest wage group (the 1st percentile) in

Estimation 1. The estimated coefficients of the DID variables are not statistically significant for all percentile wage groups in Estimation 2. 2.) For 2000 and 2001, the results show that the DID coefficients are not statistically significant for all percentile wage groups in Estimation 1. Although they are also not statistically significant for groups with wages above the 5th percentile, they are statistically significant at the 10 percent level for the lowest wage group (the 1st percentile) in Estimation 2. 3.) For 2001 and 2002, the results are similar to those for 1999–2000; the DID coefficients are positive and statistically significant at the 10 percent level for the lowest wage group (the 1st percentile). These results indicate that the effect of the minimum wage on the lowest wage group was visible during the minimum wage implementation period (1998–2002), consistent with the results from the Neumark model (see Table 13.5). However, there was no spillover effect during the implementation period.

Third, for 2007 and 2013 the results show positive and significant DID coefficients for the low-wage groups (the 5th and 10th percentiles) at the 5 percent level in Estimation 2. Moreover, the DID coefficients are negative and statistically significant for the 20th and 30th wage percentile groups at the 5 percent level in Estimation 1. These negatively affect the wage levels

for all groups with wages above the 30th percentile at the 1 percent level in Estimation 2. When the heterogeneity problem is addressed for 2007–2013, the minimum wage increased the wage levels for the low-wage groups and it decreased the wage levels for the middle- and high-wage groups during the enforcement period. These results indicate that over the long term, there may be a substitution effect between the low-wage and the other groups, possibly because in a competitive market with consistent total labor costs, if the wage levels for the low-wage group increase due to minimum wage regulations, a firm will decrease the wages for the middle- and high-wage groups, employ fewer workers, or increase the work hours to maximize profits.

Fourth, in terms of the coefficients of the DID variables for the low-wage group during each period, the effect of the minimum wage on the low-wage group is greater in 1993–1995 and 2007–2013 than it is for 1998-2002. It appears that government enforcement of the minimum wage policy since 2004 has increased the effect of the minimum wage on low-wage groups.

There are several possible reasons for these results. Specifically, during the 1993–1995 period the minimum wage level changed from “0”—the change ranges are greater than those for the 1998–2002 period—therefore, the minimum wage effect was greater in 1993–1995. Two

reasons can explain the results for 2007–2013. First, based on the 2004 minimum wage regulations, the government enforced penalties for firms that violated the regulations. By improving minimum wage compliance via penalties, the proportion of workers with wages below the minimum wage level decreases and thus the effect of the minimum wage on the low-wage group becomes significant. Second, the magnitude of increase in minimum wage levels has been larger since 2004, which might have increased the effect of the minimum wage on the low-wage groups.

Finally, the spillover effect of the minimum wage is highest in the 1993–1995 period for several reasons. As described above, when the effect of the labor cost constraint hypothesis is less than that of the skill substitution hypothesis, the monopoly hypothesis, and the efficient wage hypothesis, the spillover effect will be visible. Compared to 1998–2002 and 2007–2013, in 1993–1995 the government did not enforce ownership reform in the public sector (e.g., the SOEs), therefore the public sector contributed a greater proportion to the economy and thus had a relatively higher influence on the wage determination system. It is thought that the public sector is a monopoly sector in China; since the monopoly hypothesis had a greater effect than the labor

cost constraint hypothesis during 1993–1995, the spillover effect appeared during this period. However, the government enforced the SOE reform since the end of the 1990s, thus the influence of market mechanisms became greater, which might have resulted in the influence of the labor cost constraint hypothesis to become greater than the other hypotheses, and therefore the spillover effect disappeared for 1998–2002 and 2007–2013. Moreover, the results indicate that in 2007–2013 most firms decreased the wage levels for the middle-wage-level groups to respond to increases in labor costs in the increase in the level of the minimum wage in the higher ranges since 2004.

VI. Conclusions

The Chinese government has been officially implementing a minimum wage system since 1993 and has enforced a nationwide minimum wage policy since 2004. Implementation of the minimum wage policy is expected to contribute to increased incomes of the low-wage groups and to a poverty reduction. Has implementation of the minimum wage policy in China affected the wage distribution? Has the minimum wage affected the wages of the low-wage groups? Is

there a spillover effect from the minimum wage in China? To answer these questions, this study employs empirical analyses using cross-sectional survey data—CHIP 1995, 2002, 2007, and 2013. We employed estimations by the OLS and QR models. We also constructed panel datasets based on CHIP 1995 and CHIP 2002 to utilize the Neumark model and constructed regional panel datasets to utilize the DID method. Several major conclusions emerge.

