



What determines employment opportunity for college graduates in China after higher education reform?

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ABSTRACT

Using the 2005 placement data from two separate colleges, this paper studies graduate job allocation in China after higher education reform. Other things being equal, graduates with better college GPA were more likely to be employed (in particular by high-pay foreign firms) in both colleges. Female advantage in GPA helped to produce a surprising gender employment gap favoring female graduates. Our empirical evidence does not support the three alternative hypotheses of such a gap. Even though the job-market returns to GPA might be higher for women, there is some weak evidence that the job-market preferred male graduates over their female peers with similar qualifications. Pre-college urban *hukou* status and a proxy of father's education had positive impacts on a graduate's educational and employment outcomes. There is no evidence that father's Communist Party membership mattered.

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1. Introduction

Before higher education reform of the late-1990s, each college graduate in China was guaranteed a government-assigned job through a centralized placement system. The reform created the world's largest graduate job-market in China. In the face of massive graduate unemployment over the past decade, the functioning of this new market has received great public attention.¹ Is job allocation determined by merit? Do household registration status (*hukou*) and family background play an important role? Is the outcome fair to the women? Etc.

These new questions are important because the job-market is still in transition. While the reform has offered graduates and their employers new opportunities, *hukou* institution still restricts labor mobility in various ways, and employers (including government recruiters) often openly discriminate against job applicants with certain characteristics.² Graduate job allocation may affect the society in many important (or even disastrous) ways. For example, if the risk of unemployment for graduates from a rural/poor background is too high no matter how hard they work in college, they may shun college education altogether even if they can pay for it, deepening the existing inequality in access to higher education and blocking a traditional channel of social mobility in a highly unequal society. According to a widely circulated media report, over 10,000 mainly-rural high school students did not sign up for the 2009 college entrance exam in Chongqing when the college graduate job-market deteriorated during the global financial crisis, despite an increase in the total number of students who did sign up in this poor western province.³

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¹ Asia Times, June 20, 2007; Women of China report, December 21, 2006, etc.

² For example, a survey conducted by the Ministry of Labor and Social Security, which covered 62 cities, shows that 67% of employers set explicit employment restrictions regarding gender. Source: Xinhua News Agency, January 18, 2007. Restrictions regarding *hukou*, height, age, etc are also common. Regulation almost does not exist.

³ The Chongqing Evening News, 3/28/2009.

Even though anecdotal stories about the graduate job-market abound, there is no rigorous evidence of any “due process” regarding the way jobs are allocated among the graduates. This is largely due to the lack of reliable individual-level data set. To fill this gap, we collected a unique micro data set based upon various administrative records in two separate colleges. Our data set contains information on family background, individual characteristics, academic performance (both before and during college), and placement outcomes, allowing us to explore the functioning of the job-market in a fairly detailed way.

Our paper touches upon several dimensions of the job-market, but we will focus upon the way academic achievement during college affects post-graduate employability and contributes to the gender differences in employment outcomes. One reason is that our findings on other dimensions (such as *hukou* and family background) seem to be consistent with the perceived view of the Chinese labor market (e.g. Bian, 1994; Knight & Yueh, 2004), while the relationship between human capital accumulation within college (reflected in college academic achievement) and job-market outcomes in China is an open question. Providing an answer to this question would help us evaluate the role of college education and individual productive characteristic in the job allocation process.

Another reason is that the gender situation is counterintuitive when we look closer at it. The popular belief that female graduates are in a very weak position (see footnote 1) is not at all consistent with the employment data we found in our samples. While there are no official national statistics available, we were able to obtain regional statistics which also suggest that the female graduate unemployment rate is not in fact higher than the corresponding male rate in Shanghai (2005), Beijing (2000–2002), or Hainan (2005–2006). Our own calculation based upon 2005 mini census shows a similar pattern (details to be explored in a separate paper). Since hiring discrimination against women is widely perceived to exist (though rigorous evidence is lacking) in China, such a success demands an explanation. Our findings show that the gender difference in college academic achievement plays an important role.

To preview our main results, we find that college GPA is an important determinant of placement outcomes in both colleges. Other things equal, graduates with better college GPA were less likely to be unemployed in both colleges. Conditional upon the employment status, graduates with better GPA were also more likely to enter high-pay foreign firms. Returns to GPA tend to be larger in firms/places situated in a more competitive labor market, consistent with our supplementary evidence that grades reflect human capital investment.

Because women from both colleges received better grades, their employability in the post-reform graduate job-market was greatly improved. This helps to explain the observed employment gap in favor of women. Direct evidence of gender discrimination exists, but is not very strong. There is some weak evidence that returns to college GPA are higher for women.

Section 2 describes the background of our research and introduces the relevant literature. Section 3 describes our data. Section 4 presents our main results on the job-market returns to college GPA and its gender implications. Section 5 discusses three alternative hypotheses. Section 6 concludes this study.

2. Background and literature

Over the last ten years, China has seen the most dramatic expansion of opportunity for higher education in human history. Before market reforms of the late-1990s, university education in China was the privilege of a very small number of bright students, for whom education was almost free. Their jobs were guaranteed and assigned to them by the government through a centralized placement system (*fenpei*). From 1978 to 1998, tertiary student enrollment increased modestly, from 0.86 to 1.08 million. After several years of breakneck expansion of the educational system, enrollment had jumped to 5.4 million students in 2006.⁴

Massive graduate unemployment followed reform and college expansion. At the national level, the statistics reported by different government ministries have relatively large variations, though they seem to be at least as high as 30%.⁵ The situation is becoming worse over time. Facing a deepening economic crisis in December 2008, Chinese premier Wen Jiabao declared that dealing with graduate unemployment was his government's top priority.⁶ The situation is popularly believed to be worse for graduates from rural and poor regions, for those without good family connections, and for the female graduates who face gender discriminations.⁷

College-educated workers also face the *hukou* institutional constraint. Even though college students can get the local *hukou* at the city where they go to college, it is only a temporary status for study purposes (like a student visa). In the Chinese legal system, the pre-college *hukou* is considered the de fault legal status for a graduate. Any graduate who moves *hukou* to another city for purpose of obtaining college education is supposed to resume the original *hukou* upon graduation. If they want to keep the *hukou* at the city where they have completed college education (if their pre-college *hukou* is from a different city), or want to get *hukou* in an entirely different city, they need to seek government approval, which is often difficult to obtain, especially in large cities. Graduates may still migrate and work without local *hukou*, just as low-skilled migrant workers always do, but they will have to overcome institutional barriers and various discriminations (Knight & Yueh, 2004). In this way, *hukou* institution helps to preserve regional labor market segregation even for college-educated workers. Since regional inequality in China is very high (see details in the next section), labor market segregation has tremendous impact on a graduate's employment opportunities.

