China's Higher Education Expansion and Unemployment of College Graduates

Preliminary draft

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1. Introduction

Since the beginning of the reform and opening up policy, China's scale of higher education in numbers of students admitted and college graduates kept increasing. However the increase in the 1980s and most of 1990s was modest, especially compared to that in 1999 and thereafter. In 1999, Chinese government made a strategic decision to enlarge the scale of higher education. As a result, the number of new students admitted to college increased by over 40% from 1998 to 1999. The expansion continued in subsequent years. By 2005, the number of new college students over quadrupled (4.7) that of 1998. Many people term this radical policy a *great leap forward* in higher education. The questions we try to answer in this paper are two. First, how this radical change affects the education opportunity of individuals? Second, how did this expansion policy has affected the employment of college graduates?

These seemingly simple questions are often raised in public debates. In particular many people blame the expansion policy for the high unemployment rate of college graduates, while others argue that even without expansion, young college graduates would still experience high unemployment rate. Still some others argue that the unemployment is not caused by expansion policy but because of low ability or high reservation wage of the college graduates. Unfortunately there is little rigorous empirical research addressing this problem.

We show in this paper that the expansion policy has increased the probability of going to college for high school graduates and that the expansion has sharply increased unemployment rate of college graduates. To reach these results our basic strategy is to compare unemployment rate of younger college graduates affected by the expansion policy to that of those not affected by the policy, using a population survey for 2005. To control for the age difference in unemployment rate, we use a 2000 census data to calculate the age differential when no college graduates were affected by the expansion policy.

To have a more detailed picture, we also perform similar exercises to investigate how the expansion effects differ across regions and between male and female. We find that unemployment rate of young college graduates increased to a larger extent in non-coastal (especially central) regions rather than in large coastal cities, which is true for both male and female with male experiencing a larger increase in unemployment across the country. These results suggest that allowing (encouraging) free mobility by eliminating institutional impediments such as Hukou system could reduce unemployment rate at the national level.

Although the exercises in this paper are quite simple and often rely on strong assumptions, it is to our knowledge the first trying to use econometric method to establish the relationship between China's higher education expansion and rising youth unemployment. The paper is however related to several researches, in particular Li et al. (2011), Freeman (2009), and Meng et al. (2010). Li et al. (2011) documents the major transformation of higher education that has been underway in China since

1999 not only in scale but also in many other aspects including institutional arrangement and incentive structure. They also discussed the expansion's potential global impacts. Freeman (2009) also emphasizes China's expansion policy and discusses its potential impact on the U.S. Although both papers mentioned the employment pressure for college graduates following the expansion, neither try to present empirical evidence on this. Meng et al. (2010) studies the wage structure and earning inequality between 1988 and 2007. They notice that both the observed and unobserved skill prices slowed down at the turn of the century and attribute this slow down to the college expansion program. They do not consider unemployment however.

This paper is organized as follows. Section 2 briefly described the higher education transformation in the late 1990s and data. Section 3 studies how expansion policy affects education opportunities. Section 4 investigates how the expansion policy has affected employment of college graduates. Section 5 briefly discusses why expansion caused unemployment of college graduates and the implications of this paper.

2. Background and data

2.1 Transformations in Higher Education

With the reform and opening up policy, China's post-secondary education system also underwent major transformations.[1] Closely related to our research are the following three aspects: scale expansion, abolishment of heavy subsidies (rise in tuitions), and changes in the matching mechanism between college graduates and potential employers.

From 1978 to 1998, the scale of higher education kept increasing. The number of colleges/universities increased from 598 to 1022, the number of new college students enrollment increased from 0.4 million to 1.08 million, and the number of college students increased from 0.86 million to 3.41 million. Although the scale of higher education enlarged continuously (both in terms of establishment number and in terms of the students or graduates number), the growth rate is much lower than those in and after 1999.

In early 1999, the central government decided to increase the number of students admitted to tertiary education by 0.22 million. In June, the central government and the Ministry of Education made an announcement that a further 0.33 million new students will be admitted. These decisions made 1999 a historical year in the development of China's higher education. The number of new college students experienced the largest increase ever since (48%).[2] For many of the high school graduates and their families,

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[1] The process of transformations is well summarized in the following four major official documents. (1) *Decisions on Reforming the Education System* (Central Committee of CPC, 1985); (2) *Guides for China's Education Reform and Development* (The State Council, 1993); (3) *On Deepening the Reform of the Higher Education System* (The Ministry of Education[1], 1995); (4) *Higher Education Law of the People's Republic of China,* 1999.

[2] Some media described this reform as the "Great Leap Forward of Higher Education."

(http://gaokao.zhongzhao.com/article/2007-7-15/200771513252290.shtml).

the expansion was unexpected. Given that the college entrance exams was in early July, the announcements made in early 1999 and especially the one in June will not change the behavior of high school graduate much. The "unexpectedness" of the announcement made this policy like an experiments.[3] In subsequent years, the number of new college students kept increasing. In 2005, the number of new college students was 5.04 millions, 4.7 times of that in 1998. Meanwhile, the total number of college students in China ranked the first all over the world, amounting to 23 million. And the gross enrollment rate of higher education increased by 11.2%, reaching 21%.

Under the traditional central planning regime, higher education was heavily subsidized. With economic reform and with the enlargement of higher education scale, Chinese government lowered the level of subsidies for higher education gradually. In "Guidelines for China's Education Reform and Development" published in 1993, the central government made it clear that *higher education is noncompulsory, and students should pay tuition in principle* (The State Council, 1993). From 1995 to 2004, the tuition fee increased from 800 RMB per person year to 5000 RMB per person year on average (Yang, 2006). The expenditure on education ranked the first in total household expenditure in the 10th 5-year-plan (CYCRC, 2007). The high tuition level makes some families facing more severe financial constraint, so that some students from poor families gave up the college opportunities.[4] This also means that the poor families would benefit less from the expansion policy.

In addition to the abolishment of heavy subsidies, another aspect of the reform is to cancel the planning system for allocating college graduates to work positions. The new system resembles a two-sided market. The graduates find jobs based on mutual agreements with employers, with much less intervention from the government. With the expansion of higher education, college graduates face more and more severe competition, putting great pressure on the labor market.

2.2 Data

We use random samples of the census data for 2000 and the 1% population survey data in this paper. Their numbers of observations are 1,180,110 and 2,585,481 respectively before data cleaning. Because our focus is the effect of the expansion policy on higher education, we keep only those who have high school degrees or above. The age range is restricted to 22 to 35.

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[3] The initiation of higher education expansion in the late 1990s is also closely related to the economic conditions at that time. In 1997, the 15th National Congress of Communist Party of China quickened the reform of the economic regime. Large amount of formerly state owned enterprises were privatized. This caused large amount of laid-off or unemployed workers. Meanwhile, the financial crisis happened in 1997 also had a negative impact on Chinese economy, which deteriorate the employment condition. Under these backgrounds, higher education expansion was initiated as an instrument to alleviate the unemployment problem and to stimulate consumption.

[4] According to some calculation, the expenditure per student per year is around 10,000 RMB. The net per capita incomes in urban and rural areas were 9422 RMB and 2936 RMB respectively. It cost 4.2 and 13.6 years of net income for an average urban individual and rural individual respectively to support one child to finish a 4-year college education. Although some measures were taken (scholarship, subsidized loans for examples), the credit constraint problem seems not have been alleviated effectively (Yuan and Zhang, 2009).

Because we don't have the information when people take the college entrance exams, we assume that people enter the primary school at age 6, and they go to college at age 18.[5] The *theoretical* year for the 2000 sample to take the college entrance exams is between 1983 and 1996, no observation was affected by the expansion policy. For the 2005 sample however, it is between 1988 and 2001, some were affected by the policy, some not. In fact, many of them have not taken the college entrance exams. They may have dropped out of school before they got high school degree. Even they finished the high school they may also not to have the exams. But in order to know whether they belong to the cohorts affected by the policy, we need the hypothetical college exam year.

Summary statistics are reported in Table 1. In 2000 about 33% of the sample has above professional degrees, among which college graduates (including graduates with master degrees) account for 10% of the whole sample. In 2005 the education levels increased significantly. The number of observations with college degree has increased to 16%. Otherwise the characteristics (age, gender, minority status, etc.) of the observations in both years did not change significantly.

