Minimum Wages and Employment in China

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In the existing literature, there is no consensus from developed countries on the magnitude of the adverse employment effect associated with minimum wages or, indeed, even if there is an adverse employment effect. The relevance of the existing evidence from developed countries could be questioned as to its applicability for developing countries such as China with their large informal sectors, large pools of surplus labor in the countryside, and difficulties in ensuring compliance with such legislative initiatives. Although the evidence from developing countries is more limited, it is also not in agreement. The growing importance of this topic with its controversial nature has sparked intense debate in China, highlighting the importance of additional research to facilitate evidence-based policy making. Since China promulgated new minimum wage regulations in 2004, the magnitude and frequency of changes in the minimum wage have been substantial, both over time and across jurisdictions. This paper uses county-level minimum wage panel data and a longitudinal household survey from 16 representative provinces to estimate the employment effects of minimum wage changes in China over the period of 2002 to 2009. In contrast to the mixed results of previous studies using provincial-level data, we present evidence that minimum wage changes have significant adverse effects on employment in the Eastern and Central regions of China, and result in disemployment for females, young adults, and low-skilled workers.

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1. Introduction

Since China issued its new minimum wage regulations in 2004, minimum wages have sparked intense debate in the country. There is little doubt that employees generally welcome the minimum wage. However, there is considerably less agreement regarding whether the minimum wage is effective at attaining its goals. The issue, from the time of its introduction, has been highly controversial among scholars and policy-makers.

In China, supporters of minimum wages advocate them as a way to assist individuals or families to achieve self-sufficiency and to protect workers in low-paid occupations (Zhang and Deng 2005; Sun 2006). The minimum wage can help reduce inequality and serve as an important safety net by providing a wage floor (Zhang 2007; Jia and Zhang 2013). In addition, the higher labor cost may promote managerial efficiency and labor productivity, inducing employers to invest in productivity-improving technology (Cooke 2005). Along these lines, many Chinese scholars have argued in favor of the more proactive increase of minimum wages (Du and Wang 2008; Ding 2009; Han and Wei 2011).

On the other hand, opponents argue that raising the minimum wage can decrease the employment opportunities of low-wage workers and also lead to reduction in the compensation package (Xue 2004; Ping 2005; Gong 2009). Such regulations can undermine enterprises' dividend policies and reduce China's comparative advantage given the abundance of low-wage labor (Cheung 2004, 2010). Furthermore, rural-urban migrant workers tend to have very low pay and may accept jobs which pay less than the current minimum wage, making it exist in name only (Chan 2001; Ye 2005).

The contentious nature of the minimum wage policy in scholarly work does not allow for its impact to be easily understood. However, the initial evidence seems to show that the magnitude

and frequency of minimum wage changes have been substantial both over time and across different jurisdictions, especially after the year 2003. For example, in January 2004, China promulgated new minimum wage regulations that required local governments introduce a minimum wage increase at least once every two years, extended coverage to self-employed and part-time workers, and quintupled the penalties for violation or noncompliance. The new regulations were put into effect in March 2004, leading to frequent and substantial increases in minimum wages in the subsequent years.

[Figure 1 about here]

Figure 1 shows the nominal and real minimum wage (monthly average) in China from 1995 to 2012 as well as those of the corresponding provinces that raised the minimum wage standards for each year and its moving average over the same period. Between 1995 and 2003, the average nominal minimum wage increased steadily from 169 RMB to 301 RMB, amounting to a 78% growth in 9 years. However, since China promulgated the new minimum wage regulations in 2004, the nominal minimum wage has increased rapidly by more than 200%, reaching 944 RMB in 2012.[1] The real minimum wage grew at a slower pace before 2004 and began to rise thereafter. Furthermore, as shown by the moving average curve in Figure 1, there is an apparent rise in the number of provinces that raised the minimum wage standards in 2004, indicating that minimum wage adjustments had become more frequent since that year.

How had this regulatory environment affected the labor market outcomes in China? More specifically, did changes in the minimum wages have any impact on employment in the Chinese labor market? Despite the enormous literature documenting numerous aspects of minimum

[1] The growth rates of average nominal wage are 155 and 194% for the periods of 1995-2003 and 2004-2012, respectively (National Bureau of Statistics of China 2012).

wages and their role in the labor market, there is no consensus on the magnitude of an "average" effect of minimum wages on employment.[2]

Empirically speaking, there are at least three challenges involved in measuring the effect. First, because provinces, municipalities, and autonomous regions[3] in China have considerable flexibility in setting their minimum wage according to local conditions, there are often at least 3 or 4 levels of minimum wage standards applicable to various counties in most provinces, meaning that county- or city-level minimum wage data containing the relevant information on the dates and the extent of minimum wage increase are not readily available.[4] Second, omitted variables and endogeneity issues (such as the decision regarding the adjustment of minimum wage standards) make it difficult to separate causal effects from effects due to other unobserved confounding factors. Third, in China, it is difficult to find microdata that can be plausibly representative of the population and may be influenced by minimum wage increases. Furthermore, some provinces, such as Beijing and Shanghai, do not include social security

[2] The theoretically expected effect of minimum wages on employment is well established in the literature. For example, see reviews in Card and Krueger (1995), Brown (1999), Gunderson (2005), Cunningham (2007), and Neumark and Wascher (2008). However, there is no consensus in the existing empirical studies on the magnitude of disemployment effect associated with minimum wage changes, or, even whether there is a disemployment effect because people often find no effects. See, for example, Card (1992), Card and Krueger (1994, 1995, 2000), Neumark and Wascher (1992, 1995), and Williams (1993) for U.S. evidence; Machin and Manning (1994), Dickens et al. (1999), Stewart (2004), and Metcalf (2008) for British evidence; Campolieti et al. (2005) and Campolieti et al. (2006) for Canadian evidence.

[3] For expositional convenience, we refer to "provinces, municipalities, and autonomous regions" as provinces.

[4] The implementation date of a new minimum wage standard of a county can also differ across geographically contiguous neighbors within the same province. For example, Liaoning Province has the most complicated minimum wage scheme, in which 14 jurisdictions may enact their own standards on different dates. For instance, in 2007, Shenyang, Benxi, Dandong, and Panjin cities did not increase their minimum wages. In contrast, Dalian and Anshan cities increased their minimum wages from 600 RMB to 700 RMB on December 20th, on which day Jinzhou and Liaoyang cities increased their minimum wages from 480 RMB to 580 RMB and Chaoyang city increased its minimum wage from 35 0RMB to 530 RMB. Furthermore, the minimum wages of Fushun and Huludao cities increased from 400 RMB to 480 RMB on January 1st, whereas that of Yingkou city increased from 380 RMB to 480 RMB, that of Fuxin city increased from 350 RMB to 420 RMB, and that of Tieling city increased from 380 RMB to 420 RMB the following year.

payments and housing provident funds as part of wages when calculating the minimum wage, making their "official" minimum wage virtually higher.[5]

In the paper, we first assess whether and the extent to which minimum wage changes affected the Chinese labor market by measuring the average effect of the minimum wage on employment. To do so, we begin by analyzing the labor market reaction to changes in minimum wage standards using panel data regressions. The most distinctive feature of our data—crucial for our research design—is the combination of a large county-level panel, which includes all counties (over 2000 counties each year) in China and contains relevant information on minimum wages, with a longitudinal household survey of 16 representative provinces between 2002 and 2009.[6] The use of county-level data rather than provincial data allows a more accurate measurement of the relevant minimum wage and labor market conditions, providing more variation in detecting the effects of minimum wages on employment in China. In particular, this feature allows us to directly evaluate the effects on subgroups of the population, especially those who are at risk of being affected by a minimum wage increase, such as young adults, low-skilled workers, female employees, and rural migrant workers.

Our panel data regressions reveal significant disemployment effects of minimum wages on young adults (age 15-29) between 2004 and 2009 over the country—a 10% increase in the current and previous year's minimum wages led to a statistically significant .88% and a 1.36 to 1.56% reduction in employment, respectively. Furthermore, we find that the minimum wage has the largest lagged adverse effect on the employment of at-risk groups (defined as workers whose

[5] In other words, with or without accounting for this issue, the difference can be substantial. For instance, the mean monthly minimum wages in Beijing and Shanghai were 651 RMB and 767 RMB in 2004-2009; however, the average expenses of both social security payments and housing provident funds in Beijing and Shanghai are as high as 376 RMB and 452 RMB over the same period, amounting to 58% and 59% of the nominal minimum wages, respectively. We discuss how we address this issue in the Data section.

[6] There are 31 administrative units at the provincial level in China, including 22 provinces, 5 autonomous regions, and 4 municipalities; as of 2012, there are 2,862 county-level administrative units.

monthly wages are between the old and new minimum wage standards), showing that the elasticities are in the range of -.265 to -.340 for the entire sample over the same period.

To further substantiate our findings, we re-estimate the effects for three different time periods—pre-2004, 2004-2007, and 2008-2009 (the Great Recession)—by viewing the promulgation of new minimum wage regulations in 2004 as a quasi-experiment. The evidence supporting our panel data regression estimates is compelling: we find that minimum wages have adverse employment effects on both young adults and at-risk groups in the post-2004 period, indicating that a 10% increase in the current minimum wage led to a statistically significant 3.59% reduction in the employment of at-risk groups during 2004-2007 and a lagged effect of 1.03% reduction for young adults during 2008-2009. In contrast, we do not find a significant effect in the pre-2004 period.

Several studies on the employment effects of minimum wages in China find mixed results, and the results for different regions are often opposite to one another. For example, Ni et al. (2011) focus on all employees and find some negative effects in the more prosperous and rapidly growing East and some positive effects in the developing Central and less developed Western regions over the 2000-2005 period. In contrast, Wang and Gunderson (2011) use 2000-2007 data on rural migrants and find no adverse effects and indeed a positive employment effect in state-owned enterprises in the East and negative effects in the Central and Western regions. The discrepancies between these studies may be explained in part by the fact that the employment effects on different target groups tend to differ. Indeed, by examining the effects on several subgroups, our estimates seem to reconcile the results of previous studies—we find that, similar to Ni et al. (2011), the minimum wage has a significantly negative effect on all employees in the East and a lagged positive (though statistically insignificant) effect in the Western region in

2004-2009. In contrast, using rural migrants as the target group, we find that the minimum wage has an adverse and significant effect in the West and a positive (though statistically insignificant) effect in the East over the same period studied in Wang and Gunderson (2011).

