Chapter 7

The Impact of Higher Education Expansion Policy on the Wages of Female and Male College Graduates

Abstract Based on the quasi-natural experiment methods (DID method and DDD method), using six waves longitudinal survey data of the China Health and Nutrition Survey, this study investigates the influence of the Higher Education Expansion Policy (HEEP) on the wage levels of young college graduates and compare the different policy influences by gender. The results indicate that the HEEP does not affect the wage levels of young college graduates significantly; the HEEP decreased the wage level of new college graduates in the short term, whereas the negative effect disappears in the long term for both female and male younger workers; the gender differences in the impacts of the policy on the wage levels of new college graduates are smaller.

Keywords Higher education expansion policy · College graduates · Gender · Wage · China

7.1 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 (HEEP) was implemented by the government. Along with the policy implementation, the number of college graduates increased from 1.08 million in 1998 to 6.381 million in 2013 (NBS 2016).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

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may increase even after the implementation of the HEEP (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 the DID method (Difference in difference method) and DDD method (triple differences method) to estimate the impact of the HEEP on college graduates' wages in China, and compare of the differences of impacts by female and male groups. It uses data from a longitudinal survey data from the Chinese Health and Nutrition Survey (CHNS) conducted from 1997 to 2011. These analyses build on the findings of relevant published research.

This chapter is structured as follows: Sect. 7.2 introduces the implementation of higher education expansion policy, Sect. 7.3 introduces the channels by which the HEEP y can affect college graduates wage, and introduces previous empirical studies on the issue. Section 7.4 gives the framework of the empirical analysis, including models and datasets. Section 7.5 presents estimated results and explains these results. Section 7.6 summarizes the conclusions.

7.2 Hight 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 HEEP during the market-oriented economy period (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% 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 Fig. 7.1). From 2000 to 2011 the enrollment of regular college² students expanded from 5.56 to 26.25 million, and annual college graduate students increased from 0.95 to 6.81 million. From 2000 to 2015 enrollment of senior high school students expanded from 12.01 to 23.74 million, and annual college graduate students increased from 30.15 to 79.77 million. It is observed that with the implementation of the HEEP, both the students and graduates of college and senior high school increase

Panel A: Number of Students

Unit: 10 thousands

Panel B: Number of Graduates

Unit: 10 thousands

Fig. 7.1 Numbers of students in schools and graduates from 1990 to 2015. *Source* Based on data from *China Statistics Yearbook 2016*

greatly. It is thought that the increase in the higher education labor supply affects the employment of young graduates.

7.3 Literature Review

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

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

First, based on the general market equilibrium mechanism, when the labor demand is constant, 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).

Second, 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).

Third, according to signal theory (Spence 1976), 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's ability based on the employee's educational attainment. When the firm believes the 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.

7.3.2 Previous Empirical Studies on the Issue

For the empirical study results on the impact of the HEEP on the labor market, we summarize its impact on wage as follows.³

He (2009) used 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) analyzed 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 19–26 and the group aged 27–55. They found 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) estimated the education return based on OLS and instrument variables methods, they indicate that the education return increased from 2001 to 2005 and 2010. Xia et al. (2016) employed CHNS data from 2000 to 2009 to estimate education return based on the quantile regression model and Firpo, Fortin, and Lemieux (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) addressed this and estimate the impact of the HEEP on wage directly based on a DID method and DDD method 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 DID method whereas the impact of the policy on wages are not statistically significant based on DDD method Yao et al. (2014) also estimated the policy influence based on DID and DDD methods 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) used the same DID and DDD methods to find a different outcome for the impact of policy on wage. This suggests that more research is needed on this topic.

7.3.3 Contributions of This Study

Although 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. The main contributions of this current study can be summarized as follows.

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 DID and DDD methods which scrutinizes the short term and long-term effects. This study tries to address this need.

Second, because there remains the gender wage gap in China (Gustafsson and Li 2000; Li and Ma 2006, 2015; Ma et al. 2013; Ma 2018a, b), to consider the gender disparities of the family responsibility, labor participation behavior and work efforts, this study also compares the policy influence by gender.

