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The Impact of Higher Education Expansion Policy on the Wage of College Graduates in China

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Abstract

Using a longitudinal survey data conducted from 1997 to 2011, this study employs an empirical study to provide evidence about the impact of the higher education expansion policy on the wage levels of college graduates in China. Major conclusions emerge. First, in general, the higher education expansion policy does not affect the wage level of young college graduates. Second, the difference of policy impact on wage by various wage percentiles is small. Third, the policy decreases the wage level of new college graduates in a short term and the negative effect disappears in a long term. Fourth, to consider the group heterogeneities of policy impacts, it is shown that both the differences between the Eastern, Central and Western Region groups and the gender gaps are small, whereas the policy impact differ by the urban and rural groups.

Keywords: higher education expansion policy, college graduate, wage, Chinese labor market

1. Introduction

China's planned economic system was reformed after 1978. A set of new policies were implemented by the Chinese government, and China experienced great economic growth which achieved an average GDP growth rate of around 10% during the 1990s and 2000s. In 1999, the higher education expansion policy was implemented by the government. Along with the policy implementation, the number of college graduates increased from 108 million in 1998 to 638.1 million in 2013 (NBS, 2016) (Note 1). According to the general market equilibrium mechanism, when labor demand is consistent, an increase of the college graduate labor supply in the short term may decrease the graduate wage level (negative effect); whereas the increase of college graduate workers may promote technological innovation and increase economic growth. When the labor demand for college graduates increases greatly with economic growth or technological progress, the college graduate wage level may increase even after the implementation of the higher education expansion policy (positive effect). Thus, the influence of the policy is not clear and it deserves empirical investigation.

This study employs a quasi-experiment method based on DD and DDD models to estimate the impact of the higher education expansion policy on college graduates' wages in China. It uses data from the Chinese Health and Nutrition Survey (CHNS) longitudinal survey conducted from 1997 to 2011. The features of the Chinese labor market, such as the regional disparity, labor market segmentation by the rural and urban registration system and gender disparity are considered. These analyses build on the findings of relevant published research.

This study is structured as follows: section 2 introduces the implementation of higher education expansion policy, section 3 introduces the channels by which the higher education expansion policy can affect college graduates wage, and to introduce previous empirical studies on the issue. Section 4 gives the framework of the empirical analysis, including models and datasets. Section 5 introduces the description results between the implementation policy and wages of college graduates and senior high school graduate. Section 6 presents estimated results and explains these results, Section 7 summarizes the conclusions.

2. Higher Education Expansion Policy in China during the Economic Transition Period

The Chinese government promoted the enrollment of compulsory education and higher education since the planned economy period of the 1950s. This study focuses on the higher education expansion policy during the economic transition period as follows.

In 1999, the State Council approved the *Plan of Revitalizing Education in the Twenty-First Century* proposed by

the Ministry of Education to expand higher education enrollment. The plan included various strategies to encourage universities to set up multiple campuses as well as instituting the private colleges. The plan called for an increase in public education expenditures, especially in tertiary education. The proposal aimed at an increase in the gross enrolment ratio in tertiary education, a rise in the student-teacher ratio, and an increase in state educational funding. A target was set in the plan for China to reach a tertiary enrollment ratio of 15 percent by 2010, defined as "mass higher education" (Trow, 1972, 1973). In addition, in 2004, the Chinese State Council passed *A Plan of Education Revitalization 2003-2007*. This plan focused on the improvement of teaching, mainly for universities on the "985" and "211" lists. It emphasized the reform of the teaching and evaluation system, and the implementation of the *Improvement of New Graduates Employment Program* policy. It required the higher education system to prepare new graduates for the jobs market. In 2010, the *National Outline for Medium and Long-term Reform and Development (2010-2020)* was published. This plan sought to improve teaching, scientific research, and the social relevance of education, and to let the total number of enrolled college student increase to 33 million by 2020: this indicates that higher education expansion will continue.

China's higher education developed rapidly with the implementation of these polices (see Figure 1). From 2000 to 2011 the enrollment of regular college (Note 2) students expanded from 5.56 million to 26.25 million, and annual college graduate students increased from 0.95 million to 6.81 million. From 2000 to 2015 enrollment of senior high school students expanded from 12.01 million to 23.74 million, and annual college graduate students increased from 30.15 million to 79.77 million. It is observed that with the implementation of the higher education expansion policy, both the students and graduates of college and senior high school increase greatly. It is thought that the increase in the higher education labor supply affects the employment of young graduates.

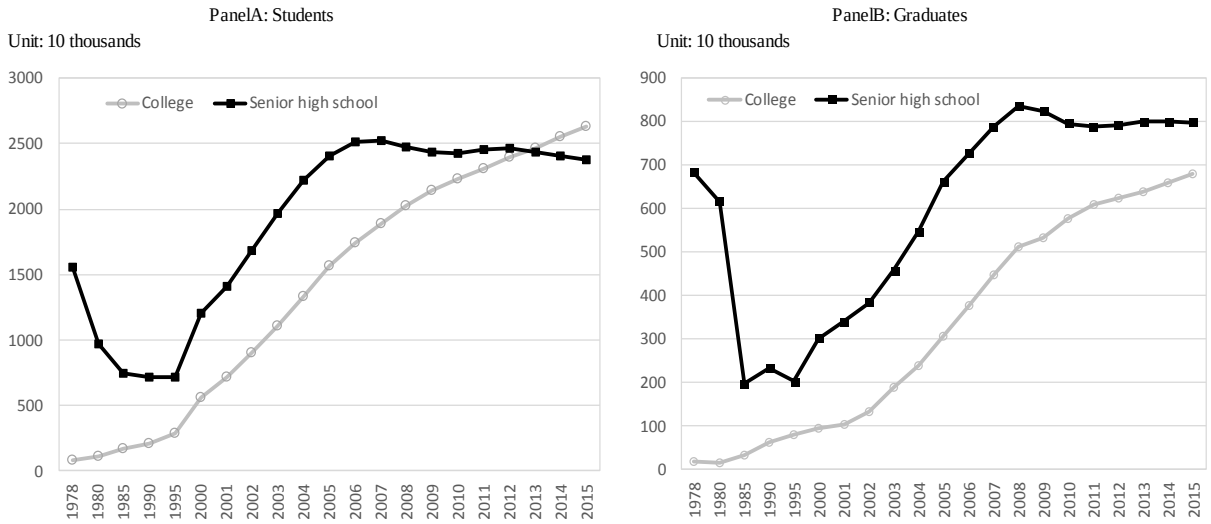

Figure 1. Numbers of students in schools and graduates from 1990 to 2015

Source: Based on data from *China Statistics Yearbook 2016*.

3. Literature Review

3.1 The Channels of the Impact of Higher Education Expansion Policy on the Wages of College Graduates

How does the higher education expansion policy affect the wage level of new college graduates? Based on economic theories, both positive and negative effects can be considered as follows.