Finally, we investigate the impact of the minimum wage on the employment of workers by skill level. In theory, low-skilled workers are relatively vulnerable when facing minimum wage increases. As anticipated, our panel data regression results show that the minimum wage has an adverse, though perhaps mild, effect on the employment of low-skilled workers (defined as high school graduates or below), a 10% increase in the current minimum wage results in statistically significant reductions in employment of .54 to .80% for the entire sample, .70% for the East, and .71 to .77% for the Central region. In contrast, we do not find a statistically significant effect for the Western region or for those workers who have at least a college degree.

The remainder of the paper is organized as follows. We provide a review of the development of minimum wages in China in Section 2. Section 3 provides details pertaining to the data and research design of the paper. In Section 4, we present and discuss the empirical results. Section 5 presents the paper's conclusions.

2. Minimum Wages in China

Prior to 1994, China had no minimum wage law. In 1984, the country simply acknowledged the 1928 "Minimum Wage Treaty" of the International Labour Organization (ILO) (Su 1993). Due to the sluggish wage growth and high inflation in the late 1980s, Zhuhai of Guangdong Province first implemented its local minimum wage regulations, followed by Shenzhen, Guangzhou, and Jiangmen in 1989. It was not until the eruption of private enterprises in 1992 when labor disputes became frequent that the Chinese Central Government began to consider the

minimum wage legislation (Yang 2006). In 1993, China issued its first national minimum wage regulations, and in July 1994, they were written into China's new version of the Labor Law.

The 1994 legislation required that all employers pay wages no less than the local minimum wages. All provincial, autonomous-region, and municipality governments should set their minimum wages according to five principles and report them to the State Council of the Central Government. Specifically, the five principles indicated that the setting and adjustment of the local minimum wage should synthetically consider the lowest living expenses of workers and the average number of dependents they support, local average wages, labor productivity, local employment, and levels of economic development among regions. These conditions provided considerable flexibility for provinces in setting minimum wage standards, with the economic development principle giving them the flexibility to restrain minimum wages to attract foreign investment (Frost 2002; Wang and Gunderson 2011). By December 1994, 7 of 31 provinces had set their own minimum wages. By the end of 1995, the number increased to 24.

In the early 2000s, the slow increase of the minimum wage along with growing concerns for uncovered/disadvantaged workers began to draw government's attention to consider new minimum wage regulations. In December 2003, the Ministry of Labour and Social Security passed "The Minimum Wage Regulations" and promulgated the new law in January 2004. The main features of this law involved extending coverage to state-owned and private enterprises, employees in self-employed businesses, and private non-enterprise units. In particular, the new law established two types of minimum wages: a monthly minimum wage applied to fulltime workers and an hourly minimum wage applied to non-fulltime employees. Importantly, the minimum wage standards were set and adjusted jointly by the local government, trade union, and enterprise confederation of each province. The draft would then be submitted to the Ministry of

Labour and Social Security for review, and the Ministry would ask for opinions from the All China Federation of Trade Unions and the China Enterprise Confederation. The Ministry of Labour and Social Security can request a revision within 14 days after receiving the proposed draft. If no revision is brought up after the 14-day period, the proposed new minimum wage program is considered to be passed.

In addition, the new regulation required local governments to renew the minimum wage standards at least once every two years, and penalties for violation were increased from 20% to 100% of the owed wage to 100% to 500% of the owed wage. Employers cannot include subsidies such as overtime pay or canteen and traveling supplements as part of the wage when calculating minimum wages. The new regulations were put into effect on March 1st, 2004 and led to substantial increases in minimum wages.

3. Data and Research Design

The data collection and research design were motivated by a desire to estimate the average effect of minimum wages on employment and to attempt to address some of the aforementioned challenges. In collecting the data, the goal was to obtain information on the minimum wage at the county level over a long time span, with a panel structure allowing for the use of fixed time and county effects to eliminate omitted variable bias arising from unobserved variables that are constant over time and those that are constant across counties. The wage sample needed to be a longitudinal microdata sample to allow the distribution of minimum wage workers—in each geographic region, age cohort, skill level, and industry—to be estimated. For these reasons, and because the paper also aimed to examine how the Great Recession influenced our results, we sought to collect information on provinces that were potentially affected over as many years as possible.

3.1. *Data*

Our study primarily uses two data sources: the annual Urban Household Survey (UHS) from 2002 to 2009 and minimum wage data collected at the county level (6-digit area code) between 1994 and 2012.[7] The UHS is a continuous, large-scale social-economic survey conducted by the National Bureau of Statistics of China (NBS) aiming to study the conditions and standard of living of urban households, which include agricultural and non-agricultural residents or non-residents who live in the city for at least six months and some migrant households with local residency. With the use of sampling techniques and daily accounting methods, the survey collects data from households in different cities and counties over all 31 provinces in Mainland China for each quarter. In late December, survey teams of all provinces are required to verify and then upload the aggregated annual data to the Division of City Socio-economic Survey of NBS through intranet by January 10th of the following year. The UHS contains household information, such as income and consumption expenditure; demographic characteristics; work and employment; housing; and other family-related matters.

[Figure 2 about here]

Figure 2 depicts the 16 representative provinces used to study the impact of minimum wages on the Chinese labor market. We divide the 31 jurisdictions into three regions following the NBS: the more prosperous and rapidly growing East, the developing Central region and the less developed and more slowly growing West. As shown in Figure 2, the data for the Eastern region are represented by darker areas, which include two major municipalities, Beijing and Shanghai, and four economically important provinces, Guangdong, Jiangsu, Shandong, and Liaoning. The Central region includes six developing provinces, namely, Henan, Anhui, Hubei, Jiangxi, and

[7] The commonly-used administrative area code in China is 6 digits. The first two digits identify a provincial administrative unit; the first four digits identify a prefectural administrative unit; whereas the six digits identify an administrative unit at the county level.

Shanxi, which are where most migrants come from. Finally, the Western region covers the only municipality in the West, Chongqing, and three less developed provinces: Gansu, Sichuan, and Yunnan. Collectively, our 16-province sample contains 65% of the total population in China, covering 60% of the counties in the country (National Bureau of Statistics of China 2010).[8]

Our primary objective was to thoroughly and accurately acquire relevant information on the minimum wage for each county. In China, provinces have considerable flexibility in setting their minimum wage standards according to local economic conditions, resulting in several levels of standards across counties/cities within the same province. Moreover, the adjustment date of a county's new minimum wage standard can also differ from its geographically contiguous neighbors within the same province, making the estimation of minimum wage effects more challenging. To effectively address this issue, we collected our minimum wage data from every local government website and carefully recorded the minimum wage information for approximately 2,000 counties every year from 1994 to 2012. As such, our data contain monthly minimum wages for full-time employees, hourly minimum wages for part-time employees, the effective dates of the minimum wage standards and the extent to which social security payments and/or housing provident funds were included as part of the minimum wage calculations.

[Table 1 about here]

We then merge the minimum wage data into the UHS, a 16-province panel dataset that contains individual/household socio-economic information over the 2002-2009 period. We present a brief summary of the minimum wage data used in our main analysis for the post new minimum wage regulations (2004) period in Table 1. Columns (1), (2), and (3) correspond to the mean of the monthly minimum wages, the standard deviation, and the number of counties for the

[8] Note that the UHS is not publicly available. The NBS allows limited access to the microdata up to 16 provinces under certain conditions for academic research. Despite that, the 16-province sample includes most economically important provinces in China.

three regions as well as the 16 provinces in 2004, respectively.[9] When calculating the mean minimum wages, we use the time-weighted method, as suggested in Rama (2001), to address the issue of different adjustment dates among counties within a province within a year. The mean minimum wages have been adjusted for inflation and converted into 2005 RMB using urban resident CPI for comparison over time. In addition, to account for the differing living costs among provinces, we apply the PPP-adjusted deflator developed by Brandt and Holz (2006).[10] The last row reports the mean of the minimum wages of all provinces, its standard deviation, and the total number of counties for each year.

Table 1 reveals several important patterns. First, calculated at the county level, the mean nominal minimum wage increased by 80% (from 310 RMB to 562 RMB) between 2004 and 2009 for all counties as a whole.[11] Second, the East region has the highest minimum wage, with an average of 522 RMB per month in this period, followed by the West (436 RMB) and the Central region (424 RMB). Surprisingly, minimum wages of the three regions have similar annual growth rates of 13%.[12] Third, raising the minimum wage standards sometimes occurred more than once in a year. For example, Beijing increased its minimum wages in January and July of 2004, and Jiangsu raised its standards in April and July of 2008.

[Table 2 about here]

We restrict the analysis to working-age population between the ages of 15 and 64 who are employed in the civilian labor force, report positive annual earnings, are not self-employed, and not enrolled in school. Individuals who work in the agricultural production or services, farming,

[9] Note that there was no minimum wage increase in 2009 because of the Great Recession.
[10] The updated version which extended to year 2010 is at http://ihome.ust.hk/~socholz/SpatialDeflators.html.
[11] In fact, the average real minimum wage has also grown at a similar rate.
[12] The average annual growth rate of the minimum wage is 12.7% in the Eastern region, 13.2% in the Central region, and 12.5% in the Western region over the 2004-2009 period.

forestry, fishing, and ranching industries are also excluded (Neumark and Wascher 1992). Sampling weights are used in all calculations.

