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Hukou System, Horizontal, Vertical, and Full Job-Education Mismatch and Wage Progression among College Graduates in Beijing, China

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Abstract

This article investigates college graduates in Beijing, China, and asks, First: Whether college graduates without local hukou are prone to educational mismatch? Second: What role does the hukou system play in the educational mismatch? And third: Whether college graduates without local hukou are willing to lower their wages in order to get a hukou? I use the Beijing College Students Panel Survey (BCSPS), and multinomial logit models and the linear regression analyses are conducted. I find that college graduates with (without) local hukou through job are more likely to be vertical and full mismatch than locals, and those who obtain a hukou through job have a higher full mismatch. After considering the educational mismatch, there is no significant difference in monthly wages between college graduates (not) having a hukou by work and locals.

Keywords: *college graduates; educational mismatch; wage; Beijing; China*

Introduction

As one of the most important redistributive institutions, the household registration (*hukou*) system has received much attention from all sectors of society in China (Cheng and Selden,1994). The *hukou* system required all Chinese households to be registered in the locale where they resided and categorized as either agricultural or non-agricultural (rural or urban) status (Wu,2019). Transforming one's *hukou* status from rural to urban is a central aspect of upward social mobility (Wu and Treiman,2004).

With the implementation of the household contract responsibility system, rural areas release a large number of surplus labourers. At the same time, with the reform of urban and rural economic system, non-agricultural industries develop rapidly, creating a large number of employment opportunities. Under the combined effect of push and pull, numbers of floating population, leaving inland villages to pursue economic opportunities in coastal cities, continue to increase and the scale expands rapidly. However, *hukou* registration status plays an important role in affecting not only rural floating population return on human capital but also their offsprings' educational opportunities (Chan and Buckingham, 2008; Cheng and Selden, 1994; Wu et al., 2015; Wu and Zhang, 2018; Wu, 2019).

The household registration system is the main reason for the different status treatment in the labour market. Due to the heterogeneity of household registration, local people and outsiders are treated unequally. Through education, workers gain knowledge and skills, and more education means more human capital and high labour productivity. In order to reduce the losses caused by

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household registration discrimination, outsiders without local *hukou* may invest more in education to improve their competitiveness in employment, which may distort the human capital return mechanism of workers, especially in megacities like Beijing, Shanghai and Shenzhen. *Hukou* in these cities is related to a lot of social welfare and public resources, such as children's schooling, college entrance examination, housing, social security, etc. Therefore, college graduates without local *hukou* may work in jobs unrelated to their educational background and/or below their skill level and accept low wages to get a *hukou* in megacities, creating the much-discussed job-education mismatch.

The present study adds to the literature by looking into the well-known *hukou* advantages through the lens of job-education mismatch, proposing and testing two models. First, I examine the likelihood of job-education mismatch for college graduate with a local *hukou* and without a local *hukou* compared to natives. Second, I explore the relationship between job-education mismatch and wages, testing whether this relationship differs by *hukou*. This study is among the first to distinguish between vertical mismatch (overeducation), horizontal mismatch (relatedness between educational field and job), and full mismatch (both horizontal and vertical mismatch), explore the important role of *hukou* in educational mismatch, and examine their effects on wages.

The distinction between different types of mismatch is important since each represents different (albeit related) aspects of labour market disadvantage and therefore has unique policy implications. Some highly skilled college graduates, for example, may work in their field but at a lower level than their education would otherwise predict. Others may work unrelated to their field of study, forcing them to change occupations altogether. Both possibilities have distorted the return on human capital. The conclusions in this article provide a better understanding of how the various types of job-education mismatch affect college labour market integration.

Vertical and Horizontal Job-Education Mismatch

The existence of a potential discrepancy between educational attainment and the“skills” actually used at their jobs has been a major concern for social scientists and economists since the 1970s. A large body of literature highlights the implications of the gaps and its measurement (Banerjee et al., 2019; Nieto and Ramos, 2017; Mavromaras et al., 2013; Sirkeci et al., 2018; Saunders 2015; Johnston et al., 2010). There are objective and subjective methods to measure the level of correspondence, named vertical mismatch, between educational degree and the educational degree required to perform that job properly.