Firstly, based on the general market equilibrium mechanism, when the labor demand is consistent, the increase of new college graduates supply in the short term may decrease the college graduate wage level (negative effect). Whereas, when economic growth is strong or technological innovation is progressing, the increase of demand for higher education and highly-skilled workers is greater than the supply, the wage level for college graduates may not change or may even increase during policy implementation (positive effect).

Secondly, according to human capital theory (Becker, 1964; Mincer, 1974), when the increase in productivity of a higher education worker is greater than that for workers with a low- and middle-education levels, the wage level which is set by the firm may be more for the worker with a higher education than for low- and middle-

education worker (positive effect).

Thirdly, according to signal theory (Spence, 1976, 2002), the education level can be used as a sign by which the firm can identify the ability of an employee. In the absence of a better way for the firm to identify an employee's actual ability, the firm may evaluate and judge the worker' ability based on the employee's educational attainment. When the firm believes college graduates are the most productive employees than the counterparts, the wage level may be higher for college graduates (positive effect). However, when the number of college graduates increases, the signal function may lead the firm to recruit college graduates to substitute the high school graduates and recruit graduates with second or postgraduate degrees to fill jobs formerly given to college graduates: this may cause the wage of the college graduates decreased (negative effect).

Based on these theories and hypotheses the influence of the higher education expansion policy on the wage of college graduates is not clear. Therefore, an empirical study is needed.

3.2 Previous Empirical Studies

For the empirical study results on the impact of the higher education expansion policy on the labor market, we summarize its impact on wage as follows (Note 3).

He (2009) draws on Chinese Health and Nutrition Survey (CHNS) data to estimate the education return from 1991 to 2006 based on the OLS, and shows that the education effects on wage (education return) decreased from 2004 to 2006. He points out that the higher education expansion policy may affect the wage level of higher education graduates. Chang and Xiang (2013) analyze the change of education return from 1989 to 2009 using CHNS data. Based on a Heckman two step model, they estimate the education return for the pre-policy period (1989~1993, 1997, 2000) and post-policy period (2004, 2006, 2009) groups, and the group aged 19 to 26 and the group aged 27 to 55. They find that compared to the pre-policy period, the wage gap between college and senior high school graduates increased during the post-policy period. It seems that the policy positively affects the wage level of college graduates. Using data from the China Urban Labor Survey (UCLS) in 2001, 2005, and 2010, Gao and Smyth (2015) estimate the education return based on OLS and Instrument Variable (IV) models, they indicate that the education return increased from 2001 to 2005 and 2010. Xia et al. (2016) employ CHNS data from 2000 to 2009 to estimate education return based on the quantile regression model and FFL decomposition method. They find the education return increased from 2000 to 2009 and the education return is higher for the high-wage group than the middle- and low-wage groups. It should be noticed that these previous empirical studies did not consider the unobserved heterogeneity problem among various groups. Wu and Zhao (2010) address this and estimate the impact of higher education expansion policy on wage directly based on a DD and DDD model using data from the China Urban Labor Survey (CULS) for 2002 and Chinese 1% Population Census data. It is found that the policy decreases the wage level based on the DD model, whereas the impact of the policy on wages are not statistically significant based on DDD model. Yao et al. (2014) also estimate the policy influence based on DD and DDD model using China Urban Household Income Survey data from 1998 to 2005. They find that the higher education expansion policy negatively affects the wage of young college graduates, but the negative effect decreases in the long term. Wu and Zhao (2010), and Yao et al. (2014) use the same DD and DDD models to find a different outcome for the impact of policy on wage. This suggests that more research is needed on this topic.

Even though the previous empirical studies investigate the impact of higher education expansion on the wages of college graduates, the empirical studies based on an experiment analysis method are scarce. There remain further areas to be researched. First, the impact of policy may vary according to period. For example, in a perfect competition market, in a short-term, the dramatic increase of college graduate labor supply may affect wage level of new college graduates. Whereas in a long-term, the influence of the policy may decrease because the labor demand for college graduates may increase with economic growth or industrial structure upgrading. Yet there is no empirical study based on DD and DDD models which scrutinizes the short term and long term effects. This study tries to address this need. Second, as the one of features of Chinese economy, the Chinese labor market is segmented by various sectors and groups. For example, due to the large regional disparity in China, the impact of the policy may differ by regions. Therefore this study also analyzes the effect of the policy in the Eastern, Central, and Western Regions. In additions, there remains the discrimination against migrants by the rural and urban registration system ("*Hukou*") (Meng & Zhang, 2001; Maurer-Fazio & Dinh 2004; Wang, 2005; Xie & Yao, 2006; Song & Appleton, 2006; Deng, 2007; Ma 2011, 2018a, 2018b; Meng & Wu 2014), we also investigate the policy effects by the rural and urban resident groups. Furthermore, because there remains the gender wage gap in China (Gustafsson & Li, 2000; Li & Ma, 2006, 2015; Ma, 2009, 2018c; Ma et al., 2013), to consider the gender differentials of the family responsibility, labor participation behavior and work efforts, this

study also compares the policy influence by gender. Third, a set of robustness checks is employed to test the analysis appropriateness. These results may develop previous studies on the issue.

4. Methodology and Data

4.1 Model

The DID (Difference in Difference) model is used to investigate the impact of higher education expansion policy on wages:

$$Y_{it}=a+\beta_1 year_t+\beta_2\ Trea_{it}+\beta_3\ Trea_{it}\ *\ year_t\ +\beta_4\ X_{it}+\beta_\lambda\ \lambda_{it}+\ \varepsilon_{it} \quad (1)$$

The object analyzed by the DD model is the college graduates aged 21 to 40. In equation (1), *Y* is hourly wage logarithms, *i* stands the individual, *t* is years, *Year* is post-policy period (2004, 2006, 2009, and 2011 in this study), *Treat* is the treatment group, *X* includes the individual characteristics variables (e.g. family numbers, health status, and gender), *Hukou*, and the regional characteristics variables. *a* is the constant term, and ε is the error term.β_1~$\beta_4$represent the estimated coefficient for each variable. This study uses the survey years before the implementation of the higher education expansion policy (1997, and 2000) as the pre-policy period and the years of 2004, 2006, 2009, and 2011 as the post-policy period. In this study the treatment group is defined as college graduates aged 21 to 25 and the control group is defined as college graduates aged 31to 40.

The DDD model is shown by Equation (2). The object analyzed by the DDD model includes both college and senior high school graduates aged 21 to 40.

$$Y_{it}=a+\beta_1 year_t+\beta_2\ age_{21\text{-}25it}+\beta_3\ Colle_{it}+\beta_4\ age_{21\text{-}25it}\ *\ Colle_{it}\ *year_t\ +\beta_5\ X'_{it}+\beta_\lambda\ \lambda_{it}+\ \varepsilon_{it} \quad (2)$$

In equation (2), $age_{21\text{-}25}$ is the group aged 21 to 25, *Colle* is the college graduate group, X' includes the individual characteristics variables, the regional characteristics variables and other variables including the interaction item of age and year dummy variable, the interaction item of college graduate and year dummy variable, and the interaction item of college graduate and age dummy variable.