3. Higher Education Expansion and Education Opportunity

For every age group, we calculate their theoretical year for college entrance exams. Figure 1 gives the share of different education levels in each age group. We kept only those with high school degree and above for the following two reasons. First, junior middle school is compulsory according to the law. Second, the people who are affected by this expansion policy are those high school graduates. Within the age groups between 28 and 35, the number of high school graduate decreased from those aged 35 to 28. There is considerable fluctuation from those aged 28 to 22. One notable thing is that the number of high school graduate dropped significantly for the 1998 cohort. The reasons underlying this drop are unclear. We made the following conjectures. First, the total number of this cohort is relatively small. Second, some graduates who are expected to take college exams postponed their exams to the next year once they anticipated the expansion in 1999. Another possibility is that those failed in 1998 took the exams again in 1999 and succeeded. The retiming story is possible but is not consistent with the background of the policy. Once we consider the proportion instead of the number, the trend is less volatile. Almost over the whole period, the proportion of high school graduate increased gradually although the absolute number decreased. The increasing trend stopped at 1998. The above possible

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[5] The typical timing of education in China is as follows: go to primary school at age 6, after 6 years of primary school, they go to junior middle school for 3 years. Completing junior middle school became compulsory from the 1980s (so called 9-year compulsory education). After junior middle school, people can choose to go to high school which takes 3 years to complete. They can also go to technical or professional school (*zhongzhuan*). Upon graduation from high school, graduates participate in college entrance examinations if they want college education. Usually people with lower scores go to 3 year professional college (*dazhuan*); and those with high score go to 4 year college. It's worth mentioning that, even until very recently, the education regime is different among various regions. In some areas, primary school takes 5 years only. But people go to school 1 year older. Therefore this difference will not have effect on our calculation. However, we don't pretend that there are no errors from other sources.

reasons are applicable here also.

The change in the number of (4-year) college graduate and above is the most remarkable. Before 1998, the change in the number of college graduate is small, with the number of male college graduate decreased slightly and females increased slightly. In 1999 and thereafter however, both the number of male and female college graduates witnessed huge jumps. The number of new college student increased by nearly 50% in 1999, and the sharp increase continued in subsequent years.

The two panels in the middle column of Figure 1 show the number and share of professional college (3-year professional college). As for the absolute numbers, males and females have different trend. The number of male professional graduates decreased, whereas the number for females increased. When we consider the proportion, they increased for both genders. But the trend stopped even before 1998 (1995 for male and 1997 for female). There seems little relationship between expansion policy and the change in number of professional graduates.

In the following, we investigate how the expansion affects individual's education choice using a multinomial logit model (see Table 2). Notice that we already dropped the sample of junior middle school and below. An individual with at least high school level, has three choices upon graduation: employment, profession school (3 years), or go to college (above 4 years). Therefore, we have the following model:

$$\Pr(I = 0 | z) = \frac{1}{1 + \sum_{j=1}^{2} \exp(\beta_j + \gamma_j * policy + \delta_j * \mathrm{X})}, \tag{1}$$

$$\Pr(I = s | z) = \frac{\exp(\beta_j + \gamma_j * policy + \delta_j * \mathrm{X})}{1 + \sum_{j=1}^{2} \exp(\beta_j + \gamma_j * policy + \delta_j * \mathrm{X})} \quad (s=1,2) \tag{2}$$

I=0, 1, 2 represents the above three choices for a high school graduate (0 for employment, 1 for profession school, and 2 for college). I=0 is used as the reference group in the estimation. *policy* is a dummy for expansion policy (policy=1 and policy=0 for younger and older groups respectively). We can therefore calculate how the expansion policy affects individuals' choice (holding others constant):

$$RRR \equiv \frac{\Pr(I = s | z')/\Pr(I = 1 | z')}{\Pr(I = s | z)/\Pr(I = 1 | z)} = \exp(\gamma_s) \tag{3}$$

Suppose s=2. The probability ratio of *go to college* to *employment* increased by $\exp(\gamma_2)$ times after expansion. If $\gamma_s > 0$, that means the relative probability of going to college increases. The results are reported in part A of Table 2. The first two columns are for males. Obviously, the relative probability of going to college increased with expansion policy (RRR=Exp(0.2)>1). The relative probability of going to professional school doesn't change significantly however. In addition, we find no significant

increasing trend of going to college for male (T for the year of taking college entrance exams). Column 4 and 5 are for females. Similar to male, the relative probability increased significantly with expansion, and the relative probability of going to professional school have not changed significantly around the time of expansion. Different from male, the increasing trend of going to college is significant for females.

In order to gain more confidence that the increase in relative probability is due to expansion policy, we do a placebo study. Instead of treating those having college entrance exams after 1999 as one single category, we separate them into three subgroups (1999, 2000, and 2001). Meanwhile, we also create a dummy for the 1998 cohort. It turns out the coefficients for year 1998 is not significant. This means that the significance for dummies for 1999, 2000, and 2001 is due to the expansion policy, not due to other factors influencing the time trend.

We perform an independence test next. Imagine two scenarios. In the first one, a high school graduate chooses between employment and going to college. With the expansion policy, the probability of going to college will increase and that of seeking employment with high school degree will decrease. In the second scenario, there's a third choice (professional school). High school graduates can choose professional school in this scenario. Those planned going to professional school may also choose college now. Therefore the choice between employment and college education may be dependent on whether there is a third choice. Whether the dependence property holds also has implication for the restructuring of higher education. To test dependence property statistically, we delete those professional graduates. The results are in column 3 and 6 for male and female respectively. As there are only two choices in the estimation, the multinomial logit model degenerates to a binary logit model. For male, the coefficients in the choice of college are very close to their counterparts in the multinomial logit model. In both part A and part B, we cannot reject the hypothesis that the two sets of coefficients are equal. The test on the coefficients of the reform variables (either the single policy dummy in part A or multi dummies in part B) also has the same conclusion. The result for female is a little different. Statistical test rejects that the coefficients are equal. Even though, the difference is small in magnitude of the estimates.

We have shown that the third alternative (professional college) have no significant effect on the choice between employment and college. This conclusion is important for two reasons. First, it implies that there was no restructuring with expansion. Second, it simplifies our study tremendously by allowing us to concentrate on how the expansion policy affects individuals' choice between two alternatives: employment upon graduate from high school and going to college.

4. Higher Education Expansion and Unemployment

In this his section we investigate how higher education expansion has affected employment of college graduates. At this stage we drop all observations that were

either still in school, handicapped, or doing housework.[6] Those who did not have any job in the week just before the survey are defined as *unemployed*. The solid line in Figure 2-a shows the unemployment rates for different ages. Clearly the younger group (aged 22-24) affected by the expansion policy had much higher unemployment rate than the elder group. The unemployment rate of those aged 22 is well above 20% while those for people older than 26 are below 5%. However we cannot attribute the whole age differential in unemployment rate to expansion because younger people tend to have higher unemployment even without this labor supply shock. The dashed line in the same figure shows the unemployment rate of various age groups in 2000. Notice that none of the observation was affected by the expansion policy the age differential in unemployment rates reflects only behavioral differences associated with age. Not surprisingly younger people still had higher unemployment rate than older people. However the unemployment rates for younger people in 2000 were much lower than their counterparts in 2005. Equally important is that older people have roughly the same unemployment rate in both years.

If the change of economic environments affected employment of different age groups differently, it could still cause the difference in unemployment rate even just for younger people between 2000 and 2005. If this was the case, we are more likely to observe similar patterns for other education levels. Figure 2-a and Figure 2-b report the unemployment rates of people with professional degrees and with high school degrees. We do find people in 2005 had higher unemployment rate than in 2000 for each age group, however the larger difference for younger people is not detected. Therefore we are more confident to say that higher education expansion has driven up unemployment rate of the young college graduates.

4.1 Model Specification

To disentangle the effect of higher education expansion quantitatively, we use a difference-in-difference strategy. Due to the inherent age difference of unemployment rate as observed earlier, we cannot simply compare (un)employment of those who were affected by the expansion policy and those not affected because they are, by definition, different in age. We therefore use data from 2000 census to control for the age difference of unemployment rate. We use a difference-in-difference strategy by estimating the following Linear Probability Model (LPM) model:[7]

$$unemployed = \alpha + \beta_1 age_{22-24} + \beta_2 year_{2005} + \beta_3 age_{22-24} * year_{2005} + \gamma X + \varepsilon \qquad (4)$$

where *unemployed* is a dummy variable indicating whether an individual is unemployed (=1) or not (=0). age_{22-24} is a dummy variable indicating whether an individual is aged between 22 and 24. For the 2005 observations, those observations aged between 22 and 24 (age_{22-24}=1) are affected by the expansion policy, or in the

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[6] We keep these observations in the analysis of previous section because what we were investigating is the effect of expansion on educational opportunity instead of its effect on employments.

[7] Using a Linear Probability Model makes the results easy to interpret, in particular when there is interaction term in the regression. Alternatively we can use a probit or logit model, but the interpretation will be more complicated (Ai and Norton, 2003).

terminology of program evaluation literature, are treated group. Dummy variable $year_{2005}$ equals one if observations are from the 2005 survey and equals zero otherwise. We also construct a variable being the interaction of these two dummy variables $age_{22-24}*year_{2005}$. 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 higher education expansion on unemployment, while the age difference and time difference can be captured by the coefficients of age_{22-24} and $year_{2005}$, respectively.

X is a vector of control covariates including gender (male=1), ethnicity (han=1), provincial GDP per capita, GDP growth rate, share of tertiary sector in GDP, and the ratio of trade volume over GDP, 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.