⁴ Source: Bai (2006).

⁵ Source: Ministry of Education, 2003, 2004; Ministry of Labor and Social Security, 2006. No method of data collection and computation was reported.

⁶ Source: China Daily online Dec 21, 2008. The other top priority was migrant workers' unemployment problem.

⁷ See articles in our footnote 1. Also see The Hebei Daily, 05/22/2006 “Nongcun Nv Daxuesheng Jiuye” (“The Employment of Graduates from the Rural Areas”), The China Youth Online, <http://www.cyol.net> 02/18/2008, “Fuqing Jiuye Shidai Daolailie?” (“Is it true that jobs are allocated through fathers' connections?”) etc.

Family connection is another important factor determining employment outcomes. Bian (1994) argued that jobs found through *guanxi* (especially connection to cadres) increased with the introduction of reform policies in the 1980s. According to a survey in Chongqing, 2007, close to half of the graduates considered *guanxi* to be the most important channel of employment.⁸

The general gender issues associated with economic transition have also received considerable attention in the literature. Many argue that economic transition tends to weaken women's employment outcomes, citing the widening gender earnings gap in China following state sector restructuring of 1997–2000.⁹ Brainerd (2000) investigated the evolution of wage gap in seven former-socialist European countries. She found that widening inequality during economic transition hurt women, but those losses have been more than offset in some countries where rewards to observed skills improved. This literature did not directly address the employment problem.

In addition to *hukou*, family background, and gender, college education and achievement should also affect graduate employment outcomes. American data suggest that good college grades lead to high earnings in later career life, and that this effect is important for reducing the gender earnings gap (Jones & Jackson, 1990; Loury, 1997; Wise, 1975). We do not know of any rigorous research in the Chinese context. The common belief seems to suggest that poor higher education quality is one big factor contributing to graduate unemployment.¹⁰ If the common belief is correct, college grades should have little market value.

3. Data

Our data come from the year-2005 student placement database of two separate Chinese colleges, supplemented with test scores or grades from the registrar's offices and personal background information from other relevant offices. Every four-year-degree-program student in the graduating class is included. All information is official and confidential.

One college is located in Shanghai, the other in the inland Sichuan province. Both colleges are considered to be elite institutions in their respective regions. They rank among the top 30% of all schools at the national level. Shanghai is one of the most developed areas in China, while Sichuan is among the poorest.

There are 1372 observations in the Shanghai sample, and 2166 observations in the Sichuan sample. In the Shanghai sample, the female percentage is 64.9%, while the Sichuan sample percentage is 53.1%. The binary gender variable is called *Female*. Tables 1 and 2 report the summary statistics by school and gender.

The graduates' job-market outcomes include the binary unemployment variable *Unemployed* (1 if unemployed, and 0 if employed), the binary firm ownership variable *Foreign* (1 if employed by a foreign firm or by a joint venture, 0 if by a domestic employer), and the binary work–study choice variable *GradSchool* (1 if enrolled in a domestic graduate program, 0 if on the job-market (employed or not)).¹¹

In both colleges, about 10% of the graduates choose to continue education. Women in Sichuan College has exceptionally higher propensity to go to graduate schools (22.3%). For those who did not go to graduate schools, the female unemployment rate is 8.9% in Sichuan, and 7.9% in Shanghai. The corresponding male rate in both colleges is about twice high. For those with a job, the percentage of graduates employed by foreign firms is also higher for women in both colleges (12.6 vs. 10.5 in Sichuan, and 44.2 vs. 28.6 in Shanghai). The regional difference is due to the fact that there are far more foreign firms in the coastal Shanghai province.

We have removed all the observations with any missing value.¹² Except for the variable *Unemployed* and *Foreign*, all variables in Tables 1 and 2 have the same sample size in a given college. The variable *Unemployed* is only defined on a subset of graduates who participated in the labor market (i.e. excluding those who went to graduate schools). This is why the sample size for *Unemployed* is smaller in both tables. The variable *Foreign* is defined on an even smaller subset of graduates, namely those who were employed upon graduation (i.e. excluding all those who went to graduate schools and those who were unemployed). So the sample size for *Foreign* is always smaller than that for *Unemployed* in both tables.

The employer information comes from the placement office which has a copy of the contracts of all employed graduates. Because some elements of the plan–economy placement system are still functioning, it is extremely difficult for the graduates to sign contracts with their employers without the knowledge of the placement offices.¹³ We could not get the sensitive wage information from the placement offices. We were told that the number on the contract may not be informative. All graduates who were not admitted into a graduate program are assumed to be participating in the labor market. This is a very realistic assumption. Virtually every graduate (man or woman) was single upon graduation and marriage typically does not enter the calculation until several years later.¹⁴

⁸ Source: The Worker's Daily 04/18/2008, <http://news.xinhuanet.com/>.

⁹ Related papers include but are not limited to Appleton, Knight, Song, and Xia (2002; 2005), Giles, Park, and Cai (2006), Gustafsson and Li (2000), Liu, Meng, and Zhang (2000), Maurer-Fazio and Hughes (2002), Zhang, Zhao, Park, and Song (2005), Zhang, Han, Liu, and Zhao (2008).

¹⁰ See comments made by delegates to the National People's Congress and the People's Political Consultative Conference during the 2007 session. 03/16/2007 at <http://www.china.com.cn/>.

¹¹ We exclude the very small subsample of graduates going abroad for advanced education.

¹² The original sample size is 2269 for the Shanghai College, and 3029 for the Sichuan College. After removing these observations with any missing value, the sample size is reduced to 1372 in Shanghai and 2166 in Sichuan. We have checked our results to make sure that these values are indeed missing at random (details omitted).