Table 2 presents summary statistics of the two key variables, minimum-to-average wage ratio and employment-to-population ratio, from 2004 to 2009. The second and third rows of the table show that male workers have approximately 10 percentage points lower minimum-to-average-wage ratios and 15 percentage points higher employment-to-population ratios than females, meaning that Chinese female workers are comparatively disadvantaged in the labor market relative to their male counterparts. As anticipated, this result shows that the more prosperous Eastern region has the lowest minimum-to-average-wage ratio (.276) and the highest employment-to-population ratio (.607) of the three regions.[13]

Mounting evidence from minimum wage studies has consistently found that minimum wages have a greater impact on young and low-skilled workers, especially teenagers. Compared to their senior counterparts, young workers, who are often equipped with less human capital, are more likely to earn the minimum wage. Table 2 also shows the two key variables by age cohort and by educational attainment over the 2004-2009 period. Indeed, we find that young Chinese workers aged 15 to 29 have the highest minimum-to-average-wage ratio (.392), at least 10 percentage points higher than that of other age cohorts. For workers with different skills, the evidence demonstrates that as the skill level increases, the minimum-to-average-wage ratio decreases quickly—dropping continuously from .593 for elementary school or below to .183 for college or above.

[13] The minimum-to-average wage ratios in Table 2 account for the fact that some provinces include social security payments and/or housing provident funds as part of the wage when calculating minimum wages. The minimum wages in Beijing, Shanghai and Jiangxi do not include social security payments and housing provident funds, and the minimum wages in Jiangsu began to include only social security payments (but not housing provident funds) on November 1st, 2005.

Table 2 also presents the minimum-to-average-wage ratio by industry. The manufacturing sector contains the largest share (21.6%) of workers in our sample; the public service sector is the second-largest (13.9%); and the third and the fourth sectors are wholesales and retail sales trade (9.9%) and housekeeping (9.6%), respectively. Looking at the minimum-to-average-wage ratios, unsurprisingly, we find that the housekeeping sector has the highest ratio (.509) among all industries, followed by the hotel and restaurant sector (.498) and wholesales and retail sales trade (.471).

[Table 3 about here]

We also provide a summary of the characteristics of workers who earn the minimum wage as well as less/more than the minimum wage over 2004-2009 in Table 3. The first row of Table 3 shows that approximately 5.62% of all workers earned less than the minimum wage and 3.28% earned just the minimum, meaning that a combined 8.90% of Chinese employees are minimum wage workers over the 2004-2009 period. Among those who earned the minimum wage exactly and less than the minimum wage, 63.84% and 61.52% are females, respectively. Furthermore, the minimum-to-average-wage ratio of workers receiving less than the minimum wage is 2.52, meaning that these disadvantaged workers earn a wage that is only approximately one-quarter of the official standard.

For different age cohorts, Table 3 shows that young adults (age 15-29) are more likely to be minimum wage workers. With increase age, the percentage decreases. Similarly, we find the same decreasing pattern in the skill panel. Looking at the characteristics of workers by industry, Table 3 shows that the housekeeping sector has the largest share of minimum wage workers: approximately 20.21% of housekeepers earn less than or equal to the minimum wage.

Wholesales and retail sales as well as hotel and restaurant sectors also have 16.76% and 16.50% of workers earning below or equal to the minimum wage, respectively.

3.2. *Research Design*

Our objective is to assess the impact of minimum wages on the employment of potentially affected workers. As noted in Section 1, nearly all existing studies on minimum wages in China use pooled time-series/cross-section data at the provincial level and tend to find mixed results, implying that a "consensus" of employment effects remains to be established. Thus, our study attempts to reconcile the existing findings using more sophisticated minimum wage data, which permit the use of a panel structure analysis of minimum wage effects, exploiting the greater variation in relative minimum wages at the county level and avoiding the measurement error caused by using a uniform provincial minimum wage. Moreover, unlike previous studies that use aggregate published statistics, our study uses household survey microdata, which allows us to calculate the dependent variable—the employment-to-population ratio—at the county level, which contains more variation and information on local conditions. Ideally, this feature should yield more reliable estimates of the employment effects of minimum wages in China.

Specifically, our panel data allow us to estimate a pre-specified equation of the form proposed in Neumark (2001) and used in Campolieti et al. (2006) and Wang and Gunderson (2011). Before the data analysis, the methodology involves precluding running alternative specifications until preferred results are obtained. Our estimation equation is

$$E_{i,t} = \alpha_0 + \alpha_1 MW_{i,t} + \alpha_2 MW_{i,t-1} + X_{i,t}\beta + Y_t\gamma + C_i\delta + e_{i,t}, \quad (1)$$

where $E_{i,t}$ is the log of employment variable (employment-to-population ratio) of county *i* in year *t*; $MW_{i,t}$ and $MW_{i,t-1}$ are the log of minimum wage index variables (minimum-to-average-wage ratio) of county *i* in year *t* and year *t*-1, respectively. We include $MW_{i,t-1}$ in the equation to

allow a lagged impact of the policy to occur as suggested by Burkhauser et al. (2000); X is a set of control variables to capture aggregate business cycle effects; Y_t is a set of fixed year effects; and C_i is a set of fixed county effects. The disturbance term e is assumed to be serially uncorrelated and orthogonal to the independent variables.

To address the bias from the specification error and the potential endogeneity problem, we include several control variables in estimating the equation. First, the county GDP per capita and CPI (city level) capture aggregate business cycle effects and controls for the Great Recession. Second, the county foreign direct investment (FDI) is used to control for that provinces may restrain the minimum wage to attract foreign investors (Frost 2002). Because the decisions of whether to increase minimum wages are determined by government officials, who often must consider local economic conditions, we collectively include these controls to address this issue.

4. Empirical Results and Discussion

4.1. *Minimum Wage Effects Across Regions*

We first present the estimation results for young adults, at-risk groups, and the entire sample for the East, Central, West, and all regions in Table 4. In each region, we estimate Eq. (1) using the fixed-effects model with both fixed year and county effects. All regressions are appropriately weighted by the size of the labor force in each county. We report the results of two estimation equations for each of the three groups: the first equation uses the minimum wage variable of the current year t ($MW_{i,t}$) and the previous year t-1 ($MW_{i,t\text{-}1}$) only, while the second equation further controls for CPI (city level), county GDP per capita, and county FDI. The signs of the regression coefficients on the independent variables are generally identical and are consistent with the theoretical expectations. Nevertheless, there are some significant differences in the magnitude of the coefficients.

[Table 4 about here]

The first and second columns of Table 4 report the estimates with cluster-robust standard errors at the county level in parentheses for young adults and at-risk groups across different regions using Eq. (1), while in the third column, we report the estimates of the entire sample for comparison. The significance of our results is compelling: over the country, we find negative effects of the current and lagged minimum wages on employment. A 10% increase in the current and previous year's minimum wage led to a statistically significant .88% and 1.36 to 1.56% reduction in young adults' employment, respectively. A 10% increase in the current and previous year's minimum wage led to a statistically significant 2.13% and 2.65 to 3.40% reduction in at-risk groups' employment, respectively. For the entire sample, a 10% increase in the current and previous year's minimum wage led to a statistically significant .45 to .55% and .28 to .31% reduction in employment, respectively.

In the more developed and prosperous East China, which has a large population residing in large cities, such as Beijing, Shanghai, and Guangzhou, the minimum wage has been an important policy tool as China makes the critical transition into a market economy. Consequently, the magnitude and frequency of minimum wage increases are relatively high in the regions in which the impact of minimum wages on employment could be evident. Indeed, consistent with the evidence in Table 4, our estimates indicate that minimum wage increases in the Eastern region have a statistically significant adverse impact on employment with elasticities ranging from -.154 to -.234 and a lagged adverse effect with an elasticity of -.100 for young adults. Furthermore, we find a large and negative lagged minimum wage effect on the employment of at-risk groups—a 10% increase in the minimum wage led to a statistically

significant 3.10 to 3.22% reduction in employment. The current minimum wage effects are negative; however, they are not statistically significant.

In the developing Central region, we also find all lagged minimum wages to have a strong negative employment effect on young adults, at-risk groups, and the entire working population. The minimum wage has an adverse lagged employment effect with an elasticity of -.216 for young adults and -.310 to -.336 for at-risk groups. For the entire working population in the Central region, the elasticity is in the range of -.041 to -.042. The estimates of the current minimum wage variable are negative; however, they are not statistically significant.

Finally, in the less developed West, we do not find an effect of the minimum wage on employment. Nevertheless, without controlling for local economic conditions, our empirical results show positive (not statistically significant) coefficients for the current and the lagged minimum wages of young adults and at-risk groups. When economic conditions are controlled, we find positive but insignificant estimates for the current and the lagged minimum wages for at-risk groups.

4.2. *Gender and Age Cohort*

An enormous number of minimum wage studies internationally have reported that young workers are most likely to be affected by minimum wage increases, and the disemployment effect seems especially strong for teenagers. Female workers are particularly vulnerable in the labor market. We therefore separate the sample into four age subgroups: 15 to 29, 30 to 39, 40 to 49, and 50 to 64.[14] In each age group, we estimate Eq. (1) using the fixed-effects model separately for males and females and report the results in Table 5. Because panel data regression with both fixed year and county effects has the advantage of eliminating omitted variable bias

[14] Because the number of workers aged 15-19 is relatively small in our sample, we use the group of workers aged 15-29 to represent young workers.

arising from unobserved variables that are constant over time and those that are constant across counties, we focus on the results of this specification. The signs of the regression coefficients of the independent variables are generally consistent with the theoretical expectations.

[Table 5 about here]

We present the estimates for all regions in panel A. The results show that the current minimum wage has an adverse effect on the employment of female young workers (age 15-29): a 10% increase in the minimum wage results in a statistically significant 1.48% reduction in employment and a minor lagged effect with an elasticity of -.061. Furthermore, we find that the negative effects on females decrease as the age cohort moves up, showing that the elasticity of the current effect is -.068 for females aged 30-39 and that of the lagged effect is -.040 for females aged 40-49. In contrast, we do not find a significant effect of minimum wages on females aged 50-64 or on male employment for any cohort over the country.

In other regions, minimum wages seem to have an adverse employment effect on young females in Eastern and Central regions, for whom a 10% increase in the current year's minimum wage led to a statistically significant 1.72% and 1.55% reduction in employment, respectively. We also find minor disemployment effects of minimum wages on males aged 30-39 in the Central region, with elasticities of -.052 for the current and -.072 for the lagged minimum wage variables.