Third, as the one of features of Chinese economy, the Chinese labor market is segmented by various sectors and regions. For example, due to the large regional disparity in China, the impact of the policy may differ by regions. 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 *Hukou* system (Meng and Zhang 2001; Song and Appleton 2006; Ma 2018c), we also investigate the policy effects by the rural *Hukou* and urban *Hukou* resident groups.

Fourth, a set of robustness checks is employed to test the analysis appropriateness. These results may develop previous studies on the issue.

7.4 Methodology and Data

7.4.1 Model

The DID method is used to investigate the impact of higher education expansion policy on wages:

$$Y_{it} = a + \beta_1 Year_t + \beta_2 Treat_{it} + \beta_3 Treat_{it} * Year_t + \beta_4 X_{it} + \varepsilon_{it} \quad (7.1)$$

The object analyzed by the DID method is the college graduates aged 21–40. In Eq. (7.1), 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 – β_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 21–25 and the control group is defined as college graduates aged 31–40.

The DDD method is shown by Eq. (7.2). The object analyzed by the DDD method includes both college and senior high school graduates aged 21–40.

$$Y_{it} = a + \beta_1 Year_t + \beta_2 age_{21-25it} + \beta_3 Colle_{it} + \beta_4 age_{21-25t} * Colle_{it} * Year_t + \beta_5 X'_{it} + \beta_\lambda \lambda_{it} + \varepsilon_{it} \quad (7.2)$$

In Eq. (7.2), age_{21-25} is the group aged 21–25, $Colle$ 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 Eqs. (7.1) and (7.2), 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 method or DDD method based on the Heckman two-step model is also used to correct the bias (Heckman 1979). In Eqs. (7.1) and (7.2), the inverse Mills' ratio λ is an adjusted item. λ is calculated by $\lambda = \phi(\gamma_t Z_{it}) / \Phi(\gamma_t Z_{it})$, $\phi(\cdot)$, $\Phi(\cdot)$ 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.

7.4.2 Data

This study employs six waves (1997, 2000, 2004, 2006, 2009, and 2011) longitudinal 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. 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 and municipalities: Beijing, Liaoning, Heilongjiang, Shanghai, Jiangsu, Shandong, Hernan, Hubei, Hunan, Guangxi, and Guizhou.

The independent variable is the logarithms value 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 7.2 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 21–25; college graduates aged 31–40, and senior high school graduates aged 21–25. The change

Fig. 7.2 Wage by age and education groups from 1989 to 2011. *Source* Calculated based on CHNS 1989–2011

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 indicates 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 Fig. 7.2 are as follows.

First, when compare the college graduates aged 21–25 with the college graduates aged 31–40, it is observed that except in 1993 and 1997, the wage is higher for the college graduates aged 21–25 than for the college graduates aged 31–40 during both pre-policy period and post-policy period. However, for college graduates aged 21–25, 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.

Second, to compare the college graduates aged 21–25 with the senior high school graduates aged 21–25, 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 from 21 to 25 than the counterpart, whereas the wage is higher for college graduates aged 21–25. Moreover, during the post-policy period, the wage is higher for college graduates aged 21–25 in 2006 and it is lower in 2009 and 2011 than for the counterpart.

7.4.3 Variable Setting

The main dependent variables are constructed as follows (see Appendix Table 7.11). 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 Eq. (7.1) 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 21–25. *DDD* in Eq. (7.2) 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 ($Year * Age_{21-25} * Colle$).

Second, for the other factors, (1) the years of experience 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 groups and regions, the private sector dummy, the urban areas, 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, number of

family members, gender, health status, urban hukou, 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.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:

$$Y_{it} = a + \beta_1 year_i + \beta_2 age_{it} + \beta_{3a} \sum_{a=21}^{30} age_{it} * year_t + \beta_4 X_{it} + \varepsilon_{it} \quad (7.3.1)$$

$$Y_{it} = a + \beta_1 year_i + \beta_2 age_{it} + \beta_3 Colle_{it} + \beta_{3a} \sum_{a=21}^{30} age_{it} * year_t * Colle_{it} + \beta_4 X_{it} + \varepsilon_{it} \quad (7.3.2)$$

In Eqs. (7.3.1) and (7.3.2), 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, X for the individual characteristics variables (e.g. family numbers, health status, gender), the regional characteristics variables and other variables. In the Eq. (7.3.2), 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 represents the estimated coefficient for each variable. The results of β_{3a} are summarized in Table 7.1.