¹³ In the Shanghai school, we also checked the employment information with related official records from an independent source a year later. The results suggest that our employment data are reliable, and those who were unemployed upon graduation were likely to be unemployed a year later.

¹⁴ According to our own calculation based upon China census 2000 1% sample, in 1998–2000, age of first marriage is 28 for college-educated men, and 26 for college-educated women.

Table 1

Summary statistics of Sichuan subsample.

Variable	Mean	Std. Dev.	Min.	Max.	N
<i>Male (Sichuan)</i>					1015
Unemployed	0.146	0.353	0	1	907
Foreign	0.105	0.307	0	1	752
GradSchool	0.106	0.309	0	1	1015
CET	0.007	0.926	−2.607	2.995	1015
GPA	2.435	0.528	0.4	3.96	1015
Log city GDP p/c	9.132	0.673	7.779	12.104	1015
<i>Female (Sichuan)</i>					1151
Unemployed	0.089	0.286	0	1	894
Foreign	0.126	0.332	0	1	784
GradSchool	0.223	0.417	0	1	1151
CET	0.022	0.952	−2.57	3.475	1151
GPA	2.804	0.491	0.820	4	1151
Log city GDP p/c	9.156	0.652	7.736	12.104	1151

The variable *GPA* measures college academic performance for each graduate. We know all course grades and credits in the Shanghai sample. So the GPA in Shanghai is calculated in a standard way by us. For the Sichuan sample we only have an overall academic rating (1, 1.5, 2, ..., 4, 4.5, 5) provided by the school and the score of the national college English level-4 test (on a 0–100 scale). These two variables are highly correlated. The overall academic rating is too rough to provide much useful information. About 63% of students scored 4.5, and about 31% scored 4. So we have decided to use English test score (divided by 20) as a proxy for GPA. It is clear that *GPA* variable is not directly comparable across these two schools. The quality of the GPA measurement in the Shanghai sample is much higher.

The variable *CET* measures the level of pre-college academic achievement, which is based upon the college entrance test (CET) score. Due to data limitations, the construction of the variable also follows different rules in these two schools. In a strict sense, direct comparison of CET raw scores in China is not feasible even within the same college, because there are many different versions of CET administered by different provinces where high school students take the exams. There were two main types of CET exams in 2001. In about half of the provinces, 5 subjects were tested. In the other provinces, only 4 were tested. The exact subjects may also vary across different provinces. CET score equals to the sum of scores of all subjects tested in a province.

This said, rough comparison of CET score across different provinces is justifiable. Except for the city of Shanghai, all CET exams were provided by the Exam Center in the Ministry of Education in 2001. Roughly speaking, all exams and testing/grading procedures were very similar to each other. Even though the number of subjects tested across different provinces could be different, the total score was also set at the same level. At the same time, the universities have used these scores to make their admission decisions. This means that the universities think that CET scores are sufficiently comparable to form the foundation for the important admission decisions.

Table 2

Summary statistics of Shanghai subsample.

Variable	Mean	Std. Dev.	Min.	Max.	N
<i>Male (Shanghai)</i>					482
Unemployed	0.185	0.388	0	1	439
Foreign	0.286	0.453	0	1	332
GradSchool	0.087	0.282	0	1	482
CET	0.486	0.306	0	1	482
GPA	2.74	0.479	1.002	3.763	482
Log city GDP p/c	9.777	0.74	7.933	10.81	482
Urban Hukou	0.844	0.363	0	1	482
Father CCP	0.448	0.498	0	1	482
Father Age	47.587	3.463	39	65	482
<i>Female (Shanghai)</i>					890
Unemployed	0.079	0.27	0	1	783
Foreign	0.442	0.497	0	1	688
GradSchool	0.12	0.325	0	1	890
CET	0.512	0.29	0	1	890
GPA	3.176	0.325	1.709	3.839	890
Log city GDP p/c	9.841	0.731	7.922	11.017	890
Urban Hukou	0.916	0.278	0	1	890
Father CCP	0.442	0.497	0	1	890
Father Age	47.807	3.37	39	73	890

To make CET score more comparable, we construct the *CET* variable using the percentile of CET score within each type of exam in each province. For example, the student with the lowest (or highest) score among those taking the same CET exam in a given province has CET percentile 0 (or 1).¹⁵ We can only do this for the Shanghai sample. Since we do not have the exam type information in the Sichuan sample, *CET* in the Sichuan sample is simply the normalized raw score.¹⁶ Because of these comparability issues, we only run separate regressions for different schools.

Our analysis uses a set of background variables, which include *Log city GDP per capita*, and the college major dummies. Graduates are majored in many diverse fields of business, economics, social sciences, humanities, and applied sciences.¹⁷ The GDP information is the log of the GDP per capita of the student's birth city (a sub-unit of the province) in the year of 2002 (unit: *yuan*, 8.3 *yuan* = 1 U.S. dollar at that time).¹⁸ There is huge inequality both across and within provinces. The GDP per capita at Shanghai is 40,646 *yuan*. The GDP per capita at Chengdu, the capital city of Sichuan province, is only 16,277 *yuan*. Most other cities in Sichuan are much poorer, with GDP per capita below 5000 *yuan*. The poorest city in Sichuan only has 2718 *yuan*.

Because of regional segregation in China, GDP per capita measures employment opportunities each graduate has. It is well known that rich cities attract huge migration because of better job opportunities and higher wages (e.g. Knight & Yueh, 2004). Since graduates who go back to their birth cities to look for jobs automatically regain their local *hukou*, those who are graduates from rich cities always have better access to local jobs because of their *hukou*, family connections, and cultural background. On the other hand, graduates from poor cities are in a relatively disadvantaged position. If they go back home, there are less job opportunities. If they choose to migrate, they have to face a relatively foreign (and often discriminating) job-market.

GDP per capita is the most popularly-adopted indicator of regional inequality in China (see Fan & Sun, 2008 and references cited in their paper). Official GDP per capita is also readily available at the city level. It is highly correlated with other major social and economic indicators. What is most relevant in our context is the quality of basic education system. Since GDP per capita is serially correlated, GDP per capita at 2002 also helps control for elements of pre-college human capital accumulation which are not captured by CET.

In Shanghai College, we also have supplementary information of pre-college *hukou* status (*Urban Hukou* is 1 if urban, 0 if rural), whether the student's father is a ruling Chinese Communist Party member (*Father CCP* is 1 if yes, 0 if no), and the age of the father (*Father Age*).