4.3. *Skill Level*

In the literature, the preponderance of evidence supports the view that minimum wages reduce the employment of low-wage workers. Moreover, when researchers focus on the least-skilled groups, which are most likely to be directly affected by minimum wage increases, the evidence for disemployment effects seems to be especially strong (Neumark and Wascher 2008). We present the estimation results by three skill groups as measured by educational attainment in

Table 6. In each group, we report the estimates using the fixed-effects model with both fixed year and county effects.

[Table 6 about here]

Our estimates reveal disemployment effects of minimum wages on low-skilled workers (high school graduates or below). For example, looking at panel A of Table 6, the results show that the current minimum wage has an adverse effect on the employment of workers who are high school graduates or below: the elasticities of -.054 and -.080 are statistically significant at the 5% level. Furthermore, we also find lagged negative effects of minimum wages on the employment of vocational school degree workers—a 10% increase in the previous year's minimum wage results in a statistically significant .40 to .47% reduction in the current year's employment.

In the East, we find that the current minimum wage has a negative employment effect on low-skilled workers, with an elasticity of -.070, but no effect on other workers with higher degrees. As shown in Panel C of Table 6, we find that the minimum wage has an adverse effect on low-skilled workers in the Central region, with elasticities of -.071 to -.077 for the current year and -.047 to -.052 for the previous year minimum wage variables. In addition, we also find a lagged disemployment effect on workers with vocational school degrees in the Central region, with elasticities in the range of -.083 to -.090. Finally, we examine the effect of minimum wages on workers with a college degree or above (including junior college) and do not find a significant effect in any region.

4.4. *Minimum Wage Effects on Migrant Workers*

The new minimum wage regulations of 2004 were designed in large part to protect rural migrant workers, who tend to work in non-state enterprises in which labor standards and wages are low (Cooke 2005; Zhang and Deng 2005; Wang and Gunderson 2011). Minimum wages are expected to have a stronger effect on rural migrant workers because they tend to work in low-

wage sectors and the higher wages will induce some enterprises to use more skilled workers or more capital to substitute for the now more expensive rural workers (Wang and Gunderson 2011).

Using the micro-level UHS data, we are able to examine how the minimum wage affects the employment of rural migrant workers at the county level. Because very few rural migrants work in state-owned enterprises in our sample, we focus on non-state enterprises and report the results for all enterprises as well. Table 7 reports the results for Eastern, Central, and Western regions. Consistent with the findings of Wang and Gunderson (2011), we find that the minimum wage has negative employment effects on rural migrant workers in the less developed and more slowly growing Western regions: for all enterprises, a 10% increase in the lagged minimum wage results in a statistically significant 2.16 to 2.82% reduction in employment. In particular, for migrant workers in non-state enterprises, we find a larger disemployment effect of current minimum wages, with elasticities of -.408 and -.411. In contrast, the results show positive coefficients (though statistically insignificant) of the minimum wage variables in the East, which is consistent with the monopsonistic behavior found in Wang and Gunderson (2011) .

4.5. *Minimum Wage Effects in the Pre- and Post-2004 Periods*

In China, the decisions of whether to increase minimum wages are determined by local government officials, who must often consider various factors, such as economic conditions, which could result in potential endogeneity problems, making our results unreliable. To address this possibly issue, we separate our sample into three different time periods—2002-2004, 2004-2007, and 2008-2009—by viewing the promulgation of new minimum wage regulations in 2004 as a quasi-experiment. Specifically, we estimate Eq. (1) for the three time periods and focus on young adults and at-risk groups.[15]

[15] Because there are not enough observations in the West in the 2002-2004 period, we combine the Central and West regions and report the results in Panel C of Table 8.

Table 8 reports the estimates for all regions in Panel A, the Eastern regions in Panel B, and Central and West regions in Panel C. The evidence supporting our main results is significant. In the country as a whole, we do not find minimum wages to have an effect on employment in the 2002-2004 period. In contrast, we find that current and lagged minimum wages do have negative effects on at-risk groups in the 2004-2007 period (elasticities -.359 and -.246 for the current and lagged minimum wages, respectively) and a lagged disemployment effect on young adults in the 2008-2009 period (elasticity -.103). In separate regions, we find a similar phenomenon in the East, where there is no statistically significant effect in the 2002-2004 period but the minimum wage has negative employment effects in both the 2004-2007 and the 2008-2009 periods. In the Central and West regions, we find lagged negative effects on young adults in both the post-2004 periods but no effect in the 2002-2004 period.[16] In short, our results in Table 8 seem to support the pattern observed in Figure 1, namely, that the year 2004 is the watershed of the minimum wage policy in China.

4.6. *Discussion of the Results*

We began with estimating the employment effects of minimum wages by three geographical regions and sought to explain the impact for the 2004 to 2009 period. The estimates showed that in the more developed East China, the negative employment effects of the current and lagged minimum wages on young adults are statistically significant, with elasticities in the range of -.088 and -.136 to -.156, respectively. Although the numbers are small, they are in the range of those found in the studies of developed and developing countries, and are very likely inside of the consensus range of -.1 to -.3 from the earlier literature as noted in Neumark and Wascher (2008).

[16] For at-risk groups, we do not find significant effects in the 2004-2007 and 2008-2009 periods, however, there is a statistically significant positive effect in the current minimum wage variable. We are aware that there are only 31 observations in the Central and West for this group; hence, one should interpret this coefficient in caution.

Besides, we found that minimum wage changes resulted in a larger lagged disemployment effect for at-risk groups over the country, with elasticities in the range of -.265 to -.340. In particular, these effects are consistently more prominent for both young adults and at-risk groups in the Central region. The result that nearly all the lagged effects are constantly more prominent than the current contemporaneous effects for young adults and at-risk groups highlights the significance that the adjustments on employment from the minimum wage effects would take sufficient time to occur. It is important to note that our finding of a lagged disemployment effect to minimum wage changes is not particularly anomalous, viewed in the context of many empirical studies in the minimum wage literature. Hamermesh (1995) points out that nonlabor inputs such as capital may be costly and slow to adjust in the short run, which will also tend to slow the adjustment of other complementary inputs such as labor. Subsequent empirical studies have tended to find evidence of longer-run disemployment effects of minimum wages: for example, Baker et al. (1999) on Canadian data, Keil et al. (2001) on a panel of U.S. state-based data, Burkhauser et al. (2000) on Current Population Survey data, and Wang and Gunderson (2011) on a Chinese provincial-level panel data.

Our study offers a potential reconciliation for the mixed results reported by Ni et al. (2011) and Wang and Gunderson (2011). By examining the effects for several subgroups, we found that, similar to Ni et al. (2011), the minimum wage has a significantly negative effect on all employees in the East and a lagged positive effect in the Western region in 2004-2009; on the contrary, using rural migrants as the target group, we found that the minimum wage has an adverse and significant effect in the West and a positive effect (though statistically insignificant) in the Eastern region over the same period, as found in Wang and Gunderson (2011). The positive but insignificant employment effects on rural migrants in the East of China would be

consistent with the fact that labor shortages of migrant workers began looming in the Eastern coastal region during the spring of 2004 (Cai and Wang 2006), and there is more new job creation and turnover in the private sector in the more prosperous and rapidly growing Eastern region (Cai et al. 2008). Besides, the effects are statistically insignificant in the East which is consistent with the finding in Wang and Gunderson (2011) that minimum wages are simply a nonbinding constraint for rural migrant workers in this region. In contrast, we found negative employment effects in the less developed Western China with stronger effects in the more market-oriented non-state enterprises which tend to employ disproportionately more rural migrants, reflecting the prevailing evidence of rural labor surplus in the Western region (Taylor 1988; Knight and Song 1999; Knight et al. 2011) and the fact that non-state enterprises are more sensitive to market forces and respond more to market pressures.[17]

Our full sample results (age 15-64) reported in column 3 of Table 4 show negative employment effects over the country and in the Eastern region, which is consistent with the findings by Ni et al. (2011), who use general working population (age 15 and above) in their analysis. When focusing on young adults and at-risk groups (which are more likely affected by the minimum wage policy), we found stronger negative employment effects in the East; in addition, we found lagged disemployment effects in the Central and positive effects (insignificant) in the Western region. The attenuating disemployment effects across regions can be explained in part by the fact that in the Central and Western regions young adults and at-risk groups tend to work in the state-owned enterprises—a sector that is considerably inefficient and less responsive to market pressures (Lin et al. 2001).[18]

[17] In our data, about 87% of rural migrant workers work in the non-state enterprises in the Western region.
[18] Over 2004-2009, 42% of young adults work in the state-owned enterprises in the Eastern region; 59 and 61% of young adults work in the state-owned enterprises in the Central and Western regions, respectively. For at-risk

Furthermore, our microdata sample allows us to assess the effect of minimum wages by gender and age cohort. Consistent with most studies in the literature, we found that the minimum wage has negative effects on female young workers (age 15-29)—the most disadvantaged and vulnerable groups in the labor market. In contrast, we did not find significant effects on the employment of their male (age 15-29) and senior counterparts (age 50-64) for the entire sample. We also investigated whether the minimum wage affects the employment of low-skilled workers. Our results show that minimum wages reduce the employment of low-skilled workers, indicating that Chinese workers who are high school graduates or below or have vocational school degrees were directly and adversely affected by minimum wage increases.

Taken together, our results show significant and heterogeneous disemployment effects of minimum wages by region, skill, and gender. In particular, the effect on young adults, at-risk groups, and rural migrants varies, highlighting the importance of heterogeneous effects of minimum wages.[19]

5. Conclusions

We use a large set of panel data at the county level that contains relevant information on minimum wages, combined with a longitudinal household survey of 16 representative provinces, to estimate the employment effect of minimum wage changes in China over the 2004 to 2009 period. Compared to previous studies using provincial-level data and reporting mixed results, we found that minimum wage changes have significant negative effects on the employment in

groups, 24% of them work in the state-owned enterprises in the Eastern region, while 43 and 47% work in the state-owned enterprises in the Central and Western regions, respectively.