First, with respect to the effect of the minimum wage on wages of the low-wage groups: 1.) The results of the OLS and QR models show that the minimum wage affected both the average wage and the wage levels for the low-wage groups for 1993–1995, 1998–2002, and 2007–2013, with the greatest effect on the low-wage group during 1993–1995. 2.) The results using the Neumark model indicate that the change in the minimum wage level affected the wage-level changes for the low-wage group during 1993–1995 and 1998–2002, with the greatest effect during 1993–1995. 3.) The DID model results indicate that when the heterogeneity problems are addressed, the minimum wage considerably affects the wage levels of the low-wage group during all three periods.

Second, the estimation results for the spillover effects of the minimum wage on the wage distribution are as follows: 1.) The results of the OLS and QR models show that the minimum wage levels positively affected the average wages and the middle- and high-wage groups during each period. 2.) The results using the Neumark model show that the change in the minimum wage also affected the wage-level changes for groups with wages above the minimum wage level during 1993–1995. 3.) The DID results indicate that when the heterogeneity problems are addressed, the minimum wage also affected the middle- and high-wage groups during 1993–1995, though the effect was higher for the high-wage group. All the estimation results indicate the presence of a spillover effect in 1993–1995, but no spillover was observed for 1998–2002 and 2007–2013.

Based on these empirical analyses, although we can conclude that the implementation of the minimum wage affected the increase in the wage level for the low-wage groups during the three periods, and the spillover effect existed during the minimum wage promulgation period (1993–1995), there are three points worthy of attention.

First, the results reveal that because the minimum wage levels rose greatly at the beginning of 2004, the minimum wage positively affected the wages for the low-wage group. Hence, an increase in the range of the minimum wage level can be used as a method to reduce poverty problems among the working poor in urban China. Of course, when assessing the total effects of the minimum wage, one should simultaneously consider the effects of the minimum wage on unemployment.

Second, the spillover effect was visible only during the promulgation period, and the substitution effect occurred during the 2007–2013 period when the heterogeneity problems were addressed. These results reveal the complexity of the effects of a minimum wage policy on reducing income inequalities. The minimum wage seems likely to increase the incomes of low-wage groups, while also hurting the incomes of middle-wage groups over the long term. In the future, detailed empirical studies on the effects of the minimum wage on income inequality should be undertaken to gain greater insights into this phenomenon.

Third, the minimum wage compliance should affect how the minimum wage influences the wage distribution. Because the minimum wage compliance problem in the public sector differs

from that in the private sector and the labor market exists in both these two sectors, future studies should conduct an analysis including sector segmentation.

Finally, although some hypotheses from neoclassical economics can explain the spillover effect of the minimum wage, we have not analyzed the influence of these hypotheses in this study. This issue can be addressed in future research.

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Table 13.1. ***DID items***

	Estimation1		Estimation2	
	T	C	T	C
1993-1994	Beijing	Shanxi	Beijing	Liaoning
1999-2000	Beijing	Shanxi	Gansu	Yunnan
2000-2001	Beijing	Shanxi	Anhui	Hubei
2001-2002	Hubei	Hernan	Shichuan	Gansu
2007-2013	Hernan	Hubei	Hernan	Jiangsu

Note: T: Treatment group, C: control group.

Source: Based on the questionnaires of CHIP1995,CHIP2002,CHIP2007, CHIP2013.