The first approach, of objective measurement and two strategies, consists of comparing the actual educational achievement with an objective education needed (Muñoz et al., 2018). The first strategy is job analysis (JA), a systematic evaluation method and an assignment educational level. Workers with a higher educational degree than the assignment educational level are considered as over-educated, while with a lower educational degree than the required level are regarded as under-educated. However, the standards are not updated every year, producing annual bias (Hartog, 2000). The second strategy, known as realized matches (RM), consists in defining at least one standard deviation from the mean or mode of others in their occupation. Educational achievement above one standard deviation is considered to be over-educated. A drawback of this method is that it is driven by demand and supply forces and also ignores variations (Leuven and Oosterbeek, 2011).

The second approach -of a subjective measurement approach (SA) - consists of asking the workers about the educational requirement by the company or the level required for job. Variations

of this approach are asking workers directly whether they are matched, whether they are using their skills sufficiently, or whether they require a extra training to deal with the tasks. Like many subjective evaluation methods, respondents may overstate or understate the requirements.

However, a form of job-education mismatch receiving less attention in the literature is horizontal mismatch, the disagreement between a worker's field of study and his or her occupation (Banerjee et al., 2019). Like vertical mismatch, horizontal mismatch also has two measurements-JA and SA. By standardized occupational classifications-such as O*Net and NOC, the job analysis method compares the required educational fields to major (Wolbers, 2003). Like JA method of vertical mismatch, updating standards is a major issue. Respondents are asked how closely their educational field is related to the job they do named SA method. A potential disadvantage is that workers' perceptions of horizontal match are by definition subject to self-report bias (Banerjee et al., 2019).

Several studies have simultaneously examined both vertical and horizontal job-education mismatch. Banerjee et al. (2019) compared the horizontal, vertical, and full job-education mismatch among white natives, white immigrant and racial minority immigrant and find immigrants, especially racial minority immigrants, are more likely to be full mismatch; Meronin and Vera-Toscano (2017) tested the persistence of vertical mismatch and full mismatch among recent graduates and evidence showed no real differences between vertical or full overeducation.

Job-Education Mismatch among College Graduates

Human capital is one of the key factors in the determination of labour market performance. Consistent with this theory, researchers have found that job-education mismatch is a major source of labour market disadvantage for migrants. Migrants and native residents may differ in childhood environment, cultural adaptation and family background, which may affect their job-education match.

All studies on migrants' job-education mismatch have focused on vertical mismatch (overeducation), but in practice, mismatches involve both vertical and horizontal mismatch. Banerjee et al. (2019) have found immigrants (particularly racial minorities immigrants) who are unable to find work related to their educational background are more likely to accept work unrelated to their major. In a word, immigrants (particularly racial minorities immigrants) are more likely to be full mismatch than white native-born Canadians. Using microdata from the 2007 wave of the Adult Education Survey (AES), Nieto et al. (2015) found immigrants are more likely to be skill mismatch than natives, and the difference is much larger for vertical mismatch, wherein the difference is higher for the origin of immigrants. Therefore, analyzing only vertical mismatch may overlook an important aspect of migrant labour market.

Household Registration and Graduate Floating Population in China

Compared with developed countries, China's household registration system, which restricts population mobility, had a profound impact on the labour market for a long time (Wu and Zheng, 2018). Besides the functions of population registration and management, the current household registration system is closely related to resource allocation and distribution. Therefore, different *hukou* status are bound with different welfare benefits (Gerber, 2000; Wu and Xie, 2003). As a result, *hukou* in big cities often becomes a scarce commodity in the job market (Song, 2016).

