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Occupational segregation and earnings inequality: Rural migrants and local workers in urban China

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ABSTRACT

This article examines the central role of occupation as the "reward packages" in creating earnings disparities between rural migrants and local workers in urban China's labor markets. Analyses of data from the population mini-census of China in 2005 show that, rural migrants' earnings disadvantages are largely attributable to occupational segregation (between-occupation variation) by workers' household registration status (*hukou*) rather than unequal pay within the same occupations, but surprisingly they enjoy a slight earnings advantage in lower-status occupations (within-occupation variation). Even after controlling for education and other characteristics, occupational segregation by *hukou* status continues to exist. The occupational segregation is the most severe in government agencies/state institutions and the least severe in the private sector, leading to earnings disparities between rural migrants and urban local workers in different work unit sectors. Our findings shed new light on how government discriminatory policies could affect occupational segregation and thereby create inequality among social groups in urban China.

Occupation assumes a central role in sociologists' theoretical conceptions of the social stratification system in industrial nations. While many sociologists focus on occupational attainment as a primary outcome of interest (e.g., Blau and Duncan, 1967; Featherman and Hauser, 1978), occupation is also employed as an important predictor of individuals' earnings attainment—another major topic of interest in stratification research (Stolzenberg, 1975). As the "backbone of reward structure" (Parkin, 1971:18), occupations can explain a significant portion of the earnings difference among individuals (e.g., Kim and Sakamoto, 2008; Mouw and Kalleberg, 2010).

Analyses of earnings inequality among social groups (e.g., gender, race/ethnicity) have pointed to the pivotal role of occupational segregation (Marini, 1989; McCall, 2001; Grodsky and Pager, 2001). Group pay gaps exist within and across occupations primarily as a result of two distinct processes. In the first process, workers are allocated to different occupations based on their personal attributes, including human capital, and receive different wages. This cross-occupation earnings inequality essentially reflects unequal "access" to differentially rewarding occupations among social groups. In the second process, workers holding occupations of a similar nature and complexity may be paid differentially, a phenomenon known as within-occupation wage discrimination (Peterson and Morgan, 1995). As many researchers have recognized, earnings

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inequality is less an issue of within-occupation discrimination and more a matter of segregation (Treiman and Hartmann, 1981). In other words, earnings disparities are largely associated with occupational segregation.

The segregation perspective has been widely adopted in research on earnings inequality based on gender, race and ethnicity in the context of the United States and other western societies (Cohen and Huffman, 2003; Tomaskovic-Devey, 1993; Grodsky and Pager, 2001; Marini, 1989; McCall, 2001; Petersen and Morgan, 1995), and less often in research on native-immigrant earnings disparities (but see Demoussis et al., 2010; Liu et al., 2004).

In this article, we examine the role of occupational segregation by the household registration (*hukou*) status in creating earnings inequality between rural migrants and local workers in urban China. Unlike other ascriptive attributes such as gender and race/ethnicity, on which most of the segregation literature tends to focus, one's *hukou* status—despite being assigned at birth on the basis of one's mother's registration status—is instituted by the state policy but alterable via one's own socioeconomic achievement (Ou and Kondo, 2013; Wu and Treiman, 2004, 2007). The *hukou* system, establishment in the 1950s and still in place today, has been serving virtually as an administrative control of "access" to opportunities in China. It controls both the migration of farmers to cities and the job opportunities available to them once they arrive there. Whereas the first "access" control has been relaxed as regional economic inequality resulting in large-scale internal migration from inland villages to coastal cities since 1990s, the second "access" hurdle evidently remains a major issue in China's urban labor markets. Hence, the occupational segregation by *hukou* status may provide not only a new perspective to understand the earnings disadvantages of rural migrants in urban China, but also a unique case to shed light on the role played by the state in generating occupational segregation among social groups in a non-western context.

Using data from the population mini-census in 2005, this article contributes to the literature by explicitly examining the role played by occupations in the linkage between the *hukou* status and earnings differentials between rural migrants and local workers in urban China. Specifically, we aim to identify the mechanism —occupational segregation or unequal pay—through which the *hukou* generates earnings inequality in urban China. We also pay attention to the institutional dynamics of occupational segregation and examine the varying patterns of *hukou*-based occupational segregation across employment sectors in China's transitional economy.

1. *Hukou* status, occupational segregation, and rural migrants' earnings disadvantages in urban China

While massive and uncontrolled migration from the countryside to urban areas typically accompanied economic development in developing nations, China was an exception at early stage of economic development because of its implementation of the *hukou* system. The Chinese government established the *hukou* system as an important administrative means to deal with demographic pressures in the course of rapid industrialization since the 1950s (Wu and Treiman, 2007), by assigning to each member of the population either an agricultural (rural) or a non-agricultural (urban) *hukou* status with a sharp differentiation of rights and privileges (Chan and Zhang, 1999; Li et al., 2015). For more than two decades, almost everyone lived in the place where his or her *hukou* was registered, and rural-to-urban migration was largely prohibited without government approval (Wu and Treiman, 2004). All citizens were spatially segregated into two different worlds by virtue of the *hukou* system, with huge disparities between rural and urban sectors but relative egalitarianism within each sector (Chan, 1994).

Such a *hukou*-based spatial segregation began to change as China started the economic reform in 1978. The reform has not only created phenomenal growth and prosperity for the country and its people but has also unleashed dynamic forces that had been suppressed during the first three decades of the communist rule. The government's control over population migration has weakened and geographic mobility, particularly from rural to urban areas, became much easier than before. The increase in the number of migrants without local *hukou* status reflects fundamental social and demographic changes in the Chinese society since the 1990s. The size of the "floating population," which consists of migrants who have resided at the place of destination for at least six months without local *hukou* status, reached 144 million in 2000 (Liang and Ma, 2004) and 147 million in 2006 (National Bureau of Statistics in China, 2006). In other words, about 11 percent of China's national population—predominantly rural farmers from inland areas—are on the move across counties for better economic opportunities in cities and coastal areas.

Although geographic mobility and employment change have become easier than before, the role of *hukou* in segregation persists (Chan, 2010; Chan and Buckingham, 2008), and local city governments often use *hukou* as the basis of social exclusion to maintain a large pool of cheap labor in the course of economic development (Hao, 2012; Wu, 2009). This has led to more visible socioeconomic disadvantages of rural migrants, who now live side by side with their local counterparts in urban areas (Zhang and Treiman, 2013).