Most of the graduates come from an urban background (84.4% for male, and 91.6% for female). For both sexes, about 44% of the students' fathers are Party members. These numbers are much higher than the national average. In 2001, only 37.66% of the population have urban *hukou*, and only about 5% of the population are CCP members.¹⁹ The average age of the fathers in our sample is about 48. Since almost all students in our sample were about 18 years old in 2001 when they filled out this information at the beginning of their college education, and only 5% of the students have an older sibling, we conclude that these fathers on average had their first child at the age of 30. This is a very late age compared to the national average of 24–25.²⁰ It is possible that fathers in our sample had more years of education compared to other men in their cohorts (see Section 4.3 for more discussions on this point).

The distributions suggest that graduates in this college tend to come from relatively good urban family backgrounds. Even though we do not have pre-reform data to construct a sequence, the overall situation is widely believed to be deteriorating over time. Take rural urban divide as one example. In January 2009, Premier Wen Jiabao said that the ratio of rural students in colleges has been falling dramatically.²¹ Our statistics are consistent with an un-tested popular belief that reforms in the late 1990s have reduced the incentive of people from the disadvantaged family background to invest in higher education, because the tuition is now much higher, while the chance of obtaining a job through the competitive job-market is lower because of their weak economic and social positions.²² The issue merits further study.

4. Determinants of employment outcomes

In Section 4.1, we will first show that 1) job-seeking graduates with higher GPA are less likely to be unemployed, and 2) conditional on their employment status, they are more likely to enter foreign firms, whose positions are among the most sought after on the market. The pattern of our results is consistent with the view that returns to productive characteristics (such as GPA) are higher in places/firms situated in a more competitive labor market. We will also show that women are not in a disadvantaged position after the reforms, nor particularly so in a more competitive environment. In Section 4.2, we will provide some evidence

¹⁵ See Han and Li (2009) for a similar construction.

¹⁶ Strictly speaking, the *CET* variable is not directly comparable within the Sichuan sample, and our results do not change even if the *CET* variable is removed from the regressions.

¹⁷ Students in our sample chose their majors in high schools. Because college majors in China are extremely specialized, there are too many majors to be listed explicitly. There is no clear rule of grouping. Different majors within the same broad category (e.g. business) may attract entirely different pools of applicants.

¹⁸ Data source: China City Statistical Yearbook 2003.

¹⁹ Data source: urban *hukou* percentage is from the China Statistical Yearbook 2006, party member percentage is from Han (2007), which is also based on official data.

²⁰ According to Chen (2008), the age of first birth was about 22–23 for women in the sixties. Since husbands were about 2 years older than the wives (based upon our own calculation using census 2000 1% sample), men on average had their first child at the age of 24–25.

²¹ The China Daily, 1/5/2009.

²² For example, see Yong He, 3/11/2009, <http://guancha.gmw.cn/>.

that GPA reflects human capital investment within college. Finally, we will discuss other determinants of employment outcomes (*hukou* and parent background) in Section 4.3.

4.1. Returns to GPA and its gender implications

Our main results are based on the following probit regression model.

$$Pr(Unemployed = 1) = \Phi(\alpha_0 + \alpha_1 \text{LogGPA} + \alpha_2 \text{LogGPA} \times \text{Female} + \alpha_3 \text{Female} + \alpha_4 X_i) \quad (1)$$

where X_i is a set of control variables including *CET*, *Log city GDP per capita*, and college major dummies. Φ is the c.d.f of the standard normal distribution.

If we want to study sex differentials in employments, we can ask the following three questions:

1. Is GPA a productive characteristic valued by the job-market? ($\alpha_1 < 0$)
2. Does the market discriminate female GPA? ($\alpha_2 > 0$)
3. Is there pure hiring discrimination against female graduates? ($\alpha_3 > 0$)

In other words, α_1 measures the job-market returns to GPA. In the spirit of [Blinder \(1973\)](#), we can distinguish two types of discrimination — discrimination against female skills (measured by α_2) and pure discrimination (α_3). Note that the existence of one type of discrimination does not necessarily imply the existence of the other one. In fact, the opposite case is typically true. The best-studied case is the relationship between schooling and wage. To some extent pure discrimination against women (i.e. women receiving a lower wage than similarly-educated men) exists in most places. At the same time, there is strong evidence that returns to schooling are actually higher for women in most countries (see [Dougherty, 2005](#), and references cited in the paper). We will show below that this pattern is also consistent with employment results in our paper.

If women's skills are not discriminated by the labor market, women could invest more in observable skills to improve their labor market outcomes. This is true even if there exists pure discrimination against women. The relationship between GPA and employment outcomes established in this paper also supports this key observation.

High GPA can greatly benefit job-seeking graduates (excluding those who went to graduate schools). To best appreciate this point, we first run the above probit regression (by school) without including any *Log GPA* information in the regressions.

Columns 1 and 3 in [Table 3](#) report the results of this regression for these two colleges separately.²³ The *Female* coefficient is negative and significant in both colleges. Being a female reduces the probability of unemployment by .058 in Sichuan college, and .090 in Shanghai College.

Why do female graduates seem to be doing so well? We know from [Tables 1 and 2](#) that female graduates have much better college grades. If higher grades lead to a better employment outcome, this question would become less puzzling. We run a regression (by college) as specified in Eq. (1). Columns 4 in [Table 3](#) report the results of the regression for Shanghai College sample. The coefficient of *Log GPA* is statistically significant at 1% level. A one percent increase in GPA reduces the unemployment probability by .0032 (or 2.7% of the mean unemployment rate) for a typical graduate in the Shanghai subsample. The sign of *Log GPA* coefficient for the regression on Sichuan subsample (as reported in column 2 of [Table 3](#)) is also negative — suggesting that one percent increase in GPA reduces the unemployment probability by .0009 (or .8% of the mean unemployment rate) for a typical graduate in the Sichuan subsample. It is statistically significant only at the 10% level.

The coefficients of the interaction terms in column 2 and 4 are both negative, suggesting that the returns to GPA could even be higher for women, but neither coefficient is statistically significant. It is quite clear that the job-market does not discriminate female GPA.