The key task of building a new type of urbanization in 2019 calls for further reform of the household registration system, focusing on settling rural migrant workers in cities and towns. Abolishing restrictions on permanent residence in small and medium-sized cities with 1 million permanent residents; restrictions in cities with 1 to 3 million residents will be lifted completely; cities with 3 to 5 million residents will fully relax household registration requirements, and abolish the household registration restrictions for key groups. However, megalopolises such as Beijing and Shanghai still control the population size and screen outstanding talents by setting up *hukou* threshold. The *hukou* policy has been gradually tightened in recent years, and the number of college graduates settling down has dropped.

Take Beijing for example: Beijing's settlement channels are divided into nine categories: fresh graduates; international students; talent introduction; postdoctoral outbound; relatives; corporate executives; college student village official; national award for voluntary bravery and national civil servants. For college graduates, fresh graduates and college student village official are major ways to achieve local *hukou* in Beijing. Of course, a fair and reasonable return on human capital is also important for college students. Getting a college degree is the result of long-term investment in human capital by individuals, families and society. It reflects the benefit of human capital investment and has an important impact on the quality of life for college students and their families. However, due to the restrictions of the household registration system, as well as the welfare of the household registration itself, college graduates may look for jobs that do not match their major or even educational background to get a local *hukou* in Beijing.

Conceptual Framework and Hypotheses

In this study, I examine vertical, horizontal, and full mismatch among college migrants with a *hukou* and without a *hukou* compared to natives. I also investigate the effect of each type of mismatch (vertical, horizontal, full) on wages. I hypothesize the following. First, consistent with previous studies (Wald and Fang, 2008; Chiswick and Miller, 2009; Joona et al., 2014), college graduates without a local *hukou* will be more likely to experience job-education mismatch than their counterparts. Second, college graduates who obtained a *hukou* through job will be more likely to face full (horizontal and vertical) mismatch. *Hukou* related benefits will cause college migrants to have much difficulty in finding work commensurate with their level of education and/or their field of study. Third, I expect that vertical job-education mismatch will be associated with greater wage disadvantage than horizontal mismatch, and full mismatch will be associated with the greatest wage disadvantage.

Data and Methods

This study is based on the data from the Beijing College Students Panel Survey (BCSPS). The baseline survey was conducted in 2009, with the population of interest being the full-time first year and third year undergraduate students at all 54 public universities affiliated with the ministry of education, other ministries, or the Beijing municipal government. For the first-year college attendees in the baseline survey, the follow-up data of the BCSPS accumulated longitudinal information across the entire 4-year college duration from 2009 to 2012. For the third-year college attendees in the baseline survey, the follow-up data of the BCSPS accumulated longitudinal school information from 2009 to 2010 and labour market information from 2011 to 2012. In 2013, a fifth round of the survey was conducted on the college graduates of the previous first and third years, respectively, with a total sample size of 2,603, including the mismatch between education and job, household change and labor market performance.

We use the fifth round of the survey and the sample is restricted to college graduates who are working in Beijing, as Beijing's *hukou* is related to a wide range of social welfare and public resources. There are opportunities differences between Beijing registered population and non-Beijing registered population. Therefore, Beijing can act a typical case to explore the impact of the household registration system and job-education mismatch. Despite its merits, it is important to note that the survey is selective, as it only examines college graduates in Beijing. Great caution would be essential in any attempt to generalize this study's conclusions to the general populations, including those with no college educational degree.

For first outcome variable, the likelihood of job-education mismatch, I examine the likelihood of vertical, horizontal, and full mismatch of college graduates. Therefore, I run three separate models: (1) only horizontal mismatch (horizontal mismatch but vertical match), (2) only vertical mismatch (vertical mismatch but horizontal match), and (3) full mismatch (horizontal mismatch and vertical mismatch). The three categories are mutually exclusive. The horizontal mismatch is measured using a question in the BCSPS that asks how closely the respondent's job is related to his or her educational field, where 1= "strongly disagree," 2= "disagree," 3= "neutral," 4= "agree," and 5= "strongly agree". Those who answer neutral and below are considered to be horizontal mismatch. The vertical mismatch is measured using a question in the BCSPS that asks the education requirement of their current job. The level of education required for job below her/ his educational degree is considered as vertical mismatch. Respondents who are both horizontal and vertical mismatch are considered as full mismatch.