Among all socioeconomic disadvantages faced by the sizable group of rural migrants, the earnings disparities between this group and urban local workers have received much attention from scholars and policymakers. According to a study based on national data collected in 2006, rural migrants earned only 68 percent of what their urban counterparts earned, despite working 8 hours more each week (Li and Li, 2007).

While scholars have typically linked rural migrants' earnings disadvantages to their lack of a local *hukou* in cities (Chan, 1996; Knight et al., 1999; Li et al., 2015; Liang, 2004; Liang and Ma, 2004; Wang, 2005; Wang et al., 2002; Wu, 2009; Xie, 2007), the mechanism remains unclear how earnings inequality between rural migrants and urban residents is generated. Inequality between those with a local urban *hukou* and those without may be derived from two sources: the differential access to high-paid occupations and the individual variability within the same occupation. The first is referred to as the "segregation effect", where *hukou* status plays an indirect role and workers are sorted into different occupations and sectors.

The second is referred to as the "discrimination effect", under which conditions employers tend to reward workers within the same occupation based on their *hukou* status; and the lack of a local urban *hukou* is the direct cause of rural migrants' earnings disadvantages in urban labor markets.

Rural migrants' earnings disadvantage could result from the fact that they are allocated to lower-paid occupations and sectors (Yang and Guo, 1996). Because migrant workers tend to have less human capital such as education, skills and work experience, their access to occupations with better economic rewards and prestige is often limited (Li, 2006; Wu, 2009; Xie, 2007). Moreover, some city governments in China have instituted various employment regulations to shield their local residents from having to compete with migrants for jobs (Knight et al., 1999), especially since the mid-1990s, when lay-offs by state-owned enterprises and urban unemployment became increasingly common (Cai et al., 2001).[1] Such exclusionary policy based on *hukou* has often relegated rural migrants to the physically demanding, low-skilled, and potentially hazardous occupations that urban locals are reluctant to take (Knight et al., 1999; Wang et al., 2002; Yang and Guo, 1996). If individual attributes and occupations were taken into account, as some analysts have shown, rural migrants' earnings disadvantages would significantly decrease or disappear in urban labor markets (Li and Li, 2007; Wu, 2009). In certain occupations, rural migrants may even be more competitive than their urban counterparts.

Other researchers have suggested that the stigma of being "a second-class citizen" without a local urban *hukou* may lead to unequal pay for rural migrants in urban labor markets, even though they have occupations similar to urban workers'. In this sense, the rural *hukou* status directly causes migrants' earnings disadvantages (Knight et al., 1999; Meng and Zhang, 2001). For example, it is found that a large proportion of the earnings gap between rural migrants and urban workers in Shanghai in the mid-1990s could be attributed to unequal pay within the same occupations, which supports the claim of direct wage discrimination against migrant workers in urban China (Meng and Zhang, 2001).

While occupational segregation and within-occupation unequal pay are distinct sources to earnings inequality between rural migrants and urban locals, it is difficult to empirically differentiate their contributions. As most empirical analyses on segregation are based on censuses or by-censuses with fine-tuned classification of occupations and information on income, appropriate data are either not available or not easy to access in China. The issue of data availability is a major limitation for scholars to compare occupational segregation and unequal pay in examining income inequality between rural migrants and urban locals in China.[2]

Another limitation of previous literature is the neglect of work units when examining income inequality between rural migrants and urban locals, which play an important role in shaping inequality in urban China (Lin and Bian, 1991; Wu, 2002).[3] As suggested in the literature on the gender wage gap (Bielby and Baron, 1986; Peterson and Morgan, 1995), occupational segregation should be examined in given establishments, particularly in China, because segregation by *hukou* status as a direct result of government policy differs across work units. Indeed, most rural migrants work in the private sector as they have difficulty gaining access to jobs in the state sector, and even if they were able to find jobs in the state sector, they tend to be employed in low-end and temporary occupations (Li, 2006). Therefore, the role of both occupations and work units should be simultaneously considered in examining occupational segregation and earnings inequality between rural migrants and urban locals in China.

In this study, we overcome the limitations above by taking advantage of the one-percent national population survey conducted in 2005, which contains a large sample and information on income and occupation with two-digit coding. We conduct OLS regression and decomposition analyses to examine the earnings disadvantages of rural migrants relative to those of local workers in urban China and reveal the contribution of occupational segregation to such disparities between the two groups. To remove earnings disparities resulted from differences in occupational distributions and individuals' attributes, we further employ the propensity score matching method to identify the net effect of *hukou* status on earnings. We place the investigation in the context of institutional change and show how the patterns of *hukou*-based occupational segregation and earnings inequality vary across sectors in China's transitional economy.

2. Data, variables, and methods

The data we analyze were extracted from the one-percent population sample survey of China in 2005 (known as the "mini-census"). This multi-stage stratified clustering probability sampling survey was conducted by the National Bureau of Statistics to collect social and demographic information on the national population in China between two censuses. Unlike

[1] The Beijing Municipal Government, for instance, has classified all occupations into three categories: those open to rural migrants with junior high school education or above, those from which rural migrants are excluded (which increased from 32 occupations in 1997 to 103 occupations in 2000), and those open to rural migrants only after a certain proportion of the job openings has been filled by local laid-off urban workers (Xie, 2007).

[2] An econometric study by Meng and Zhang (2001) was an exception, but their conclusions should be treated with caution, because the survey data they analyzed were restricted to one city (Shanghai) and they classified occupations into four categories only due to small sample size, which did not allow the contribution of occupational segregation to earnings inequality to be distinguished from that of wage discrimination within each occupation. As a result, within-occupation earnings inequality, they claimed, was likely the differentials across occupations classified in a more fine-tuned way.

