



The medium-run effect of China's higher education expansion on the unemployment of college graduates

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ABSTRACT

China's unemployment rate for new college graduates has increased significantly in recent years, and many people attribute this increase to the higher education expansion policy. In this paper, we use three nationally representative data sets for 2000, 2005, and 2010 to investigate the short and medium term effects of the expansion policy on the unemployment of college graduates. Treating higher education expansion as an exogenous shock and using a difference-in-difference (DID) strategy, we find that this policy increased the unemployment rate of new college graduates in the short run, but the unemployment rate kept declining and the dis-employment effect mostly disappeared after five years. We also find some heterogeneous effects by gender, region, and city.

1. Introduction

High youth unemployment is observed in a number of developed and developing countries and it is often prevalent among the college-educated workforce. Unemployment of the educated labor force often results in a waste of human capital and leads to serious economic and social problems, and thus has attracted much attention of policy makers and researchers. In this paper, we study the unemployment of young college graduates in China, focusing on those who have experienced the supply shock of higher education expansion (the treated or affected cohorts).

In 1999, the Chinese government made a bold decision to enlarge the scale of higher education. As a result, the number of new students admitted to college increased by over 40% between 1998 and 1999. The expansion continued in subsequent years and the number of new college students more than quadrupled (4.7) between 1998 and 2005. This *great leap forward* in higher education significantly increased the opportunity of higher education for young people. This policy is also controversial, and the arguments against it include the deterioration of education quality, increasing tuition, and increased unemployment among new college graduates. The last argument is supported by casual observations and rigorous empirical analysis. Li, Whalley, and Xing (2014) show that the expansion policy increases the unemployment rate of new college graduates by 6 to 9%. That paper uses the 2005 mini census and the 2000 census data to examine the effect of higher education expansion on unemployment for those aged 22–24 in 2005. The effect identified therein is the short-run effect, that is, the effect on those who have just entered the labor market. In this paper, we use the 2010 census data to examine the med-term unemployment effect on those affected cohorts who had entered the labor

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market for over 5 years.¹

Will the unemployment effect last in the medium run? What are the unemployment dynamics for the affected cohorts? Different answers to these questions imply significantly different labor market consequences of the expansion policy and thus have major policy implications. We address these questions using more recent data from the 2010 census in addition to the data sets of 2000 and 2005. These data allow us to track the employment behavior of the treated cohorts for a longer period of time. In particular, by comparing the unemployment rate for the same cohort affected by the expansion policy in 2005 (aged 22–24) and 2010 (aged 27–29), we find that their unemployment rate declined sharply in this five-year period.

Next, we use a difference-in-difference (DID) strategy to see the policy impact on the unemployment of the treated cohorts in the medium run. A simple exercise is to compare the unemployment of this specific treated cohort in 2010 with that of the unaffected cohort in 2005 (or 2000) who are of the same age as the treated cohort in 2010. However, the results may be biased due to the fact that unemployment as a whole differs in these two years. We therefore use the difference in the unemployment rates of the older cohort to control for the difference in employment situation (or time effects). We find that in the medium run, the expansion's impact on the unemployment rate of college graduates does not persist.

The spatial allocation of the college graduates is also an important consideration in policy making and has major implications for outcomes in both national and local labor markets. As the return to education is significantly higher in urban than in rural areas, most college graduates work and reside in cities. In the CHIP 2007 data, the share of college educated workers account for 15% of the work force in urban China, and the share is only 1% in rural areas (Xing, 2016).² College educated workers are also unevenly distributed within urban areas. Research shows that educated workers are more likely to work in large cities in coastal areas as they have higher return to education than small and med-sized cities (Xing, 2016). As a result, large cities are getting increasingly more educated and larger. The governments often encourage the college graduates to find employments in rural areas or in small cities.

We find that the short-run effect of higher education expansion is larger in central and northeastern than in eastern and western regions, and unemployment declined more in eastern and central than in western and northeastern regions. As many college educated workers from the west choose to work in coastal regions, our results suggest that the coastal labor market is flexible in that it absorbs unemployment in a relatively short period of time.

This paper first contributes to a comprehensive evaluation of China's higher education expansion policy. Freeman (2009) and Li, Whalley, Zhang, and Zhao (2011) are the two early studies that document the major transformation of China's higher education expansion. Both studies mention employment pressure for college graduates following the expansion, but they do not present empirical evidence on this. Meng, Shen, and Sen (2010) study wage structure and earnings inequality between 1988 and 2007. They notice that the increase in observed and unobserved skill prices slowed at the turn of the century and attribute this to the college expansion program. They do not, however, consider unemployment. Li et al. (2014) and Wu and Zhao (2010) study the unemployment effect of higher education expansion, but they only examined the short-run effects.

Sun (2013) argues that new college graduates after the expansion have higher unemployment because some of them are of lower ability or have poor family backgrounds. They would be high school graduates without the expansion policy. Li et al. (2014), however, show that the unemployment effect exists even after controlling for the changes in ability composition. These two studies have different predictions on the medium run effect of the expansion policy on unemployment. If Sun (2013)'s argument holds, the unemployment rate would remain high. The results in this study shows the opposite, suggesting that composition effect alone cannot explain the unemployment effect.

Second, this paper also deepens our understanding of the returns to education in China. China's demand for skilled labor and returns to education (Zhang, Zhao, Park, & Song, 2005; Meng et al., 2010; Heckman & Li, 2004; Li & Ding, 2003) increased significantly in the last two decades. As new college graduates saw higher unemployment rates when an increasing number of college graduates entered the labor market, concerns have been growing that China's workforce is over-educated relative to its industrial structure. If higher unemployment rates persist among college graduates, the ex-ante college premium should take this into consideration, which reduces the return to college education. Our results suggest that the high unemployment rate for new college graduates is unlikely to affect college premium considerably.

Finally, as we regard higher education expansion as an exogenous supply shock that causes employment pressures, this paper adds to the literature that studies the medium term effects of negative employment experiences. As an example in this literature, Oreopoulos, von Wachter, and Heisz (2012) use a unique data set and find that the cost of recessions for new graduates is substantial and unequal.

This paper is organized as follows. Section 2 briefly describes the higher education transformation in the late 1990s. Section 3 discusses data and the summary statistics. Section 4 investigates how the expansion policy affected the unemployment rate of college graduates in the short term. Section 5 investigates how the expansion policy affected the unemployment rate of college graduates in the medium term. Section 6 discusses possible mechanisms for the sharp decline in the unemployment rate of the affected cohorts in the medium run. Section 7 briefly discusses some implications of the study.