The key explanatory variable in the first analysis is the migration status. This variable is constructed from two separate questions in the BCSPS. The first question asks respondents to identify their origin province of the college entrance examination. Those whose origin province of the college entrance examination are not Beijing but work in Beijing are defined as migrants. The second question asks respondents that whether your organization or company provide a *hukou*. From these two questions, I construct a single set of two dummy variables representing: (1) migrant getting a *hukou* by work, (2) migrant not getting a *hukou* by work. To model the determinants of an education–occupation mismatch, multinomial logistic regression is employed since there are four categories (only horizontal mismatch, only vertical mismatch, full mismatch and full match (reference group)) of the dependent variable. The coefficients of the model represent changes in the log odds of being in each education–occupation mismatch category compared to the reference category corresponding to a unit change in the corresponding independent.

My second analysis examines the wage effects of horizontal, vertical, and full mismatch on migrant who (not) getting a *hukou* compared to natives. There are two main sets of explanatory variables: (1) migration status and (2) horizontal, vertical, and full job-education mismatch. I also examine the interaction between migration status and job-education mismatch to test whether the wage effect of each type of mismatch has different effects. For both outcome measures, the control variables are age, gender, occupation, non-agricultural household, graduate student, Party membership, father's education and father's Party membership.

Results

Descriptive Results

Table 1 indicates descriptive statistics of selected variables for natives, migrant getting a *hukou* by work, and migrant not getting a *hukou* by work. Looking into the likelihood of job-education

mismatch, I find that about 20 percent of native-born college graduates are full job-education match, higher than migrant without a *hukou* (13.1%) and migrant with a *hukou* (3.3%); 38.5% of natives experience horizontal mismatch without vertical mismatch; that is, they work in a job not related to their educational field yet commensurate with their years of education.

Table 1. Descriptive statistics of selected variables for natives, migrant without a *hukou*, and migrant with a *hukou*.

Variable	Natives	Migrant without a *hukou*	Migrant with a *hukou*
Match type			
Full match	0.202	0.131	0.033
Only horizontal mismatch	0.385	0.303	0.355
Only vertical mismatch	0.183	0.189	0.185
Full mismatch	0.230	0.377	0.427
Age (years)	24.61	24.90	24.90
Male	1.585	1.560	1.411
Non-agricultural	0.696	0.611	0.726
Graduate student	0.044	0.143	0.532
Party membership	0.296	0.360	0.597
Father's education	12.53	11.67	13.23
Father's Party membership	0.321	0.320	0.492
Industry			
The second industry	0.153	0.143	0.170
Banking and finance	0.195	0.114	0.145
The IT industry	0.148	0.354	0.177
Other industries	0.504	0.389	0.508
N	405	175	124

The disparity in job-education mismatch becomes more apparent when I examine full mismatch. Only about 23 percent of natives are both horizontal and vertical mismatch. In contrast, nearly 38 percent of migrant without a *hukou* and 43 percent of migrant with a *hukou* report full mismatch. In other words, college graduates, especially those who have a *hukou* by work, are more likely to work both in jobs unrelated to their field of expertise and in jobs less than their years of education.

Likelihood of Job-Education Mismatch

I model the likelihood of horizontal, vertical, and full job-education mismatch using multinomial logistic regression. The results are presented in Table 2.