Table 13.2. ***Descriptive statistics***

	PanelA: 1993-1995		Panel B: 1998-2002		Panel C: 2007-2013	
	Means	S.D.	Means	S.D.	Means	S.D.
w/MW dummies						
R1: 0.00<w/MW≤ 0.50	0.022	0.146	0.015	0.121		
R2: 0.50<w/MW≤ 1.00	0.112	0.315	0.062	0.241		
R3: 1.00<w/MW≤ 1.01	0.003	0.054	0.003	0.055		
R4: 1.01<w/MW≤ 1.05	0.016	0.125	0.009	0.093		
R5: 1.05<w/MW≤ 1.10	0.024	0.154	0.011	0.106		
R6: 1.10<w/MW≤ 1.20	0.028	0.164	0.024	0.153		
R7: 1.20<w/MW ≤ 1.30	0.038	0.192	0.024	0.155		
R8: 1.30<w/MW≤ 1.50	0.062	0.241	0.061	0.240		
R9: 1.50<w/MW ≤2.00	0.212	0.409	0.157	0.363		
R10: 2.00<w/MW ≤ 3.00	0.277	0.447	0.294	0.456		
R11: 3.00<w/MW ≤ 4.00	0.131	0.338	0.174	0.379		
R12: 4.00<w/MW ≤5.00	0.043	0.202	0.081	0.273		
R13: 5.00<w/MW ≤6.00	0.017	0.127	0.039	0.194		
R14: 6.00< w/MW≤ 8.00	0.012	0.108	0.028	0.165		
R15: w/MW>8.00	0.004	0.066	0.017	0.129		
DD	0.226	0.418	0.173	0.378	0.307	0.461
Male	0.502	0.500	0.564	0.496	0.544	0.498
Schooling years	11	3	11	3	12	3
Experience years	28	10	29	9	29	11
Sectors: public sector	0.805	0.397	0.675	0.468	0.183	0.387
No-skill job	0.388	0.487	0.291	0.454	0.165	0.371
Industries: manufacture inds.	0.396	0.489	0.261	0.439		
Regions					0.497	0.500
West region	0.470	0.499	0.468	0.499	0.480	0.500
Central region	0.263	0.441	0.264	0.441	0.283	0.450
East region	0.267	0.442	0.269	0.443	0.238	0.426
Observations	40012		37597		24438	

Note. w is wage in the prior survey year(t-1), MW is highest minimum wage level in survey year (t).

Source: Calculated using CHIP1995,CHIP2002,CHIP2007, CHIP2013.

Table 13.3. ***The distribution of the ratios of wages to the minimum wage (w / MW) by groups***

	Male	Female	Age16-24	Age25-49	Age50-60	Low-skill	High-skill	Public	No-public	Blue-Color worker	White-Color worker	Manu.	No-manu.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel A: 1993-1995													
R1: 0.00<w/MW≤ 0.50	1.6	3.4	9.0	1.8	2.2	3.1	1.3	1.7	3.5	2.8	2.3	1.2	3.2
R2: 0.50<w/MW≤ 1.00	6.7	16.0	18.9	9.1	15.8	18.0	3.2	9.4	16.3	15.9	8.8	12.7	10.7
R3: 1.00<w/MW≤ 1.01	0.2	0.4	0.4	0.3	0.3	0.5	0.0	0.2	0.7	0.5	0.2	0.3	0.3
R4: 1.01<w/MW≤ 1.05	0.9	2.1	2.9	1.3	1.9	2.0	0.8	1.4	2.2	1.9	1.3	2.2	1.2
R5: 1.05<w/MW ≤ 1.10	1.8	3.0	4.1	2.4	1.8	2.8	0.8	2.1	3.4	2.8	2.2	2.8	2.2
R6: 1.10<w/MW≤ 1.20	2.3	3.2	6.2	2.1	3.5	3.1	1.3	2.8	2.6	3.1	2.5	2.6	2.8
R7: 1.20<w/MW ≤ 1.30	4.0	3.7	4.9	3.7	3.5	4.1	2.4	3.6	4.6	4.3	3.5	5.1	3.1
R8: 1.30<w/MW≤ 1.50	5.4	6.9	4.5	5.8	7.8	8.0	3.4	5.4	8.4	7.6	5.3	7.1	5.6
R9: 1.50<w/MW ≤2.00	20.4	21.4	14.8	22.8	17.4	21.3	15.2	20.4	23.3	23.3	19.5	23.8	19.4
R10: 2.00<w/MW ≤ 3.00	29.9	25.6	19.7	29.7	24.3	23.4	34.7	30.9	19.0	24.6	29.5	25.0	29.2
R11: 3.00<w/MW ≤ 4.00	16.3	10.0	12.7	13.2	13.1	8.7	21.8	14.4	9.8	9.0	15.5	12.2	13.6
R12: 4.00<w/MW ≤5.00	5.9	2.5	2.1	4.4	4.5	3.3	7.4	4.6	3.4	2.8	5.0	3.0	4.9
R13: 5.00<w/MW ≤6.00	2.7	0.6	0.0	1.8	1.9	1.2	2.4	1.8	1.2	1.0	2.0	0.9	2.0
R14: 6.00< w/MW≤ 8.00	1.5	0.8	0.0	1.2	1.4	0.2	3.9	1.3	1.0	0.1	1.8	0.6	1.4
R15: w/MW>8.00	0.6	0.3	0.0	0.6	0.3	0.4	1.3	0.3	0.7	0.3	0.6	0.7	0.4
Panel B: 1998-2002													
R1: 0.00<w/MW≤ 0.50	1.1	2.0	6.8	1.2	1.2	2.2	0.9	1.2	2.1	1.6	1.5	1.1	1.7
R2: 0.50<w/MW≤ 1.00	3.8	9.6	13.7	6.2	4.1	10.7	2.5	4.2	10.3	7.6	5.8	6.1	6.4
R3: 1.00<w/MW≤ 1.01	0.2	0.5	0.4	0.3	0.1	0.5	0.2	0.2	0.5	0.4	0.3	0.3	0.3
R4: 1.01<w/MW≤ 1.05	0.6	1.3	1.8	0.9	0.7	1.5	0.4	0.6	1.4	1.1	0.8	1.1	0.8
R5: 1.05<w/MW ≤ 1.10	0.8	1.7	1.8	1.2	0.7	1.7	0.6	0.8	2.0	1.3	1.1	1.2	1.1
R6: 1.10<w/MW≤ 1.20	1.8	3.3	4.4	2.5	1.3	3.4	1.2	1.8	3.7	3.2	2.2	3.0	2.2
R7: 1.20<w/MW ≤ 1.30	1.9	3.2	4.2	2.5	1.8	3.8	1.1	1.8	3.9	3.3	2.1	3.3	2.2
R8: 1.30<w/MW≤ 1.50	5.3	7.4	10.0	6.2	4.3	8.6	3.3	4.9	8.7	7.9	5.5	8.2	5.5
R9: 1.50<w/MW ≤2.00	14.7	16.8	19.1	15.7	13.6	19.6	10.9	13.9	19.4	19.5	14.0	21.2	13.7
R10: 2.00<w/MW ≤ 3.00	30.1	28.2	24.5	29.9	27.1	26.6	30.4	31.5	25.2	30.1	28.9	30.6	28.8
R11: 3.00<w/MW ≤ 4.00	19.7	14.4	7.3	17.3	21.7	12.0	23.3	20.5	11.0	13.5	18.9	13.6	18.7
R12: 4.00<w/MW ≤5.00	9.6	6.3	3.3	7.9	11.8	4.9	11.6	9.5	5.3	5.9	9.1	5.6	9.1
R13: 5.00<w/MW ≤6.00	4.9	2.6	1.6	3.8	5.6	2.2	6.2	4.5	2.7	2.5	4.4	2.4	4.4
R14: 6.00< w/MW≤ 8.00	3.5	1.8	0.8	2.7	3.9	1.2	4.8	3.2	2.1	1.3	3.4	1.3	3.3
R15: w/MW>8.00	2.2	1.0	0.4	1.7	2.2	1.3	2.7	1.6	1.8	1.0	2.0	1.0	1.9