The results indicate that although all coefficients are not statistically significant, the higher education expansion policy negatively influences the wage of college graduates aged 21–25; whereas it almost positively affects the wage of the university graduates aged 26–30. It is observed that the influences of the policy are different between the group aged 21–25 and the group aged 26–30. The results of estimation 2 showed a similar tendency, the influence of the policy is negative for the treatment group (group aged 21–25), whereas they are almost positive for the other group. It is confirmed that to define the treatment group as college graduates aged 21–25 is appropriate. However, the impacts of the policy on the college graduate group aged 26–30 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 Sect. 7.5.

Table 7.1 Test results for treatment group setting

	Model 1: DID		Model 2: DDD	
	coef.	S.E.	coef.	S.E.
Age 21	−0.065	0.265	−0.079	0.399
Age 22	−0.116	0.194	−0.259	0.305
Age 23	−0.110	0.206	−0.237	0.324
Age 24	0.123	0.164	0.272	0.259
Age 25	−0.079	0.106	−0.031	0.233
Age 26	−0.015	0.125	0.610**	0.271
Age 27	0.033	0.098	0.115	0.235
Age 28	0.220**	0.095	0.106	0.238
Age 29	0.033	0.087	0.274	0.227
Age 30	0.058	0.084	0.151	0.220

Source Calculated based on CHNS 1989–2011

Note

(1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) The treatment group, age, year, male, health status, occupation, private sector, regular worker, urban hukou, province dummy variables are estimated, these results are not expressed in this table. The DID item and DDD item coefficients are only shown in this table

7.5 Results

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

The calculated results based on DID method are shown in Table 7.2. The treatment group is college graduates aged 21–25, the control group is college graduates aged 31–40. 2000 is the pre-period of policy implementation, and 2004, 2006, 2009, 2011 are the post-periods. The values of coefficients of DID items are from −0.109 to −3.447, it is shown that the HEEP 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 influences differ by the short term and the long term after the policy implementation.

The calculated results based on a DID method shown in Table 7.2 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? Tables 7.3, 7.4 and 7.5 summarizes the econometric analysis results. Panel A is the results based on DID method, and Panel B is the results based on DDD method. The main findings are as follow:

First, based on the results shown in Table 7.3, the coefficients of DDD item are not statistically significant in both Panel A and Panel B. It indicates that, generally, the

Table 7.2 Calculated result based on the DID method

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

Source Calculated based on CHNS 1989–2011

Note

(1) Values in parentheses are standard deviation

(2) Treatment group is the college graduates aged 21–25; Control group is the college graduates aged 31–40

higher education expansion policy does not affect the average wage level of young college graduates.

The results based on the quantile regression model are shown in Table 7.4. For both low-wage (10th), middle-wage (30th, 60th) and high-wage (90th) groups, the coefficients of DID item are not statistically significant. It suggests that the difference of policy effect between various wage centile groups is small.

Finally, to compare the influence of the HEEP 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 7.5. The results based on DID method indicates that the higher education expansion policy negatively affected wages in 2004, whereas the coefficients of DID items are not statistically significant for 2006, 2009 and 2011. It indicates that the HEEP 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. First, in the short term,

Table 7.3 Results of the impact of the higher education expansion policy on the wage of college graduates

Panel A: DID method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	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
DID	−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			−0.119	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	2.0124	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 method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
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 * Aged 21–25	0.113	0.489	0.128	0.524	0.234	0.475

(continued)

Table 7.3 (continued)