In the equation (1) and equation (2), β_3 and β_4 represents the estimated coefficient of DID or DDD items. When β_3 and β_4 is a negative value, and it is statistically significant, it indicates that the implementation of the higher education expansion policy reduces the wage level of young college graduate, and *vice versa*.

A sample selection bias problem may exist therefore a DID model or DDD model based on the Heckman two-step model is also used to correct the bias (Heckman, 1979). In equation (1) and equation (2), the inverse Mills ratio λ is a correct item. λ is calculated by $\lambda=\varphi(\gamma_t Z_{it})/\Phi(\gamma_t Z_{it})$, $\varphi(\cdot)$, $\Phi(\cdot)$ is a normal density function and distribution function based on the probit regression model, *Z* is factors which affect the employment status selection (e.g. to work or not to work), γ represents the coefficients of these factors.

4.2 Data

This study employs six waves (1997, 2000, 2004, 2006, 2009, and 2011) of data from the Chinese Health and Nutrition Survey (CHNS) conducted from 1997 to 2011. CHNS is a nationwide longitudinal survey conducted by the Carolina Population Center at the University of North Carolina and the National Institute for Nutrition and Health (NINH, former National Institute of Nutrition and Food Safety) at the Chinese Center for Disease Control and Prevention (CCDC). The survey took place over seven days using a multistage, random cluster process to draw a sample of about 7,200 households with over 30,000 individuals in fifteen provinces and municipal cities that vary substantially in geography, economic development, public resources, and health indicators. Although the longitudinal survey began in 1989 this study uses the survey data from 1997 to 2011 because the higher education expansion policy was implemented in 1999. This study uses samples from 11 provinces: Beijing, Liaoning, Heilongjiang, Shanghai, Jiangsu, Shandong, Hernan, Hubei, Hunan, Guangxi, and Guizhou.

The independent variables of employment are logarithms of hourly wage. The wage is the earning income including the basic wage and the allowance, and not including the bonuses. The nominal wage is adjusted to the real wage by the 2011 CPI (Consumption Price Index).

Figure 2 shows both the monthly wage and hourly wage from 1989 to 2011. Because the higher education expansion policy was implemented in 1999, the effect of the policy on wage appears in the period after 2002 for college graduates whose degree takes for three years and 2003 for college graduates whose degree takes for more than four years. Thus the period from 1989 to 2000 is the pre-policy period and the survey period from 2004 to 2011 is the post-policy period. The monthly wage and hourly wage are calculated for three groups: college graduates aged 21 to 25; college graduates aged 31 to 40, and senior high school graduates aged 21 to 25. The change tendency of wages from 1989 to 2011 is similar for Panel A (monthly wage) and Panel B (hourly wage). It is observed that as the wage increased from 1989 to 2011, the wage gaps between the three groups are different.

It can be thought that the work hours may be different between the three groups. To consider the influence of work hours, the hourly wages are used in the study. The main results of Panel B (hourly wage) in Figure 2 are as follows.

First, when compare the college graduates aged 21 to 25 with the college graduates aged 31 to 40, it is observed that except in 1993 and 1997, the wage is higher for the college graduates aged 21 to 25 than for the college graduates aged 31 to 40 during both pre-policy period and post-policy period. However, for college graduates aged 21 to 25, the wage decrease is greater for 2004 and 2009. It is indicated that the higher education expansion policy seems likely to reduce the wage gaps in both 2004 and 2009. Excepting the period of world financial crisis in 2007, the higher education expansion policy seems to affect the wage of young college graduates in a short term.

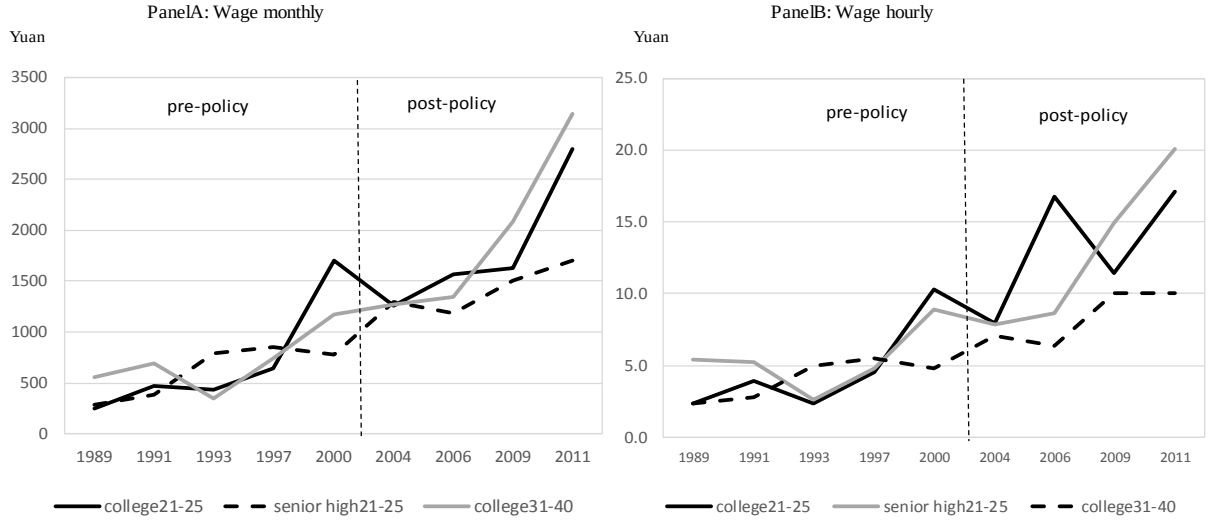

Figure 2. Wage by age and education groups from 1989 to 2011

Source. Calculated based on CHNS1989-2011.

Second, to compare the college graduates aged 21 to 25 with the senior high school graduates aged 21 to 25, even though the wage gaps between these two groups are different by periods, the relations between these two groups are not observed clearly. For example, during the pre-policy period, the wage is higher for senior high school graduates aged 21 to 25 than the counterpart, whereas the wage is higher for college graduates aged 21 to 25. Moreover, during the post-policy period, the wage is higher for college graduates aged 21 to 25 in 2006 and it is lower in 2009 and 2011 than for the counterpart.

The main dependent variables are constructed as follows (see Appendix Table 1). First, *Year* is a set of year dummy variables. In the study, 1997, 2000 is the pre-policy period, and 2004, 2006, 2009, and 2011 is the post-policy period. *DID* in the equation (1) is the interaction term of the two variables used: the post-policy period and treatment group dummy variables. The treatment group is defined as the college graduates aged 21 to 25 (*Year*DID*).*DDD* in equation (2) is the interaction term of the three variables used: the post-policy period dummy, the group aged 21-25 years old dummy, and the college graduate dummy variables (*Year*Age*$_{21\text{-}25}$**Colle*).