Note. w is wage in the prior survey year(t-1), MW is highest minimum wage level in survey year (t).

Source：Calculated using CHIP1995,CHIP2002.

Table 13.4. ***Results of the minimum wage effects on wages using the OLS model***

	PanelA: 1993-1995		Panel B: 1998-2002		Panel C: 2007-2013	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
lnMW	0.759 ***	28.9	0.883 ***	65.82	0.882 ***	55.23
Male	0.155 ***	15.86	0.188 ***	34.93	0.371 ***	34.9
School year	0.041 ***	21.16	0.064 ***	55.81	0.096 ***	42.82
Exp.	0.059 ***	24.43	0.040 ***	26.60	0.067 ***	27.9
Exp-sq.	-0.001 ***	-18.56	0.000 ***	-17.62	-0.001 ***	-26.45
No-skill job	-0.133 ***	-11.6	-0.063 ***	-9.41	-0.027 *	-1.76
Manusfacture	-0.013	-1.27	-0.071 ***	-10.87	0.074 ***	4.76
Public sector	0.174 ***	13.73	0.160 ***	27.25	0.085 ***	7.54
Regions (East)						
Central	-0.078 ***	-5.46	-0.065 ***	-8.97	0.038 ***	2.96
West	0.081 ***	5.08	0.075 ***	9.70	-0.040 ***	-2.99
Year	Yes		Yes		Yes	
cons.	0.573 ***	3.38	-0.129	-1.56	-0.914 ***	-7.51
Observations	13410		46740		24428	
Adj R-squared	0.322		0.254		0.245	

Notes: 1. Time dummy variables are also estimated in Panel A and Panle B models.
2.*,**,*** :statistically significant in 10%,5%,1% levels.
3.OLS models are utilized in these calculations.
Source：Calculated using CHIP1995,CHIP2002,CHIP2007,CHIP2013.