Table 2 presents a number of interesting findings. First, as shown in Column 1, the coefficient for migrants is 0.45, not significant. Dividing migrants into those with a *hukou* and without a *hukou*, the effect changes: comparing with natives in Beijing, the coefficient for migrant with a *hukou* is 1.56, meaning that migrant with a *hukou* is associated with a 378% increase to horizontal mismatch. Second, Columns 2 and 5 show that the estimated effect of migrants on vertical mismatch is substantially larger than native-born college graduates, and migrants are more likely to be vertical mismatch in order to obtain a *hukou*. Third, compared with locals, the likelihood of full mismatch is higher for migrants, and those migrants with *hukou* are more likely to be full mismatch.

Table 2. Multinomial logistic regression estimates of the likelihood of an education–occupation mismatch

	Model 1			Model 2		
	Horizontal Mismatch	Vertical Mismatch	Full Mismatch	Horizontal Mismatch	Vertical Mismatch	Full Mismatch
Migrant	0.449	0.753*	1.150***			
	(1.615)	(2.457)	(4.094)			
Ref. group: Natives						
Migrant without a *hukou*				0.101	0.447	0.778**
				(0.337)	(1.349)	(2.592)
Migrant with a *hukou*				1.564**	1.792**	2.319***
				(2.711)	(2.955)	(4.017)
Age	0.039	0.238*	0.057	0.058	0.256*	0.080
	(0.404)	(2.180)	(0.563)	(0.596)	(2.322)	(0.784)
Male	0.466+	0.151	0.116	0.533*	0.208	0.196
	(1.934)	(0.559)	(0.466)	(2.195)	(0.763)	(0.779)
Urban	-0.329	-0.212	-0.449	-0.336	-0.218	-0.455
	(-1.133)	(-0.650)	(-1.492)	(-1.155)	(-0.668)	(-1.512)
Graduate	1.098*	0.514	0.914+	0.758	0.206	0.536
	(2.223)	(0.953)	(1.827)	(1.498)	(0.370)	(1.036)
Party membership	-0.188	-0.097	-0.197	-0.224	-0.128	-0.237
	(-0.712)	(-0.330)	(-0.715)	(-0.844)	(-0.432)	(-0.854)
Father's education	0.003	-0.051	-0.002	-0.003	-0.056	-0.010
	(0.065)	(-0.991)	(-0.052)	(-0.076)	(-1.096)	(-0.213)
Father's Party membership	0.205	0.410	0.246	0.203	0.408	0.244
	(0.710)	(1.259)	(0.815)	(0.698)	(1.244)	(0.801)
Industry						
Banking and finance	-0.829+	0.086	-0.785	-0.831+	0.087	-0.787
	(-1.816)	(0.160)	(-1.645)	(-1.815)	(0.161)	(-1.644)
The IT industry	-0.826+	-0.530	-0.557	-0.760+	-0.471	-0.481
	(-1.855)	(-0.975)	(-1.232)	(-1.699)	(-0.863)	(-1.059)
Others industries	-0.861*	0.175	-0.893*	-0.889*	0.151	-0.926*
	(-2.179)	(0.373)	(-2.181)	(-2.244)	(0.321)	(-2.255)
cons	-0.177	-5.596+	-0.463	-0.637	-6.019*	-1.024
	(-0.070)	(-1.930)	(-0.175)	(-0.248)	(-2.060)	(-0.383)
N						704

Note: t statistics in parentheses. †p < .1, * p < 0.05, ** p < 0.01, *** p < 0.001.
Source: Authors calculations using BCSPS2013.

Taken together, these results from multinomial logistic regression models reveal that migration status led to the education–occupation mismatch, which includes horizontal mismatch, vertical mismatch and full mismatch. Differences in mismatch between those migrants having a *hukou* and not having a *hukou* are also probably due to *hukou* per se. The household registration system interferes with and even distorts the human capital return mechanism of college migrants. In order to get the welfare on *hukou*, college floating population have to take jobs that do not match their major background or even educational degree.