Second, for the other factors, (1) the experience years and health status are used as human capital. (2) The male dummy is used to control the gender gap in labor market. (3) To control the influence of occupation on wage, the occupation dummy variables (manager, technician, clerk, agriculture job, high-level manufacturing job, low-level manufacturing job, service job, the other job) are constructed. (4) To consider the labor market segmentation by various sectors and regions, the private sector dummy, the urban, and region blocks (Eastern, Central, Western) dummy variables are constructed.

Third, the first-step in the Heckman two-step model is a work probability function (e.g. work or not to work). The factors that affect labor participation behavior are also constructed. They are the individual variables including age, family member, gender, health status, urban registration, and the province level variables including regional ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP,

and GDP per capita (Note 4).

It is thought that the results may be sensitive by the treatment group setting. In this study, the rule to distinguish the treatment group and control group is based on age categories. To compare the impact of the higher education expansion policy on wage by various age category groups, an analysis by the following function is used:

$$Y_{it}=a+\beta_1 year_t+\beta_2\ age_{it}+\beta_{3a}\sum_{age=21}^{30} age_{it}*\ year_t\ +\beta_4\ X_{it}\ +\ \varepsilon_{it} \quad (3.1)$$

$$Y_{it}=a+\beta_1 year_t+\beta_2\ age_{it}\ +\beta_3\ Colle_{it}+\beta_{3a}\sum_{age=21}^{30} age_{it}*\ year_t\ *\text{Colle}_{it}+\beta_4\ X_{it}\ +\ \varepsilon_{it} \quad (3.2)$$

In equation (3.1) and equation (3.2), *i* stands for the individual, *t* for years, *year* for policy implementation years (2004, 2006, 2009, and 2011 in this study), *age* for the age dummy variables from age 21 to 30, *X* for the individual characteristics variables (e.g. family numbers, health status, gender), the regional characteristics variables and other variables. In the equation (3.2), X also includes the interaction item of age and year dummy variable, the interaction item of college graduate and year dummy variable, and the interaction item of college graduate and age dummy variable. a is the constant term, and ε is the error term.β_1, β_2, β_{3a}, β_4 represent the estimated coefficient for each variable. The results of β_{3a} are summarized in Table 1.

Table 1. Test results for treatment group setting

	Model1: DD			Model2:DDD		
	coeff.		S.E.	coeff.		S.E.
age21	-0.065		0.265	-0.079		0.399
age22	-0.116		0.194	-0.259		0.305
age23	-0.110		0.206	-0.237		0.324
age24	0.123		0.164	0.272		0.259
age25	-0.079		0.106	-0.031		0.233
age26	-0.015		0.125	0.610	**	0.271
age27	0.033		0.098	0.115		0.235
age28	0.220	**	0.095	0.106		0.238
age29	0.033		0.087	0.274		0.227
age30	0.058		0.084	0.151		0.220

Note. 1) *, **, ***: statistical significant levels are10%, 5%, 1%.

2) The treatment group, age, year, male, health, occupation, private sector, regular worker, urban registration, province dummy varibales are estimated, these results are not expressed in Table 1. The DD item and DDD item coefficients are only shown in Table 1.

Source: Calculated based on CHNS1989-2011.

The results indicate that although all coefficients are not statistically significant, the higher education expansion policy negatively influences the wage of college graduates aged 21 to 25; whereas it almost positively affects the wage of the university graduates aged 26 to 30. It is observed that the influences of the policy are different between the group aged 21 to 25 and the group aged 26 to 30. The results of estimation 2 showed a similar tendency, the influence of the policy is negative for the treatment group (group aged 21 to 25), whereas they are almost positive for the other group. It is confirmed that to define the treatment group as college graduates aged 21 to 25 is appropriate. However, the impacts of the policy on the college graduate group aged 26 to 30 are various, it indicates that the estimated results may differ by the treatment group setting. The results of a set of robustness checks for age groups will be discussed in section 6.

5. Results

5.1 The Impact of Higher Education Expansion Policy on the Wage of College Graduates

The calculated results based on DID model are shown in Table 2. The treatment group is college graduates aged 21 to 25, the control group is college graduates aged 31 to 40. 2000 is the pre-period of policy implementation, and 2004, 2006, 2009, 2011 are the post-periods. The DID values are from -0.109 to -3.447, it is shown that the higher education expansion policy decreased the average wage level of young college graduate from 2004 to 2011. In addition, to compare with 2004 (-0.114) and 2006 (-0.109), the negative values are greater for 2009 (-3.447) and 2011 (-3.385). It indicates that the policy influence differ by the short term and the long term after the policy implementation.

Table 2. Calculated result based on a DID model

Panel A			
	a:2000	b:2004	D(b-a)
T:Treatment group	8.685	7.584	-1.101
	(10.000)	(4.640)	
C: Control group	8.865	7.878	-0.987
	(9.675)	(5.648)	
D(T-C)	-0.180	-0.294	-0.114
Panel B			
	a:2000	b:2006	D(b-a)
T:Treatment group	8.685	8.360	-0.325
	(10.000)	(5.256)	
C: Control group	8.865	8.649	-0.216
	(9.675)	(11.857)	
D(T-C)	-0.180	-0.289	-0.109
Panel C			
	a:2000	b:2009	D(b-a)
T:Treatment group	8.685	11.258	2.573
	(10.000)	(7.168)	
C: Control group	8.865	14.885	6.020
	(9.675)	(28.312)	
D(T-C)	-0.180	-3.627	-3.447
Panel D			
	a:2000	b:2011	D(b-a)
T:Treatment group	8.685	16.553	7.868
	(10.000)	(19.259)	
C: Control group	8.865	20.118	11.253
	(9.675)	(25.972)	
D(T-C)	-0.180	-3.565	-3.385

Note. 1) Values in parentheses are standard deviation.

2) Treatment group is the college graduates aged 21 to 25; Control group is the college graduates aged 31 to 40.

Source: Calculated based on CHNS1989-2011.