Table 13.5. ***Results of the minimum wage effects on wages using the Neumark model***

	1993-1995		1998-2002	
	coeff.	t-value	coeff.	t-value
R1: 0.00<w/MW ≤ 0.50	0.670 ***	8.90	0.562 ***	5.90
R2: 0.50<w/MW < 1.00	0.441 ***	7.06	0.137	1.62
R4: 1.00<w/MW ≤1.01	-0.248	-0.72	0.165	0.08
R5: 1.01<w/MW ≤ 1.05	0.249 ***	3.55	0.075	0.14
R6: 1.05<w/MW ≤ 1.10	0.200 ***	4.15	0.349	0.07
R7: 1.10<w/MW ≤ 1.20	0.209 **	2.21	-0.089	0.36
R8: 1.20<w/MW ≤ 1.30	0.218	0.29	0.200	1.22
R9: 1.30<w/MW ≤ 1.50	0.136	0.79	0.293	1.48
R10: 1.50<w/MW ≤ 2.00	0.194 ***	4.08	0.232	1.61
R11: 2.00<w/MW ≤ 3.00	0.136 **	2.48	0.154	1.26
R12: 3.00<w/MW ≤ 4.00	0.140 *	1.69	0.084	0.64
R13: 4.00<w/MW ≤5.00	0.788	-0.32	0.033	0.39
R14: 5.00<w/MW ≤ 6.00	0.153	0.45	0.056	0.26
R15: 6.00< w/MW≤ 8.00	0.778	-0.19	-0.009	0.09
R16: w/MW>8.00	3.438	0.28	-0.054	-0.05
Observations	2446		36998	
Adj R-squared	0.500		0.263	

Notes: 1. Neumark model (Neumark *et al*. 2004) is used in the analysis.

2. w is wage in the prior survey year(t-1), MW is highest minimum wage level in survey year (t).

3.The other varibles-male, schooling, experience, occupation, industry, pulic-sector, region dummy, year dummy, R, interacttions of R and w/MW are also estimated in these models.

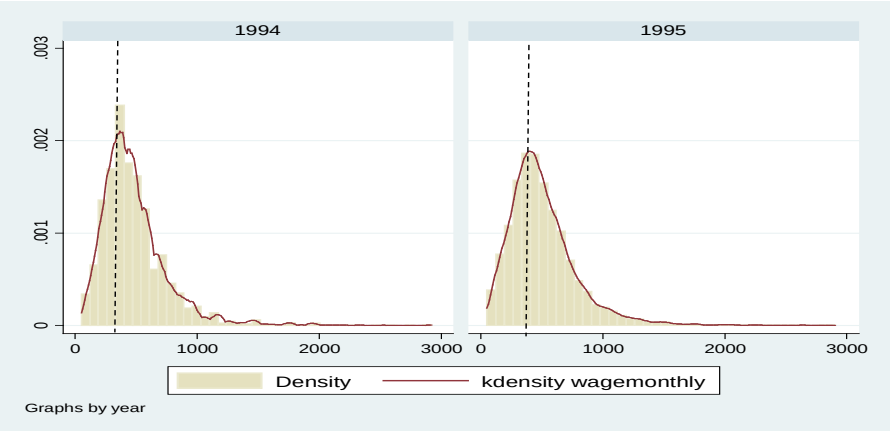
4. The reference group is wt-1/MWt=1.

5..*,**,*** :statistically significant in 10%,5%,2% levels.

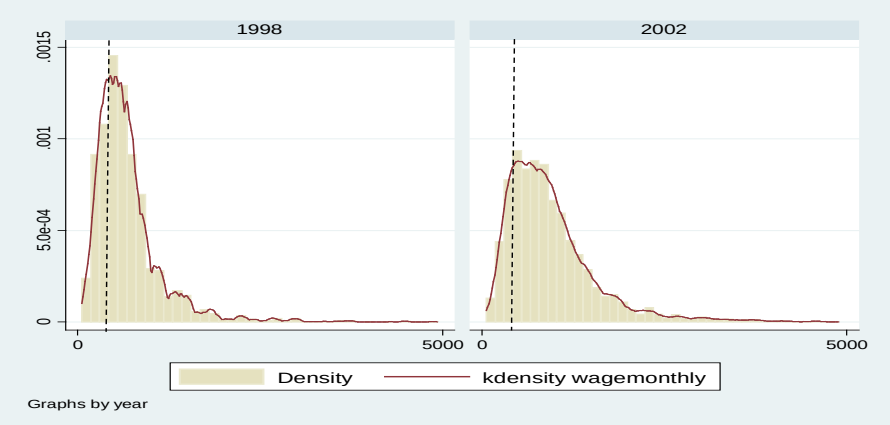
Source：1993-1995 panel data based on income retrospective survey data in CHIP1995, 1998-2002 panel data based on income retrospective survey data in CHIP2002.