The change of the coefficient of the *Female* variable in column 2 and 4 is striking. They are no longer statistically significant. So after controlling for GPA information there is no gender employment gap in favor of women. In the Shanghai subsample the *Female* coefficient even turns positive (column 4) — suggesting that women are more likely to be unemployed, other things equal. However, the evidence of pure hiring discrimination against women in the post-reform graduate job-market is not strong. The *t*-statistics for the *Female* coefficient in column 4 is 1.47. Controlling for more variables does not change our results for Shanghai College (column 5).

The estimated returns to GPA seem to be larger and stronger in Shanghai College. This is consistent with the view that economic transition tends to increase market returns to productive characteristics (such as GPA), as labor market reform in Shanghai is probably much deeper than that in the inland Sichuan province. There is also the possibility that the measure of GPA variable in the Sichuan subsample is too noisy, as it contains only English test scores.

We can use another measure of labor market outcome to corroborate our conclusions on unemployment status. Even though we do not have wage data for those who were employed, we know each employer's ownership information. It is well known that

²³ The sample size for Sichuan in [Table 3](#) is smaller than the sum of the sample sizes for the variable *Unemployed* in [Table 1](#) ($1764 < 907 + 894$). This is mainly because students in one major were all employed upon graduation. Probit regression model had to drop these observations since there was no variation within that major. If we use linear probability model instead, the sample size would still be 1801, which is exactly the sum of 907 and 894. The same thing is true for the Shanghai subsample in [Table 3](#). The sample sizes in [Tables 1 and 2](#) for *Foreign* and *GradSchool* always add up to the corresponding sample sizes in [Tables 4 and 6](#), because it is never the case that graduates in one major all went to foreign or domestic firms, nor that graduates in one major all went to graduate schools or the job market.

Table 3Probit regression results of binary unemployment outcomes (dependent variable: *Unemployed*).

	Sichuan		Shanghai		
Female	−0.058*** (0.015)	−0.040 (0.064)	−0.090*** (0.019)	0.115 (0.078)	0.115 (0.077)
CET	−0.009 (0.009)	−0.004 (0.008)	0.005 (0.031)	0.041 (0.030)	0.037 (0.029)
Log GDP p/c	0.030** (0.013)	0.033** (0.012)	−0.080*** (0.011)	−0.064*** (0.010)	−0.059*** (0.010)
Log GPA		−0.090* (0.056)		−0.323*** (0.083)	−0.320*** (0.076)
LogGPA × Female		−0.003 (0.070)		−0.136 (0.094)	−0.134 (0.094)
Urban Hukou					−0.022 (0.026)
Father CCP					0.021 (0.014)
Father Age					−0.001 (0.002)
Major Dummies	Yes	Yes	Yes	Yes	Yes
Prob > χ^2	0	0	0	0	0
N	1764	1764	1201	1201	1201

Sample: students who did not go to graduate schools.

All reported coefficients (the same for other tables) are marginal effects. For dummy variables, it reports the discrete change in the probability from 0 to 1. For continuous variables, it is estimated at the average value of the explanatory variables.

Standard errors are adjusted for intragroup correlation at the birth city level.

Level of significance: * 10%, ** 5%, *** 1%.

foreign firms pay a premium wage in China (e.g. [Chen, Demurger, & Fournier, 2005](#)). We use foreign firm employment as a proxy for a high-wage, high-quality job. We specify the following probit regression for both colleges.

$$Pr(\text{Foreign} = 1) = \Phi(\beta_0 + \beta_1 \text{LogGPA} + \beta_2 \text{LogGPA} \times \text{Female} + \beta_3 \text{Female} + \beta_4 X_i) \quad (2)$$

First, we also run the above regression without including any GPA information. Instead of observing a female disadvantage, we find that females are more likely to enter foreign firms when GPA information is not included in Eq. (2) (columns 1 and 3 in [Table 4](#)). Being a female enhances the chance of entering a foreign firm by .028 in the inland Sichuan sample. The advantage of being female is much larger in the coastal Shanghai sample. Being female enhances the chance of entering a foreign firm by .150.

Table 4Probit regression results of binary foreign-firm employment outcomes (dependent variable: *Foreign*).

	Sichuan		Shanghai		
Female	0.028** (0.014)	−0.036 (0.069)	0.150*** (0.041)	−0.378* (0.226)	−0.409* (0.234)
CET	0.013 (0.009)	0.006 (0.007)	0.006 (0.065)	−0.078 (0.076)	−0.076 (0.074)
Log GDP p/c	0.029** (0.011)	0.024** (0.010)	0.070*** (0.021)	0.057** (0.020)	0.035 (0.022)
Log GPA		0.136* (0.075)		0.741*** (0.172)	0.746*** (0.159)
LogGPA × Female		0.046 (0.072)		0.392* (0.205)	0.415* (0.213)
Urban Hukou					0.134*** (0.038)
Father CCP					0.006 (0.024)
Father Age					0.013*** (0.004)
Major Dummies	yes	yes	yes	yes	yes
Prob > χ^2	0	0	0	0	0
N	1536	1536	1020	1020	1020

Sample: students who had a job upon graduation.

All reported coefficients are marginal effects.

Standard errors are adjusted for intragroup correlation at the birth city level.

Level of significance: * 10%, ** 5%, *** 1%.

We then run a regression (by college) as specified in Eq. (1), adding GPA information as control variables. We can see that the above female advantage is also caused by GPA differentials. Columns 2 and 4 in Table 4 report the results of the regression for both colleges. The coefficient of *Log GPA* is statistically significant in both colleges (though only at 10% level in Sichuan college). A one percent increase in GPA increases the probability of entering foreign firms by .0014 (or 1.2% of the mean foreign-employment rate) for a typical graduate in the Sichuan subsample, and 0.0074 (or 1.9% of the mean foreign-employment rate) in Shanghai.

The coefficients of the interaction terms in column 2 and 4 are both positive, suggesting that the returns to GPA (in terms of enhanced chance of being admitted into foreign firms) could even be higher for women. The coefficient is even statistically significant at 10% level in Shanghai. It is quite clear that foreign firms not only does not discriminate female GPA, it may even value female GPA more.