4.2 Results: Expansion Caused College Graduate Unemployment

The estimation results are reported in Colum 1 of Table 3. The coefficient for the interaction term turns out to be 0.088. The unemployment rate increased 9% (absolute) due to the expansion policy. Except for variables *age22-24* and *trade/gdp*, none of the control variables reported in the table is significant after controlling for provincial dummies and provincial specific age-unemployment patterns. The trade variable is significantly negative, which means that the region with more openness tends to absorb more college graduates. Some other variables reflecting economic conditions (demand factors) also have negative coefficients. In other words, advantageous economic conditions can alleviate employment pressures for college graduate. However there coefficients have relatively large standard errors.

We also considered individuals main income sources instead of employment status. For the working age population we are in particular interested in whether an individual's living expenses were from family members rather than from her own labor income. We construct a dummy variable indicating whether an individual was in such a condition. Figure 3, similar to Figure 2-a, shows that young people in 2005 have much higher rate of being dependent on family than their counterpart in 2000. Use this variable as the dependent variable we estimate a model similar to model (4).

The results are reported in column (3) Table 3. Not surprisingly the results are similar to those when the unemployment dummy is used as dependent variable. The coefficient for the interaction term is 0.086, significant at 1% level. It being close to the unemployment case suggests that most of the unemployed are not registered in the official statistical system and therefore are not entitled to unemployment insurance. Instead family is the main source of insurance when one is unemployed.

For those who were unemployed in 2000 and 2005, there are two possibilities: being unemployed due to separation with former employer and being unemployed since graduation. In Figure 4 we plot the proportion of unemployed observations being unemployed since graduation. For those aged more than 25, the lines for 2000

and for 2005 are very close. For the younger cohorts (aged 22-24) in 2005 however were more likely to have been searching for jobs than those in 2000, suggesting that college graduates face a more disadvantageous situation after expansion. Similarly we estimate a different-in-difference model using unemployed observations. The dependent variable is a dummy variable indicating whether one had been searching after graduation. Still the interaction term is significantly positive (column 5 Table 3), confirming the pattern shown by Figure 4.

All the above regressions use observations of college graduates. What if the same regression model is run using observations with professional degrees or high school degrees? The results are reported in Table 4. For observations with professional degrees, the coefficients for the interaction term are significantly positive but are much smaller in magnitudes than those for college graduates, consisting with expansion having more effect on college education. If we consider high school graduates, the coefficient for the interaction term becomes insignificant at all. Therefore for the same age groups the unemployment effect of higher education expansion concentrated in the college graduate population.

4.3 Accounting for Compositional Change

In essence the college entrance examination system determining who can go to college and who cannot is a screening process. Higher education expansion has allowed more high school graduate to go to college by lowering requirements. Therefore the expansion of higher education has been associated with composition change in ability (if we believe the marks in college entrance examination are good proxies for ability). Without expansion policy some college graduates could only have high school degrees and would anyway have higher unemployment rate. In other words, the higher unemployment rate caused by 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 college entrance examination system select students admitted to college from the top of the examination, the more are admitted to college the lower the average ability of the college graduates. For both 2000 and 2005 data 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 (named *ratio*) is then added to the regression. The results are reported in column 2, 4, and 6 in Table 3.

In column 2 and 4 the coefficients for ratio is significantly positive, which means lower average ability is associated with higher unemployment rate. Meanwhile the coefficients for the interaction term ($age_{22-24}*year_{2005}$) become smaller. In both columns the coefficients are around 0.06, one third smaller than when the ability proxy is not controlled. Another message sent by the change in magnitude of the coefficients is that even controlling for ability, the expansion policy still caused sharp increase in unemployment rate for college graduates.

4.4 Results by Region: Going to the West?

Location is an important factor influencing a college graduate's employment choice. As China's development is uneven geographically, many college graduates choose to work in coastal regions putting great pressure on those regions. That is why the Chinese government encourages college graduate to look for job in western areas or in medium-small sized cities. Therefore it is of interest to see the regional dimension of the expansion impact on unemployment rate of college graduates.

We divide the whole nation into three regions: coastal (eastern), central, and western regions, and see the effect of expansion policy for these regions separately. We describe unemployment rate of college graduate by region and by year in Figure 5. In 2000 (see Figure 5-a) central and eastern regions have roughly the same level of interest rate for the age ranging 22 to 35. The unemployment rates of western provinces were much higher than in central and eastern provinces, but this is only true for younger age groups (22-24). By 2005 the pattern has changed dramatically: Younger people tended to have much higher unemployment rate (see Figure 5-b). But the changes in youth unemployment rate are not evenly distributed across regions. Clearly it was the central provinces that experience the sharpest increase in unemployment.

The quantitative results are reported in Table 5. Using the same DID strategy we find the unemployment rate of the youth after the expansion policy increased by 7% in eastern region and 17% in central region. Due to already high level of unemployment rate in the west, the increase in unemployment rate associated with the expansion policy is small (3% and insignificant). Another reason is that residents in the west were less likely to benefit from the expansion policy in terms of education opportunity.

4.5 Results by Gender

Finally we estimate the effect of expansion policy by gender. As mentioned in Freeman (2009) the increase of education level for female is a prominent feature of the higher education expansion. We have already seen this in previous section. Did the impact of expansion policy have differential effect on unemployment rate of male and female? In Figure 7, there appears to be significant difference between male and female. For male (Figure 7-a) the difference in unemployment rate between 2000 and 2005 is concentrated in population aged 22-24, especially those aged 22 and 23. The difference for other age groups is small. For female (Figure 7-b) the difference also concentrated in population in younger group, but the difference relatively small in comparison with their male counterparts.

In Table 6 we repeat the same exercises as in Table 3 except for estimating the model by gender. From the magnitudes of the coefficients we reaffirm that the expansion policy has more impact on male than on female. With the expansion policy male unemployment rate and the proportion depending on family increased around 11% while that of female increased 7%. After controlling for ability, the expansion effects

for male deceases only slightly (to 9-10%) while that for female decreases to 3% and become insignificant. However among those unemployed, higher proportion of young female did not have job after graduation till the time of population survey.

In Table 7 we use unemployed dummy as dependent variable and run DID regressions by gender and by region. For every region, young male observations were affected to a larger extent by the expansion policy than young females. For both genders, young people in central provinces and in small-medium sized cities experienced largest increase in unemployment rate.

5. Discussions

5.1 Why Higher Education Expansion Has Caused Unemployment?

The analysis above provides several potential answers to this question. First is the compositional change due to lowered requirements for high school graduate to be admitted to college. The counterfactual unemployment rate would be high if they did not go to college because of the expansion policy. However our results show that expansion policy still caused high unemployment rate for the youth after accounting for composition change.

The second possible reason is location mismatch. As showed by the results in section 4.4, the increase in unemployment rate associated with the policy is higher in central and western regions (in particular central regions). Although the unemployment rate also increased in coastal provinces, it is relatively lower. To alleviate the unemployment problem at the national level, young college graduates should be encouraged to find jobs in coastal regions. However there are impediments preventing college graduate choosing location freely. One is the Hukou (or household registration) system. Many college graduates found it hard to obtain official permanent resident status in destination cities, especially large coastal cities like Beijing and Shanghai. They are thus not entitled to some benefits or welfare associated with Hukou status. The other is the limited supply of housing due to monopolistic control of land by local government. In addition there is unfavorable attitude (of the urban residents) towards huge cities. The policy makers also tends to encourage the college graduate to find jobs in central-western regions or small-medium sized cities, where the college premia were significantly lower than in coastal regions (Whalley and Xing, 2010).

Skill mismatch is another possible reason for higher unemployment rate among college graduates. As mentioned in Pissarides (2000), greater extent of skill mismatch often occurs when there is exogenous shock or structural changes in labor supply or demand. Even if there was already an increasing demand for college graduates as evidenced by the increasing college premium, the increasing supply of college graduates was so huge and in such a short period of time that both the education system and the labor market need time to adjust.

A strong evidence for skill mismatch is the shortage of skilled labor in coastal regions since around 2003 or 2004 despite high unemployment rate of college

graduates. According to the statistics of Ministry of Human Resources and Social Security, the ratio of vacancy to applicants for positions requiring skilled labor were well above one (see Table 8). For senior level engineers or technicians the number of vacancies opened was as twice as that of applicants. Even in 2010, the demand for skilled labor were still much higher than supply.

Finally higher education level may increase one's reservation wage. In addition, previous research finds that those affected by the expansion policy were more likely to come from single child family. College graduates from single child families tended to decline low pay and indecent jobs.

5.2 Why Go to College?

Given the high unemployment rate of college graduates, it seems a puzzle that Chinese parents are still enthusiastic to send their child to college. The answer partly lies in the high college premium. In Figure 8 we plot the college premia from various studies. Clearly college premium increased dramatically in the 1990s. By the end of 1990s the return to college education has reached 30-50% (Heckman and Li, 2004, Zhang et al., 2005, Li and Ding, 2003, and Meng et al., 2010). Possibly due the expansion policy, the increasing trend stopped after 2003, but college premia were still approaching 40% (Meng et al. 2010). Even with unemployment rate of 20% the expected return of college educations would still be as high as 30%. In fact the unemployment rate for college graduates of older ages was much lower than other education levels. Therefore college education still seems an attractive investment.