[19] Indeed, our sample shows that the three groups are different in terms of employment type, skill, and wage distribution. Over the period of 2004-2009, less than 3 and 2.5% of young adults are at-risk groups and rural migrants in each region, respectively. Likewise, less than 3 and 2% of at-risk groups are young adults and rural migrants in each region, respectively.

the Eastern and Central regions of China, and resulted in disemployment for young adults, low-skilled workers, and rural migrants, particularly at-risk groups.

The significance of our findings rests on several factors. First, the use of county data (over 1,400 counties) allows for greater accuracy and more informational variation (127 changes) in detecting the minimum wage effects. Second, the feature of microdata allows us to directly evaluate the effects on those who are at risk of being affected by a minimum wage increase such as young adults and low-skilled workers. Third, our estimates of the control variables generally have the expected signs. Fourth, viewing the promulgation of new minimum wage regulations in 2004 as a quasi-experiment further supports our findings.

China is a large developing country in the transition to a market economy, with an abundance of workers in low-paid occupations that are at risk of being affected by minimum wage changes. Although its experience with minimum wages is new, our results provide both regional relevance and general implication, viewed in the context of the minimum wage literature. Future research such as using microdata solely on rural migrants is certainly needed, given the evidence that migrant workers are substantially affected.

References

Baker, Michael, Dwayne Benjamin and Shuchita Stanger. 1999. The highs and lows of the minimum wage effect: A time-series cross-section study of the canadian law. *Journal of Labor Economics*, 17(2): 318-50.

Brandt, Loren and Carsten A. Holz. 2006. Spatial price differences in china: Estimates and implications. *Economic Development and Cultural Change*, 55(1): 43-86.

Brown, Charles. 1999. Chapter 32 minimum wages, employment, and the distribution of income, C. A. Orley and C. David, *Handbook of labor economics.* Elsevier, 2101-63.

Burkhauser, Richard V., Kenneth A. Couch and David C. Wittenburg. 2000. A reassessment of the new economics of the minimum wage literature with monthly data from the current population survey. *Journal of Labor Economics*, 18(4): 653-80.

Cai, Fang, Albert Park and Yaohui Zhao. 2008. The chinese labor market in the reform era, L. Brandt and T. G. Rawski, *China's great economic transformation.* Cambridge: Cambridge University Press, 167-214.

Cai, Fang and Meiyan Wang. 2006. Labor shortage in an aging but not affluent society. *China Opening Herald*, 1: 31-39 (in Chinese).

Campolieti, Michele, Tony Fang and Morley Gunderson. 2005. How minimum wages affect schooling-employment outcomes in canada, 1993–1999. *Journal of Labor Research*, 26(3): 533-45.

Campolieti, Michele, Morley Gunderson and Chris Riddell. 2006. Minimum wage impacts from a prespecified research design: Canada 1981–1997. *Industrial Relations: A Journal of Economy and Society*, 45(2): 195-216.

Card, David. 1992. Do minimum wages reduce employment? A case study of california, 1987-89. *Industrial and Labor Relations Review*, 46(1): 38-54.

Card, David and Alan B. Krueger. 1994. Minimum wage and employment: A case study of the fast-food industry in new jersey and pennsylvania. *American Economic Review*, 84(4): 772-93.

____. 1995. *Myth and measurement: The new economics of the minimum wage*. Princeton: Princeton University Press.

____. 2000. Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania: Reply. *American Economic Review*, 90(5): 1397-420.

Chan, Anita. 2001. *China's workers under assault: The exploitation of labor in a globalizing economy*. ME Sharpe.

Cheung, Steven N. S. 2004. Another eye on minimum wages, *Southern Weekly.* June 17 (in Chinese):

____. 2010. The lethality of minimum wages, *Economic Information Daily.* February 24 (in Chinese):

Cooke, Fang Lee. 2005. *Hrm, work and employment in china*. Routledge.

Cunningham, Wendy. 2007. Minimum wages and social policy : Lessons from developing countries, Washington, DC: World Bank,

Dickens, Richard, Stephen Machin and Alan Manning. 1999. The effects of minimum wages on employment: Theory and evidence from britain. *Journal of Labor Economics*, 17(1): 1-12.

Ding, Shouhai. 2009. An analysis of minimum wage effects on the employment of rural-urban migrant-evidence from the survey of 827 rural-ruban migrants in beijing. *China Rural Survey*, 4: 26-36 (in Chinese).

Du, Yang and Meiyan Wang. 2008. The implementation of minimum wage system and its effects in china. *Journal of Graduate School of Chinese Academy of Social Sciences*, 6: 56-62 (in Chinese).

Frost, Stephen. 2002. Labour standards in china: The business and investment challenge, *Association for Sustainable and Responsible Investment in Asia.*

Gong, Qiang. 2009. The impact of mimimum wages on welfare of firm and labor in china. *Journal of Nanjing University*, 2: 61-68 (in Chinese).

Gunderson, Morley. 2005. Minimum wages in canada: Theory, evidence and policy, F. L. S. R. Commission, Ottawa:

Hamermesh, Daniel, S. 1995. Myth and measurement: The new economics of the minimum wage: Comment. *Industrial and Labor Relations Review*, 48(4): 835-38.

Han, Zhaozhou and Zhangjin Wei. 2011. Minimum wage standards: Questions and policies. *Guangdong Social Sciences*, 1: 192-200 (in Chinese).

Jia, Peng and Shiwei Zhang. 2013. Spillover effects of minimum wages increase. *Statistical Research*, 30(4): 37-41 (in Chinese).

Keil, Manfred W., Donald Robertson and James Symons. 2001. Minimum wages and employment, Claremont Colleges,

Knight, John B. and Lina Song. 1999. *The rural-urban divide: Economic disparities and interactions in china*. Oxford: Oxford University Press.

Knight, John, Quheng Deng and Shi Li. 2011. The puzzle of migrant labour shortage and rural labour surplus in china. *China Economic Review*, 22(4): 585-600.

Lin, Justin Yifu, Fang Cai and Zhou Li. 2001. *State-owned enterprise reform in china*. Hong Kong: The Chinese University of Hong Kong.

Machin, Stephen and Alan Manning. 1994. The effects of minimum wages on wage dispersion and employment: Evidence from the U.K. Wages councils. *Industrial and Labor Relations Review*, 47(2): 319-29.

Metcalf, David. 2008. Why has the british national minimum wage had little or no impact on employment? *Journal of Industrial Relations*, 50(3): 489-512.

National Bureau of Statistics of China. 2010. The 6th china population census,

____. 2012. China labour statistical year book.

Neumark, David. 2001. The employment effects of minimum ages: Evidence from a pre-specified research design. *Industrial Relations: A Journal of Economy and Society*, 40: 121-44.

Neumark, David and William Wascher. 1992. Employment effects of minimum and subminimum wages: Panel data on state minimum wage laws. *Industrial and Labor Relations Review*, 46(1): 55-81.

____. 1995. Minimum-wage effects on school and work transitions of teenagers. *American Economic Review*, 85(2): 244-49.

Neumark, David and William L. Wascher. 2008. *Minimum wages*. The MIT Press.

Ni, Jinlan, Guangxin Wang and Xianguo Yao. 2011. Impact of minimum wages on employment: Evidence from china. *The Chinese Economy*, 44(1): 18-38.

Ping, Xinqiao. 2005. On the industrial relations of private companies. *China Reform*, 4: 61-62 (in Chinese).

Rama, Martin. 2001. The consequences of doubling the minimum wage: The case of indonesia. *Industrial and Labor Relations Review*, 54(4): 864-81.

Stewart, Mark B. 2004. The employment effects of the national minimum wage. *Economic Journal*, 114: C110-C16.

Su, Hainan. 1993. Research on the legislation of minimum wage law of china. *Review of Economic Research*, Z1: 26-36 (in Chinese).

Sun, Suqing. 2006. The economic analysis for the chinese employment influence to the adjusting the lowest wage policy. *Journal of Hubei College of Finance and Economics*, 18(5): 13-15 (in Chinese).

Taylor, Jeffrey R. 1988. Rural employment trends and the legacy of surplus labour, 1978–86. *The China Quarterly*, 116: 736-66.

Wang, Jing and Morley Gunderson. 2011. Minimum wage impacts in china: Estimates from a prespecified research design, 2000-2007. *Contemporary Economic Policy*, 29(3): 392-406.

Williams, Nicolas. 1993. Regional effects of the minimum wage on teenage employment. *Applied Economics*, 25(12): 1517-28.

Xue, Zhaofeng. 2004. The undesirable minimum wage law, *21st Century Business Herald.* November 18 (in Chinese): 11-18.

Yang, Tao. 2006. What is the social background when china implemented its minimum wage law?, *People's Daily*.

Ye, Min. 2005. Discussions on the effects of minimum wages on rural-urban migrant workers and the youth. *Theory and Modernization*, 7: 86-87.

Zhang, Juan and Juqiu Deng. 2005. On minimum wage system of peasant laborers. *Journal of Beijing Agricultural Vocation College*, 19(5): 46-49 (in Chinese).

Zhang, Zhiyong. 2007. Will minimum wage decrease immigrant peasant workers' employment? *Finance and Economics*, 10: 103-10 (in Chinese).