[3] Prior to the economic reform, almost all urban workers were organized as part of a work unit, also known as *danwei*, be it a factory, a store, a school or a government office. The *danwei* organizations had multiple social, political and economic functions, a permanent "membership" of life employment. Workers and their families were totally dependent upon their affiliated work units for material resources and career chances. Chinese urban society was organized as a hierarchy, in which each work organization functioned as a social "unit" in the system dominated by the state. *Danwei* continues to play an important role in determining workers earnings in reform-era China (Xie and Wu, 2008).

previous censuses and mini-censuses, the survey in 2005, for the first time, collected information on respondents' income, work unit sector, working hours, and fringe benefits, in addition to employment status, occupation (two-digit code), *hukou* status, place of *hukou* registration, current place of residence, education and other demographics (Wu and He, 2015). Compared to the academic survey data collected by universities or research institutes, the mini-census contains a much larger sample size with information on two-digit occupation coding and income, and is particularly suited to our research purpose. We restrict our sample to adults aged between 16 and 60 who were residing in cities and towns, at the time of survey for our analysis. As the focus of this paper is on earnings inequality, we further restrict our analytical sample to those who were employed with work income and not enrolled in school.[4]

The respondents' earnings in the mini-census refer to "income in the last month" (i.e., October 2005), including wages/salary and other sources of work income such as that from self-employment. To address the legitimate concern about the reliability of the income information an individual reported to the government statistical agency, we evaluate the income data from the mini-census. Results show that they are largely consistent with comparable information for the period around 2005 obtained from other urban surveys (see details in Appendix I).

As this study aims to investigate earnings disparities between rural migrants and urban residents in labor markets, we define the key independent variable based on *hukou* status, the place of registration, and the place of residence. *Hukou* status is also called the *hukou* "type" (*leibie*) or "nature" (*xingzhi*) which is, as mentioned before, differentiated into "agricultural" (rural) and "non-agricultural" (urban) *hukou*. The place of registration refers to where a person's *hukou* is registered and is considered as the individual's official "permanent" residence. If a person lacks a local (*bendi*) *hukou*, i.e., a migrant lives in a place other than his or her registration location, then he or she will not be entitled to rights and services in the locality. In sum, *hukou* status and place of registration are dual *hukou* classifications to distinguish agricultural vs. non-agricultural *hukou* and local vs. non-local *hukou* (for a comprehensive review of the *hukou* system, please refer to Chan [2009]).

As Table 1 shows, about 30 percent of urban residents did not have *hukou* registration in the cities/townships where they lived. These people/residents are classified as migrants. Because of the complexity surrounding the definition of "urban" in China (Chan, 2007), only around 60 percent of urban local residents actually held an urban *hukou*. Among migrants, 61 percent (=18.0/30.2) came from rural areas and 60 percent (=[17.3 + 0.8]/30.2) had a rural *hukou*. Nearly 95 percent (=17.3/18.3) of migrants from rural areas held a rural *hukou*, and nearly 94 percent (=11.1/11.9) of migrants from urban areas held an urban *hukou*.

The mean earnings for each of the six groups are also presented in Table 1 (figures in parentheses). The average monthly earnings of local residents with a rural *hukou* were 550 *yuan*, only half of the earnings of local residents with an urban *hukou* (1134 *yuan*). Rural migrants from rural and urban areas earned 945 and 978 *yuan* per month, respectively, whereas the corresponding figures for urban migrants were 1182 and 1609 *yuan*.[5] The results from group comparisons suggest that *hukou* status mattered more than the migrants' origin (place of registration) in determining their earnings in

Table 1
Chinese urban population (aged 16–60) by migrant status and *Hukou* characteristics, 2005.

Hukou status	Migrants		Local residents
	Hukou registration place		
	Rural areas	Urban areas	
Agricultural/Rural *hukou*	17.3% (945)	0.8% (978)	27.3% (550)
Non-agricultural/Urban *hukou*	1.0% (1182)	11.1% (1609)	42.6% (1134)
Subtotal	18.3%	11.9%	
Total	30.2%		69.9%

Note: All percentages are cell percentages of the *total* urban population (aged 16–60, N = 119,675). Average monthly earnings are reported in parentheses (unit: *yuan*), calculated based on the *working population who reported their earnings* (sample sizes used to calculate average monthly earnings, correspondingly from left to right for the first and second rows, are 16,349, 617, 24,988, and 826, 8,709, 30,206).

[4] One may be concerned about the potential bias associated with leaving out the unemployed workers. Because of their temporary *hukou* status, labor migrants without jobs hardly stay in cities, and the proportion of family migrations are still small and no-working housewives are even rare. Therefore, if there were any potential bias, rural migrants' earnings disadvantages are under-estimated. Taking into account this potential bias would strengthen our argument and main findings.

[5] Rural locals in Table 1 (i.e., local residents with a rural *hukou*) are farmers who live in suburban places that used to be classified as rural but later were defined as urban areas due to rapid urban expansion. Although the territories were re-defined as urban, the residents' *hukou* status remained rural. A comparison between rural locals and urban locals in the table reflects the effect of *hukou* status on earnings in China's urban labor market, and the difference between urban locals and urban migrants shows the effect of migrant status. The average earnings in Table 1 suggest that migrant status *per se* does not necessarily result in lower earnings, but rather, *hukou* status plays an important role. In this paper, our focus is on the comparison between rural migrants and urban locals.

Table 2
Descriptive statistics of rural migrants and local workers (aged 16–60) in urban China, 2005.

	Rural migrants	Urban locals
Education		
Primary school and below	19.6	4.7
Junior high school	61.9	29.1
Senior high school and above	18.5	66.2
Occupation		
Manager	1.6	4.9
Professional	3.2	24.7
Clerk	3.6	15.9
Sales & service worker	34.9	26.4
Manual worker	56.7	28.1
Employment status		
Employee	78.8	85.1
Employer	4.3	3.5
Self-employed	16.9	11.4
Work unit		
Government agencies/state institutions	1.5	27.4
Public enterprises	9.0	34.4
Private sector	89.6	38.2
Female	41.5	40.9
Married	62.7	85.0
Age	30.2 (9.4)	38.0 (9.1)
Working hours per week	55.2 (13.2)	45.8 (10.4)
N	15,996	28,661

Note: Percentages are presented for categorical variables, and means and standard deviations are presented for continuous variables.

urban labor markets.[6] Thus our main interest is in comparing migrant workers with rural *hukou* status and local residents with urban *hukou* status. Here, rural migrant workers refer to those who live and work in urban areas but hold an agricultural *hukou* registered elsewhere (i.e., 17.3% + 0.8% in Table 1), whereas urban locals refer to those who live in urban areas where their non-agricultural *hukou* is registered (i.e., 42.6% in Table 1). After restrictions to non-missing data on all the variables described below, the final analytical sample includes 15,996 rural migrants and 28,661 urban locals in subsequent analyses.