¹ There is research suggesting that the effect of exogenous shock on the labor market often dissipate in around 10 years (Blanchard & Katz, 1992). The effect of a policy shock after a period of 5–10 years is defined as a med-term effect by a number of studies (Bound & Holzer, 2000; p28). According to Topel and Ward (1992), two-thirds of the job changes happened in the first ten years of his/her career. Of course, we have to admit that there is no standard for defining “med term”.

² This gap is mainly due to the fact that college graduate from rural areas do not return to countryside after graduation.

2. Background

With economic reform and market opening, China's education system underwent a major transformation. Closely related to our research are the following two aspects: scale expansion in higher education and changes in the mechanism for matching college graduates with employers.³

Although the scale of higher education increased continuously, the growth rate before 1998 was significantly lower than that from 1999 onwards. In 1999, the Chinese government initiated the higher education expansion policy: the government increased the higher education admissions quota by 0.55 million for 1999. The number of new college students experienced its largest annual growth since 1978 (48%). In subsequent years, the scale of higher education kept increasing: the number of universities increased from 1022 to 2442 from 1998 to 2012, college student enrollment increased from 1.08 million to 6.89 million, the number of college graduates from 0.83 million to 6.25 million, and the number of college students from 3.41 million to 23.91 million. Although the policy might be endogenously determined by the economic situation,⁴ the expansion was unexpected for many families with high school graduates.

Along with higher education expansion, the government reformed the planning system for allocating college graduates to work positions. The market forces of supply and demand and mutual agreements between employers and graduates mainly determine the employment of college graduates. An increasing number of college graduates seek employment in large coastal cities and work in non-public sectors. The large inflow of college graduates into the labor market after the higher education expansion constitutes a major supply shock to the labor market. Li et al. (2014) find that the unemployment rate of new college graduates increased significantly as a consequence of the expansion policy. Employment pressure for new college graduates seems more severe, with the number of new college graduates approaching 7 million annually in recent years. Partly due to the employment pressure, the Chinese government suspended further expansion in higher education in 2012.

The central government has taken a number of measures to alleviate the employment pressure of college graduates. These policies generally encourage college graduates to work in western regions or even rural villages.⁵ College graduates are also encouraged to start their own businesses, and they enjoy preferential policies in credit granting and tax deduction.

3. Data

We use random samples of the census data for 2000, the 1% population survey for 2005, and the census data for 2010 to investigate the unemployment effect of the higher education expansion policy in the short and medium run. The National Bureau of Statistics (NBS) collects all data following similar procedures of random sampling, covering 31 provinces, municipalities, and autonomous regions. The numbers of individual observations in these data are 1,180,110, 2,585,481, and 1,267,381 before cleaning. Our analysis mainly focuses on the observations with four-year college or above education degrees. As most college graduates work in urban areas, we consider the urban sample for our analysis.⁶ For comparison, we also keep those with high school degrees or professional (3 year) college degrees. Although these observations might be systematically different from college graduates, they provide useful information for us to assess the employment situations in different years.⁷

Because we do not have information on when people take the college entrance exam, we assume that one enters primary school at age 6 and takes the college entrance exam at age 18. For those who did not go to college, we assume they would have taken the exam at age 18. Thus, everyone has a hypothetical year for college entrance exam. In the three datasets, age is restricted to 22 to 35. According to the year of survey and age, we can determine who are affected by the expansion policy and who are not. For example, those in the 2000 sample would have taken the college entrance exam between 1983 and 1996, and no observation was affected by the expansion policy. For the 2005 sample, those aged 22 to 24 were affected by the policy, and those aged above 27 were not. For the 2010 sample, those affected by the policy in the 2005 sample are 5 years older, so those aged between 27 and 29 were affected and those aged above 32 were not.

Summary statistics for the 2000 census, the 2005 min-census, and the 2010 census samples are reported in Table 1. All variables except education level are similar. When the samples are limited to those with high school and above degrees, the share of high school graduates decreased from 60.6% in 2000 to 50.6% in 2005 and then to 39.1% in 2010; the share of 3-year college graduates slowly increased from 25.9% in 2000 to 29.4% in 2005 and then to 32.5% in 2010; the share of 4-year college graduates increased

³ With economic reform and enlargement of the scale of higher education, the Chinese government also gradually lowered subsidies for higher education. From 1995 to 2004, tuition fees increased from 800 RMB per person per year to 5000RMB per person per year on average (Yang, 2006). Ou and Zhao (2016) show that the ratio of tuition fees per student to the per capita disposable income of urban households increased from 39.53% in 1998 to 57.26% in 2001. Tuition fees have increased only slightly since 2004 due to the regulation of the central and local governments.

⁴ Some believe that the policy was to stimulate the economy in the aftermath of the Asian financial crisis. Others emphasize that the policy aimed to alleviate employment pressure following the ownership restructuring reform that caused a large amount of laid-off workers.

⁵ There are several important projects: the college graduate volunteers serving the west plan (2003); special teacher positions set for rural compulsory education and college graduates engaged in agriculture, education, health and poverty alleviation in rural areas (2006); the college graduate village cadre plan (hire college graduates to serve the village) (2008).

⁶ The area in which an individual currently resides or works is classified into three categories in the data: city area (*shi*), town (*zhen*), and village (*cun*). In this analysis, cities are defined as urban areas and villages and towns are defined as rural areas. Considering observations in both rural and urban areas does not change our results considerably, and we do not report the results in the paper.

⁷ According to the timing of education in China, high school graduates and vocational school graduates have the same number of years of schooling. We combine high school graduates and vocational school graduates into one category so that both 2000 and 2005 data have three broader categories.

Table 1

Summary statistics for the 2000 census, the 2005 min-census, and the 2010 census.

	Census 2000		Min-census 2005		Census 2010	
	All sample	High school & above	All sample	High school & above	All sample	High school & above
Age (year)	28.975	28.617	29.151	28.841	28.689	28.537
Male (male = 1/female = 0)	0.532	0.529	0.513	0.508	0.524	0.515
Han (han = 1/non-han = 0)	0.955	0.954	0.951	0.957	0.956	0.962
East (east = 1/otherwise = 0)	0.418	0.420	0.525	0.553	0.482	0.502
Education level						
Middle school and below	0.497	–	0.433	–	0.317	–
High school or vocational	0.305	0.606	0.287	0.506	0.267	0.391
3-year (professional) college	0.13	0.259	0.167	0.294	0.222	0.325
4-year college and above	0.068	0.135	0.113	0.2	0.194	0.284
Obs	59,488	29,906	141,239	80,045	64,262	43,863

Note: (1). The samples are limited to the people who live in the city at the time of the survey.

(2). “All sample” refers to the population of all educational levels, “Only high school and above” is the sample that is restricted to the level of high school education and above.