What is most striking is the coefficient of the *Female* variable in column 2 and 4. They both turn negative — suggesting that women are less likely enter foreign firms, other things equal. The coefficient for Shanghai is even statistically significant at 10% level. This can be interpreted as weak evidence of the existence of gender hiring discrimination even in foreign firms. Controlling for more variables does not change our main results for Shanghai College (column 5).

Overall, our main results based upon foreign-employment outcome almost mirror our previous results based upon unemployment outcome. GPA is highly valued by the job-market, and tips the employment balance in favor of women. Pure hiring discrimination against women may exist, while discrimination against women's GPA does not exist at all. On the other hand, returns to GPA could be higher for women.

4.2. Does GPA reflect human capital investment?

Economists debate whether the human capital (Jones & Jackson, 1990; Wise, 1975) or the screening hypothesis (Lazear, 1977) explains the relationship between GPA and labor market outcomes. Even though which thesis is correct does not matter in the student's perspective, it nevertheless has important theoretical and policy implications. However, empirically distinguishing these two views on education is a well-known research challenge. It is certainly beyond our scope to provide a rigorous treatment. Here we will provide some suggestive evidence which could be interpreted as less in favor of the screening hypothesis.

We will consider the basic version of the screening hypothesis, namely that GPA reflects innate ability, which is an important parameter but not directly observable to the labor market. We have one main counter-argument to this hypothesis. CET grades also reflect innate ability. But the labor market is not responding to CET information in the way predicted by the screening hypothesis.

It is quite clear from Tables 3 and 4 that CET has little impact on employment outcomes. We have tried other alternative specifications of the regression model (such as adding the interaction of the gender dummy and GPA and/or CET variable for separate colleges), and the returns to GPA are quite robust while the returns to CET are insignificant almost all the time. This casts doubt on the screening hypothesis.

Because only the official college GPA score is available to prospective employers (official CET report does not exist in China), this result might not appear to be inconsistent with the screening hypothesis. However, because it is commonly known that women make much larger score gains in college, the labor market should systematically discount women's college grades at least to some extent, because according to the logic of the screening hypothesis, women “cheated” (at least to some degree) by inflating the measure of their innate ability.²⁴ In equilibrium, the rational employers should not take such a systematic inflation for granted.

Our argument has substantial empirical support. First we can show that freshmen entered this college without any gender gap in CET grade. This should not surprise anyone, as college admission in China is strictly based on CET score. If there exists a gender gap in CET grades in a particular college, at least one sex would have systematically forfeited the valuable opportunities of moving up to a better college.²⁵ To confirm this point, we run a linear regression with *CET* as a function of *Female*. The coefficient of *Female* in columns 1 and 4 of Table 5 is indeed insignificant. This result is robust if we add the major dummies as well (columns 2 and 5). Since the major dummies are arguably functions of the CET score, this regression is descriptive only, and has endogeneity problem.

Second, we can show that girls have better college GPA. We run a linear regression with *LogGPA* as a function of *Female*, controlling for *CET*, *Log GDP per capita*, and major dummies. We also add the interaction of *CET* and the *Female* variable.

$$\text{Log}(GPA_i) = \gamma_0 + \gamma_1 \text{Female}_i + \gamma_2 \text{CET}_i + \gamma_3 \text{Female}_i \times \text{CET}_i + \gamma_4 X_i + \epsilon_i. \quad (3)$$

The results are reported in columns 3 and 6. It is clear from the results that the *Female* variable is highly significant, suggesting that overall the girls made bigger score improvement during college. Column 7 reports the results with additional control variables for the Shanghai subsample. The same conclusion holds.

Thus, we find that GPA gap in favor of women was entirely produced in college. The screening hypothesis is not consistent with the fact that the labor market did not systematically discount female GPA. In fact, the coefficients of the interaction terms in Tables 3 and 4 actually suggest that female GPA could be more valuable than the male GPA.

The human capital view offers a parsimonious explanation of our results. For women who might be discriminated against on the job-market right after graduation and will accumulate less on-the-job human capital in the middle of the career because of

²⁴ For an article on female advantage in GPA, see the China Youth Daily 03/09/2009 (National Scholarship Sex Imbalance). <http://zqb.cyol.com/>.

²⁵ Note that this logic applies to a particular college even if on average girls have better CET grades at the national level.

Table 5

Does GPA reflect human capital accumulation?

	Sichuan			Shanghai			
	CET	CET	Log GPA	CET	CET	Log GPA	Log GPA
Female	0.016	0.008	0.148***	0.026	−0.006	0.194***	0.194***
	(0.039)	(0.039)	(0.008)	(0.016)	(0.012)	(0.022)	(0.023)
CET			0.058**			0.139***	0.140***
			(0.020)			(0.023)	(0.022)
CET × Female			−0.011			−0.079***	−0.078***
			(0.010)			(0.022)	(0.022)
Log GDP p/c.			0.022			0.021**	0.020**
			(0.015)			(0.007)	(0.008)
Urban Hukou							−0.017
							(0.015)
Father CCP							0.010
							(0.012)
Father Age							0.003**
							(0.001)
Major Dummies	No	Yes	Yes	No	Yes	Yes	Yes
R ²	0	0.064	0.222	0.002	0.378	0.300	0.304
N	2166	2166	2166	1372	1372	1372	1372

Sample: all students.

All reported coefficients are marginal effects.

Standard errors are adjusted for intragroup correlation at the birth city level.

Level of significance: * 10%, ** 5%, *** 1%.

marriage and child caring, investing in additional human capital during college is a reasonable strategy, as their investment in GPA is highly valued by the job-market.

What's more, superior female GPA does appear to result from serious effort and hard work. Having higher GPA and declaring a double major appear to be highly correlated outcomes (correlation .29 in Shanghai College).²⁶ Taking up a double major clearly requires a lot of effort in China, as the average course load for the major filed alone is already about 6–10 units per semester. Since students with high GPA are still highly motivated to study for double major coursework, it does appear that such students work very hard in college.

The relationship between GPA and CET grade is also consistent with the human capital view. Suppose GPA is a function of pre-college academic preparation (measured with CET) and study effort during college. If all female college students systematically invest more effort (say, ΔE) to produce GPA, it is not surprising to observe a sizable gender gap between females and males with the same CET grade. What is more, the relationship between GPA and CET should be stronger for men, whose GPA is largely determined by their pre-college academic preparations.