Table 1 Minimum Wages Across Various Jurisdictions in China, 2004–2009

Province	2004			2005			2006			2007			2008			2009		
	MW	S.D.	Obs.	MW	S.D.	Obs.	MW	S.D.	Obs.	MW	S.D.	Obs.	MW	S.D.	Obs.	MW	S.D.	Obs.
East																		
Beijing	509.5	.0	2	562.5	.0	2	611.8	.0	2	665.4	.0	2	735.4	.0	2	820.1	.0	2
Shanghai	590.3	.0	2	662.5	.0	2	712.1	.0	2	757.7	.0	2	894.0	.0	2	984.2	.0	2
Liaoning	282.3	46.0	96	361.9	36.6	96	405.5	41.2	96	465.8	48.7	96	550.1	59.9	97	587.8	63.2	97
Shandong	348.4	35.2	129	440.9	50.0	129	454.6	53.5	129	476.2	66.3	129	571.9	75.6	129	609.9	80.6	129
Jiangsu	416.2	59.9	66	457.6	66.8	66	517.9	70.4	66	591.0	78.0	75	647.8	88.1	75	694.4	94.7	75
Guangdong	361.2	59.9	104	442.1	80.6	104	475.0	84.9	104	516.6	88.5	104	574.3	88.2	104	636.1	98.2	104
All East	349.1	68.5	339	426.7	72.1	399	460.6	76.0	399	507.4	86.5	408	583.6	87.6	409	629.7	95.7	409
Central																		
Heilongjiang	282.0	28.1	30	287.8	28.7	30	384.0	45.7	30	418.0	53.6	30	456.0	58.6	30	486.3	62.5	30
Anhui	304.6	11.7	86	330.7	17.1	86	350.1	19.1	86	400.7	27.1	86	420.4	29.2	86	448.3	31.2	86
Jiangxi	246.7	6.6	99	317.7	8.9	100	328.9	9.4	100	427.5	15.2	100	460.3	21.8	100	490.9	23.3	100
Shanxi	348.2	21.8	119	445.4	22.3	119	454.2	22.4	119	476.3	21.6	119	536.6	22.8	119	642.5	28.6	119
Hubei	271.9	34.9	89	320.6	36.8	89	330.2	37.2	89	402.4	39.1	89	453.4	45.6	89	541.5	58.5	89
Henan	251.5	15.5	127	278.5	17.0	127	345.0	27.9	127	371.1	25.7	127	477.2	42.5	127	509.0	45.3	127
All Central	284.8	43.6	550	337.1	63.8	551	366.2	54.7	551	416.3	46.3	551	473.1	51.7	551	529.1	77.0	551
West																		
Gansu	298.2	8.5	87	304.4	8.7	87	322.1	16.3	87	344.6	35.1	87	471.6	36.3	87	549.4	39.2	87
Chongqing	334.7	21.7	42	365.7	24.6	42	409.0	30.1	42	477.8	39.8	42	554.8	44.5	42	591.7	47.4	42
Sichuan	295.4	32.1	50	352.2	41.9	50	392.2	43.8	50	425.0	42.3	181	477.9	53.0	181	509.7	56.5	181
Yunnan	297.5	18.0	138	365.2	23.4	138	403.6	23.4	138	427.0	22.8	138	527.2	31.5	138	562.3	33.6	138
All West	302.3	23.3	317	346.5	36.1	317	380.1	45.0	317	414.9	51.8	448	499.1	52.3	448	541.3	54.1	448
All Provinces	309.5	56.7	1266	367.7	73.1	1267	399.4	73.3	1267	442.3	74.8	1407	513.5	79.2	1408	562.2	88.3	1408

Note: MW represents the mean of time-weighted monthly minimum wages calculated using all counties in a jurisdiction, and it has been adjusted for inflation and converted into 2005 RMB.

Table 2 Summary Statistics

Variable		Minimum/Average Wage		Employment/Population	
		Mean	S.D.	Mean	S.D.
All	100.0	.291	.094	.595	.072
Gender					
Male	55.3	.256	.089	.673	.074
Female	44.7	.354	.115	.520	.087
Region					
East	54.1	.276	.099	.607	.068
Central	32.9	.298	.086	.586	.074
West	13.0	.335	.074	.572	.071
Age Cohort					
Age 15–29	13.1	.392	.167	.359	.129
Age 30–39	30.7	.295	.107	.810	.096
Age 40–49	35.8	.283	.096	.802	.094
Age 50–64	20.3	.278	.128	.415	.110
Educational Attainment					
Elementary School or Below	2.1	.593	.505	.226	.139
Junior High School	20.7	.433	.135	.447	.101
High School	25.2	.355	.107	.566	.098
Vocational School	12.0	.314	.112	.673	.131
Junior College	24.8	.246	.086	.801	.092
College or Above	15.2	.183	.085	.797	.120
Industry					
Mining	2.3	.291	.201	-	-
Manufacturing	21.6	.346	.134	-	-
Power Production and Supply	3.4	.248	.142	-	-
Construction	3.2	.352	.211	-	-
Transportation and Postal Service	7.6	.288	.132	-	-
Information Technology	2.4	.292	.314	-	-
Wholesales and Retail Sales	9.9	.471	.197	-	-
Hotel and Restaurant	2.7	.498	.333	-	-
Banking and Finance	2.9	.234	.157	-	-
Real Estate	1.9	.355	.353	-	-
Leasing and Commercial Service	1.6	.371	.313	-	-
Scientific Research	2.1	.204	.175	-	-
Environment and Public Facility	1.3	.311	.212	-	-
Housekeeping	9.6	.509	.213	-	-
Education	7.2	.237	.101	-	-
Health Care	4.8	.265	.170	-	-
Sports and Entertainment	1.8	.280	.226	-	-
Public Service	13.9	.245	.094	-	-
Total observations	287,668				

Note: The average wage is calculated as the mean wage in each category. Because age cohort 16-19 and 20-24 only account for .17 percent and 3.6 percent of total observations, respectively, we choose the first age cohort to be age 16-29.

Table 3 Characteristics of Workers Earning the Minimum Wage, 2004-2009

Variable	Less than Minimum	Minimum	Above Minimum
Percent of Total (%)	5.62	3.28	91.09
Percent of Female (%)	61.52	63.84	42.99
Minimum/Average Wage	2.52	1.00	.35
	(4.66)	(.06)	(.20)
Region (%)			
East	5.33	3.27	91.40
Central	5.46	2.88	91.66
West	7.26	4.36	88.38
Age			
Age 15–29	9.53	4.30	86.17
Age 30–39	4.73	2.84	92.43
Age 40–49	4.90	3.26	91.83
Age 50–64	5.73	3.33	90.94
Educational Attainment			
Elementary School or Below	15.75	9.41	74.84
Junior High School	9.43	6.00	84.57
High School	6.60	3.99	89.40
Vocational School	4.89	2.85	92.26
Junior College	3.08	1.50	95.43
College or Above	2.17	.82	97.01
Industry			
Mining	3.10	1.88	95.02
Manufacturing	5.50	3.30	91.20
Power Production and Supply	2.47	1.37	96.16
Construction	5.78	3.04	91.17
Transportation and Postal Service	4.00	2.10	93.90
Information Technology	5.42	2.27	92.31
Wholesales and Retail Sales	10.46	6.30	83.24
Hotel and Restaurant	9.98	6.52	83.50
Banking and Finance	2.74	1.21	96.04
Real Estate	5.46	3.05	91.49
Leasing and Commercial Service	6.37	3.16	90.46
Scientific Research	2.20	.84	96.96
Environment and Public Facility	3.89	2.23	93.87
Housekeeping	12.63	7.58	79.79
Education	2.74	1.39	95.87
Health Care	3.57	1.74	94.69
Sports and Entertainment	4.10	1.77	94.13
Public Service	2.41	1.77	95.82

Note: standard deviations are in parentheses. There are 287,668 observations in this period. "Less than the Minimum" are workers earning wages at or below 90 percent of the minimum wage. Minimum wage workers earn wages above 90 percent and up to 110 percent of the minimum wage. Above minimum wage workers earn wages above 110 percent of the minimum wage.

Table 4 Estimates of Minimum Wage Effects on the Employment-to-Population Ratio

Dependent Variable: log (Employment/Population)	Young Adults		At-Risk Group		Entire Sample	
Independent Variables (log)	(1)	(2)	(1)	(2)	(1)	(2)
			A. All Regions			
MW	-.088**	-.062	-.213*	-.200	-.055***	-.045**
	(.042)	(.043)	(.128)	(.129)	(.018)	(.018)
MW, lagged 1 year	-.156***	-.136***	-.340***	-.265***	-.031***	-.028**
	(.040)	(.042)	(.102)	(.102)	(.012)	(.011)
CPI		-.002		.006		.002
		(.010)		(.013)		(.003)
GDP per capita		.042**		.231*		.007
		(.019)		(.126)		(.006)
FDI		.034***		-.012		.003
		(.011)		(.015)		(.004)
R^2	.144	.218	.024	.025	.079	.091
Sample size	1,601	1,504	1,294	1,209	1,681	1,580
			B. East			
MW	-.234***	-.154**	-.201	-.213	-.068***	-.067**
	(.047)	(.070)	(.219)	(.220)	(.025)	(.027)
MW, lagged 1 year	-.100**	-.046	-.322**	-.310**	-.018	-.015
	(.048)	(.057)	(.128)	(.124)	(.020)	(.020)
CPI		-.001		.021		.000
		(.016)		(.015)		(.004)
GDP per capita		.142		.362**		.004
		(.274)		(.173)		(.011)
FDI		.043		-.022		-.003
		(.034)		(.027)		(.007)
R^2	.213	.223	.041	.056	.084	.085
Sample size	733	731	617	615	762	760
			C. Central			
MW	-.032	-.034	-.297	-.272	-.039	-.039
	(.068)	(.070)	(.181)	(.177)	(.025)	(.026)
MW, lagged 1 year	-.216***	-.216***	-.336*	-.310*	-.041***	-.042***
	(.061)	(.061)	(.174)	(.184)	(.015)	(.014)
CPI		-.025		-.029		-.006
		(.022)		(.024)		(.006)
GDP per capita		.006		.192		.003
		(.032)		(.162)		(.010)
FDI		.026		-.015		.011**
		(.018)		(.023)		(.006)
R^2	.129	.151	.031	.043	.094	.133
Sample size	663	627	497	464	708	670
			D. West			
MW	.088	-.037	.018	.022	-.096	-.069

	(.114)	(.106)	(.208)	(.223)	(.063)	(.064)
MW, lagged 1 year	.124	-.153	.000	.124	.055	-.005
	(.107)	(.110)	(.258)	(.276)	(.075)	(.043)
CPI		-.021		.037		.005
		(.028)		(.032)		(.008)
GDP per capita		.059		.019		.014
		(.068)		(.023)		(.018)
FDI		.010		.001		-.007
		(.025)		(.012)		(.007)
R^2	.153	.169	.014	.051	.015	.043
Sample size	205	146	180	130	211	150

Note: *** statistically significant at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Cluster-robust standard errors at the county level are in parentheses. All variables in the table are at the county level, except that CPI is at the city level. Young adults are defined as workers who are 15-29 years olds. At-risk groups are workers whose monthly wages are between the old and new minimum wage standards. Among young adults, less than 3 percent are at-risk groups in each region; likewise, among at-risk group, less than 3 percent are young adults in each region.