In addition, Chinese labor market is a segmented one. Higher education is often the channel through which an individual can move upward, from the country side to the city for example (Xing, 2010). Given the large difference in income, social status, and welfare benefits between different sectors, the return of higher education is still high.

5.3 Implications

The surge in the amount of college graduates and their high unemployment rate will have strong implications for China's economic growth. The labor shortage in coastal areas we have mentioned has raised big concerns about China's economic prospect, worrying about the constraints of labor. Indeed labor constraints proved to be an important factor in the slowdown of some ever fast growing economy such as Post war soviet in the 1960s (Weitzman, 1970). The simple fact we present here suggest that China's economy is far from being constrained by labor supply. Lack of skilled labor will not be a bottleneck for development.

As China is getting more integrated into the world economy, the high unemployment rate of college graduates may also have big impacts on world labor market. Companies will find much cheaper college graduates in China, and consequently college graduates in other countries will face fierce competition coming from China.
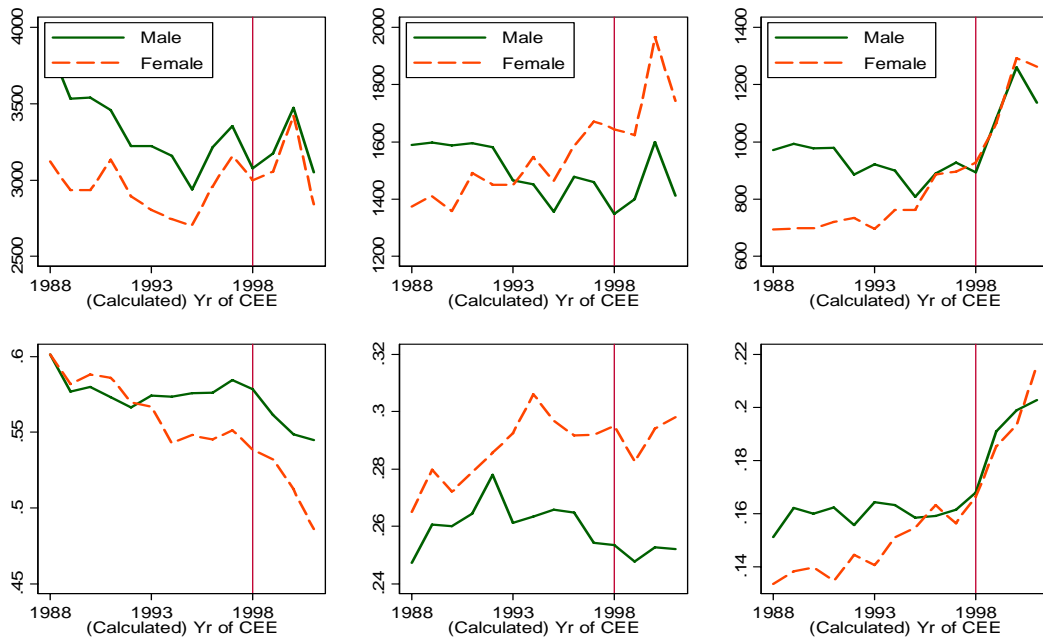
Figure 1 Number and proportion of different education levels

Note: from left to right, each column for high school, 3-year college, and 4-year college (and above) respectively.

The upper panels are for absolute numbers and the lower panels are for proportions.
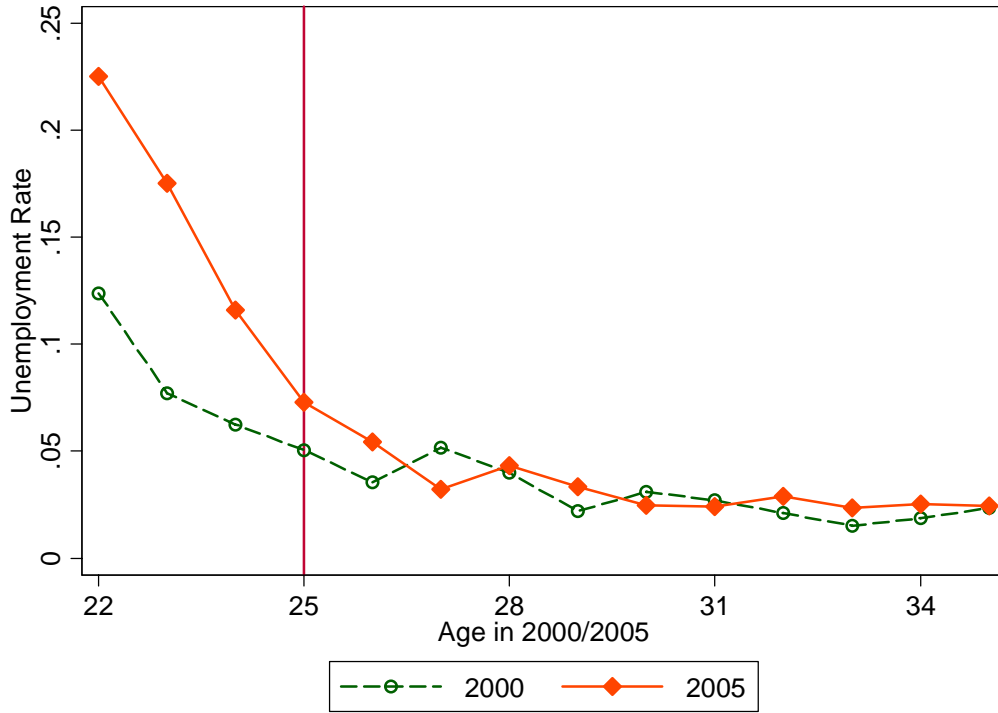
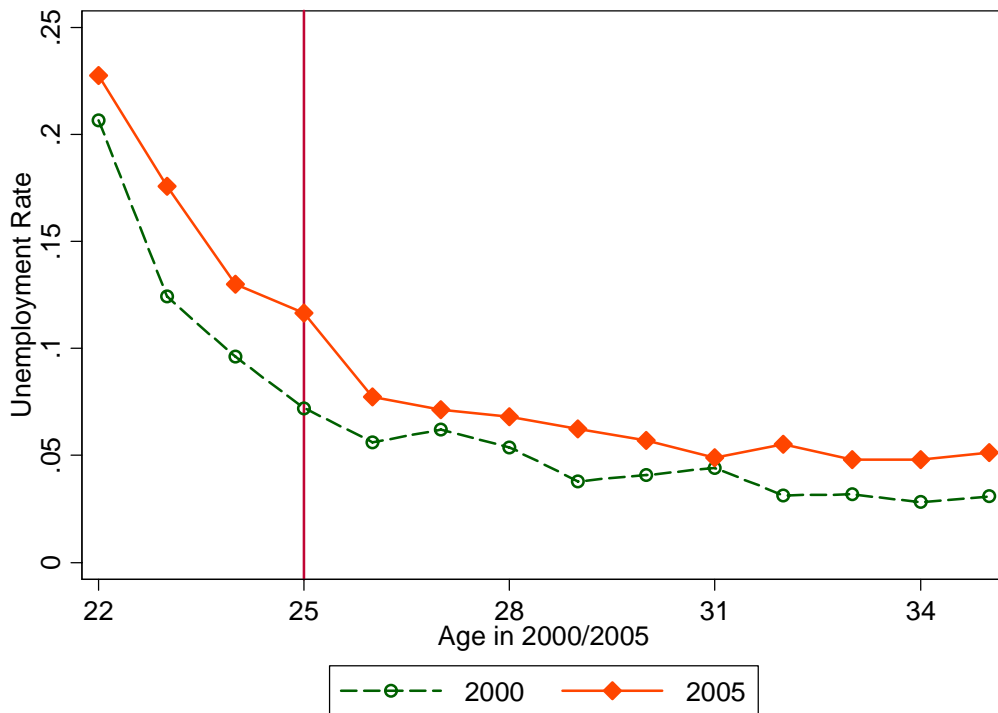Figure 2-a Unemployment Rate by Age, College and Above Degrees