The results (by school) reported in column 2 and 4 of Table 5 confirm our hypotheses. The *Female* coefficient is positive, and the interaction of *Female* and *CET* is negative in either college. The coefficient for the interaction term is also significant at 1% level in our Shanghai College.

4.3. Other determinants of graduate employment

From Tables 3 and 4 we can see that the GDP per capita of a graduate's birth city is an important determinant of his or her employment status, suggesting of the regional segregation of the job-market as a result of *hukou*. In both colleges, graduates from richer cities which tend to have more foreign-invested firms are more likely to be employed by a foreign firm (Table 4), conditional upon their employment status. In Shanghai College, graduates from richer cities are also less likely to be unemployed, while the opposite is true in Sichuan College (Table 3). Though this result about unemployment in Sichuan seems to be abnormal, it is also caused by geographic segregation of the Chinese labor market.

Since Sichuan is one of the poorest provinces in China, most of the out-of-province graduates, especially those from more developed cities, tend to go back home to look for jobs.²⁷ That typically takes more time and effort. The railway distances between the capital city of Sichuan province and major coastal cities such as Beijing, Shanghai, and Shenzhen are all over two thousand kilometers. The trips took more than 24h to finish. The cheapest one-way hard-seat tickets all cost over two hundred RMB. There are also institutional disadvantages. For example, if a Beijing native high school student chooses to study in a Sichuan college, she would have trouble obtaining some job opening information in the city of Beijing, as many Beijing firms would only send their job opening advertisements to some selected college career offices in Beijing.

²⁶ The correlation does not appear to be fantastically high, because not every high-performing student chose to get a double major. On the other hand, only less than 20% of the students having a double major had GPA below college average level.

²⁷ Using data from the Shanghai college, one of the authors have found strong evidence supporting the claim that graduates from richer places are more likely to go back home to work. See Li (2008).

Table 6Probit regression results of job-market participation vs. further study outcomes (binary dependent variable: *GradSchool*).

	Sichuan		Shanghai		
Female	0.120*** (0.014)	0.168* (0.092)	0.050** (0.023)	−0.780* (0.435)	−0.763* (0.460)
CET	0.031** (0.011)	0.011 (0.010)	0.139*** (0.034)	0.064** (0.026)	0.060** (0.025)
Log GDP p/c	−0.014 (0.014)	−0.021* (0.013)	−0.033** (0.013)	−0.027*** (0.007)	−0.025*** (0.008)
Log GPA		0.585*** (0.054)		0.388*** (0.095)	0.391*** (0.096)
LogGPA × Female		−0.118 (0.094)		0.273* (0.149)	0.260* (0.146)
Urban Hukou					0.016* (0.009)
Father CCP					0.007 (0.010)
Father Age					−0.002 (0.002)
Major Dummies	Yes	Yes	Yes	Yes	Yes
Prob > χ^2	0	0	0	0	0
N	2166	2166	1372	1372	1372

Sample: all students. *GradSchool* = 0 refers to all those on the job-market, employed or not.

All reported coefficients are marginal effects.

Standard errors are adjusted for intragroup correlation at the birth city level.

Level of significance: * 10%, ** 5%, *** 1%.

In a recent large-scale survey conducted in Beijing, the parents and students cited “the difficulty of getting a job in Beijing upon graduation” as the top concern why they do not want to attend a non-Beijing college.²⁸ Because of such realistic concerns, those high school students from rich provinces who do choose to study in another province are always compensated by receiving a better college education – they can get into a much better non-hometown college with a lower CET score. In rich provinces, the average CET score of those entering a non-hometown college is always way below that of those entering a comparable hometown college.²⁹ If hometown employers take out-of-province college education as a signal of reduced human capital, this tends to reinforce the negative incentive to pursue college education in another poor province.

In Shanghai College, we also have supplementary information of pre-college *hukou* status (rural or urban), whether the student's father is a ruling Communist Party member, and the age of the father. Results of the regressions adding these explanatory variables are reported in the last columns of Tables 3–6.

We expect that urban *hukou* status and father's CCP affiliation would positively contribute to students' educational and employment outcomes, either because graduates from such families have better un-observed human capitals, or because they have better access to jobs and graduate schools through family connections.

The impact of father's CCP affiliation is not statistically significant in any of these regression results. It suggests that parental CCP affiliation itself does not necessarily improve graduates' employment and educational outcomes in post-reform China. It is possible that returns to CCP membership may have declined in this respect. It is also possible that only CCP cadres can bring benefits to their children (as documented in Bian, 1994). Since most CCP members are not cadres, our regression results are probably not very surprising.

Graduates with urban pre-college *hukou* status are less likely to be unemployed (Table 3), more likely to enter foreign firms conditional upon employment status (Table 4), and more likely to continue education (Table 6). Except for the unemployment outcome in Table 3, the estimated coefficients are statistically significant. On the other hand, urban pre-college *hukou* status does not affect college academic performance (Table 5). These results imply the existence of pre-college urban *hukou* advantage on graduates' access to jobs and graduate schools. Such an advantage does not seem to be based on human capital accumulation differences, as *hukou* has no significant impact on college GPA (Table 5).

The *Father Age* variable is not significant in predicting the unemployment status (Table 3) or the probability of continuing education (Table 6). Interestingly, graduates with older fathers are significantly more likely to have better GPA (Table 5) and more likely to join foreign firms conditional upon their employment status (Table 4). It is possible that father's age serves as a proxy for father's education. Since almost all students in our sample were about 18 years old when they filled out these information at the beginning of their college education, father's age minus 18 effectively measures the age of the father when the student was born. According to our own calculation based upon China Census 2000 1% sample, people with more schooling are much more likely to marry at a later age. For men born between 1951 and 1963 (roughly corresponding to the cohorts of

²⁸ “The trend of attending non-Beijing colleges”, Deng Xingjun, 05/09/2007. <http://career.eol.cn>.

²⁹ This is a well-known empirical regularity. See, for example, “Begging Students to Apply for Non-Shanghai Colleges.” The China Youth, 07/29/2009. <http://www.cyol.net/>.

the students' fathers), those who did not go to high schools married at 24.5, while those with above college education married at 26.2.