Table 3. Results of the impact of the higher education expansion policy on the wage of college graduates

Panel A: DD model									
	Model 1			Model 2			Model 3		
	coeff.		S.E.	coeff.		S.E.	coeff.		S.E.
Treatment	0.146		0.455	0.386		0.445	0.096		0.203
Year	0.683	***	0.243	0.757	***	0.219	0.586	***	0.098
DD	-0.277		0.480	-0.397		0.462	-0.095		0.209
Exp.	-0.113		0.078	-0.109		0.069	-0.043		0.031
Exp-sq.	0.008		0.007	0.008		0.006	0.004		0.003
Health				-0.006		0.028	-0.007		0.013
Male				0.087		0.163	0.121	*	0.070
Occupation (Clerk)									
Manager				0.220		0.188	0.302	***	0.080
Technician				-0.022		0.255	0.017		0.106
Agriculture				-0.118		1.013	-0.044		0.682
Manufacturing job(H)				-0.240		0.369	-0.156		0.155
Manufacturing job(L)				-0.473		0.616	-0.071		0.285
Service				0.033		0.359	0.076		0.153
Others				0.033		0.277	0.034		0.127
Regular worker							0.022		0.079
Private sector							-0.034		0.143
Urban							0.276	***	0.076
Region(East)									
Central							-0.338	***	0.103
West							-0.289	**	0.129

Constants	2.205	***	0.342	2.012	***	0.378	1.792	***	0.195
Inverse Mills ratio	-2.833		1.177	-2.502	**	0.981	-1.030	**	0.518
Observations	980			980			980		
Prob>chi2	0.0321			0.056			0.000		
Panel B: DDD model									
Treatment	0.038		0.407	0.140		0.430	-0.006		0.404
Year	0.234		0.215	0.277		0.215	0.005		0.209
College	0.503		0.344	0.338		0.340	0.228		0.302
Year*College	0.079		0.379	0.076		0.370	0.138		0.325
Year*Aged21-25	0.113		0.489	0.128		0.524	0.234		0.475
College*Aged21-25	-0.116		0.875	0.063		0.910	-0.011		0.846
DDD	-0.146		1.015	-0.345		1.061	-0.200		0.963
Exp.	0.019		0.059	0.010		0.058	0.019		0.052
Exp-sq.	0.000		0.005	0.000		0.005	0.000		0.004
Health				-0.009		0.029	-0.018		0.026
Male				-0.104		0.159	-0.112		0.142
Occupation (Clerk)				0.207		0.211	0.209		0.179
Manager				0.125		0.284	0.120		0.241
Technician				0.011		0.436	0.037		0.471
Agriculture				-0.133		0.260	-0.127		0.227
Manufacturing job(H)				-0.260		0.275	-0.218		0.249
Manufacturing job(L)				-0.036		0.261	-0.062		0.230
Service				-0.007		0.247	0.084		0.248
Others							0.021		0.142
Regular worker							-0.013		0.272
Private sector							-0.125		0.155
Urban							-0.171		0.160
Region(East)							0.048		0.224
Central									
West									
Constants	2.128	***	0.342	2.324	***	0.453	2.746	***	0.455
Inverse Mills ratio	-5.347	***	1.526	-5.090	***	1.385	-4.213	***	1.088
Observations	4064			4064			4064		
Prob>chi2	0.1512			0.547			0.778		

Note. 1) *, **, ***: statistical significant levels are10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table.

Source: Calculated based on CHNS1989-2011.

Table 4. Results of the impact of the higher education expansion policy on the wage of college graduates by wage centiles

	10th		30th		60th		90th	
Treatment	0.255		0.254		0.102		-0.100	
	0.548		0.207		0.180		0.341	
Year	0.948	***	0.720	***	0.629	***	0.445	***
	0.241		0.091		0.079		0.150	
DD	-0.097		-0.028		-0.023		-0.084	
	0.582		0.220		0.191		0.362	
Inverse Mills ratio	-3.009	*	-2.779	***	-3.005	***	-2.617	***
	1.658		0.627		0.545		1.032	
Constants	0.627		1.209	***	1.859	***	2.825	***
	0.425		0.161		0.140		0.265	
Observations	980		980		980		980	
Pseudo R2	0.1117		0.146		0.1407		0.14	

Note. 1) *, **, ***: statistical significant levels are10%, 5%, 1%. 2) The coefficients and statistical significances are summarized in the Table 4. 3) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table. 4) In the second step examination, experience year, health, male, occupation, private sector, regular worker, urban, region dummy variables are estimated, these results are not shown in the Table.

Source: Calculated based on CHNS1989-2011.

The calculated results based on a DID model shown in Table 2 did not consider the other factors which may affect wage. When the other factors are controlled, does the higher education expansion policy affect the wage level of college graduates? Table 3, Table 4 and Table 5 summarizes the econometric analysis results. Panel A is the results based on DID model, and Panel B is the results based on DDD model. The main findings are as follow:

First, based on the results shown in Table 3, the coefficients of DDD item are not statistically significant in both Panel A and Panel B. It indicates that, generally, the higher education expansion policy does not affect the average wage level of young college graduates.

The results based on quantile regression model are shown in Table 4. For both low-wage (10^{th}), middle-wage (30^{th}, 60^{th}) and high-wage (90^{th}) groups, the coefficients of DD item are not statistically significant. It suggests that the difference of policy effect between various wage centile groups is small.

Table 5. Results of period effect of the impact of higher education expansion policy on the wage of college graduates

Panel A: DD model									
	Model 1			Model 2			Model 3		
	coeff.		S.E.	coeff.		S.E.	coeff.		S.E.
Treatment	0.145		0.436	0.376		0.417	0.076		0.180
Year	0.690	***	0.233	0.766	***	0.205	0.607	***	0.085
DDy2004	-0.585		0.620	-0.777		0.574	-0.550	**	0.244
DDy2006	-0.388		0.586	-0.576		0.559	-0.279		0.235
DDy2009	-0.287		0.598	-0.318		0.576	0.008		0.240
DDy2011	-0.085		0.523	-0.180		0.493	0.151		0.209
Constants	2.180	***	0.329	1.985	***	0.357	1.700	***	0.171
Inverse Mills ratio	-2.714	**	1.139	-2.341	**	0.937	-0.760	*	0.456
Obsevations	980			980			980		
Prob>chi2	0.0821			0.000			0.000		
Panel B: DDD model									
Treatment	0.035		0.251	0.099		0.259	-0.057		0.221
College	0.467		0.212	0.308		0.205	0.184		0.166
y2004	0.209		0.158	0.243		0.154	-0.001		0.129
y2006	0.094		0.160	0.133		0.156	-0.012		0.138
y2009	0.380	***	0.175	0.447	***	0.173	0.252		0.159
y2011	0.656	***	0.187	0.720	***	0.186	0.436	**	0.188
Year*College	0.025		0.234	0.015		0.223	0.114		0.178
College*Aged21-25	-0.033		0.540	0.134		0.548	0.067		0.463
Year*Aged21-25	0.099		0.302	0.107		0.315	0.233		0.260
DDDy2004	-0.149		0.813	-0.334		0.816	-0.257		0.663
DDDy2006	0.088		0.784	-0.150		0.810	-0.082		0.647
DDDy2009	-0.117		0.799	-0.173		0.831	-0.133		0.659
DDDy2011	-0.220		0.696	-0.360		0.704	-0.227		0.571
Constants	1.769	***	0.240	1.876	***	0.307	2.131	***	0.326
Inverse Mills ratio	-3.296	***	1.137	-3.060	***	1.029	-2.302	***	0.872
Obsevations	4046			4046			4046		
Prob>chi2	0.000			0.000			0.000		

Note. 1) *, **, ***: statistical significant levels are10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table. 3) In the second step examination, experience year, health, male, occupation, private sector, regular worker, urban, region dummy variables are estimated, these results are not shown in the Table.