Panel B: DDD method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
College * Aged 21–25	−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)						
Manager			0.207	0.211	0.209	0.179
Technician			0.125	0.284	0.120	0.241
Agriculture			0.0111	0.436	0.037	0.471
Manufacturing job (H)			−0.133	0.260	−0.127	0.227
Manufacturing job (L)			−0.260	0.275	−0.218	0.249
Service			−0.036	0.261	−0.062	0.230
Others			−0.007	0.247	0.084	0.248
Regular worker					0.021	0.142
Private sector					−0.013	0.272
Urban					−0.125	0.155
Region (East)						
Central					−0.171	0.160
West					0.048	0.224
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	4,064		4,064		4,064	
Prob > chi2	0.151		0.547		0.778	

Source Calculated based on CHNS 1989–2011

Note

(1) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table

Table 7.4 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**	0.630***	0.445***
	(0.241)	(0.091)	(0.079)	(0.150)
DID	−0.097	−0.028	−0.0226	−0.084
	(0.581)	(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	0.112	0.146	0.1407	0.14

Source Calculated based on CHNS 1989–2011

Note

- (1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$
- (2) The coefficients, standard error and statistical significances are summarized in this table
- (3) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table
- (4) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table
- (5) The quantile regression model is used

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.

Table 7.5 Results of period effect of the impact of higher education expansion policy on the wage of college graduates

Panel A: DID method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	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
DIDy2004	−0.585	0.620	−0.777	0.574	−0.550**	0.244
DIDy2006	−0.388	0.586	−0.576	0.559	−0.279	0.235
DIDy2009	−0.287	0.598	−0.318	0.576	0.008	0.240
DIDy2011	−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
Observations	980		980		980	
Prob > chi2	0.082		0.000		0.000	
Panel B: DDD method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
Treatment	0.035	0.251	0.0992	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 * Aged 21–25	−0.033	0.540	0.134	0.548	0.067	0.463
Year * Aged 21–25	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	−0.083	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
Observations	4,046		4,046		4,046	

(continued)

Table 7.5 (continued)

Panel B: DDD method						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
Prob > chi2	0.000		0.000		0.000	

Source Calculated based on CHNS 1989–2011

Note

(1) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noeearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table

7.5.2 The Results of the Impact of the Higher Education Expansion Policy on Wage by Gender

Does the impact of the HEEP differ by males and females? The results by gender are summarized in Table 7.6. It indicates that in both male and female groups, the impacts of the policy on wage are not statistically significant. It indicates that the

Table 7.6 Results of the impact of higher education expansion policy on wage by gender

Panel A: DID method				
	Female		Male	
	coef.	S.E.	coef.	S.E.
Treatment	0.290	0.323	0.035	0.252
Year	0.622***	0.138	0.641***	0.127
DID	−0.255	0.344	−0.060	0.264
Constants	1.655***	0.249	1.829***	0.236
Inverse Mills ratio	−1.011**	0.470	0.247	0.612
Observations	408		572	
Prob > chi2	0.000		0.000	
Panel B: DDD method				
	Female		Male	
	coef.	S.E.	coef.	S.E.
Treatment	−0.144	0.671	0.069	0.428
Year	−0.096	0.376	0.085	0.213
College	0.289	0.523	0.162	0.313

(continued)

Table 7.6 (continued)

Panel B: DDD method

	Female		Male	
	coef.	S.E.	coef.	S.E.
Year * College	0.086	0.553	0.222	0.340
Year * Aged 21–25	0.077	1.570	−0.045	0.842
College * Aged 21–25	0.298	0.784	0.206	0.507
DDD	−0.270	1.748	−0.189	0.973
Constants	2.943	2.301	2.235*	1.200
Inverse Mills ratio	−1.446	1.615	−0.394	1.520
Observations	1,722		2,342	
Prob > chi2	0.999		0.690	

Source Calculated based on CHNS 1989–2011

Note

(1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table

gender disparities of the influence of the HEEP 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.