Summarizing, the impact of other variables on graduates' educational and employment outcomes seems to be consistent with our understanding of the Chinese labor market, namely that the market is regionally segregated, and that *hukou* and family backgrounds may play important roles.

5. Alternative hypotheses

Can the lower female unemployment rate be explained by other circumstances? There are at least three potential scenarios.

- *Alternative Hypothesis 1:* Female graduates have a lower unemployment rate because they are more likely to fill low-paying positions.
- *Alternative Hypothesis 2:* Female graduates have a lower unemployment rate because the girls entered college with better pre-college grades than their male schoolmates.
- *Alternative Hypothesis 3:* Female graduates have a lower unemployment rate because they are more likely to pursue higher education, thereby avoiding labor market participation.

The first two hypotheses are not supported by our existing results. The first hypothesis is contradicted by our evidence in Table 4 that female graduates are more likely to fill high-pay foreign firm positions in both colleges. The second hypothesis is contradicted by our evidence in Table 5 that girls entered college with similar CET grades. To explore the last hypothesis we specify a probit regression model similar to Eqs. (1) and (2):

$$Pr(\text{GradSchool} = 1) = \Phi(\delta_0 + \delta_1 \text{LogGPA} + \delta_2 \text{LogGPA} \times \text{Female} + \delta_3 \text{Female} + \delta_4 X_i). \quad (4)$$

We first run the above regression without including any GPA information. Columns 1 and 3 of Table 6 report the results. They appear to confirm the *Alternative Hypothesis 3*. Girls in both schools are significantly more likely to go to graduate schools than boys. Being female enhances the chance of entering a graduate program by .120 in the inland Sichuan sample. The gender effect is smaller in the coastal Shanghai sample. Being female enhances the chance of entering a graduate program by .050. Since female graduate school going rate is higher, the female labor market participation rate is lower.

However, lower female labor market participation rate does not necessarily imply lower female unemployment rate. These are two entirely different concepts. When lower female labor market participation rate does lead to lower female unemployment rate, it is probably because all those less-competitive women hide in the graduate schools when the job-market is tight — making average female job seekers to have higher ability than average male job seekers. This argument is contradicted by the following results. Those women who go to graduate schools are not expected losers on the job-market. In fact, they are among the best of the graduates. This implies that women who go to work are, on average, of lower ability than the men. This helps strengthen our argument that women's success on the job-market is due to their superior college grades.

Columns 2 and 4 in Table 6 report the results of the separate regressions (by school) including *Log GPA* and its interaction with *Female*. Again, the pattern of the change after adding GPA information is very similar to those in Tables 3 and 4. The *Female* coefficients become less significant or even switch signs.

The coefficients of *Log GPA* are both positive and statistically significant. In Sichuan College, a one percent increase in GPA increases the probability of going to a graduate school by .0059 (or 3.5% of the average graduate-school going rate) and .0039 (or 3.6% of the average rate) for a graduate in Sichuan and Shanghai, respectively. In both colleges, it is the graduates from poorer cities who were more likely to read for a post-graduate program. One possible cause is the government policy on *hukou*. When deciding whom to award *hukou*, the local governments tend to favor those migrants with more education.³⁰ This offers additional incentives for the graduates from poorer cities to pursue further education.

The gender gap in graduate-school going rate is also mainly caused by the gender gap in GPA. The *Female* coefficients after including GPA information become significant only at 10% level. More interestingly, in the Shanghai subsample, its sign turns negative — implying that females are actually less likely to read for post-graduate programs, other things equal. When we add more control variables in the Shanghai subsample (column 5), we find that only the pre-college *hukou* is significant, but only at 10% level.

Overall we find no support for these alternative hypotheses. The high returns to college-period human capital accumulation and our explanation of the observed lower female unemployment rate are also consistent with the view of a field expert. When asked by a journalist why the female graduate unemployment rate is much lower in their university than the corresponding male rate, the Career Office director in Shanghai's Fudan University cites their higher average college grades as the most important factor benefiting female graduates.³¹

³⁰ For example, the point system used by the Shanghai municipal government explicitly gives more points to graduates with post-graduate degrees.

³¹ Source: Xinhua Net 11/26/2003. Other important factors include foreign language skills and organization and communication skills.

6. Conclusion

Even though regional segregation because of *hukou* and graduates' family backgrounds affect the graduate job-market in many important ways, we nevertheless find consistent evidence that human capital investment within-college reflected in college GPA is highly valued by the job-market. The importance of GPA can be best seen as a powerful productive characteristic which female college students can heavily invest in to gain a competitive edge over their male peers.

Academic achievement may not be so relevant for women from less-selective universities, or for educated women with job experience. Nevertheless, our paper is consistent with the argument that investing in observable skills in general could help women overcome market discrimination.

We find some evidence of gender discrimination in our two-college placement data, though the evidence is not very strong. Our results suggest that the scope of gender discrimination in this market might be much smaller than our expectation. According to Gary Becker's classic argument, when the economy becomes more competitive, employers with strong male preferences will be punished by the market. And they do have good reasons to give up their hiring prejudice when educated women in China are more likely to marry much later, have only one child several years after marriage, and pay greater attention to their jobs even after having a child.³² Compared to the gender issue, a more serious problem is unequal access to college education and jobs along the line of *hukou* and family background.

Since universities in China are generally believed to be inefficient and contributes to the graduate unemployment problem (see footnote 10), our results that college grades play a positive role in job allocation are encouraging. Improving the quality of higher education may further enhance this role. In particular, it may help graduates from a disadvantaged background more effectively overcome market barriers. To improve the functioning of the graduate job-market in the long run, the government also needs to reform the *hukou* institution and provide effective legal sanctions against various hiring discriminations.

The scope and aim of this paper is quite modest. Because graduates in each of our colleges are from a very homogeneous background, it is easier for us to uncover the relationship between college GPA and job-market outcomes. Because we work with a data set on employment opportunity for new college graduates, we can remove the possible influence of gender differences in experience, promotions, job changes, and other factors. But there are also important dimensions that we cannot address, such as college selectivity, occupation, work life earnings (which may differ from starting earnings), location, etc. A full dataset with more information on these aspects would shed more light on graduate job allocation in China.

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³² For an article on this issue, see The China Youth, 22/05/2006, <http://zqb.cyol.com/>.

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