Wage Effects of Job-Education Mismatch

Next, I model the wage effects of each type of job-education mismatch and examine how these effects differ by *hukou* status (see Table 3). Compared Model 3 to Model 5, I have two findings. First, after accounting for a vector of other wage-determining characteristics, migrants face an initial monthly wage advantage of 33.9 percentage points compared to natives while migrants with a *hukou* face a larger initial wage advantage (34.8%) than those without a *hukou* (33.4%). This was not unexpected. It's easy for natives to find work while college migrants who want to stay in Beijing have to go through a series of selection, and only the elite can stay in Beijing. Second, vertical mismatch and full mismatch will lower the individual's wage, yet only vertical mismatch's effect is significant. Compared with full match, vertical mismatch is associated with a 22-percentage point decrease in monthly wage.

Table 3: OLS regression models on determinants of logarithmic monthly earnings among three categories

	Model 3	Model 4	Model 5	Model 6
Migrant	0.339***	0.234		
	(5.064)	(1.323)		
Horizontal mismatch	0.024	0.022	0.023	0.022
	(0.258)	(0.204)	(0.248)	(0.200)
Vertical mismatch	-0.218*	-0.245+	-0.219*	-0.246+
	(-2.111)	(-1.930)	(-2.114)	(-1.932)
Full mismatch	-0.154	-0.246*	-0.156	-0.245*
	(-1.621)	(-2.046)	(-1.626)	(-2.037)
Migr # Hori		0.039		
		(0.189)		
Migr# Vert		0.106		
		(0.468)		
Migr # Full		0.219		
		(1.056)		
Migr without a *hukou*			0.334***	0.278
			(4.469)	(1.479)
Migr with a *hukou*			0.348***	-0.019
			(3.625)	(-0.047)
Migr without a *hukou* # Hori				-0.021
				(0.092)
Migr without a *hukou* # Vert				0.082
				(0.326)
Migr without a *hukou* # Full				0.161
				(0.710)
Migr with a *hukou* # Hori				0.313
				(0.731)
Migr with a *hukou* # Vert				0.335
				(0.745)
Migr with a *hukou* # Full				0.489
				(1.142)
N	704	704	704	704

Note: t statistics in parentheses. †p < .1, * p < 0.05, ** p < 0.01, *** p < 0.001.
Source: Authors calculations using BCSPS2013.

Figure 1. Predicted logarithmic monthly wages for natives and migrants, dependent on education mismatch. The estimations are based on Model 4 in Table 3.

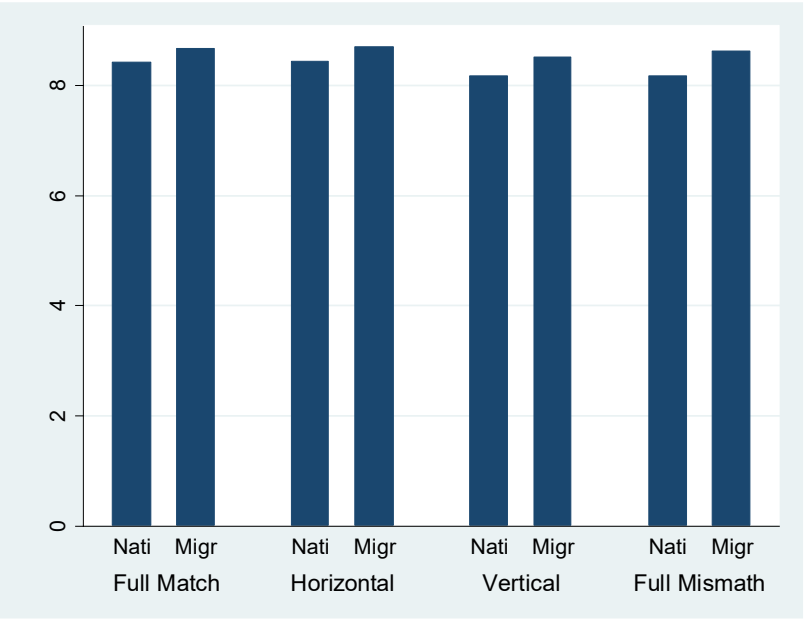
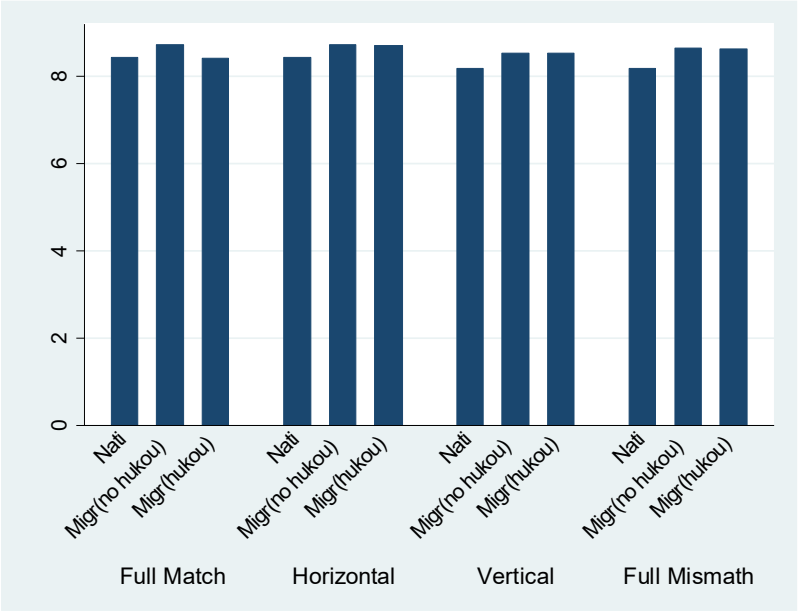