Figure 13.1. ***Minimum wage levels and kernel density estimates of the wage distributions***

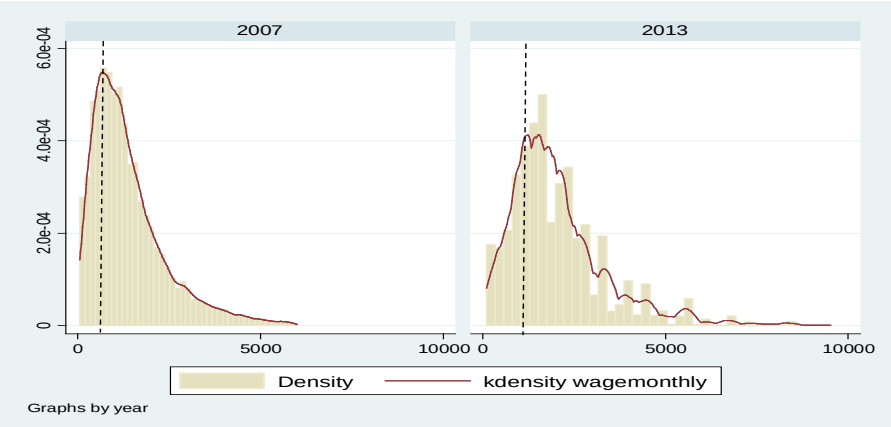
Panel A: 1993-1994 (the MW promulgate period)



Panel B: 1998-2002 (the MW implementation period)

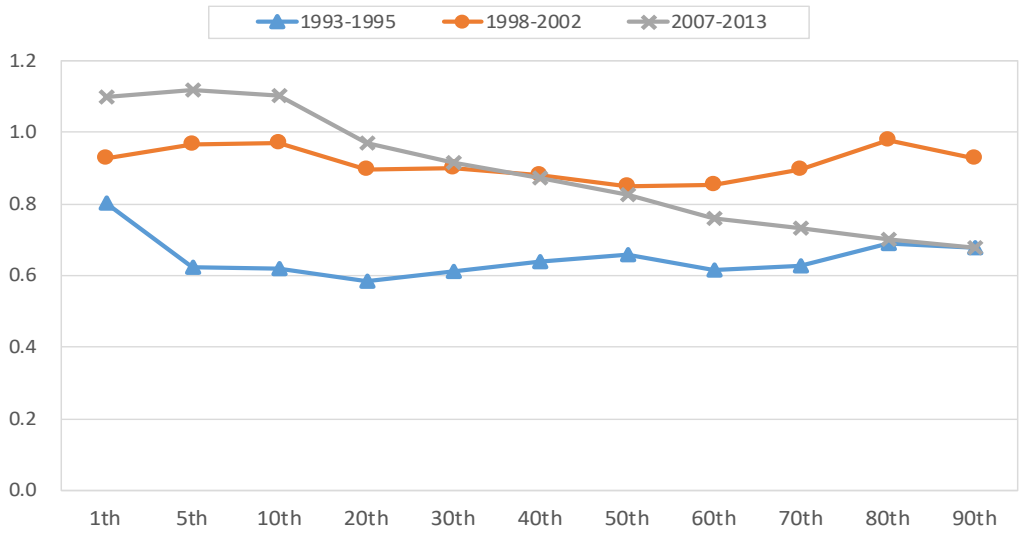


Panel C: 2007-2013 (the MW enforcement period)



Note: 1.The dotted line shows the maximum values of the MW levels.
2. Monthly wages are utilized in these calculations.
3. Wages in 1994 and 1998 are retrospective survey data in CHIP1995 and CHIP2002.
Source: Calculated using CHIP1995,CHIP2002,CHIP2007, CHIP2013.

Figure 13.2. ***Results of the minimum wage effects on wages using the QR model***



Note: 1.The results of 1%~90 % wage distribution are estimated using quantile regression model.
2.The other varibles—occupations, indutries, region dummy, year dummy are also extimated in these models.
Source: Calculated using CHIP1995,CHIP2002,CHIP2007,CHIP2013.