Source: The 2010 census, the 2005 min-census and the 2000 census.

from 13.5% in 2000 to 20.0% in 2005 and then to 28.4% in 2010.⁸ Because of the higher education expansion, an increasing number of young people go to universities.

To examine the effect of higher education expansion on the unemployment rate, we first drop all observations that were either still in school, handicapped, retired, or doing housework. Those who did not have a job in the week before the survey are defined as *unemployed*. Using this information to define unemployment has several shortcomings. In particular, those who were not working might not be actively looking for a job or would be unready to accept a job if offered. If the youth are more likely to be inactive in the labor market after the expansion, our definition will overestimate the unemployment effect of the expansion. These caveats should be kept in mind when the results are interpreted. In a robustness check, we use more information to define unemployment, sacrificing some consistency between 2000 and later years. In 2005 and 2010, the unemployed workers are those who (1) did not work in the last week, (2) have been actively seeking employment in the last three months, and (3) were available for work.⁹ The last piece of information are not available in the data for 2000, and unemployment is defined by work status in the week before the survey (not working but was seeking jobs). As the regression results using this definition are similar, we do not report them here.¹⁰

Figs. 1 and 2 illustrate unemployment rates by age for observations of different education levels. Fig. 1 shows the unemployment rates of 4-year college graduates for different ages (22–35 years old) in 2000, 2005, and 2010. The younger group aged 22 to 24 in 2005 (those affected by the expansion) had a higher unemployment rate than that of the same age group in 2000. Five years later, the 22 to 24 years old cohorts in 2000 (2005) became 27 to 29 years old in 2005 (2010). The unemployment rate gap nearly disappeared. This is the central information this paper conveys. The results by gender show a similar pattern.

Fig. 2 shows the unemployment rates by age for high school graduates (upper panel) and 3-year college graduates (lower panel), respectively. The short run effect of the expansion policy cannot be observed among these samples. In addition, the unemployment rate-age profiles are roughly parallel between different years, suggesting that the changes in unemployment do not differ much by age for workers with lower education levels.

4. Higher education expansion and unemployment in the short term

4.1. Model specification

Due to the presence of time effects or age effects, we cannot simply compare the unemployment rates of those who were affected by the expansion policy and those who were not affected. We use a DID strategy to identify the unemployment effects of the expansion policy, which is estimated using a Linear Probability Model (LPM):

$$unemployed = \alpha + \beta_1 age_{22-24} + \beta_2 year_{2005} + \beta_3 age_{22-24} * year_{2005} + \gamma X + \varepsilon \quad (1)$$

where *unemployed* indicates whether an individual is unemployed (= 1) or not (= 0), and *age*_{22–24} indicates whether an individual is between 22 and 24 years old or not. For the 2005 sample, those between ages 22 and 24 (*age*_{22–24} = 1) were affected by the expansion policy. The dummy variable *year*₂₀₀₅ equals one if observations are from the 2005 survey and equal zero otherwise.

⁸ When we consider all education levels (that is without deleting low education observations), the share of high school graduates slowly decreased from 30.5% in 2000 to 28.7% in 2005 and then to 26.7% in 2010; the share of 3-year college graduates increased from 13.0% in 2000 to 16.7% in 2005 and then to 22.2% in 2010; the share of 4-year college graduates rapidly increased from 6.8% in 2000 to 11.3% in 2005 and then to 19.4% in 2010.

⁹ According to the standard definition of International Labour Organization, an individual to be defined as unemployed should be (1) without work (not in paid employment or self-employment), (2) currently available for work, and (3) seeking work.

¹⁰ This is mainly due to fact that the share of individuals who answered “unavailable for work” is rather small.

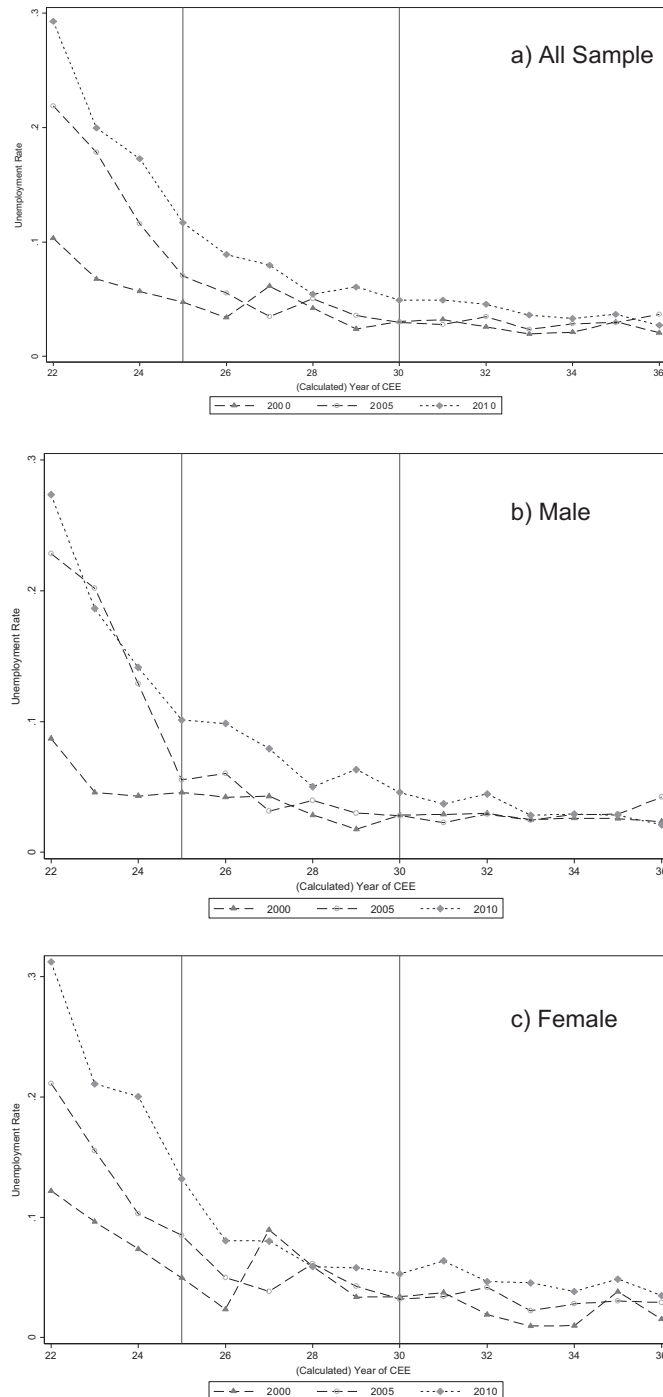


Fig. 1. Unemployment rate of 4-year college and above graduates by age. Notes: (1). A person is *unemployed* if he/she did not have a job in the week before the surveys. Sources: The 2000 census, the 2005 min-census and the 2010 census.