Occupation and work unit are important independent variables in the analysis of earnings determination in China. In the mini-census, every occupation is given a two-digit code, and there are 68 occupations in our sample. In the regression analysis of earnings attainment, we recode occupations into five broad categories: managers, professionals, clerks, sales and service workers, and manual workers. We use the two-digit classification to capture the effect of occupational segregation in the decomposition and propensity score matching analyses.[7] Work units are coded into three categories: government agencies/state institutions, public enterprises (i.e., state-owned and collective enterprises), and private sector (i.e., joint ventures, private enterprises, and the self-employed).

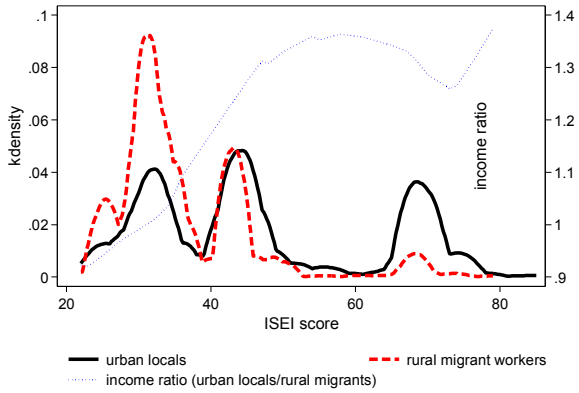
Education, gender, marital status, age, employment status, working hours per week, and county of residence are included as control variables. Education is broadly measured in three levels in regression analysis: primary school or below, junior high school and senior high school or above. Very few rural migrants have attained education beyond senior high school. In the decomposition and propensity score matching analyses, education is measured in seven levels to better capture the differences between rural migrants and urban locals: illiterate, primary school, junior high school, senior high school, three-year college, four-year college, and graduate school.

Marital status is a dummy variable (coded 1 if currently/ever married). A survey respondent may be self-employed, an employee, or an employer. This employment status information is coded as two dummies in the analysis. Age and working hours per week are continuous variables, and to capture their non-linear effects, we include the squared term of each.

Our dependent variable is monthly earnings, which is transformed into the natural logarithm in the regression analysis. In the following, we first present descriptive statistics for rural migrants and urban local workers and compare their labor market characteristics and earnings. We then employ linear regression models with county-level fixed effects to examine their earnings disparities, taking into account their personal attributes and structural positions in the labor markets. We further decompose the earnings gap between rural migrants and urban locals into two parts: a within-occupation component

[6] Place of registration plays an important role in defining whether an individual has or does not have rights to pursue many activities and eligibility for services in the locality, and thus is not an inconsequential status as the levels and availability of services vary from place to place (Chan, 2009). However, our data show that, with regard to earnings, *hukou* status matters more than place of registration.

[7] Due to insufficient cases for some of the original 68 categories, we collapse occupations into 38 categories in the decomposition analysis. Please refer to Appendix II Table A1 for recoding of the original Chinese Standard Classification of Occupations, with sample size listed for each of the 38 occupational categories.



Note: Please refer to Appendix II Table A1 for the original Chinese Standard Classification of Occupations and converted ISEI scores.

Fig. 1. Kernel Densities of ISEI Scores and Monthly Income Ratio of Urban Local versus Rural Migrant Workers in China (2005). *Note*: Please refer to Appendix II Table A1 for the original Chinese Standard Classification of Occupations and converted ISEI scores.

and a between-occupation component, using the method proposed by Brown et al. (1980). Finally, we employ propensity score matching methods to further identify the net effect of *hukou* status on earnings attainment in urban China.

3. Descriptive statistics

Table 2 presents the descriptive statistics for rural migrants and urban local workers. Rural migrants were disadvantaged in many observed characteristics pertaining to earnings. Rural migrants had lower education than urban locals: only 18.5 percent of rural migrants, but 66.2 percent of urban locals, had received senior high school education or above. This is because most rural migrants were educated in rural areas, where educational opportunities are not as plentiful/available as in the cities (Jordan et al., 2014; Wu, 2011; Wu and Zhang, 2010).

The distributions of occupation and work unit in Table 2 clearly show how rural migrants and urban local workers were segregated in urban labor markets. Only 8.4 percent (=1.6 + 3.2 + 3.6) of rural migrants, but 45.5 percent of urban locals, were employed as managers, professionals, and clerks. Fig. 1 displays the pattern of segregation between the two groups by plotting the distribution of occupations sorted according to the International Socio-economic Index of occupational status (ISEI) (Ganzeboom and Treiman, 1996), with a higher ISEI score representing a higher-status occupation, as well as the monthly income ratio of urban locals vs. rural migrants. About one-third of urban locals had occupations with ISEI scores lower than 40, one-third with scores between 40 and 60, and one-third with scores over 60. However, most rural migrant workers had occupations with ISEI scores lower than 50. They were concentrated particularly at the lower end of the distribution. In occupations with ISEI scores lower than 30, rural migrant workers seem to have no disadvantage in earnings compared to urban locals (the ratio is below 1 on the right axis).

The contrast between rural migrants and urban locals is even sharper in terms of their work unit sector. Only 1.5 percent of rural migrants were employed in government agencies/state institutions[8] and 9 percent in public enterprises, whereas 61.8 percent (=27.4 + 34.4) of urban locals were employed in these types of work units. Rural migrants were more likely to be self-employed as they had more difficulties in finding regular jobs in the cities (Li, 2006). Rural migrants were younger, less likely to be married, and worked 10 more hours per week than urban locals.

Our main interest in this study is earnings inequality between rural migrants and urban locals, and as Table 3 shows, on average urban locals earned 1169 *yuan* per month whereas rural migrants earned 968 *yuan* per month, 17 percent (=1–968/1169) less than urban locals. The gap is even more substantial if we take into account the fact that rural migrants worked 10 h more per week (shown in Table 2) than urban locals, with much fewer benefits. The earnings gap also varied across work units: rural migrants earned 36 percent less than urban locals in government agencies/state institutions, 13 percent less in public enterprises and 8 percent less in private enterprises. Two-sample t-tests show that the differences are all statistically significant ($p < 0.001$).

As discussed before, rural migrants and urban locals differ substantially in educational and occupational attainments and other characteristics pertaining to earnings. To rule out the confounding factors and identify the effect of migrant status on earnings, we now turn to multivariate analyses.

[8] Among these migrant workers, most were security workers, catering service workers, post/telecom workers, and storage employees.