Figure 2-b Unemployment Rate by Age, Professional Degrees (3-year college)
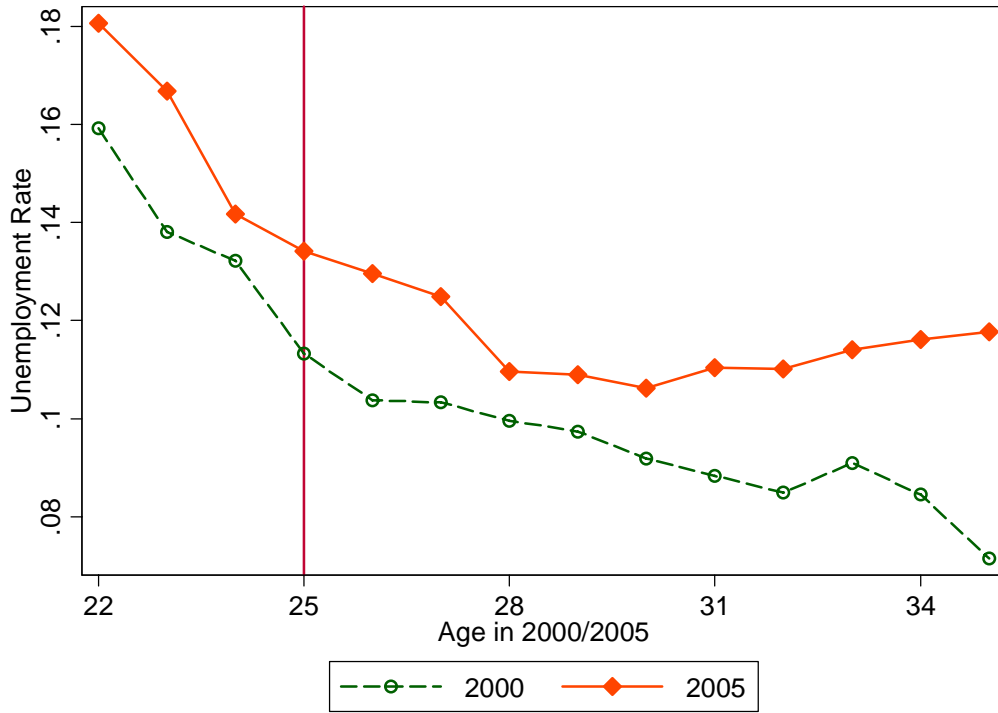
Figure 2-c Unemployment Rate by Age, High School Graduates

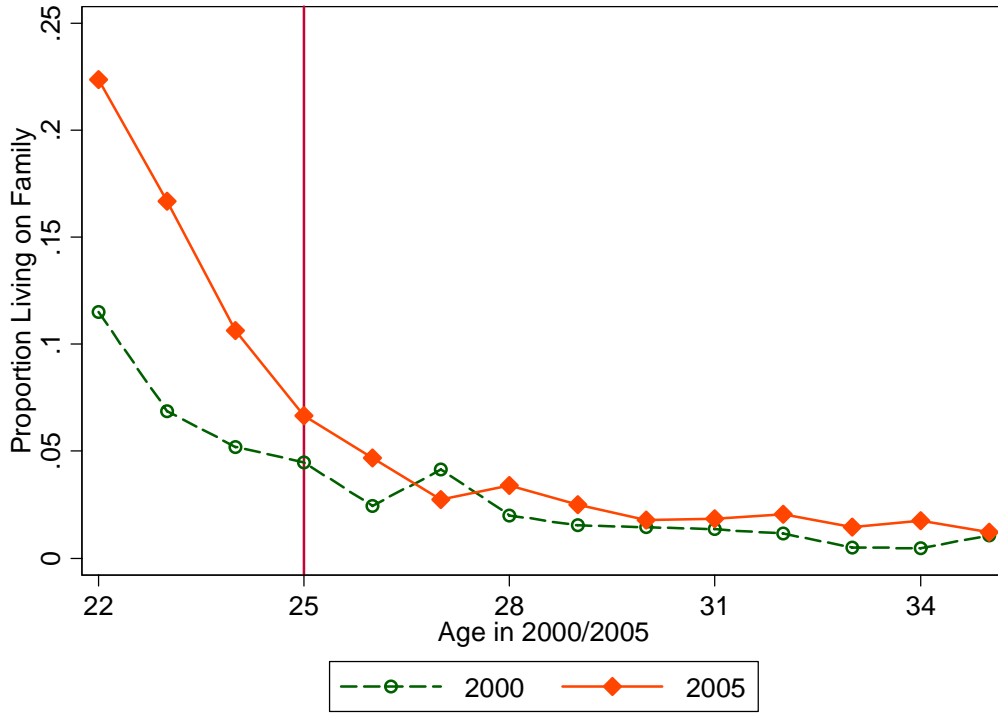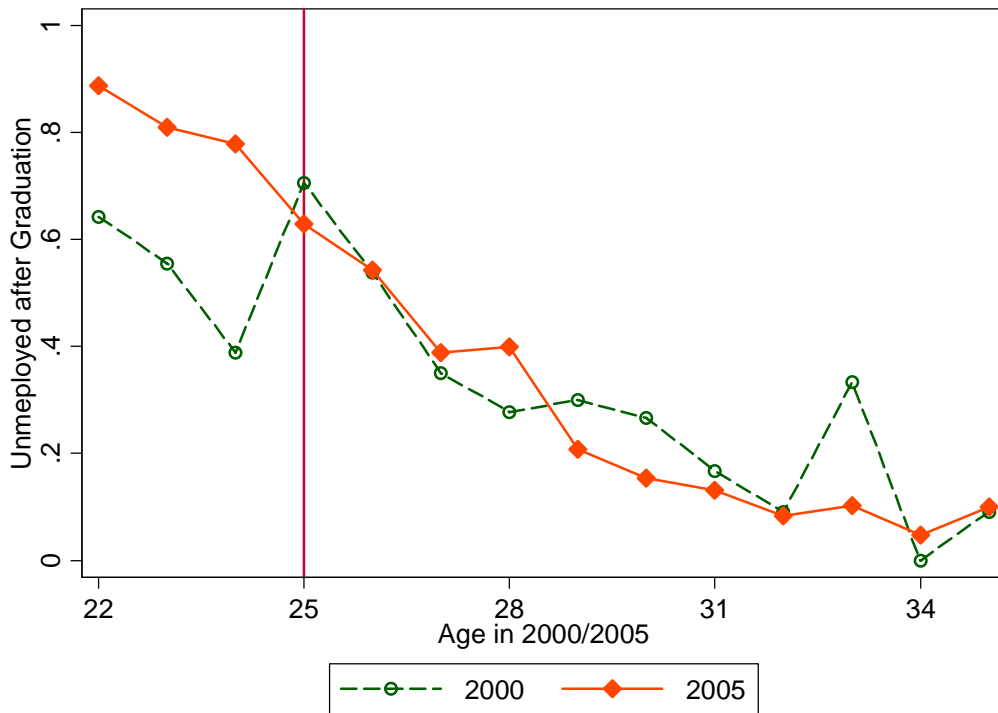Figure 3 Proportion of People with Main Income from Family Members or Relatives