$age_{22-24} * year_{2005}$ is the interaction of these two dummy variables. When we run a regression of the variable *unemployed* on age_{22-24} , $year_{2005}$, and $age_{22-24} * year_{2005}$, the coefficient of the interaction term captures the effect of the expansion policy on unemployment, while the age difference and time difference are captured by the coefficients of age_{22-24} and $year_{2005}$, respectively.

The presence of the expansion of adult continuing higher education may pose a challenge for this strategy, because older people were also likely to be influenced by the expansion. In this case, our estimates provide a lower bound (in absolute terms) of the unemployment effect of the expansion. In fact, the empirical evidence we present in Fig. 1 suggests that the expansion of adult continuing higher education did not have a significant impact on the unemployment of older people, making us more confident in

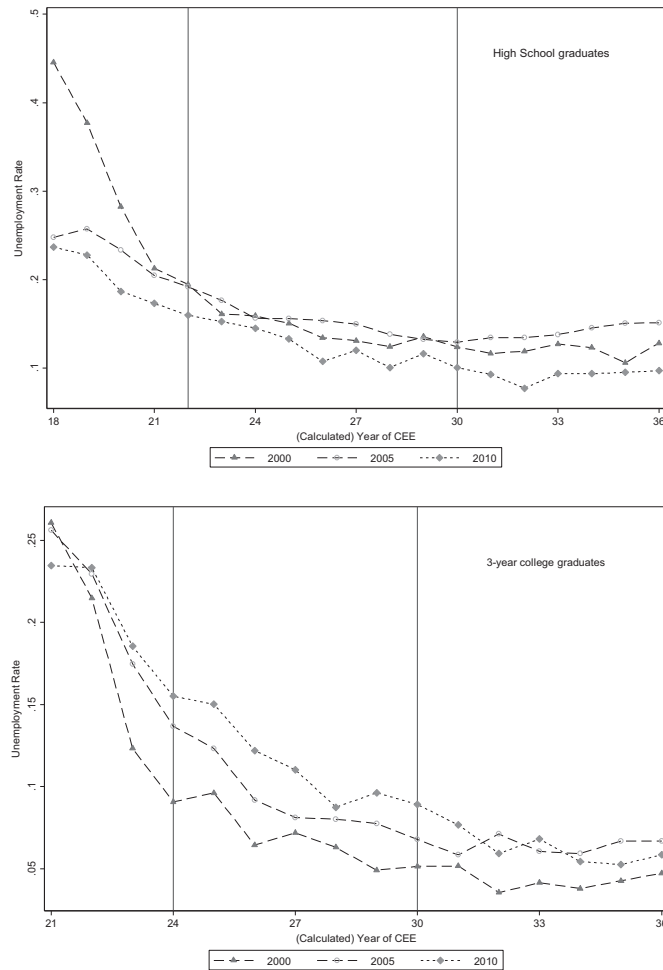


Fig. 2. Unemployment rates of high school and 3-year college graduates by age. Notes: (1). A person is *unemployed* if he/she did not have a job in the week before the surveys. Sources: The 2000 census, the 2005 min-census and the 2010 census.

using this DID strategy. Moreover, the adult continuing higher education mainly influenced the amount of graduates with professional college degrees.

X is a vector of control covariates including gender (*male*), ethnicity (*han*), provincial GDP per capita (*gdppc*), GDP growth (*gdpg*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and provincial dummies. We allow for a non-linear unemployment-age pattern for each province by controlling for age, age squared, and their interactions with provincial dummies. ε is the error term.

The expansion has allowed more high school graduates to go to college by lowering requirements. Therefore, the expansion of higher education has been associated with composition change in ability (if the marks in college entrance examination are good proxies for ability). Without an expansion policy, some college graduates could only have high school degrees and would also have higher unemployment rates. In other words, the higher unemployment rate caused by the expansion policy may be just reflecting this compositional change. To account for the compositional change, we assume the ability distribution for each age group is identical. As the college entrance examination system enrolls students from the top of the distribution of examination scores, the more are admitted to college, the lower the average ability of the college graduates. For all three data sets and for each age group, we calculate the share of college graduates in all observations of that age group with at least junior middle school degrees. This variable (*collegeshare*) is then added to the regression.

The (un)employment status may also be affected by the ex-post ability after one graduated. How the higher education expansion affected the ex-post ability distribution of the college graduates is an important question, but is hard to examine. In particular, the expansion may lower the education quality and value added of colleges education due to the sharply increased number of students. On the other hand, the technological change and physical capital investment may increase the quality of education. We leave this for further research as we are unable to control for the ex-post ability using the census and population survey data. However, research using other data suggests that after controlling for the tiers of universities (which is mainly determined by one's ex-ante ability before entering college), controlling for both academic and non-academic performance in universities do not have a consistently significant

effect on starting salaries, the choice of industries, and the type of enterprises (Wang et al., 2016).

Another potential challenge to our empirical strategy is that some changes in the demand side of the labor market may have different impacts on the unemployment of college graduates in different age groups. If this is the case, we will not be able to separate the effect of the expansion policy from the effects of other factors. To alleviate this concern, we construct interaction terms of the above demand-side variables¹¹ with the age group dummy (age_{22-24}) and include them as additional controls. Results suggest that adding these interactions does not have a major impact on our conclusions. Therefore, we focus on a more parsimonious model without those interactions.

4.2. Results

The results are reported in Table 2. For the whole sample, the coefficient for the interaction term is 0.045 (in column 1) and unemployment rate increases by 4.5% in absolute terms due to the expansion; for the male sample (in column 2), the coefficient on the interaction term is 0.081 and significant; for the female sample (in column 3), the coefficient on the interaction term is small (0.008) and insignificant. Thus the expansion had a larger impact on males than on females. One reason for this gender difference is that females had relatively low labor force participation rate (see Fig. 2) and were more likely to undertake housework at home (see Li et al., 2014).

To assess the regional dimension of the expansion's impact on the unemployment rate, we divide the sample into eastern, central, western, and northeastern regions.¹² Columns 4 to 7 of Table 2 suggest that the effects of the expansion in different regions are different. The coefficients on the interaction terms are 0.138 and 0.191 for the central and northeastern regions (see columns 5 and 7), respectively, suggesting that a sharp increase in the relative supply of college graduates caused their unemployment rate to rise in these two regions. In the northeast, the demand for labor has been declining since the mid-1990s. In the eastern and western regions, the coefficients are small and insignificant (see columns 4 and 6), possibly due to different reasons. The increased supply in college graduates can be absorbed because eastern regions have higher demand for labor; the western regions, however, do not experience a rising unemployment possibly because the increase in the supply of college graduates is limited.