Table 5 Estimates of Minimum Wage Effects on Employment by Age Cohort

Dependent Variable: log (Employment/Population)	Age 15-29		Age 30-39		Age 40-49		Age 50-64	
Independent Variables (log)	Male	Female	Male	Female	Male	Female	Male	Female
				A. All Regions				
MW	-.031	-.148***	-.019	-.068***	.017	-.040	.009	.023
	(.047)	(.047)	(.027)	(.025)	(.016)	(.027)	(.053)	(.056)
MW, lagged 1 year	-.027	-.061**	-.031	-.034	-.015	-.040**	-.009	-.023
	(.029)	(.030)	(.019)	(.021)	(.013)	(.017)	(.032)	(.034)
CPI	-.002	-.007	.001	.006	.001	.007	.013	-.003
	(.014)	(.012)	(.005)	(.006)	(.004)	(.006)	(.009)	(.017)
GDP per capita	.078***	.015	.008	.009	.001	.032***	.153	.227
	(.023)	(.022)	(.058)	(.011)	(.059)	(.011)	(.113)	(.214)
FDI	.020	.041***	-.001	.010	.005	.003	.014	.032
	(.015)	(.012)	(.006)	(.007)	(.005)	(.007)	(.013)	(.029)
R^2	.173	.169	.022	.097	.012	.093	.052	.055
Sample size	1,428	1,430	1,532	1,532	1,537	1,532	1,523	1,363
				B. East				
MW	-.103	-.172**	-.023	-.098***	-.001	-.043	.022	-.057
	(.112)	(.076)	(.022)	(.033)	(.017)	(.032)	(.042)	(.061)
MW, lagged 1 year	-.012	-.040	-.010	.007	-.016	-.021	-.018	-.001
	(.049)	(.046)	(.011)	(.024)	(.013)	(.025)	(.031)	(.041)
CPI	.014	.001	.001	.003	.005	.015	.022	-.028
	(.025)	(.018)	(.005)	(.009)	(.008)	(.011)	(.017)	(.031)
GDP per capita	.116	.011	-.000	.001	.005	.022	.032	.124**
	(.298)	(.035)	(.012)	(.017)	(.011)	(.020)	(.022)	(.044)
FDI	.040	.055**	-.007	.002	-.001	-.003	-.014	-.056*
	(.046)	(.023)	(.006)	(.011)	(.017)	(.014)	(.016)	(.031)
R^2	.176	.195	.049	.094	.013	.092	.039	.094
Sample size	711	712	737	741	745	739	737	675
				C. Central				
MW	.014	-.155**	-.052**	-.087**	.013	.034	.025	.152**
	(.062)	(.068)	(.020)	(.040)	(.023)	(.062)	(.085)	(.075)
MW, lagged 1 year	-.014	-.066	-.072***	-.071**	-.018	-.013	.021	-.024
	(.068)	(.044)	(.020)	(.036)	(.022)	(.029)	(.052)	(.047)
CPI	-.036	-.037	-.010	.015	-.005	.000	.013	-.000
	(.029)	(.028)	(.009)	(.015)	(.007)	(.015)	(.016)	(.034)
GDP per capita	.079**	.054	.008	.007	.024	.034	.106	.301
	(.037)	(.036)	(.010)	(.018)	(.047)	(.094)	(.151)	(.283)
FDI	.011	.054***	.003	.023*	.004	.024	.007	.035
	(.022)	(.018)	(.006)	(.013)	(.008)	(.015)	(.016)	(.038)
R^2	.123	.114	.076	.148	.015	.057	.044	.089
Sample size	577	584	645	642	643	647	640	550
				D. West				
MW	-.071	-.145	.231*	.078	.093	-.018	-.394**	-.400***

	(.170)	(.109)	(.123)	(.078)	(.080)	(.111)	(.188)	(.120)
MW, lagged 1 year	-.121	-.215*	.117**	-.103**	.004	.066	-.136	-.037
	(.124)	(.110)	(.053)	(.046)	(.053)	(.072)	(.139)	(.093)
CPI	-.032	.005	.009	-.006	.001	.014	-.011	-.001
	(.035)	(.028)	(.010)	(.013)	(.011)	(.022)	(.025)	(.056)
GDP per capita	.045	.053	.252	.029	.082	.032	.157	.611
	(.081)	(.065)	(.162)	(.026)	(.178)	(.241)	(.422)	(.605)
FDI	.036	.003	.010	.012	.019	.004	.031	.017
	(.040)	(.027)	(.013)	(.011)	(.013)	(.016)	(.037)	(.042)
R^2	.172	.179	.236	.152	.102	.085	.091	.269
Sample size	140	134	150	149	149	147	146	138

Note: *** statistically significant at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Cluster-robust standard errors at the county level are in parentheses. All variables in the table are at the county level, except that CPI is at the city level.

Table 6 Estimates of Minimum Wage Effects on Employment by Educational Attainment

Dependent Variable: log (Employment/Population)	High School or Below		Vocational School		Junior College		College or Above	
Independent Variables (log)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
				A. All Regions				
MW	-.080**	-.054**	-.037	-.046*	-.018	-.023	-.006	-.013
	(.040)	(.025)	(.025)	(.025)	(.020)	(.020)	(.013)	(.014)
MW, lagged 1 year	-.019	-.029	-.040**	-.047**	-.002	-.016	-.005	-.019
	(.020)	(.018)	(.020)	(.020)	(.021)	(.021)	(.015)	(.015)
CPI		.004		-.009		-.000		.001
		(.005)		(.007)		(.014)		(.006)
GDP per capita		.009		.035***		.011*		.040***
		(.008)		(.010)		(.006)		(.010)
FDI		.010**		.003		.008**		.011
		(.004)		(.006)		(.003)		(.007)
R^2	.046	.076	.036	.068	.044	.079	.003	.032
Sample size	1,655	1,555	1,593	1,497	1,637	1,538	1,578	1,480
				B. East				
MW	-.070*	-.061	-.049	-.054	-.048	-.064	-.031	-.032
	(.038)	(.041)	(.046)	(.047)	(.037)	(.040)	(.020)	(.020)
MW, lagged 1 year	-.025	-.017	-.003	-.006	.028	.018	-.039	-.039
	(.023)	(.024)	(.028)	(.030)	(.027)	(.028)	(.027)	(.027)
CPI		.004		-.014		-.001		-.007
		(.007)		(.011)		(.017)		(.010)
GDP per capita		.000		.133		.003		.199***
		(.015)		(.128)		(.009)		(.087)
FDI		.007		.008		.018***		.000
		(.010)		(.015)		(.006)		(.025)
R^2	.056	.062	.028	.036	.053	.091	.011	.032
Sample size	752	750	726	724	744	742	733	731
				C. Central				
MW	-.071**	-.077**	-.048	-.051	.012	.007	.074	.077
	(.034)	(.035)	(.037)	(.037)	(.023)	(.023)	(.056)	(.057)
MW, lagged 1 year	-.052**	-.047*	-.083***	-.090***	-.030	-.033	.080	.079
	(.025)	(.025)	(.032)	(.033)	(.033)	(.034)	(.038)	(.038)
CPI		-.006		-.012		.001		-.001
		(.008)		(.014)		(.008)		(.016)
GDP per capita		.005		.039**		.030**		.001
		(.014)		(.017)		(.013)		(.077)
FDI		.015**		.000		-.002		.012
		(.006)		(.009)		(.005)		(.020)
R^2	.083	.111	.073	.094	.045	.082	.045	.046
Sample size	693	655	659	625	683	646	639	604
				D. West				
MW	-.184	-.030	-.019	.012	-.068	-.034	.033	.112

	(.163)	(.092)	(.073)	(.086)	(.062)	(.060)	(.084)	(.103)
MW, lagged 1 year	.154	.037	-.046	-.031	.020	-.021	-.020	-.054
	(.120)	(.092)	(.090)	(.089)	(.078)	(.072)	(.070)	(.062)
CPI		.008		.009		-.000		-.003
		(.012)		(.021)		(.010)		(.014)
GDP per capita		.088**		.061		.021		.045
		(.038)		(.038)		(.018)		(.030)
FDI		-.020		.018		.009		.011
		(.014)		(.016)		(.009)		(.019)
R^2	.013	.059	.028	.052	.017	.099	.019	.080
Sample size	210	150	208	148	210	150	206	145

Note: *** statistically significant at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Cluster-robust standard errors at the county level are in parentheses. All variables in the table are at county level. All variables in the table are at the county level, except that CPI is at the city level.

Table 7 Estimates of Minimum Wage Effects on the Employment of Migrant Workers

Dependent Variable: log (Employment/Population)	East		Central		West	
Independent Variables (log)	(1)	(2)	(1)	(2)	(1)	(2)
			A. All Enterprises			
MW	.022	.043	-.005	-.037	-.146	-.135
	(.058)	(.056)	(.051)	(.056)	(.097)	(.010)
MW, lagged 1 year	.027	.034	.031	.066	-.282***	-.216***
	(.047)	(.049)	(.067)	(.048)	(.058)	(.074)
CPI		-.010		.112		.119
		(.038)		(.076)		(.093)
GDP per capita		.155**		.321***		2.483*
		(.057)		(.083)		(1.454)
FDI		.171***		.174***		.012
		(.043)		(.048)		(.047)
R^2	.014	.102	.091	.223	.399	.477
Sample size	249	248	104	99	83	72
			B. Non-state Enterprises Only			
MW	.077	.087	-.017	-.044	-.411***	-.408***
	(.113)	(.111)	(.057)	(.071)	(.098)	(.128)
MW, lagged 1 year	.013	.002	.057	.058	-.120	-.070
	(.075)	(.078)	(.079)	(.073)	(.124)	(.129)
CPI		-.072		.127		-.066
		(.061)		(.102)		(.096)
GDP per capita		.110		.255**		1.182
		(1.325)		(.107)		(1.619)
FDI		.242		.137**		.084
		(.208)		(.063)		(.069)
R^2	.147	.178	.202	.289	.489	.581
Sample size	224	223	84	80	69	62

Note: *** statistically significant at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Cluster-robust standard errors at the county level are in parentheses. All variables in the table are at the county level, except that CPI is at the city level. The effects of migrant workers of state-owned enterprises cannot be estimated due to an insufficient number of observations. Number of migrants shows the total migrant population of each region in our sample.