Table 3
Average monthly earnings by work unit type of rural migrants and urban locals (aged 16–60) in urban China, 2005.

	Rural migrants (R)	Urban locals (U)	Ratio (R/U)	T-test
Government agencies/state institutions	846 (500)	1329 (852)	0.64	$Pr(T_R < T_U) = 0.0000$
Public enterprises	1022 (576)	1172 (910)	0.87	$Pr(T_R < T_U) = 0.0000$
Private sector	965 (754)	1052 (1295)	0.92	$Pr(T_R < T_U) = 0.0000$
Full sample	968 (737)	1169 (1066)	0.83	$Pr(T_R < T_U) = 0.0000$
N	15,996	28,661		

Note: Unit of outcome is *yuan*; standard deviations are in parentheses.

4. Empirical findings

4.1. Results from regression analysis

Table 4 presents estimated coefficients for county-level fixed-effect regression models of earnings attainment. Model 1 shows that, even after controlling for the effects of gender, marital status, education, age and its squared term, rural migrants still earned 11.2 percent ($=1-e^{-0.119}$) less than urban workers. In Model 2, after adding occupation, employment status and working hours to the equation, the earnings gap decreases to 7.4 percent ($=1- e^{-0.077}$), but continues to be statistically significant ($p < 0.01$). Model 3 further includes work units, which sees the gap decreasing to 5.3 percent ($=1-e^{-0.054}$). These results suggest that the observed earnings differential between rural migrants and urban workers cannot be completely explained by their differences in personal characteristics such as human capital, occupations, and in other working conditions.

The effects of other independent variables are just as expected. Other things being equal, women earned less than men.[9] Those who were married earned more than those who were not. Those who were more educated made more. The effects of both age and working hours on earnings are curvilinear, first increasing and then declining. In general, managers, professionals, and clerks earned more than manual workers, but sales and service workers earned less. Employers made more than the self-employed, but employees made less. Workers in public and private enterprises earned significantly less than those who worked in government agencies/state institutions.

In Model 4, we allow the effect of rural migrant status to vary across work unit sectors by including interaction terms between migration status and work units. Confirming the results in Table 3, the multivariate analysis shows that the earnings gap between rural migrants and urban local workers was the largest in government agencies/state institutions, smaller in public enterprises and the smallest in private enterprises. Rural migrants earned 36.2 percent less ($=1-e^{-0.450}$) than their urban counterparts in government agencies/state institutions, 9.3 percent less ($=1-e^{-0.450+0.352}$) in public enterprises, and only 3 percent less ($=1-e^{-0.450+0.420}$) in private enterprises, controlling for other factors.

These findings are surprising to some extent. It seems that rural migrants faced more earnings disadvantages in government agencies/institutions, which have long cherished the socialist egalitarian ideology, than in public and private enterprises. There may be two possible explanations. First, rural migrants' disadvantages may have resulted from employers' preferences and differential treatments towards them in different types of work units. In private enterprises and to some extent in public enterprises that put more emphasis on economic efficiency, skills and merits count more than *hukou* status, which is an institutional legacy associated with socialist redistributive economies (Wu, 2009). Second, both migrants and local workers may differ in personal characteristics (e.g., education, work experience, and occupation) across work units. As previously shown in Table 2, only 1.5 percent and 9 percent of rural migrants respectively worked in government agencies/state institutions and public enterprises, whereas over 60 percent of urban locals worked in these two sectors. Moreover, rural migrants in government agencies/state institutions and public enterprises tended to concentrate in low-status occupations, with most being security workers, post/telecom workers, storage employees, catering service workers, etc. Hence, segregation by occupation and work unit seems to drive the earnings disparities between rural migrants and local workers.

To confirm this speculation, we compute the segregation index, also called the dissimilarity index (Duncan and Duncan, 1955), to measure the difference in occupational distribution between rural migrants and urban workers.[10] Overall, around 45 percent of rural migrants in the full sample would have to move to a different occupation to produce a distribution that is as even as that for urban workers. The corresponding percentages are 57 percent in government agencies/state institutions, 42 percent in public enterprises, and 32 percent in private enterprises. These figures suggest that the two groups concerned were the most segregated in government agencies/state institutions and the least segregated in private enterprises.

[9] Despite the fact that occupational gender segregation is an important research topic and gender may also play a role in occupational segregation and earnings inequality alongside the other group boundary/boundaries, our focus here is on the occupational segregation and earnings disparities between migrants and local workers for both men and women. We pool men and women together in the subsequent analyses, controlling only for the main effect of gender. Analyses for men and women separately show similar patterns. Results are available upon request.

[10] The index of dissimilarity refers to the percentage of rural migrants that would have to move to a different occupation to produce a distribution that is the same as that of urban locals. The basic formula is $1/2\sum_{j=1}^{N}|r_j/R - u_j/U|$, where r_j = the rural migrant population in the*jth* occupational category, R = the total rural migrant population in the sample, u_j = the urban local population in the *jth* occupational category, U = the total urban local population in the sample, and N = the total number of occupations.

Table 4
Determinants of logged monthly earnings of workers (aged 16–60) in urban China, 2005 (county-level fixed effects models).