We also separately consider the effects of the expansion of higher education on the unemployment of college graduates in large, middle, and small cities. A large city has a population above 5 million; a middle city has a population between 1 million and 5 million; a small city has a population below 1 million.¹³ The results are reported in columns 8 to 10 of Table 2. All coefficients are significant, and the impact of the expansion in the small sized cities is greater than those of the middle and large cities, which suggest that large and middle cities have more job opportunities for college graduates than small cities.

Li et al. (2014) also show that the higher education expansion had similar impact on the probability of a newly graduated college student being dependent on other family members (income coming from family). Moreover, they show that these effects are largely absent for professional college graduates and high school graduates. All these suggest that the expansion policy caused employment pressure for university graduates who entered the labor market shortly.

5. Five years later

5.1. Model specification

In this section, we use the 2010 census data in combination with the 2000 census to examine whether the unemployment effect of the expansion policy persisted or disappeared in a longer period of time. We compare the unemployment rates of those aged 27 to 29 in the 2010 census (the affected cohorts who were 22 to 24 years old in 2005) with those of the same ages in the 2000 census. Note that the observations in the 2000 census were not affected by the expansion policy. As the economic situation changed between 2000 and 2010, we use the difference in unemployment rate for older age groups to control for the time trend.¹⁴ Again, our empirical strategy is essentially a DID similar to model (1). Specifically, we estimate an LPM as follows:

$$unemployed = \alpha + \beta_1 age_{27-29} + \beta_2 year_{2010} + \beta_3 age_{27-29} * year_{2010} + \gamma X + \varepsilon \quad (2)$$

where age_{27-29} is a dummy variable indicating whether an individual is between 27 and 29 years of age (control group aged 32 to 34). The 2010 observations aged between 27 and 29 ($age_{27-29} = 1$) were affected by the expansion policy. The dummy variable

¹¹ These variables include provincial GDP per capita ($gdppc$), GDP growth ($gdpg$), share of tertiary sector in GDP ($tertiaryshare$), and the ratio of trade volume over GDP ($trade/gdp$).

¹² This is similar to the standards of Chinese geographical division, the eastern region includes Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan; the central region includes Shanxi, Anhui, Jiangxi, Henan, Hubei, Hainan; the western region includes Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Gansu, Shaanxi, Qinghai, Ningxia, Xinjiang; the northeast region includes Liaoning, Jilin, Heilongjiang.

¹³ According to the urban resident population at the end of 2013 in the China City Statistical Yearbook, a giant city has an urban resident population above 10 million; a mega city has an urban resident population larger than 5 million and less than 10 million; a big city has an urban resident population larger than 1 million and less than 5 million; a medium city has an urban resident population larger than 0.5 million and less than 1 million; and a small city has an urban resident population less than 0.5 million.

¹⁴ We want to emphasize that our strategy is not a simple comparison between those aged 27–29 and those aged 32–34 in 2010. To further understand our strategy, we interpret it in an alternative way. The difference between these two groups include the expansion effect and the age difference. To difference out the age effect, we use the 2000 data to estimate the age difference between these two age groups (those aged 27–29 and those aged 32–34). The age differences in the 2000 data are the natural age effect. By using a DID, we have differenced out this natural difference.

Table 2

The short term effect of the education expansion on the unemployment rate of 4-year college graduates, LPM.

	Dependent variable: unemployed (yes = 1/no = 0)									
	Samples from									
	All sample (1)	Male sample (2)	Female sample (3)	East (4)	Central (5)	West (6)	Northeast (7)	Large city (8)	Middle city (9)	Small city (10)
$age_{22-24} \times year_{2005}$	0.045** (0.017)	0.081*** (0.021)	0.008 (0.028)	0.023 (0.021)	0.138*** (0.037)	−0.049 (0.046)	0.191** (0.068)	0.073** (0.025)	0.059* (0.028)	0.177*** (0.042)
$year_{2005}$	−0.011 (0.022)	0.004 (0.027)	−0.041 (0.036)	−0.023 (0.047)	−0.106 (0.059)	−0.114 (0.059)	−0.038 (0.111)	0.082 (0.063)	0.043 (0.038)	−0.023 (0.040)
age_{22-24}	−0.014 (0.014)	−0.019 (0.017)	−0.006 (0.022)	−0.008 (0.017)	−0.032 (0.029)	0.035 (0.038)	−0.04 (0.055)	−0.046* (0.023)	0.003 (0.024)	−0.063 (0.038)
Adj. R ²	0.063	0.069	0.059	0.034	0.122	0.081	0.093	0.043	0.064	0.111
N	27,205	15,126	12,079	15,768	3701	5433	2303	10,298	8869	3290

Note: (1). Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpg*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies.

(2). The eastern regions: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan; the central regions: Shanxi, Anhui, Jiangxi, Henan, Hubei, Hainan; the western regions: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Gansu, Shaanxi, Qinghai, Ningxia, Xinjiang; the northeast regions: Liaoning, Jilin, Heilongjiang.

(3). Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Sources: The 2000 and 2005 census.

$year_{2010}$ equals one if observations are from the 2010 census and zero otherwise. All other variables are defined similarly as in [model \(1\)](#).

5.2. Results

Estimation results for the whole sample are reported in column 1 of [Table 3](#). The coefficient for the interaction term $age_{27-29} \times year_{2010}$ is not significant. In other words, higher education expansion has no medium term effect on the unemployment rate of 4-year college graduates. Other variables reflecting economic conditions (demand factors) are mostly insignificant. The results

Table 3

The medium term effect of expansion on the unemployment and “depending on other family members” of four-year college graduates, LPM.

A	Dependent var. = unemployed (yes = 1/no = 0)			Income from family (yes = 1/no = 0)		
	All sample	Male	Female	All sample	Male	Female
	Samples from: 2000 and 2010 census					
	(1)	(2)	(3)	(4)	(5)	(6)
$age_{27-29} \times year_{2010}$	0.014 (0.014)	0.024 (0.018)	0.002 (0.022)	0.008 (0.012)	0.013 (0.015)	0.004 (0.018)
$year_{2010}$	0.057 (0.036)	0.032 (0.045)	0.083 (0.061)	0.003 (0.028)	−0.026 (0.035)	0.035 (0.047)
age_{27-29}	−0.023* (0.012)	−0.023 (0.015)	−0.025 (0.019)	−0.023* (0.010)	−0.023 (0.013)	−0.025 (0.015)
Adj. R ²	0.014	0.019	0.011	0.015	0.021	0.014
N	11,727	6424	5303	11,727	6424	5303
B	Samples from: 2005 and 2010 census					
$age_{27-29} \times year_{2010}$	0.007 (0.010)	0.015 (0.013)	−0.004 (0.015)	−0.002 (0.009)	0.004 (0.011)	−0.009 (0.014)
$year_{2010}$	0.031 (0.025)	−0.014 (0.034)	0.084* (0.038)	−0.016 (0.021)	−0.051 (0.027)	0.026 (0.032)
age_{27-29}	−0.005 (0.008)	−0.01 (0.010)	0.002 (0.012)	−0.006 (0.007)	−0.014 (0.008)	0.004 (0.010)
Adj. R ²	0.01	0.014	0.007	0.011	0.015	0.008
N	19,488	10,316	9172	19,488	10,316	9172

Notes: (1). Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpg*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies.