Figure 4 Proportion of Unemployed Immediately after Graduation
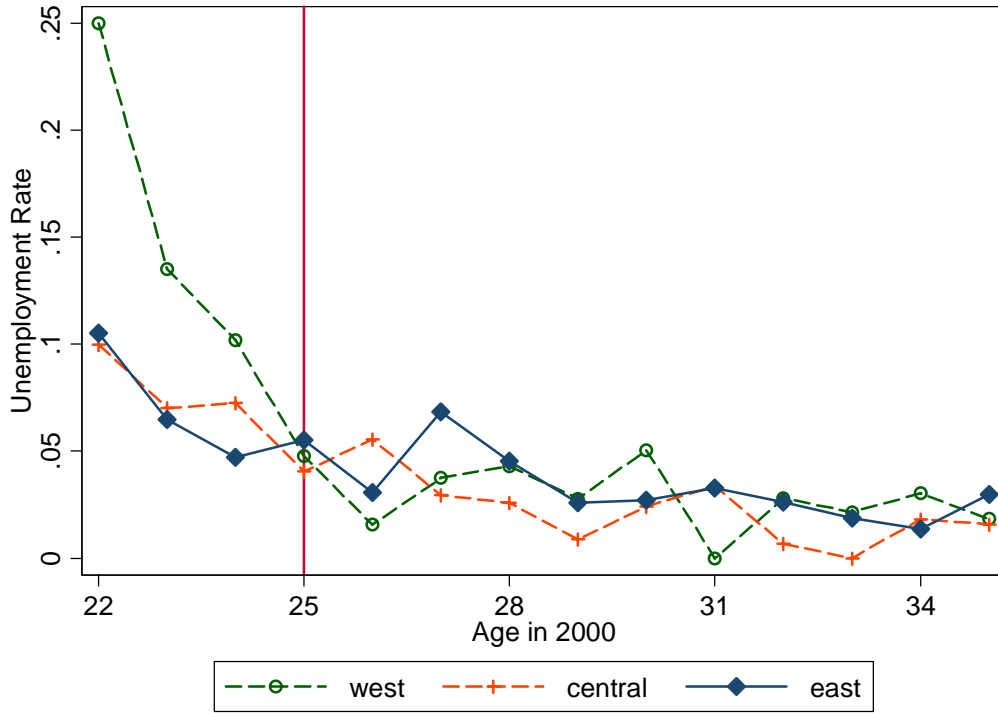
Figure 5-a Unemployment by Region, 2000
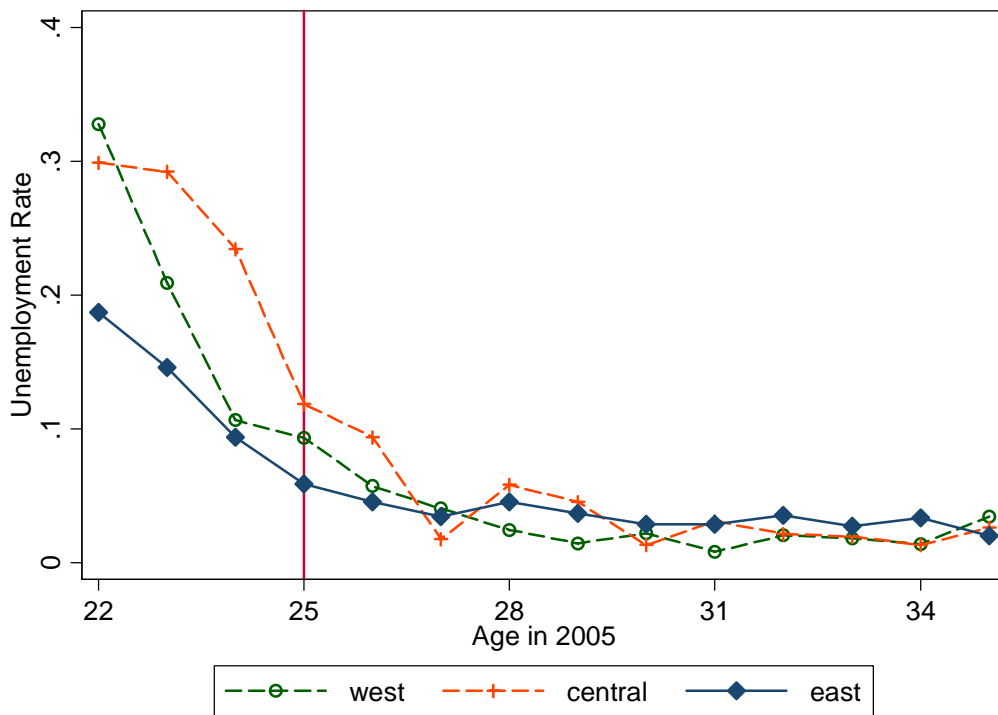
Figure 5-b Unemployment by Region, 2005
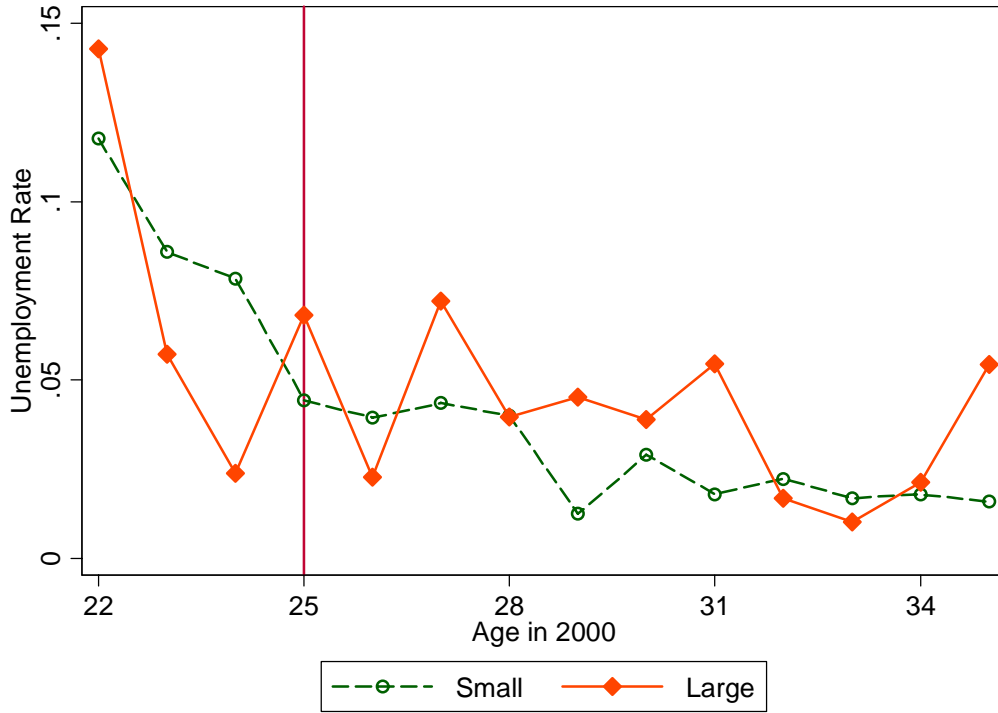
Figure 6-a Unemployment by City Size, 2000
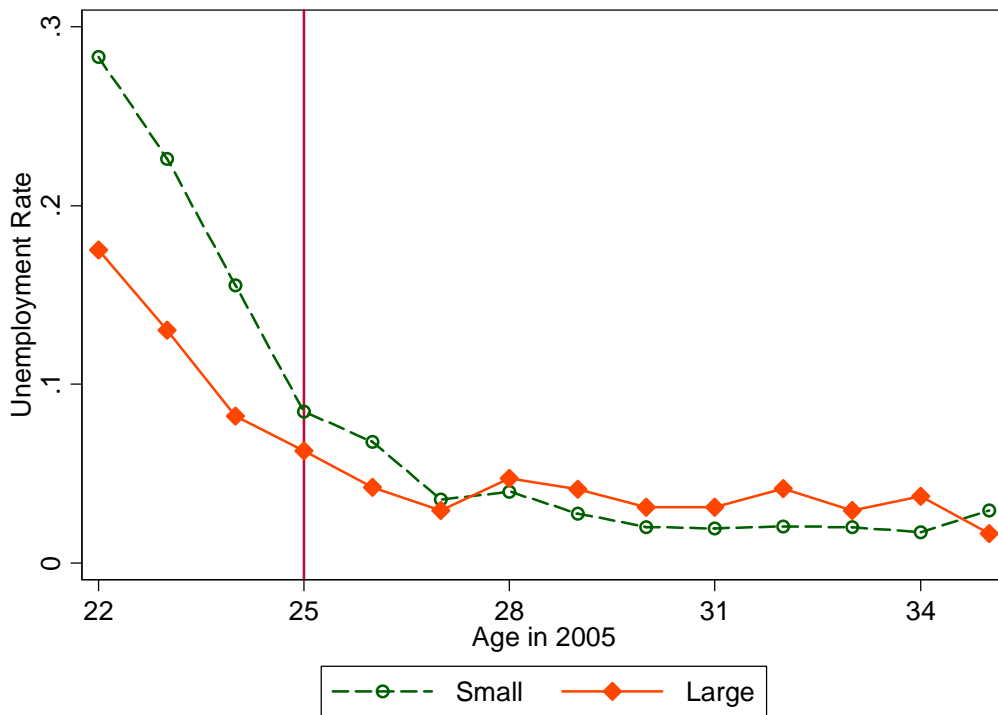
Figure 6-b Unemployment by City Size, 2005
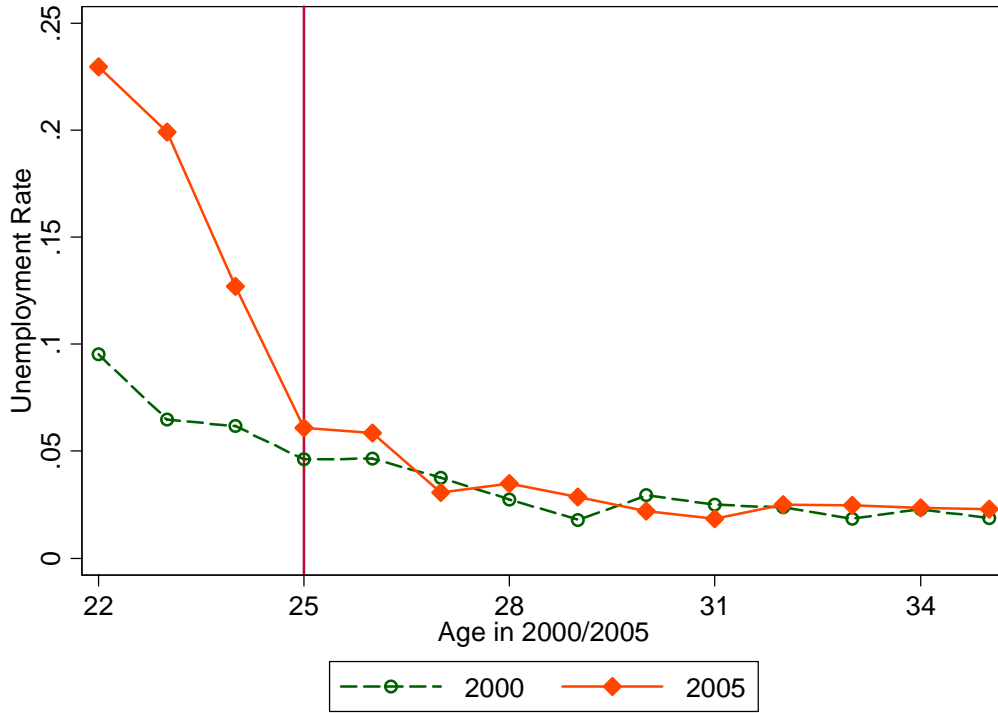
Figure 7-a Male Unemployment
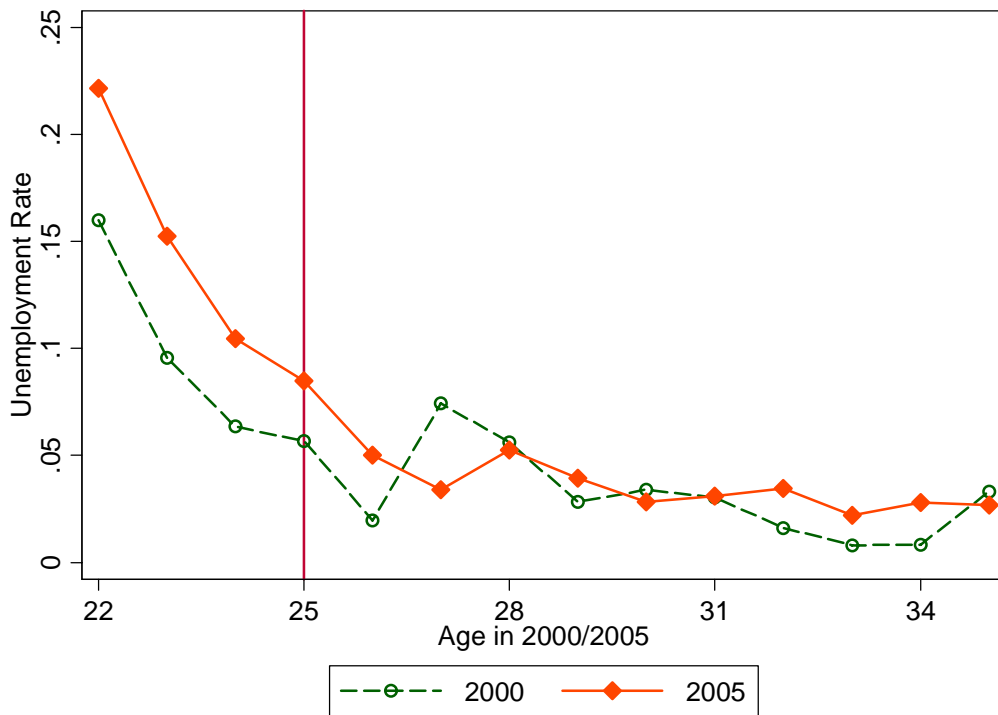
Figure 7-b Female Unemployment
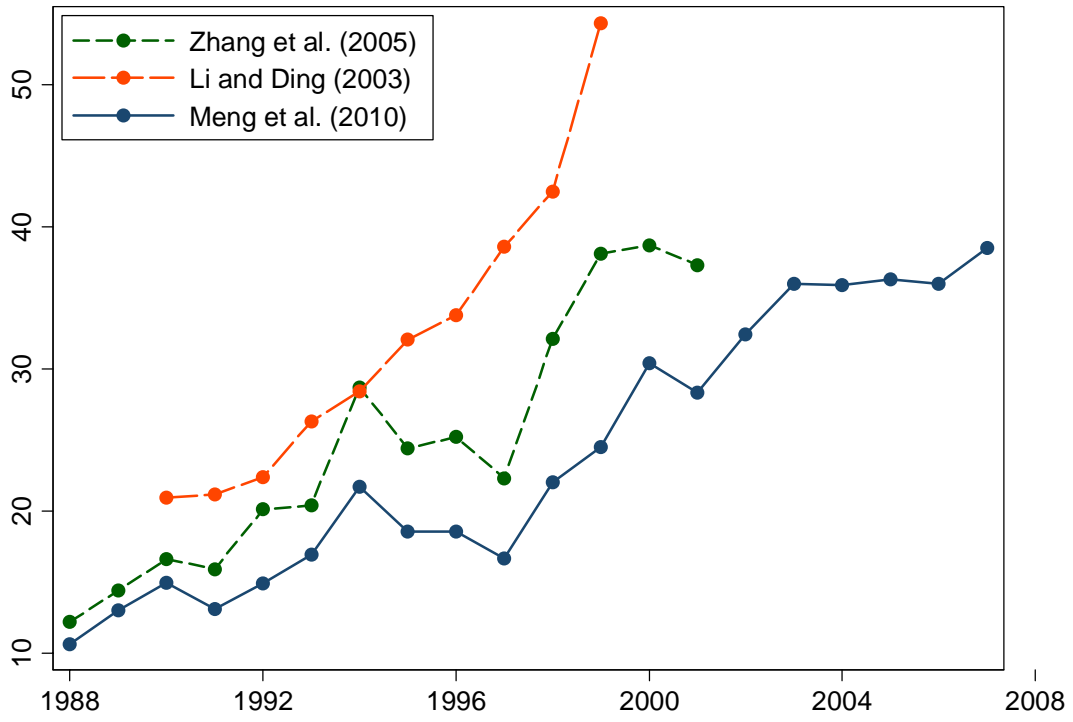
Figure 8 College Premium between 1988 and 2007