Source: Calculated based on CHNS1989-2011.

Finally, to compare the influence of the policy on wage by different periods (e.g. a short term, or a long term after the policy implementation), the year dummy variable is used and the results are summarized in Table 5. The results based on DD model indicates that the higher education expansion policy negatively affected wages in

2004, whereas the coefficients of DD items are not statistically significant for 2006, 2009 and 2011. It indicates that the higher education expansion policy may decrease the wage level of new college graduates in the short term, whereas the negative effect disappears in the long term. The reason for the results can be considered as follows. Firstly, in the short term, here 2004, the great increase of college graduates from 0.95 million in 2000 to 2.39 million in 2004 became a great shock of labor supply of higher education workers, which may reduce the probability of labor participation for young college graduates and decrease the higher education graduate group's wage level. Second, in a long term, with economic growth and technological progress, labor supply and demand can be adjusted by the general equilibrium mechanism, and the negative effect of the policy may become smaller or disappear.

5.2 The Results of the Impact of the Higher Education Expansion Policy on Wage by Groups

In China, various groups segment the labor market. Does the impact of higher education expansion policy differ between various groups? The results by various groups are summarized in Table 6 (Eastern, Central, Western Region groups), Table 7 (urban and rural registration groups), and Table 8 (gender groups).

First, with regard to regional disparity, the results in Table 6 show that although the policy effect is a negative value for the Eastern Region and a positive value for the no-Eastern Region, these results are not statistically significant. The results indicate that the difference of the impact of the policy on college graduates wage between Eastern, Central and Western Region groups is small. Two cause may be considered. First, during the 2000s, the Chinese government promoted the economic development in the Western, and Central Regions to reduce the regional disparity, and the GDP growth rate became greater for the Western and Central Regions than for the Eastern Region. For example, the GDP growth rate was 7.8 % for the Western Region, 10.5% for the Central Region, and 7.2% for the Eastern Region in 2009 (NBS, 2010). Currently, economic growth in Western and Central Regions may increase the college graduate labor demand in these regions. Second, with the deregulation of the registration system, labor migrations between various regions became easier during the 2000s. Labor migration may cause the various regional wage levels convergence.

Table 6. Results of the impact of the higher education expansion policy on wage by regions

Panel A: DD model						
	Eastern			Central/Western		
	coeff.		S.E.	coeff.		S.E.
Treatment	0.165		0.916	-0.050		0.253
Year	0.397		0.466	0.502	***	0.116
DD	-0.060		0.933	0.221		0.295
Constants	2.401	***	0.861	1.361	***	0.260
Inverse Mills ratio	-2.740		2.035	-0.172		0.390
Observations	533			447		
Prob>chi2	0.000			0.000		
Panel B: DDD model						
Treatment	0.197		0 577	-0.097		0.187
Year	0.045		0.321	0.213	**	0.090
College	0.321		0.439	0.169		0.137
Year*College	0.049		0.460	0.175		0.151
Year*Aged21-25	-0.022		1.113	0.067		0.397
College*Aged21-25	-0.039		0.662	0.415		0.222
DDD	0.111		1.235	-0.313		0.466
Constants	2.880	***	0.579	1.637	***	0.202
Inverse Mills ratio	-3.359	***	1.077	-1.572	***	0.450
Observations	1712			2352		
Prob>chi2	0.796			0.000		

Note. 1) *, **,***: statistical significant levels are 10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table. 3) In the second step examination, experience year, health, male, occupation, private sector, regular worker, urban, region dummy variables are estimated, these results are not shown in the Table.

Source: Calculated based on CHNS1989-2011.

Table 7. Results of the impact of higher education expansion policy on wage by urban and rural groups

Panel A: DD model						
	Urban			Rural		
	coeff.		S.E.	coeff.		S.E.
Treatment	0.213		0.210	-0.538		0.344
Year	0.633	***	0.108	0.406	***	0.135
DD	-0.301		0.221	0.819	**	0.374
Constants	1.975	***	0.180	1.514	***	0.291
Inverse Mills ratio	-0.792	*	0.515	-0.009		0.421
Observations	645			335		
Prob>chi2	0.000			0.000		
Panel B: DDD model						
Treatment	0.126		0.130	-0.013		0.401
Year	0.187	**	0.080	0.144		0.182
University	0.490	***	0.106	0.267		0.323
Year*University	-0.018		0.163	-0.007		0.346
Year*Aged21-25	0.309		0.346	-0.555		1.010
University*Aged21-25	-0.700	***	0.182	0.242		0.449
DDD	-0.008	*	0.238	0.451		1.123
Constants	1.975	***	0.180	2.819	***	0.883
Inverse Mills ratio	-0.792	*	0.515	-2.850	***	0.788
Observations	2342			1857		
Prob>chi2	0.690			0.432		

Note. 1) *, **,***: statistical significant levels are 10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table. 3) In the second step examination, experience year, health, male, occupation, private sector, regular worker, urban, region dummy variables are estimated, these results are not shown in the Table.

Source: Calculated based on CHNS1989-2011.

Table 8. Results of the impact of higher education expansion policy on wage by gender

Panel A: DD model						
	Male			Female		
	coeff.		S.E.	coeff.		S.E.
Treatment	0.035		0.252	0.290		0.323
Year	0.641	***	0.127	0.622	***	0.138
DD	-0.060		0.264	-0.255		0.344
Constants	1.829	***	0.236	1.655	***	0.249
Inverse Mills ratio	0.247		0.612	-1.011	**	0.470
Observations	572			408		
Prob>chi2	0.000			0.000		
Panel B: DDD model						
Treatment	0.069		0.428	-0.144		0.671
Year	0.085		0.213	-0.096		0.376
College	0.162		0.313	0.289		0.523
Year*College	0.222		0.340	0.086		0.553
Year*Aged21-25	-0.045		0.842	0.077		1.570
College*Aged21-25	0.206		0.507	0.298		0.784
DDD	-0.189		0.973	-0.270		1.748
Constants	2.235	*	1.200	2.943		2.301
Inverse Mills ratio	-0.394		1.520	-1.446		1.615
Observations	2342			1722		
Prob>chi2	0.690			0.999		

Note. 1) *, **, ***: statistical significant levels are 10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table. 3) In the second step examination, experience year, health, male, occupation, private sector, regular worker, urban, region dummy variables are estimated, these results are not shown in the Table.

Source: Calculated based on CHNS1989-2011.

Second, it is known that in China there remains the discrimination against migrants by the *Hukou* system, and there persists the wage gap between the local urban residents and the migrants in Chinese urban labor market. The analyses for the rural and urban groups are summarized in Table 7. It suggests that the policy positively affects the wage of the migrants (Panel A); whereas, the policy negatively affects the wage of the local urban residents (Panel B).