Dependent variable: Log (monthly earnings)	1	2	3	4
Rural migrants	−0.119**	−0.077**	−0.054**	−0.450**
	(0.007)	(0.007)	(0.007)	(0.033)
Female	−0.205**	−0.197**	−0.195**	−0.195**
	(0.005)	(0.005)	(0.005)	(0.005)
Married	0.083**	0.068**	0.060**	0.059**
	(0.009)	(0.009)	(0.009)	(0.009)
Education (primary and below [omitted])				
Junior high school	0.176**	0.161**	0.158**	0.158**
	(0.009)	(0.008)	(0.008)	(0.008)
Senior high school and above	0.487**	0.379**	0.360**	0.358**
	(0.009)	(0.009)	(0.009)	(0.009)
Age	0.024**	0.024**	0.023**	0.024**
	(0.002)	(0.002)	(0.002)	(0.002)
Age^2 × 100	−0.028**	−0.029**	−0.030**	−0.029**
	(0.003)	(0.003)	(0.003)	(0.003)
Occupation (manual worker [omitted])				
Manager		0.423**	0.390**	0.389**
		(0.013)	(0.013)	(0.013)
Professional		0.273**	0.213**	0.210**
		(0.008)	(0.008)	(0.008)
Clerk		0.166**	0.104**	0.103**
		(0.008)	(0.009)	(0.009)
Sales & service worker		−0.078**	−0.077**	−0.073**
		(0.006)	(0.006)	(0.006)
Employment status (self-employed[omitted])				
Employee		−0.017*	−0.067**	−0.069**
		(0.008)	(0.008)	(0.008)
Employer		0.289**	0.297**	0.300**
		(0.014)	(0.014)	(0.014)
Work unit (government/state institutions [omitted])				
Public enterprises			−0.121**	−0.130**
			(0.008)	(0.008)
Private sector			−0.217**	−0.247**
			(0.009)	(0.009)
Interactions				0.352**
Public enterprises × Rural migrants				(0.035)
				0.420**
Private sector × Rural migrants				(0.033)
Working hours		0.003**	0.005**	0.006**
		(0.001)	(0.001)	(0.001)
Working hour^2 × 100		−0.003**	−0.004**	−0.004**
		(0.001)	(0.001)	(0.001)
Constant	6.089**	6.009**	6.188**	6.194**
	(0.036)	(0.048)	(0.049)	(0.048)
N	44,657	44,657	44,657	44,657
R^2	0.186	0.251	0.262	0.265
Number of counties	2418	2418	2418	2418

Note: Standard errors are in parentheses. *p < 0.05; **p < 0.01 (two-tailed tests).

The computed segregation indexes, together with results from regression models, suggest occupational segregation to be an important mechanism in creating the overall earnings inequality between rural migrants and urban locals. To empirically demonstrate this, in the next section, we employ a decomposition method to disentangle within- and between-occupation earnings disparities between the two groups.

4.2. Results from decomposition analysis

Two decomposition methods have been widely adopted in econometric studies of occupational segregation and earnings inequality. While the Blinder-Oaxaca decomposition method treats occupation as a productivity-related characteristic and assumes that coefficients in the earnings equation do not vary across occupations (Blinder, 1973; Oaxaca, 1973), Brown et al. (1980) proposed another decomposition method in which occupation is treated as an intervening variable and earnings equation coefficients are allowed to vary across occupations (hereafter the Brown et al. method). Given our research interest, we adopt the latter to assess the relative contributions of within- and between-occupation earnings differentials to the overall earnings inequality between rural migrants and urban locals.

Table 5
Decomposition results of earnings differentials between local workers and rural migrants in urban China (2005).[a]

	Full sample	% of subtotal	Private sector only	% of subtotal
	Log monthly earnings		Log monthly earnings	
Total earnings differential[b]	0.1174		−0.0542	
Within-occupation	−0.0826	100	−0.1407	100
Explained	0.0528	−64	0.0389	−28
unexplained	−0.1355	164	−0.1796	128
Between-occupation	0.2000	100	0.0865	100
Explained	0.1534	77	0.0459	53
unexplained	0.0466	23	0.0406	47
Total explained	0.2062		0.0848	
Total unexplained	−0.0889		−0.1390	

Notes:
[a] Results of this table are calculated using Brown et al.'s (1980) decomposition method. Please refer to the text for details. Decompositions are based on 38 occupational categories.
[b] urban workers' average logged earnings minus rural migrant workers' average logged earnings.

The Brown et al. decomposition method also estimates the hypothetical occupational distribution and hypothetical earnings attainment within each occupation for the segregated group members concerned (rural migrants in this case) as if they were treated the same as their counterparts (urban locals in this case) in occupational and earnings attainment equations. As a result, the within- and between-occupation earnings variations can each be further divided into two parts: (1) the part that can be explained by differences in observable characteristics included in the equations (hereafter referred to as "explained"), and (2) the part that comes from differences in coefficients in the occupational and earnings attainment equations (hereafter referred to as "unexplained"). The earnings differentials between urban locals and rural migrants thus can be decomposed as follows:

$$\begin{aligned}\overline{W}^U-\overline{W}^R&=\sum_j\left(P_j^U\overline{W}_j^U-P_j^R\overline{W}_j^R\right)\\&=\sum_j\left(P_j^R\overline{W}_j^U-P_j^R\overline{W}_j^R+P_j^U\overline{W}_j^U-P_j^R\overline{W}_j^U\right)\\&=\sum_j P_j^R\left(\overline{W}_j^U-\overline{W}_j^R\right)+\sum_j\overline{W}_j^U\left(P_j^U-P_j^R\right)\\&=\underbrace{\sum_j P_j^R\widehat{\beta}_j^U\left(\overline{X}_j^U-\overline{X}_j^R\right)}_{(1)}\underbrace{\sum_j P_j^R\overline{X}_j^R\left(\widehat{\beta}_j^U-\widehat{\beta}_j^R\right)}_{(2)}+\underbrace{\sum_j\overline{W}_j^U\left(P_j^U-\widehat{P}_j^R\right)}_{(3)}\underbrace{\sum_j\overline{W}_j^U\left(\widehat{P}_j^R-P_j^R\right)}_{(4)}\end{aligned}\tag{1}$$

where superscripts U and R respectively refer to urban locals and rural migrants, and subscript$j$ refers to the *jth* occupation category. $\overline{W}^U$ and $\overline{W}^R$ denote, respectively, the mean logarithm of monthly earnings of urban locals and rural migrants for the entire sample, and $\overline{W}_j^U$ and $\overline{W}_j^R$ are the mean logarithm of monthly earnings of urban locals and rural migrants within each occupation j. $\overline{X}_j^U$ and $\overline{X}_j^R$ are mean values of the personal characteristics of each group in occupation j. $\widehat{\beta}_j^U$ and $\widehat{\beta}_j^R$ are the estimated coefficients of personal attributes in two separate earnings equations for occupation j. P_j^U and P_j^R are the observed proportions of each group in occupation j. $\widehat{P}_j^R$ refers to the hypothetical proportion of rural migrants who would be in occupation j if they were treated as urban locals in the occupational attainment equation.[11]

As mentioned before, due to the small sample size for some occupations, we collapse occupations into 38 categories (here $j = 1, 2, 3, \ldots, 38$). Within each category, to obtain $\widehat{\beta}_j^U$ and $\widehat{\beta}_j^R$, we estimate earnings equations for urban workers and rural migrants, with gender, marital status, education, employment status, work unit, age and its squared term, and working hours and its squared term as the independent variables.[12] To generate the hypothetical occupational distribution of rural migrants, $\widehat{P}_j^R$, we first develop a multinomial logit model of occupational attainment for urban workers based on a set of independent

[11] We treat urban local workers as the reference group and assume that rural migrants are treated discriminatorily.
[12] Since the decomposition analysis requires a separate estimation on earnings for each occupational category, we do not break the sample down by types of work unit due to sample size limitation, but include work unit as an independent variable in the equations (we can conduct the decomposition analysis for the private sector, though, as there are sufficient cases for both rural migrants and local workers in the sector). This strategy is appropriate because the main purpose of the decomposition analysis is to examine the relative importance of occupational segregation versus within-occupational pay difference. We will make comparisons by the work unit type in the following propensity score matching analysis.

variables including gender, marital status, education, and age and its squared term, and then predict the occupational distribution of rural migrants using the estimated equation for urban workers.