Table 1 Summary statistics

	Census 2000		1% population survey 2005	
	mean	sd	mean	sd
age	28.36	3.99	28.43	4.1
female	0.446	0.497	0.483	0.5
non-han	0.068	0.252	0.067	0.251
east	0.449	0.497	0.551	0.497
single child			0.198	0.399
education level				
high school	0.674	0.469	0.563	0.496
professional	0.223	0.416	0.273	0.446
college and above	0.103	0.303	0.164	0.371
obs	61889		156417	

Table 2 Expansion and education choice in mlogit model, employment as reference group

	Male			Female		
	Model 1		Model 2	Model 3		Model 4
	（1）	（2）	（3）	（4）	（5）	（6）
	professional	college	college	professional	college	college
A:						
T	0.004	0.003	0.003	0.022***	0.031***	0.030***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
policy	-0.007	0.200***	0.202***	-0.028	0.152***	0.156***
	(0.029)	(0.034)	(0.034)	(0.028)	(0.035)	(0.034)
Constant	-8.915	-7.020	-6.803	-44.379***	-62.359***	-61.514***
	(5.833)	(6.965)	(6.950)	(5.936)	(7.559)	(7.551)
R2_p	0.005		0.008	0.006		0.013
N	80835		59911	75582		53804
chi2(4)	6.06			11.48		
Prob > chi2	0.1948			0.0217		
chi2(1)	0.88			6.59		
Prob > chi2	0.3494			0.0102		
B:						
T	0.006*	0.001	0.001	0.023***	0.028***	0.027***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
yr1998	-0.054	0.016	0.016	-0.033	0.011	0.011
	(0.039)	(0.046)	(0.046)	(0.037)	(0.046)	(0.046)
yr1999	-0.051	0.163***	0.164***	-0.088**	0.095**	0.100**
	(0.040)	(0.046)	(0.046)	(0.039)	(0.047)	(0.047)
yr2000	-0.013	0.224***	0.225***	-0.032	0.141***	0.144***
	(0.041)	(0.047)	(0.047)	(0.040)	(0.048)	(0.048)
yr2001	-0.015	0.250***	0.250***	0.013	0.277***	0.282***
	(0.045)	(0.051)	(0.051)	(0.043)	(0.052)	(0.052)
Constant	-12.835*	-3.935	-3.788	-45.610***	-57.038***	-56.164***
	(6.740)	(8.085)	(8.069)	(6.932)	(8.882)	(8.871)
R2_p	0.005		0.008	0.006		0.013
N	80835		59911	75582		53804
chi2(7)	5.92			14.92		
Prob > chi2	0.549			0.037		
chi2(4)	0.99			8.44		
Prob > chi2	0.9109			0.0769		

Note: ***, **, * represent the significance level of 1%, 5%, and 10% respectively. Standard errors are in (). We controlled region dummies in the regression.