Table 8 Estimates of Minimum Wage Effects on the Employment by Period

Dependent Variable: log (Employment/Population)	2002-2004		2004-2007		2008-2009	
Independent Variables (log)	Young Adults	At-Risk Groups	Young Adults	At-Risk Groups	Young Adults	At-Risk Groups
			A. All Regions			
MW	-.141	.391	-.060	-.359**	-.052	.010
	(.162)	(.301)	(.080)	(.165)	(.047)	(.227)
MW, lagged 1 year	-.014	-.084	-.106*	-.246**	-.103***	-.283
	(.090)	(.377)	(.060)	(.110)	(.039)	(.196)
CPI	-.060	-.012	.005	.024	.002	-.008
	(.062)	(.030)	(.022)	(.021)	(.010)	(.015)
GDP per capita	-.001	.004	.099***	.152	.034	.069
	(.066)	(.027)	(.028)	(.154)	(.023)	(177)
FDI	.006	.009	-.002	-.004	.043***	.006
	(.008)	(.010)	(.015)	(.022)	(.013)	(.021)
R^2	.102	.073	.172	.050	.176	.014
Sample size	79	66	585	502	919	707
			B. East			
MW	.082	-.017	-.171	-.293	-.126**	.236
	(.168)	(.475)	(.111)	(.230)	(.054)	(.169)
MW, lagged 1 year	.017	-.012	-.022	-.218*	-.060	-.382*
	(.088)	(.540)	(.078)	(.117)	(.055)	(.205)
CPI	-.106	-.040	-.017	-.001	-.030	-.014
	(.091)	(.080)	(.037)	(.056)	(.039)	(.019)
GDP per capita	.041	.050	.032	.298	.053	.023
	(.110)	(.073)	(.040)	(.365)	(.035)	(.017)
FDI	.011	.019	.029	.037	.022	.026
	(.012)	(.020)	(.025)	(.027)	(.030)	(.023)
R^2	.080	.043	.203	.030	.198	.033
Sample size	41	35	298	258	418	348
			C. Central and West			
MW	-.291	.213	-.011	-.176	-.018	-.207
	(.384)	(.485)	(.102)	(.141)	(.068)	(.276)
MW, lagged 1 year	-.262	-.580	-.152*	-.129	-.131**	-.248
	(.319)	(.768)	(.079)	(.153)	(.054)	(.274)
CPI	-.069	-.013	-.060	-.007	-.029	-.039
	(.100)	(.036)	(.053)	(.020)	(.029)	(.049)
GDP per capita	.019	-.015	.083	.009	.096***	.348
	(.102)	(.044)	(.057)	(.021)	(.034)	(.240)
FDI	.016	.009	.034	.036	.026	.022
	(.015)	(.018)	(.054)	(.065)	(.043)	(.038)
R^2	.169	.242	.103	.018	.086	.023
Sample size	38	31	316	270	519	376

Note: *** statistically significant at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Cluster-robust standard errors at the county level are in parentheses. All variables in the table are at the county level, except that CPI is at the city level.

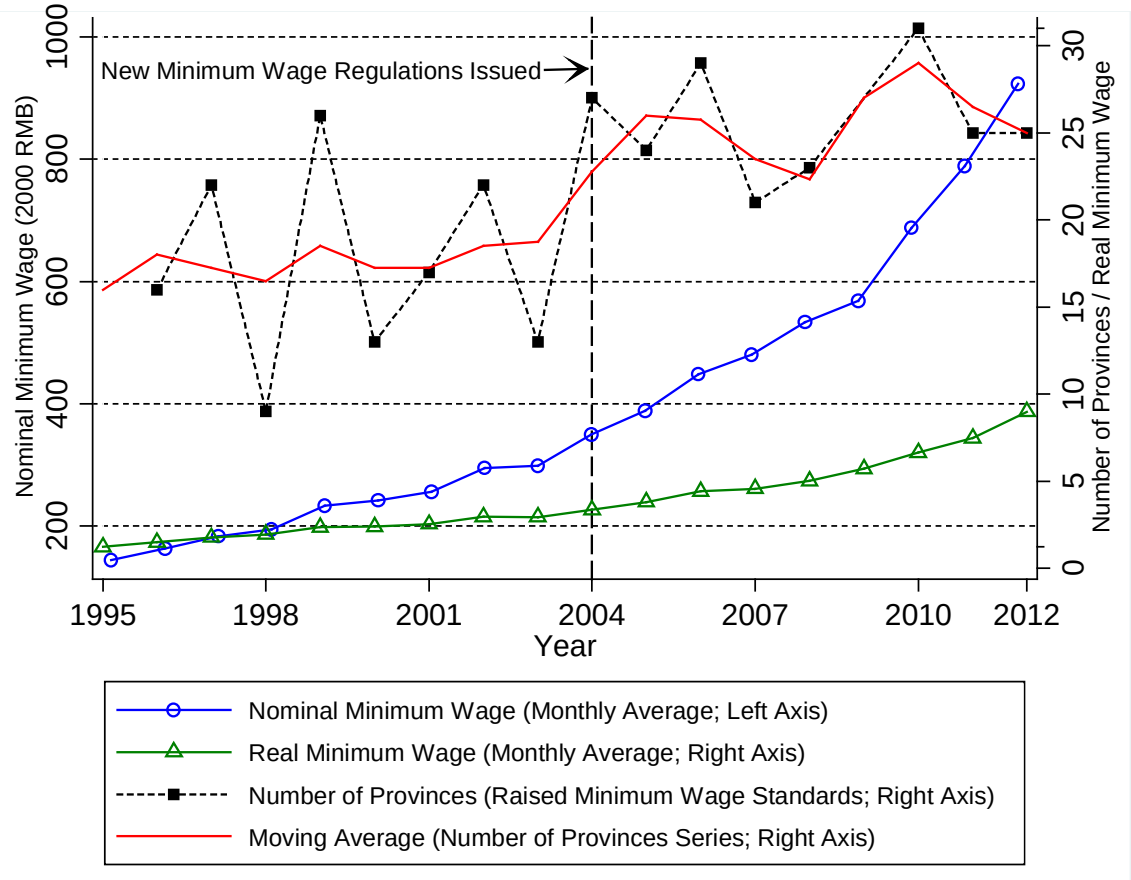

Figure 1 Minimum Wages in China, 1995−2012

Nominal and real minimum wages are adjusted for inflation and expressed in 2000 RMB.

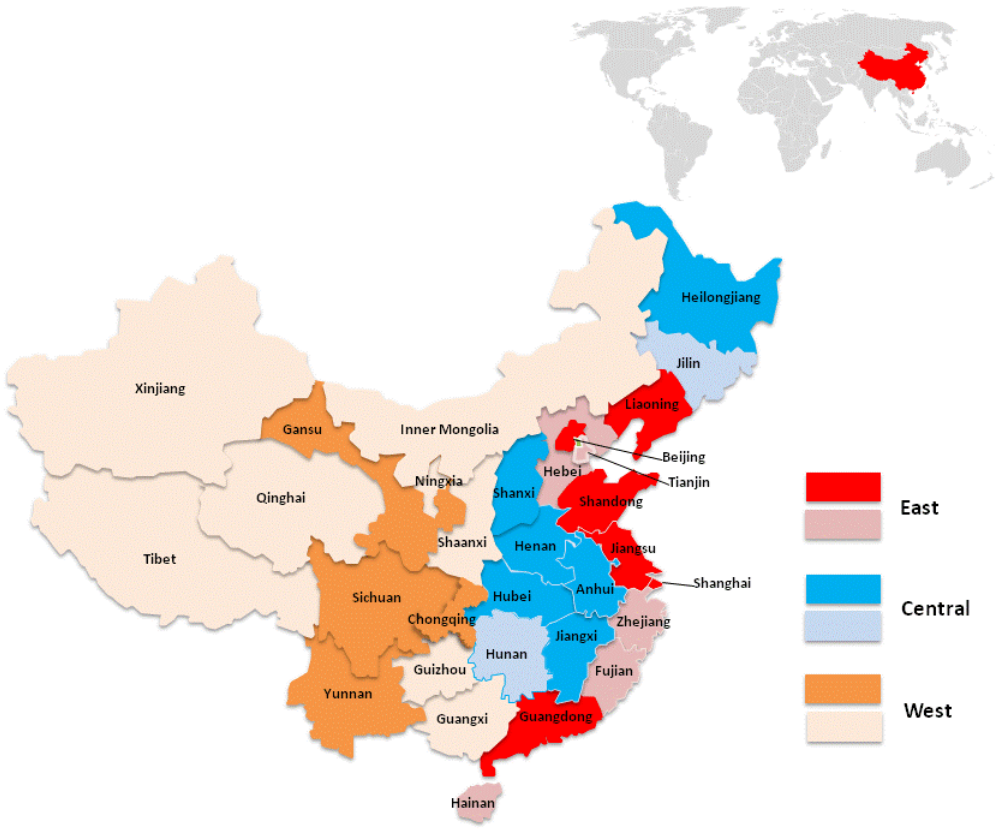

Figure 2 Panel Data with Minimum Wages in China

The panel data used in the analysis include 16 provinces (darker areas in the map) covering three regions in Mainland China. The East includes Liaoning, Beijing, Shandong, Jiangsu, and Guangdong; the Central region includes Heilongjiang, Shanxi, Henan, Anhui, Hubei, and Jiangxi; and the West includes Gansu, Chongqing, Sichuan, and Yunnan.