(2). Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Sources: The 2000 census, the 2005 min-census and the 2010 census.

Table 4

The medium term effect of expansion on the unemployment rate of four-year college graduates by region and by city size (dependent var.: unemployed, LPM).

	By region				By city size		
	East (1)	Central (2)	West (3)	Northeast (4)	Large city (5)	Middle city (6)	Small city (7)
A	Samples from: 2000 and 2010 census						
$age_{27-29} \times year_{2010}$	− 0.009 (0.018)	0.043 (0.024)	0.035 (0.027)	0.088* (0.042)	0.022 (0.028)	0.01 (0.019)	0.014 (0.029)
$year_{2010}$	0.064 (0.050)	− 0.083 (0.403)	0.017 (0.112)	0.314* (0.148)	0.220* (0.089)	0.039 (0.057)	0.001 (0.076)
age_{27-29}	− 0.007 (0.015)	− 0.02 (0.018)	− 0.007 (0.025)	− 0.06 (0.035)	− 0.018 (0.024)	− 0.026 (0.015)	− 0.003 (0.026)
Adj. R ²	0.011	0.016	0.008	0.023	0.004	0.013	0.041
N	8628	2798	3347	1561	4891	5946	2182
B	Samples from: 2005 and 2010 census						
$age_{27-29} \times year_{2010}$	− 0.017 (0.012)	0.019 (0.021)	0.029 (0.016)	0.056 (0.033)	0.005 (0.015)	0.003 (0.014)	0.03 (0.022)
$year_{2010}$	0.002 (0.032)	0.149 (0.117)	0.009 (0.052)	0.155 (0.121)	0.025 (0.045)	0.058 (0.037)	− 0.062 (0.064)
age_{27-29}	0.008 (0.008)	0.016 (0.017)	− 0.008 (0.011)	− 0.007 (0.029)	0.01 (0.011)	− 0.01 (0.011)	0.003 (0.019)
Adj. R ²	0.007	0.013	0.01	0.009	0.004	0.008	0.035
N	14,922	3873	5712	2306	9270	9083	3347

Notes: (1). Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpgp*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies.

(2). The regions are defined as in Table 2.

(3). Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Sources: The 2000 census, the 2005 min-census and the 2010 census.

by gender in columns 2 and 3 show a similar pattern.

We then run the regression by region and by city size to examine the heterogeneity in the medium term effect of the expansion policy. The results in Table 4 suggest that medium term unemployment effect of the expansion policy is not significant in all regions except in the northeast (see columns 1 to 4). The medium term unemployment effect in the northeast remains large and is significant at the 10% level. After differencing out the time and age effects, the unemployment rates of the cohorts affected by the expansion policy was 8.8% higher than the control group. This is caused by the long run decline in the relative demand there. The results in columns 5 to 7 of Table 4 suggest that the unemployment effect is absent in cities of different sizes.

5.3. A robustness check

The economy and the labor market changed significantly between 2000 and 2010. Using the 2000 census data to control for age difference in unemployment rate in absence of expansion policy might be problematic if these changes influenced the unemployment rates for workers of different ages differently. Thus, we perform robustness checks by replacing the 2000 census data with the 2005 min-census. Otherwise, the model specification is the same as model (2). The results are reported in the B parts of Tables 3 and 4, and they show patterns similar to previous ones.

All these suggest that the expansion policy have no consistently significant effect on the unemployment of university graduates in the medium term.

6. Accounting for the decline in unemployment for the affected cohorts

There are several candidate reasons to explain the sharper decline in unemployment rate for the college graduates affected by the expansion policy. We evaluate these explanations in this section. One possibility is that the unemployed college graduates became discouraged and left the labor market. To check whether this is the case, we draw the change of labor force participation rate by age in 2000, 2005, and 2010 (see Fig. 3). The upper panel in Fig. 3 indicates that the labor force participation rate for males aged above 27 in 2010 are very close to those of the same ages in 2000 and 2005. For females (the lower panel), the labor force participation for those aged 26–32 are even slightly higher in 2010 than in 2005 and 2000.

Moreover, an individual would be living on other family members if she is a discouraged worker. We therefore consider a dummy variable of “income from family” as dependent variable to see this possibility. The results in Table 3 (columns 4 to 6) suggest that the expansion policy had no long term effects on the probability of living on other family members. Columns 4 to 6 in Table 3 show that the probability of living on other family members decreased significantly for the affected cohorts. These two pieces of evidence suggest that the change in labor force participation is unlikely the reason for a sharper decline of the unemployment rate for the affected group.

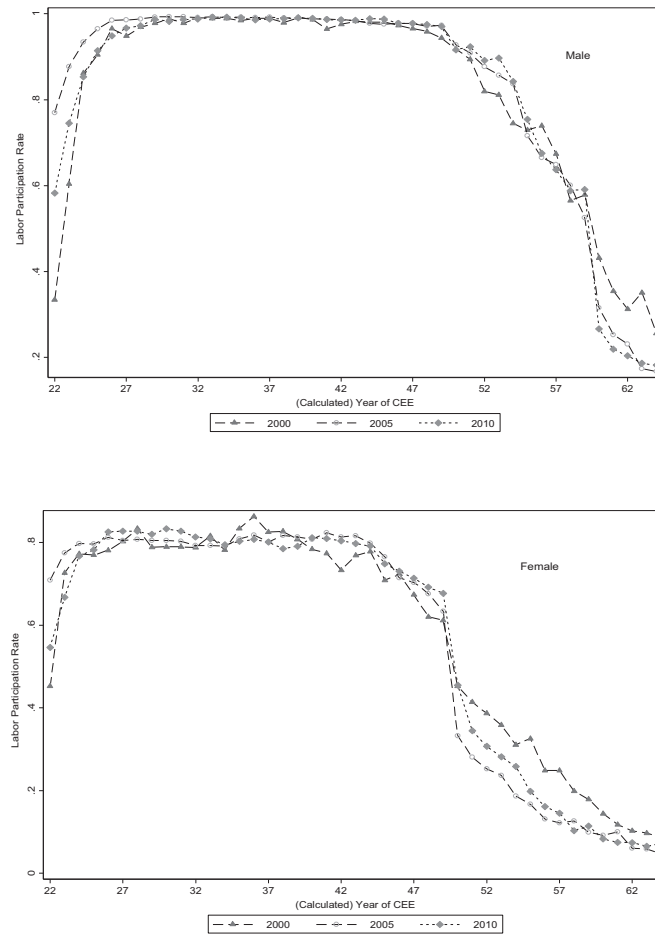


Fig. 3. Labor force participation rates by age for males and females. Note: (1). Labor force participation rate = (employed population + unemployed population) / (population aged 16–64 years old). Sources: The 2000 census, the 2005 min-census and the 2010 census.