Based on the results obtained from the above procedures, we decompose the logarithm of the monthly earnings gap between urban workers and rural migrants ($\overline{W}^U - \overline{W}^R$) into four parts (corresponding to the four terms in Eq. (1)): (1) within-occupation earnings difference that can be explained by difference in predictive characteristics of earnings attainment (i.e., $\overline{X}_j^U - \overline{X}_j^R$); (2) within-occupation earnings difference resulting from coefficient difference in the earnings equations (i.e., $\widehat{\beta}_j^U - \widehat{\beta}_j^R$); (3) between-occupational earnings difference attributed to difference in predictive characteristics of occupational attainment (i.e., P_j^U-$\widehat{P}_j^R$); and (4) between-occupational earnings difference arising from coefficient difference in the occupational attainment equations (i.e., $\widehat{P}_j^R$-P_j^R). In brief, parts (1) and (2) refer to within-occupation earnings disparity, whereas parts (3) and (4) represent between-occupational earnings difference.

Table 5 presents the decomposition results. A positive number means that urban locals earned more than rural migrant workers, whereas a negative one means that they earned less. In line with the results in Table 4, urban workers generally earned about 12 percent more ($=e^{0.1174}-1$) than rural migrants. This disparity can be decomposed into a positive between-occupation earnings gap (0.2000) and a negative within-occupation earnings gap (−0.0826). This suggests that the general earnings advantage of urban local workers was entirely due to occupational segregation: they were more likely to take up higher-status occupations with better pay than rural migrant workers. Furthermore, local workers' earnings advantage resulting from occupational segregation/attainment was to some extent offset by their within-occupation earnings disadvantage. In general, they earned less than rural migrant workers within the same occupations.

Moreover, the between-occupation earnings gap was largely associated with the different characteristics between the two groups pertaining to occupational attainment: 77 percent of the between-occupation gap can be explained by the independent variables in the equations. Urban local workers earned more because they were more likely to be in higher-paid occupations due to their better education, more relevant work experience, and other demographic characteristics relevant to higher earnings. On the other hand, within the same occupations, urban local workers tended to earn less than rural migrant workers. This finding cannot be explained by differences in education, employment status, work unit, working hours, age, etc. Rather it resulted from an unexplained component (−0.1355). The positive *total explained* (0.2062) and the negative *total unexplained* (−0.0889) components of the earnings gap suggest that urban workers on average earned more than rural migrants because they enjoyed advantages in observed characteristics positively associated with occupational and earnings attainment.

The result that urban local workers in general earned less than rural migrant workers within the same occupations is somewhat surprising. We speculate that the pattern was largely driven by the workers in the private sector and thus replicate the decomposition analyses for the private sector only. Results are presented in the right panel of Table 5. As shown in the occupational segregation index by sector we calculated above, the two groups were the least segregated in the private sector, and earnings differentials were mainly due to within-occupation variations rather than between-occupation ones. Most of the within-occupation variations, for which migrants indeed have earnings advantages over local workers, cannot be explained by observed characteristics.[13]

Hence, the decomposition results in Table 5 clearly show that rural migrants' earnings disadvantages relative to urban workers were attributable to the occupational segregation in urban labor markets. In other words, they earned less because they were less likely than urban local workers to have access to high-paid occupations. Furthermore, occupational segregation was largely associated with rural migrants' disadvantages in observed characteristics, notably, human capital, but occupation *per se* also explains a non-negligible portion.

4.3. The propensity score matching analysis

The decomposition results above suggest that, on the one hand, occupational segregation was the source of migrants' earnings disadvantages relative to urban local workers, and on the other hand, such restrictive access to higher-pay occupations can be largely explained by the migrants' observable characteristics. The question is whether and how rural migrants continue to differ from urban locals in earnings if we rule out the effect of occupational segregation and differentials from/in other observable attributes? Do they still have earnings disadvantage compared to their counterparts in the same occupation with similar individual attributes? We here conduct a propensity score matching analysis to further examine the effect of *hukou* (migration) status on earnings.

[13] It is well known that both earnings and migration patterns vary substantially across regions in China (Xie and Hannum, 1996). To check whether the patterns we identified above differ by region, we also conduct decomposition analysis of subsamples separately for the eastern region and for the central and western regions (the latter two are combined due to the small sample size). The result for the latter is similar to that in Table 5: urban local workers generally earned more than rural migrants, and such an advantage was due to occupational segregation and offset to some extent by their within-occupation earnings disadvantage. In the eastern region, however, results show that urban locals possessed both between-occupation and within-occupation earnings advantages. Therefore, the findings that migrants enjoyed within-occupation advantages are not applicable to the eastern region, the destination for most migrants in China. However, our main argument still holds that the overall earnings gaps between urban workers and rural migrants are mainly due to occupational segregation rather than within-occupational unequal pay.

Table 6
Propensity score matching results of hourly income by type of work unit of rural migrants and urban locals (aged 16–60) in urban China, 2005.

	Treated (rural migrants) (T)	Controls (urban locals) (C)	ATT[a]: (T)-(C)
Full sample	4.66	4.38	0.28**
Government agencies/state institutions	4.67	5.73	−1.06**
Public enterprises	5.42	4.92	0.50
Private sector	4.59	4.10	0.49***

Note: Unit of hourly wage is *yuan*. ***p < 0.01; **p < 0.05 (two-tailed tests).
[a] ATT is the average treatment effect on the treated.