The reasons can be considered as follows. Firstly, because there remains the discrimination against migrants during both the pre-policy period and the post-policy period, the wage of migrant college graduates is lower and the wage rise is smaller than for the urban college graduates. When the discrimination against migrants did not appeared, even after the higher education expansion policy was implemented, for the migrant group, the wage gap of college graduates aged 21 to 25 and the group aged 31 to 40, the wage gap between the college graduates and the senior high school graduates, and the wage gap between pre-policy and post-policy may be smaller than the urban college graduates. Therefore, the results in Panel A show that the policy only negatively influenced the wage of local urban residents. Whereas, when the human capital and other factors are consistent, because the average wage level is lower for migrants than local urban residents, the labor demand for migrants may increase, which causes the migrant college graduates' wage rise during the post-policy period. Therefore, as it is shown in Panel B, the policy may positively affect the wage of migrant groups. It indicates that there may remain the substitutions of labor demand for the young college graduates between the migrants and urban residents. More detailed study is needed on this issue.

Third, the results in Table 8 indicate that in both male and female groups, the impacts of the policy on wage are not statistically significant. It indicates that the gender gap of the policy influence on wage is small. It may be caused by that the gender gap for the young college group is smaller than for the middle age or older age groups.

5.3 Robustness Checks Using Various Treatment Groups

Two types of treatment groups are used to investigate if the policy effect varies by treatment group constructions. The results are summarized at Table 9. Estimation 1 is the analysis using the college graduates aged 21 to 27 as the treatment group. Estimation 2 is the analysis using the college graduate aged 21 to 30 as the treatment group. It is found that the results for these two varied treatment groups are similar: the policy effects are not statistically significant. In comparison with the results of Panel A in Table 3 which uses the same model, it is indicated that the estimated results are sensitive for the treatment group setting.

Why is the policy effect different for the college graduate group aged 21 to 25, and the group aged 21 to 27 or the group aged 21 to 30? It can be thought that a new college graduate aged from 21 to 25 searches for his (her) work in the first career period. When the labor demand is consistent, the increase of new college graduates labor supply may reduce the wage level of this group easily and quickly. Thus the results for the policy impact is more sensitive for the young college graduates who are aged 21 to 25 than for the group aged 21 to 27 or aged 21 to 30 years old.

Table 9. Results using various treatment groups

Estimation 1(college graduates aged 21 to 27)									
	Model 1			Model 2			Model 3		
	coeff.		S.E.	coeff.		S.E.	coeff.		S.E.
Treatment	0.010		0.397	0.182		0.389	-0.016		0.156
Year	0.675	***	0.251	0.751	***	0.233	0.594	***	0.096
DD	-0.225		0.415	-0.309		0.404	-0.073		0.163
Exp.	-0.093		0.077	-0.092		0.071	-0.035		0.029
Exp-sq.	0.007		0.007	0.007		0.007	0.004		0.003
Health				-0.007		0.028	-0.009		0.012
Male				0.078		0.162	0.110	*	0.064
Occupation (Clerk)				0.235		0.186			
Manager				0.016		0.251	0.305	***	0.073
Technician				-0.095		1.077	0.042		0.097
Agri.				-0.239		0.379	-0.036		0.670
Manufacturing job(H)				-0.256		0.541	-0.170		0.147
Manufacturing job(L)				-0.008		0.363	0.041		0.228
Service				0.061		0.277	0.013		0.142
Others							0.065		0.118

Regular worker							0.002		0.073
Private sector							-0.046		0.129
Urban							0.252	***	0.071
Region(East)									
Central							-0.325	***	0.099
West							-0.231	**	0.111
Constants	2.167	***	0.346	1.984	***	0.390	1.797	***	0.187
Inverse Mills ratio	-2.912	**	1.307	-2.662	**	1.137	-1.015	*	0.580
Observations	1116			1116			1116		
Prob>chi2	0.057			0.066			0.000		
Estimation 2 (college graduates aged 21 to 30)									
	Model 1			Model 2			Model 3		
	coeff.		S.E.	coeff.		S.E.	coeff.		S.E.
Treatment	0.010		0.397	0.223		0.463	0.046		0.286
Year	0.675	***	0.251	0.710	**	0.329	0.554		0.207
DD	-0.225		0.415	-0.213		0.480	-0.027		0.297
Exp.	-0.093		0.077	-0.055		0.095	-0.024		0.058
Exp-sq.	0.007		0.007	0.004		0.009	0.003		0.006
Health				-0.008		0.035	-0.009		0.022
Male				0.039		0.205	0.055		0.125
Occupation (Clerk)									
Manager				0.251		0.235	0.295	**	0.141
Technician				0.056		0.320	0.070		0.189
Agri.				0.239		1.262	0.066		1.120
Manufacturing job(H)				-0.182		0.462	-0.142		0.276
Manufacturing job(L)				-0.317		0.664	-0.072		0.435
Service				-0.073		0.461	-0.074		0.274
Others				0.090		0.360	0.080		0.233
Regular worker							0.015		0.138
Private sector							-0.029		0.265
Urban							0.162		0.135
Region(East)									
Central							-0.246		0.207
West							-0.161		0.228
Constants	2.167	***	0.346	2.040	***	0.509	1.975	***	0.362
Inverse Mills ratio	-2.912	**	1.307	-3.766	***	1.741	-2.201		1.413
Obsevations	1454			1454			1454		
Prob>chi2	0.531			0.872			0.872		

Note. 1) *, **,***: statistical significant levels are 10%, 5%, 1%. 2) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table.

Source: Calculated based on CHNS1989-2011.

5.4 The Results of the Placebo Test

A placebo test is used to test the propriety of the DID/DDD models used in the study. It is thought that the higher education expansion policy greatly affects the college graduate labor supply, whereas the influence of the policy on senior high school graduates is smaller. Therefore, when the senior high school graduate sample is used to take a similar analysis based on the DID model, the results should be different to that shown in Panel A of Table 3. In the placebo test, the treatment group is defined as the senior high school graduates aged 21 to 25, and the treatment group is defined as the senior high school graduates aged 31 to 40. The results are summarized in Table 10. It is found that the whole coefficient of DD items are not statistically significant. It is clearly that these results are different from those shown in Table 3.