7.5.3 The Results of the Impact of the Higher Education Expansion Policy on Wage by Region and Hukou Groups

(1) The results by region

Table 7.7 summarizes the results by Eastern Region and no-Eastern Region (Western and Central Region). It is shown 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 reasons may be considered for the results. First, during the 2000s, the Chinese government promoted the economic development in the Western, and

Table 7.7 Results of the impact of the higher education expansion policy on wage by region

Panel A: DID method				
	East		Central/West	
	coef.	S.E.	coef.	S.E.
Treatment	0.165	0.916	−0.050	0.253
Year	0.397	0.466	0.502***	0.116
DID	−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 method				
	East		Central/West	
	coef.	S.E.	coef.	S.E.
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 * Aged 21–25	−0.022	1.113	0.067	0.397
College * Aged 21–25	−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	1,712		2,352	
Prob > chi2	0.796		0.000	

Source Calculated based on CHNS 1989–2011

Note

(1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, and urban dummy variables are also estimated, these results are not presented in this table

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.

(2) *The results by hukou type*

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 *hukou* residents and the migrants with rural *hukou* in Chinese urban labor market. The analyses for the rural *hukou* group and urban *hukou* group are summarized in Table 7.8. 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 *hukou* residents (Panel B).

The reasons can be considered as follows. First, because there remains the discrimination against migrants during both the pre-policy period and the post-policy period, the wage is lower and the wage rise is smaller for the migrants (Ma 2018c). When there maintains the discrimination against migrants, even after the HEEP was implemented, for the migrant group, the wage gap of college graduates aged 21–25 and the group aged 31–40, 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 those for the urban residents. Therefore, the results in Panel A show that the policy only negatively influenced the wage of local urban residents. Second, when the human capital and other factors are constant, because the average wage level is lower for migrants than local urban *hukou* 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 positively affected the

Table 7.8 Results of the impact of higher education expansion policy on employment by *hukou* type

Panel A: DID method				
	Urban		Rural	
	coef.	S.E.	coef.	S.E.
Treatment	0.213	0.210	−0.538	0.344
Year	0.633***	0.108	0.406***	0.135
DID	−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 method				
	Urban		Rural	
	coef.	S.E.	coef.	S.E.
Treatment	0.126	0.130	−0.0133	0.401
Year	0.187**	0.080	0.144	0.182

(continued)

Table 7.8 (continued)

Panel B: DDD method				
	Urban		Rural	
	coef.	S.E.	coef.	S.E.
University	0.490***	0.106	0.267	0.323
Year * University	−0.018	0.163	−0.007	0.346
Year * Aged 21–25	0.309	0.346	−0.555	1.010
University * Aged 21–25	−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	2,342		1,857	
Prob > chi2	0.690		0.432	

Source Calculated based on CHNS 1989–2011

Note

(1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noeearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, and region dummy variables are also estimated, these results are not presented in this table

wage of migrant groups. It indicates that there may remain the substitutions of labor demand for the young college graduates between the migrants and local urban *hukou* residents. More detailed study is needed on this issue.

7.5.4 Robustness Checks

(1) 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 7.9. Estimation 1 is the analysis using the college graduates aged 21–27 as the treatment group. Estimation 2 is the analysis using the college graduate aged 21–30 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 7.3 which uses the same model, it is indicated that the estimated results are sensitive for the treatment group setting.

Table 7.9 Results using various treatment groups

Estimation 1						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	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
DID	−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)						
Manager			0.235	0.186	0.3054***	0.073
Technician			0.016	0.251	0.042	0.097
Agri.			−0.095	1.077	−0.036	0.670
Manufacturing job (H)			−0.239	0.379	−0.170	0.147
Manufacturing job (L)			−0.256	0.541	0.041	0.228
Service			−0.008	0.363	0.013	0.142
Others			0.061	0.277	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	1,116		1,116		1,116	
Prob > chi2	0.057		0.066		0.000	
Estimation 2						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	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
DID	−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

(continued)

Table 7.9 (continued)

Estimation 2						
	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
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
Observations	1,454		1,454		1,454	
Prob > chi2	0.531		0.872		0.872	

Source Calculated based on CHNS 1989–2011

Note

(1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

(2) Heckman two step model is used. In the first step estimation, individual level variables including the age, health status, number of family members, gender, noearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table

(3) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table

Why is the policy effect different for the college graduate group aged 21–25, and the group aged 21–27 or the group aged 21–30? It can be thought that a new college graduate aged from 21–25 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 21–25 than for the group aged 21–27 or aged 21–30 years old.