There also is a concern that the employment quality of college graduates deteriorated after the higher education expansion (Schucher, 2015; Jun, 2015). We use the 2005 population survey data to calculate the average income for each 2-digit industry and the average income for all industries. We define high income industries as those having income higher than the average income (*industry_dummy* = 1), and low income industries otherwise (*industry_dummy* = 0). We use the same DID specification as in model (2) and the data for 2000 and 2010 to estimate the policy's impact on the industrial distribution of college graduates. Only employed observations are used to estimate this model. The results reported in Table 5 show that the coefficients on the interaction terms are positive but not significant, suggesting that the industrial distribution for college graduates affected by the expansion policy has not deteriorated, but weakly improved.

Migration can also influence unemployment rate. As workers move across regions, they form better matches with jobs. It is probable that workers in regions with high unemployment rate migrate to low unemployment regions, which helps reduce the overall unemployment rate. However, the following exercise indicates that migration cannot explain all the unemployment dynamics of the affected cohorts: We restrict our sample to those whose current place of residence is the same province as it was 5 years ago and apply similar models as in previous sections. The results reported in Tables 6 and 7 show that the short term and medium term effects for the non-migrant sample are slightly different to those considering the whole sample. In the short run (see Table 6), the unemployment effect in the central and northeastern regions for the non-migrant sample is larger than the effect considering all observations. Panel B considers individuals who changed residence of province between 2000 and 2005. It shows that the unemployment effect on the migrant sample is not significant. This suggests that migration helped reduce the unemployment of the affected college graduates in the short run. In the medium run, the results are similar for migrant and non-migrant samples.¹⁵

We next use the regional variations to explore what factors will influence the dynamics of unemployment rates for the affected cohorts. We calculate provincial unemployment rates for college graduates aged 22–24 in 2005 and those for college graduates aged 27–29 in 2010. The changes in unemployment rates are obtained by taking the difference of the unemployment rates in these two

¹⁵ Another exercise is to restrict the sample to those with local Hukou, and the results are similar.

Table 5
Medium term effect of higher education expansion on industrial distribution of college graduates.

	Dependent variable: industry_dummy (high income industry or not)		
	Samples from		
	All sample (1)	Male sample (2)	Female sample (3)
$age_{22-24} \times year_{2010}$	0.07 (0.062)	0.029 (0.082)	0.126 (0.094)
$year_{2010}$	0.048 (0.076)	− 0.008 (0.104)	0.14 (0.114)
age_{22-24}	0.185 (0.365)	0.118 (0.482)	0.349 (0.569)
Collegeshare	− 0.654 (0.441)	− 0.378 (0.607)	− 1.01 (0.646)
Adj. R ²	0.013	0.011	0.009
N	12,350	6859	5491

Note: (1) We define high income industries as those have income higher than the average income (*industry_dummy* = 1), and low income industries otherwise (*industry_dummy* = 0). The incomes are calculated using the 2005 population survey data. (2) Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpg*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies. (3) Standard errors in parenthesis. (4) *, **, and *** represent statistical significance at 10%, 5%, and 1% levels. (5) Data sources: 2000 and 2010 census data.

years. The unemployment dynamics differ considerably across province, and we consider provincial economic growth, structure of the economy, growth in physical capital, and openness to explain this regional variation. Specifically, the variables are: the log change of the GDP per capita between 2005 and 2010 (*gdpgrowth*), the growth in the share of exports in GDP between 2005 and 2010 (*expgrowth*), the share of the tertiary industry in provincial GDP (*tertiary_avg*), the share of fixed asset investment in GDP (*fai_avg*), and the share of foreign direct investment (FDI) in GDP (*fdi_avg*). The results are reported in Table 8.

The first five columns of the simple regression results show that higher economic growth and fixed asset investment help reduce the unemployment rate of new college graduates. A 10% increase in the share of fixed asset investment is associated with a 0.6 percentage decline in unemployment rates. The variation in this factor alone can explain 20% of the regional variation in the unemployment dynamics. Export growth, economic structure, and the share of FDI are negatively but not significantly associated with the changes in unemployment rate.

Table 6
The short term effect of the education expansion on the unemployment rate of 4-year college graduates, (dependent var.: unemployed, LPM).

	Male & female (1)	Male (2)	Female (3)	East (4)	Central (5)	West (6)	Northeast (7)
A: 2005 sample restricted to non-migrant observations (interprovincial between 2000 and 2005)							
$age_{22-24} \times year_{2005}$	0.075*** (0.019)	0.123*** (0.025)	0.035 (0.030)	0.043 (0.024)	0.200*** (0.039)	− 0.044 (0.056)	0.235*** (0.071)
$year_{2005}$	0.002 (0.026)	0.009 (0.033)	− 0.012 (0.042)	− 0.012 (0.056)	− 0.074 (0.064)	− 0.092 (0.078)	− 0.007 (0.122)
age_{22-24}	− 0.028 (0.015)	− 0.039* (0.019)	− 0.019 (0.025)	− 0.025 (0.019)	− 0.027 (0.032)	0.028 (0.047)	− 0.053 (0.058)
Adj. R ²	0.067	0.081	0.059	0.038	0.139	0.084	0.098
N	20,261	10,874	9387	12,077	2611	3586	1987
B: 2005 sample restricted to migrant observations (interprovincial between 2000 and 2005)							
$age_{22-24} \times year_{2005}$	0.011 (0.023)	0.018 (0.028)	0.002 (0.040)	0.018 (0.028)	0.063 (0.107)	− 0.114 (0.091)	− 0.080 (0.174)
$year_{2005}$	− 0.017 (0.069)	− 0.108 (0.085)	0.145 (0.117)	0.123 (0.088)	0.308 (0.651)	− 0.406 (0.293)	− 1.322 (1.011)
age_{22-24}	0.014 (0.017)	0.006 (0.021)	0.030 (0.029)	0.015 (0.021)	0.000 (0.044)	0.020 (0.055)	0.015 (0.083)
Adj. R ²	0.019	0.020	0.017	0.012	0.026	0.068	0.020
N	6475	3938	2537	4181	814	889	591

Note: (1). Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpg*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies.