Table 10. Results of the placebo test

	Model			Model 2			Model 3		
	coeff.		S.E.	coeff.		S.E.	coeff.		S.E.
Treatment	-0.539		0.416	-0.318		0.413	-0.342		0.394
Year	0.174		0.171	0.250		0.166	0.048		0.175
DD	0.237		0.306	0.206		0.313	0.223		0.304
Exp.	-0.073		0.087	-0.061		0.086	-0.039		0.081
Exp-sq.	0.001		0.006	0.000		0.005	0.000		0.005
Health				-0.008		0.027	-0.023		0.027
Male				-0.115		0.143	-0.146		0.140
Occupation (Clerk)									
Manager				0.096		0.206	0.106		0.190
Technician				0.240		0.269	0.177		0.247
Agriculture				-0.013		0.313	0.106		0.368
Manufacturing job(H)				-0.129		0.213	-0.125		0.201
Manufacturing job(L)				-0.232		0.218	-0.238		0.209
Service				0.004		0.213	-0.048		0.206
Others				-0.042		0.212	0.057		0.232
Regular worker							-0.008		0.131
Private sector							-0.055		0.234
Urban							-0.075		0.151
Region(East)									
Central							-0.218		0.149
West							0.070		0.203
Constants	2.653	***	0.471	2.720	***	0.565	3.125	***	0.596
Inverse Mills ratio	-3.375	***	0.990	-3.113	***	0.926	-2.757	***	0.775
Observations	1892			1892			1892		
Prob>chi2	0.0276			0.094			0.807		

Note. 1)*, **, ***: statistical significant levels are 10%, 5%, 1%. 2) Treatment group: senior high school graduates aged from21to 30 years old Control group: senior high school graduates aged from 31 to 40 years old.

3) Heckman two step model is used. In the first step estimation, the age, health status, family number, gender, no-earning income, urban registration, region block (Central, Western Region), region level variables including ratio of fixed asset investment to GDP, ratio of tertiary to GDP, ratio of trade to GDP, GDP per capita are estimated, these results are not summarized in the Table.

Source: Calculated based on CHNS1989-2011.

6. Conclusions

In 1999, the Chinese government implemented a higher education expansion policy. With the implementation of the policy, new college graduates increased yearly from 0.8 million to 6.1 million from 1999 to 2011 (NBS, 2016). It is thought this dramatic increase in the college graduate labor supply may affect the wage level of young college graduates. Based on the quasi-natural experiment models (DID model and DDD model), using six waves (1997, 2000, 2004, 2006, 2009, and 2011) of Chinese Health and Nutrition Survey (CHNS) longitudinal survey data, this study employs an empirical study to provide new evidences on the issue.

Five major conclusions emerge. First, in general, the higher education expansion policy does not affect the wage level of young college graduates. Second, the difference of policy impact on wage by various wage centiles is small. Third, the higher education expansion policy decreased the wage level of new college graduates in the short term (in 2004); whereas the negative effect disappears in the long term (in 2006, 2009, and 2011). Fourth, to consider the group heterogeneities of policy impacts, it is shown that the difference between the Eastern, Central and Western Region groups and the gender gaps are small, whereas the policy impact differ by the urban and rural groups. Fifth, the results for the policy impacts are more sensitive for the young college graduates aged from 21 to 25 than for the group aged from 21 to 27 or aged from 21 to 30. The placebo test results show that the DD model and the DDD model used in this study are appropriate.

Based on these empirical study results, some policy implications emerge. First, it suggests that in a short term, the policy may affect the wage level of new college graduates, but in a long term, the negative effect of the policy on wages may disappear. Wolf (2002), De Meulemeester and Rochat (1995) argued that higher education can contribute to economic growth by training intellectuals and facilitating scientific and technological innovation, or if the content of the courses is directed towards a productive objective. It indicates that from a

long-term perspective, with economic growth and technological innovation, the labor demand for highly-educated labor should increase, and as a result the increase of college graduates supply can be absorbed. An important issue for the government is to promote the economic growth through the implementation of the higher education expansion policy and to upgrade industry structure based on the technological innovation. Second, it is clear that the impact of the higher education expansion policy on wage differs between migrants and local urban residents. It may be caused by the discrimination against migrants in the Chinese urban labor market. Maurer-Fazio and Dinh (2004), Wang (2005), Deng (2007), Xie and Yao (2006), Meng and Wu (2014), Chang and Zhao (2016), Ma (2018a, 2018b) show that there remains the wage gap between migrants and local urban residents, and the unexplained parts including the discrimination against migrants is the main factor. These evidence suggests Chinese government need to improve the *Hukou* system reform to reduce the discriminations against the migrants in urban labor market.

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Notes

Note 1. In China there are two types of colleges: colleges with three years of study course, and universities with four or five years of study course. In the study, the two types are referred to simply as "college".

Note 2. In China, college includes regular college and irregular college (such as colleges which provide education courses at night, or colleges which provide the education courses by television communication).

Note 3. For the impact of higher education expansion policy on employment, please refer to Wu and Zhao (2010), Xing and Li (2011), Li, Whalley, and Xing (2014), Yao, Fang, and Zhang (2013), Knight, Deng, and Li (2017) and Ma (2018a).

Note 4. Regional level variables are obtained from the China Statistics Yearbook in each survey year.

Appendix

Appendix 1. Descriptive statistics

	College aged 21-25		College aged 31-40		Senior high school aged 21-25	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
lnwr	2.282	0.754	2.337	0.929	1.730	0.799
exp	8	1	19	3	11	1
family number	4	1	4	1	4	1
health	6.842	2.662	5.905	2.935	6.434	2.591
male	0.596	0.492	0.586	0.493	0.549	0.498
no-earning income	48077	90626	38849	41826	32475	50876
Occupation						
Manager	0.247	0.433	0.459	0.499	0.103	0.304
Technician	0.075	0.265	0.139	0.347	0.029	0.169
Clerk	0.411	0.494	0.228	0.420	0.190	0.393
Agri.	0.000	0.000	0.003	0.051	0.026	0.158
Manufacturing job (H)	0.055	0.228	0.045	0.207	0.205	0.405
Manufacturing job (L)	0.021	0.142	0.011	0.102	0.136	0.343
Service	0.082	0.276	0.045	0.207	0.223	0.417
Others	0.110	0.313	0.071	0.257	0.088	0.284
Regular worker	0.568	0.497	0.793	0.405	0.458	0.499
Private sector	0.123	0.330	0.038	0.192	0.040	0.197
Urban registration	0.699	0.460	0.657	0.475	0.520	0.501
Region						
East	0.664	0.474	0.613	0.487	0.505	0.501
Central	0.288	0.454	0.284	0.451	0.333	0.472
West	0.048	0.214	0.103	0.304	0.161	0.368
Regional level variables						
Ratio of fixed asset investment to GDP	0.417	0.147	0.426	0.162	0.447	0.164
Ratio of trade to GDP	0.422	0.155	0.454	0.178	0.340	0.079
Ratio of tertiary industry to GDP	0.513	0.524	0.453	0.452	0.257	0.286
GDP per capita	39424	30197	43018	30097	23130	20092
Survey year						
y1997	0.096	0.295	0.061	0.239	0.198	0.399
y2000	0.068	0.253	0.107	0.309	0.172	0.378
y2004	0.137	0.345	0.093	0.291	0.139	0.347
y2006	0.158	0.366	0.113	0.317	0.099	0.299
y2009	0.151	0.359	0.112	0.315	0.147	0.354
y2011	0.390	0.490	0.514	0.500	0.245	0.431

Source: Calculated based on CHNS1989-2011.