(2) *The Placebo test*

A placebo test is used to test the propriety of the DID/DDD methods 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 method, the results should be different to that shown in Panel A of Table 7.3. In the placebo test, the treatment group is defined as the senior high school graduates aged 21–25, and the treatment group is defined as the senior high school graduates aged 31–40. The results are summarized in Table 7.10. It is found that the whole coefficients of DID items are not statistically significant. It is clearly that these results are different from those shown in Table 7.3.

Table 7.10 Results of the placebo test

	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	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
DID	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

(continued)

Table 7.10 (continued)

	Model 1		Model 2		Model 3	
	coef.	S.E.	coef.	S.E.	coef.	S.E.
Inverse Mills ratio	−3.375***	0.990	−3.113***	0.926	−2.757***	0.775
Observations	1,892		1,892		1,892	
Prob > chi2	0.0276		0.094		0.807	

Source Calculated based on CHNS 1989–2011

Note

- (1) Note *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$
- (2) Treatment group: senior high school graduates aged from 21 to 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, individual level variables including the age, health status, number of family members, gender, noeearned income, urban hukou, region block (Central, Western Region), and region level variables including ratio of fixed asset investment to GDP, ratio of tertiary industry to GDP, ratio of trade to GDP, and GDP per capita are estimated, these results are not presented in this table
- (4) In the second step examination, years of experience, health status, male, occupation, private sector, regular worker, urban, and region dummy variables are also estimated, these results are not presented in this table

7.6 Conclusions

In 1999, the Chinese government implemented a Higher Education Expansion Policy (HEEP). 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 methods (DID method and DDD method, using six waves (1997, 2000, 2004, 2006, 2009, and 2011) longitudinal survey data from the Chinese Health and Nutrition Survey (CHNS), this study employs an empirical study to provide new evidences on the issue.

Five major conclusions emerge. First, in general, the HEEP does not affect the wage level of young college graduates; the difference of policy impact on wage by various wage centiles is small; the HEEP 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). Second, the gender disparity of the impact of the HEEP on wage levels of young college graduates is small. Third, the regional disparity of the influence of the policy on wage between Eastern Region and Non-Eastern Region (Central Region, Western Region) is small. But there maintains a larger difference of the policy effect between urban *hukou* group and rural *hukou* group. Concretely, the policy positively affects the wage of the migrants most of whom are with the rural *Hukou*, whereas the policy negatively affects the wage of the local urban *Hukou* residents. Fourth, the robustness checks confirms these results.

Based on these empirical study results, it suggests that although the gender differences of the impact of the policy on the wage level of new college graduates is smaller, for both female and male workers, 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 HEEP and to upgrade industry structure based on the technological innovation.

Notes

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”.
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).
3. For the impact of higher education expansion policy on employment, please refer to Wu and Zhao (2010), Xing and Li (2011), Li et al. (2014), Yao et al. (2013), Knight et al. (2017) and Ma (2018a).
4. Regional level variables are obtained from the China Statistics Yearbook in each survey year.

Appendix

See Table 7.11.

Table 7.11 Descriptive statistics of variables

	College aged 21–25		College aged 31–40		Senior high aged 21–25	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
log.hourly wage	2.282	0.754	2.337	0.929	1.730	0.799
Exp	8	1	19	3	11	1
Number of family members	4	1	4	1	4	1
Health status	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
Noearned income	48,077	90,626	38,849	41,826	32,475	50,876

(continued)

Table 7.11 (continued)

	College aged 21–25		College aged 31–40		Senior high aged 21–25	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
<i>Occupation</i>						
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 hukou	0.699	0.460	0.657	0.475	0.520	0.501
<i>Region</i>						
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
<i>Regional level variables</i>						
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	39,424	30,197	43,018	30,097	23,130	20,092
<i>Survey year</i>						
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 CHNS 1989–2011

Note Calculated based on total samples including females and males

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