(2). Migrants are defined as those who changed the residence of province between 2000 and 2005; non-migrants are those who did not change the residence of province.

(3). Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Sources: The 2000 census, the 2005 min-census and the 2010 census.

Table 7

The medium term effect of university enrollment expansion on the unemployment rate of four-year college graduates using the 2005 census and the 2010 census, LPM.

	Male & female (1)	Male (2)	Female (3)	East (4)	Central (5)	West (6)	Northeast (7)
A: 2010 sample restricted to non-migrant observations (interprovincial between 2005 and 2010)							
$age_{27-29} \times year_{2010}$	0.008 (0.010)	0.017 (0.014)	− 0.005 (0.016)	− 0.013 (0.014)	0.030 (0.027)	0.020 (0.021)	0.065 (0.036)
$year_{2010}$	0.019 (0.026)	− 0.032 (0.035)	0.082* (0.041)	0.018 (0.037)	0.225 (0.151)	0.022 (0.066)	0.136 (0.137)
age_{27-29}	− 0.001 (0.007)	− 0.006 (0.010)	0.006 (0.011)	0.004 (0.009)	0.013 (0.022)	− 0.015 (0.016)	− 0.020 (0.031)
Collegeshare	0.158 (0.256)	0.281 (0.333)	0.028 (0.399)	0.485 (0.350)	− 0.312 (0.652)	0.109 (0.490)	− 0.745 (0.893)
Adj. R ²	0.009	0.012	0.007	0.008	0.015	0.004	0.009
N	20,853	11,210	9643	12,408	2705	3771	1969
B: 2010 sample restricted to migrant observations (interprovincial between 2005 and 2010)							
$age_{27-29} \times year_{2010}$	0.003 (0.023)	− 0.020 (0.031)	0.039 (0.037)	− 0.014 (0.029)	0.037 (0.047)	0.072 (0.052)	− 0.028 (0.084)
$year_{2010}$	0.117 (0.072)	0.117 (0.084)	0.132 (0.130)	0.032 (0.087)	0.272 (0.439)	0.280 (0.358)	0.285 (0.260)
age_{27-29}	0.016 (0.008)	0.013 (0.010)	0.023 (0.013)	0.019 (0.010)	0.042 (0.023)	0.000 (0.018)	0.010 (0.032)
Collegeshare	− 1.097 (0.636)	− 0.377 (0.791)	− 2.404* (1.132)	− 0.166 (0.779)	− 5.230* (1.864)	− 2.151 (1.261)	− 2.819 (2.629)
Adj. R ²	0.002	0.003	0.002	0.002	0.009	0.003	− 0.001
N	12,750	7025	5725	8054	1345	2258	1093

Note: (1). Control variables also include ethnicity and gender dummies (*han* and *male*), real GDP per capita (2000 Yuan) in log terms (*gdppc*); GDP growth rate (*gdpgpr*), share of tertiary sector in GDP (*tertiaryshare*), the ratio of trade volume over GDP (*tradegdp*), and the share of college graduates in all observations with at least junior middle school degrees within each age group (*ratio*), and region dummies.

(2). Migrants are defined as those who changed the residence of province between 2005 and 2010; non-migrants are those who did not change the residence of province.

(3). Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Sources: The 2005 min-census and the 2010 census.

Table 8

Factors associated with the decline in provincial unemployment rate for college graduates between 2005 and 2010.

Dependent var. = the change in unemployment rate between 2005 and 2010							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
gdpgrowth	− 0.035* (0.019)					− 0.008 (0.034)	− 0.002 (0.034)
expgrowth		− 0.117 (0.074)				− 0.146 (0.123)	
tertiary_avg			− 0.002 (0.031)			− 0.055 (0.036)	− 0.066* (0.035)
fai_avg				− 0.064*** (0.022)		− 0.069 (0.045)	− 0.095** (0.040)
fdi_avg					− 0.021 (0.181)	− 0.317 (0.266)	− 0.062 (0.157)
_cons	0.006 (0.013)	− 0.023*** (0.005)	− 0.017 (0.014)	0.014 (0.011)	− 0.017** (0.007)	0.05 (0.030)	0.062** (0.029)
R2_adj	0.078	0.049	− 0.036	0.202	− 0.035	0.257	0.245
N	30	30	30	30	30	30	30

Note: (1) *gdpgrowth*, *expgrowth*, *tertiary_avg*, *fdi_avg*, and *fai_avg* denote growth of GDP per capita between 2005 and 2010, changes in the share of exports in GDP between 2005 and 2010, share of tertiary sector in GDP, the share of FDI in GDP, and the share of investment in fixed assets in GDP, respectively. All shares are averaged value between 2005 and 2010.

(2) Standard errors in parentheses: *, **, and *** significant at 10%, 5% and 1% levels.

Data sources: The change in unemployment rate between 2005 and 2010 is calculated using the population survey and the 2010 census data; The explanatory variables are from China Statistical Yearbooks for 2006 and 2011.

The multiple regression result considering all these explanatory variables is reported in column 6 of Table 8. All factors are negatively associated with changes in unemployment rate, but none of them is statistically significant. The absolute values of the estimated coefficients on all variables except for *gdpgrowth* are larger than their standard errors. Column 7 drops the variable *expgrowth*. The coefficients on *tertiary_avg* and *fai_avg* become more statistically significant. This model can explain one quarter of the variation in the provincial changes in the unemployment rates for the young college graduates.

7. Concluding remarks

Concerns on the unemployment of new college graduates have been growing as China's higher education expanded. We show in this paper that the high unemployment rate among new college graduates after the higher education expansion is largely a short term effect, and it declined significantly in a longer period of time. This finding indicates that the unemployment risk is unlikely to influence the *ex-ante* return to college to a large extent. Thus, existing studies on the returns to college provide reasonable estimate of the size of the incentive for human capital investment, without considering the unemployment risk. As most recent research shows sizeable returns, college education still seems to be an attractive investment that should be encouraged by the government.

Our research also suggests that the mobility of college educated workers and the development of local economy help reduce the unemployment of new college graduates. Thus reducing mobility impediments across regions and increasing investment are two potential ways to cope with the unemployment of college graduates.

This paper has several shortcomings. First, it is unclear whether the existing measures of those government initiated programs (college graduates serving as village cadre, for example) are effective in reducing the employment pressure. We leave this for future research. Second, although we show that it is unlikely that the unemployed found employment in the informal sector or they lowered reservation wages to be employed in low-paid jobs, a rigorous examination on such issues requires longitudinal data. Third, we do not consider the heterogeneity of the short term and medium term effects of the expansion policy on graduates from universities of different tiers and graduates of different study fields. The effects estimated in this paper can be regarded as the average treatment effects.

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