Figure 2. Predicted logarithmic monthly wages for natives and migrants (*hukou*), dependent on education mismatch. The estimations are based on Model 6 in Table 3.



Adding the interaction between migration status and job-education mismatch to test whether the wage effect on each type of mismatch has different effects, I get some interesting findings

(Figure 1 and Figure 2). Whether or not educational mismatch occur, the wages of migrants are higher than natives, but not significant. Migrants who not having a Beijing *hukou* have higher wages than their counterparts, while the effect was not significant.

Discussion and conclusion

This study examines the incidence and wage effects of horizontal, vertical, and full job-education mismatch for college migrants (not) getting a *hukou* by work compared to natives in Beijing. My analysis of job-education mismatch yields two key findings. First, both college migrants with a local *hukou* and without a local *hukou* are more likely to be vertical and full mismatch than natives. Second, college migrants with a local *hukou* through work have a higher full mismatch. These findings show that the effects of the *hukou* system on job-education mismatch between the three groups are different. Natives can easily find a job and are better matched, while migrants need to sacrifice their human capital to achieve a job.

The second part of the study examines the wage effects of job-education mismatch. Here, I have three important findings. First, vertical mismatch and full mismatch by itself result in wage disadvantage. Second, college migrants face an initial monthly wage advantage of 33.9 percentage points compared to natives while migrants with a *hukou* face a larger initial wage advantage (34.8%) than those migrants without a *hukou* (33.4%). Third, adding the interaction between migration status and job-education mismatch shows that there is no significant difference in monthly wages.

The results show that many college migrants accept unrelated jobs to get a local *hukou*, but this does not lead to a decrease in their wages. In other words, although migrants have an educational mismatch in order to obtain the *hukou*, they are not willing to sacrifice their wages and benefits. These findings highlight the importance of disaggregating the various types of job-education mismatch experienced by college migrants. Most previous studies of job-education mismatch have focused exclusively on overeducation (Wald and Fang, 2008; Chiswick and Miller, 2009; Sharaf, 2013), which may result in misleading conclusions and policy recommendations.

Although these results are inconsistent with previous findings on migrants' wage disadvantage, the unpacking of horizontal, vertical, and full job-education mismatch provides further insight into the underlying causes of human capital distortions. We know that vertical and full mismatch by themselves differently affect workers' wage.

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