Table 3 Effect Education Expansion on Unemployment, College Graduate

	unemployed		income from family		unemployed after graduation	
	(1)	(2)	(3)	(4)	(5)	(6)
$age_{22\text{-}24}*year_{2005}$	0.088***	0.062***	0.086***	0.058***	0.314***	0.348***
	(0.013)	(0.016)	(0.012)	(0.015)	(0.084)	(0.116)
$year_{2005}$	0.027	-0.008	0.007	-0.031*	-0.049	0.014
	(0.020)	(0.023)	(0.017)	(0.019)	(0.230)	(0.268)
$age_{22\text{-}24}$	-0.033**	-0.019	-0.034***	-0.019	-0.300***	-0.319***
	(0.013)	(0.014)	(0.012)	(0.013)	(0.093)	(0.106)
male	0.000	0.000	-0.004	-0.004	0.046**	0.046**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.022)	(0.022)
han	0.000	0.000	0.004	0.004	-0.012	-0.010
	(0.006)	(0.006)	(0.005)	(0.005)	(0.049)	(0.049)
gdpgr	-0.080	-0.079	-0.184	-0.184	-3.504**	-3.549**
	(0.182)	(0.182)	(0.155)	(0.155)	(1.730)	(1.723)
gdppc	-0.019	-0.017	0.021	0.024	0.195	0.188
	(0.034)	(0.034)	(0.028)	(0.028)	(0.392)	(0.393)
tertiaryshare	-0.124	-0.128	-0.094	-0.097	0.157	0.169
	(0.088)	(0.088)	(0.076)	(0.076)	(1.124)	(1.126)
Trade/gdp	-0.053***	-0.055***	-0.042***	-0.044***	0.023	0.022
	(0.017)	(0.017)	(0.014)	(0.014)	(0.205)	(0.205)
Ratio		1.335***		1.450***		-2.121
		(0.433)		(0.386)		(4.664)
Constant	1.280**	1.062**	1.080**	0.844*	4.650	5.163
	(0.526)	(0.526)	(0.474)	(0.471)	(4.627)	(4.833)
R-squared	0.062	0.062	0.075	0.076	0.355	0.354
N	27205	27205	27205	27205	1465	1465

Note: (1) Standard errors in parentheses. (2) *, **, and ***significant at 10%, 5%, and 1% level. (3) Age, age squared, and their interactions with provincial dummies, as well as provincial dummies are controlled for.

Table 4 Effect Education Expansion on Unemployment, College Graduate and Professional Graduates

	professional degrees			high school graduates		
	unemployed	income from family	unemployed after grad	unemployed	income from family	unemployed after grad
	(1)	(2)	(3)	(4)	(5)	(6)
$age_{22-24}*year_{2005}$	0.025***	0.025***	-0.001	0.001	0.002	-0.012
	(0.009)	(0.008)	(0.035)	(0.005)	(0.005)	(0.019)
$year_{2005}$	0.019	0.032**	-0.052	-0.036***	-0.004	-0.139***
	(0.017)	(0.015)	(0.110)	(0.014)	(0.012)	(0.049)
age_{22-24}	-0.002	-0.000	0.013	0.007	0.007	0.033
	(0.009)	(0.009)	(0.043)	(0.006)	(0.005)	(0.024)
male	-0.010***	-0.012***	0.082***	-0.044***	-0.047***	0.032***
	(0.002)	(0.002)	(0.013)	(0.002)	(0.002)	(0.007)
han	0.011**	0.006	-0.093***	0.005	0.008**	0.002
	(0.005)	(0.004)	(0.029)	(0.004)	(0.003)	(0.015)
gdpgr	-0.037	0.078	-0.300	-0.524***	-0.316***	-0.953**
	(0.154)	(0.133)	(1.030)	(0.121)	(0.103)	(0.455)
gdppc	0.003	-0.020	0.148	0.115***	0.064***	0.151*
	(0.031)	(0.027)	(0.191)	(0.024)	(0.021)	(0.087)
tertiaryshare	0.022	0.039	-0.030	0.164***	0.136**	-0.228
	(0.078)	(0.070)	(0.545)	(0.062)	(0.053)	(0.260)
Trade/gdp	-0.011	-0.005	0.039	-0.010	0.001	-0.050
	(0.015)	(0.013)	(0.115)	(0.012)	(0.011)	(0.047)
Constant	0.844	1.055**	4.738*	-0.725*	-0.150	2.672**
	(0.529)	(0.492)	(2.458)	(0.426)	(0.379)	(1.335)
R-squared	0.040	0.048	0.349	0.021	0.030	0.216
N	52811	52811	4210	120254	120254	14360

Note: (1) Standard errors in parentheses. (2) *, **, and ***significant at 10%, 5%, and 1% level. (3) Age, age squared, and their interactions with provincial dummies, as well as provincial dummies are controlled for.

Table 5 Effect of Education Expansion on Unemployment by Region

	West	Central	West& Central	East	Medium-Small	Large Cities
	(1)	(2)	(3)	(4)	(5)	(6)
$age_{22-24}*year_{2005}$	0.031	0.171***	0.112***	0.073***	0.105***	0.062***
	(0.037)	(0.028)	(0.023)	(0.015)	(0.017)	(0.019)
$year_{2005}$	-0.142*	-0.071	-0.007	0.002	0.022	0.268
	(0.083)	(0.064)	(0.042)	(0.032)	(0.023)	(0.347)
age_{22-24}	0.001	-0.038	-0.031	-0.032**	-0.021	-0.037*
	(0.037)	(0.029)	(0.023)	(0.016)	(0.017)	(0.020)
male	0.004	0.003	0.004	-0.003	0.002	-0.004
	(0.006)	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)
han	0.008	-0.038*	-0.002	0.003	-0.002	0.004
	(0.007)	(0.021)	(0.007)	(0.009)	(0.006)	(0.011)
gdpgr	-0.534*	-0.272	-0.125	1.356	-0.053	-
	(0.308)	(0.501)	(0.236)	(0.920)	(0.205)	-
gdppc	0.209*	0.116	0.023	-0.033	-0.013	-0.369
	(0.120)	(0.104)	(0.066)	(0.043)	(0.042)	(0.480)
tertiaryshare	0.526	0.068	0.113	-0.215*	-0.062	-0.548
	(0.325)	(0.201)	(0.133)	(0.119)	(0.105)	(0.761)
Trade/gdp	0.228	0.608	0.039	-0.042*	-0.053**	-0.224
	(0.291)	(0.593)	(0.219)	(0.024)	(0.023)	(0.268)
Constant	-1.101	-0.714	-1.319	1.536***	-0.877	5.749
	(1.577)	(1.150)	(0.855)	(0.590)	(0.710)	(5.683)
R-squared	0.079	0.121	0.099	0.038	0.087	0.029
N	5433	5054	10487	16718	15882	11323

Note: (1) The dependent variable is a dummy indicating unemployment. (2) Standard errors in parentheses. (3) *, **, and ***significant at 10%, 5%, and 1% level. (4) Age, age squared, and their interactions with provincial dummies, as well as provincial dummies are controlled for.

Table 6 Effect of Education Expansion on Unemployment by Gender

	male			female		
	unemployed	income from family	unemployed after graduation	unemployed	income from family	unemployed after graduation
	(1)	(2)	(3)	(4)	(5)	(6)
without controlling for ability						
$age_{22\text{-}24}$*$year_{2005}$	0.112***	0.108***	0.217*	0.066***	0.067***	0.446***
	(0.017)	(0.016)	(0.118)	(0.021)	(0.020)	(0.118)
Controlling for ability						
$age_{22\text{-}24}$*$year_{2005}$	0.098***	0.094***	0.260*	0.032	0.034	0.423**
	(0.019)	(0.019)	(0.138)	(0.026)	(0.024)	(0.191)

Note: (1) Standard errors in parentheses. (2) *, **, and ***significant at 10%, 5%, and 1% level. (3) Age, age squared, and their interactions with provincial dummies, as well as provincial dummies are controlled for. (4) Other control variables are identical with those reported in table 3 and table 5.

Table 7 Effect of Education Expansion on Unemployment by Region and by Gender

	West	Central	West& Central	East	Medium-Small Cities	Large Cities
	(1)	(2)	(3)	(4)	(5)	(6)
male						
$age_{22\text{-}24}$*$year_{2005}$	0.074	0.196***	0.143***	0.092***	0.127***	0.092***
	(0.049)	(0.038)	(0.030)	(0.020)	(0.023)	(0.021)
female						
$age_{22\text{-}24}$*$year_{2005}$	-0.035	0.148***	0.075**	0.064***	0.086***	0.038
	(0.061)	(0.044)	(0.037)	(0.024)	(0.026)	(0.033)

Note: (1) The dependent variable is a dummy indicating unemployment. (2) Standard errors in parentheses. (3) *, **, and ***significant at 10%, 5%, and 1% level. (4) Age, age squared, and their interactions with provincial dummies, as well as provincial dummies are controlled for. (5) Other control variables are identical with those reported in table 3 and table 5.

Table 8 Demand-Supply Conditions of Skilled Labor in Human Resource Agencies

Skill level	vacancy/applicants ratio	
	2005	2010
Occupation Certificates (Technician)		
level 5	1.52	1.47
level 4	1.57	1.48
level 3	2.1	1.63
level 1	1.85	1.87
level 1	2.08	1.89
Junior Engineer	1.31	1.53
Middle Level Engineer	1.51	1.59
Senior Engineer	2.06	1.87

Note: For technicial level 1 to 5, the higher the level the more skilled the worker.

Data Sources: Ministry of Human Resources and Social Security. The data are collected from labor market intermediate agencies in 116 cities.

http://www.mohrss.gov.cn/page.do?pa=40288020240500280124088 2b84702d7&guid=dddfd8f828c145a1b9a268ca2c352c08&og=8a81f0842d0d556d012d11155d8c0043

http://www.mohrss.gov.cn/page.do?pa=40288020240500280124088 2b84702d7&guid=801f571faa8d4bda823b180d35469d57&og=8a81f0842d0d556d012d11155d8c0043

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