The key feature of the propensity score matching method is that it allows researchers to summarize all the differences in observable characteristics between the two groups under comparison (the treated and control groups) with a single dimension, the propensity score, which is the conditional probability of receiving the treatment given the observed covariates (Rosenbaum, 2002:296). A large body of literature has shown that the propensity score matching method can remove a great deal of bias attributable to observed covariates in causal inference (e.g., Morgan and Winship, 2007; Xie and Wu, 2005).

The strategy is to first estimate propensity scores for the treated and control groups, then stratify the two groups by the propensity scores and match them across the propensity score strata, and finally use the difference in mean outcomes in the matched samples within each stratum to obtain an estimate of the average treatment effect on the treated (DiPrete and Gangl, 2005).

We define rural migrants as the treated group and urban locals as the control group. The observed covariates include years of schooling (converted from educational level), ISEI score, age, gender, marital status, and county of residence. We use hourly wage as the outcome variable considering that the working hours are much longer for rural migrants than for urban workers. As the effect of migrant status was found to vary across work units in the OLS regression analysis, we also conduct propensity score matching by type of work unit.

To perform the matching analysis, we first obtain the propensity score using a binary logit model, in which the dependent variable is whether one is a rural migrant or not. We then match the rural migrants and urban local workers based on their propensity scores using one-to-one nearest-neighbor caliper matching with replacement.[14] Finally, we evaluate the net effect of rural migrant status by comparing the mean hourly wage between rural migrants and urban local workers.[15]

Table 6 presents the results based on the matched samples of rural migrants (treated group) and urban workers (control group) for the pool sample and by work unit sector. The average treatment effect on the treated (ATT) is presented in the last column. The average treatment effect is positive and statistically significant in the pooled sample, suggesting that given rural migrants and urban workers have comparable propensity scores, the former earned 0.28 *yuan* per hour more than the latter on average. Assuming both groups worked 55 h per week (i.e., the average working hours of rural migrants in Table 2), rural migrants earned 62 *yuan* more than urban workers every month (i.e., $0.28 \times 55 \times 4$).

The propensity matching result differs by type of work unit. In government agencies/state institutions, the average treatment effect is negative. Rural migrants earned 1.06 *yuan* per hour less than urban workers. Recall from the descriptive statistics discussion that most rural migrants in this sector had low-end occupations such as security or catering workers. Results here show that rural migrants still face a significant earnings disadvantage after we match them to comparable urban local workers, although this disadvantage (i.e., $-1.06/5.73 = 18$ percent less) is smaller than the one without matching in regression analysis (i.e., 36 percent less).

In public enterprises and the private sector, the average treatment effect is positive and significant (ATT is significant at 0.10 level in public enterprises). On average, rural migrant workers earned 0.50 *yuan* and 0.49 *yuan* per hour more than urban workers in public enterprises and the private sector, respectively. Assuming both rural migrants and urban local workers worked 55 h per week, rural migrants earned 110 *yuan* ($=0.50 \times 55 \times 4$) more in public enterprises and 108 *yuan* ($=0.49 \times 55 \times 4$) more in the private sector.

The above results are consistent with the findings in the decomposition analysis. Indeed, by removing more bias attributable to observable characteristics apart from occupation, the propensity score matching analysis provides even stronger evidence to the claim that rural migrants' overall disadvantages were caused by occupational structural barriers and imbalanced opportunities in systems such as education, rather than by direct pay discrimination against them in urban labor markets. In addition, the propensity matching analysis answers our previous questions about earnings disparity between the two groups with comparable characteristics. Contrary to their general earnings disadvantage, rural migrants earned a higher

[14] Nearest-neighbor matching constructs the counterfactual for each treated case using the control cases having the closest propensity score. A caliper is used to avoid very poor matches in treatment cases that may occur in nearest-neighbor matching by restricting matches to some maximum distance (Morgan and Winship, 2007:107–108). We set the caliper size to 0.025, which restricts matches to within 2.5 percentage points of propensity scores from the treated case. We also impose a common support to drop treatment observations whose propensity score is higher than the maximum or less than the minimum propensity score of the controls.

[15] Other basic matching algorithms include exact matching, interval matching, and kernel matching (Morgan and Winship, 2007:107–109). Results reported here are substantively identical to those that use alternative matching algorithms.

hourly wage in public enterprises and the private sector than their urban counterparts once we rule out the effects of occupational segregation and disparities from/in other observable attributes.[16]

The results estimated above rely on the assumption that there is no unobserved systematic difference between the treated and control groups, known as the ignorability assumption. To check whether or not our estimation may be subject to potential selection bias on unobservable characteristics (or hidden bias), we implement the Rosenbaum bounds sensitivity analysis (Rosenbaum, 2002). Our results are quite robust. Hence it is very unlikely that the estimates are biased due to the omitted difference in unobservable characteristics between the two groups (see details in Appendix II in Table A2).

5. Conclusions and discussions

The unprecedented waves of rural migrants arriving in urban areas since the 1990s have not only fundamentally transformed the social landscape of China but also bear far-reaching implications for the evolution of the nation's social structure in the long term. While the governmental controls over population migration through the household registration (*hukou*) system have waned and increasingly more and more rural migrants go to cities seeking for upward socioeconomic mobility from farming, the effect of the *hukou* system lingers on in urban China's labor markets. The general picture is that rural migrants are significantly disadvantaged compared to local workers, both economically and socially, in Chinese cities. To foster the social and economic integration of rural migrants in cities, it is crucial to understanding the mechanisms and process through which the overall inequality between migrants and local residents is generated.

Against this backdrop, based on the analysis of sample data from the population mini-census of China conducted in 2005, we examined the commonly observed earnings inequality between rural migrants and urban local workers and adjudicated between two competing explanations for rural migrants' earnings disadvantages: occupational segregation and wage discrimination in urban China's labor markets. Multivariate linear regression analyses confirm that rural migrants earned significantly less than their urban counterparts, with this earnings disadvantage being the greatest in government/state institutions, followed by public enterprises, and finally the private sector. We attribute the inequality pattern to the varying occupational segregation across work unit sectors. The occupational segregation between rural migrants and urban workers, measured by the dissimilarity index, is more prominent in the government agencies/state institutions than in public enterprises and the private sector. Even though rural migrants were able to enter government agencies/state institutions, they usually ended up in low-end and unskilled occupations.

The decomposition analysis using more fine-tuned occupational categories allowed us to separate the between-occupation and within-occupation earnings differentials. It showed that the earnings inequality between rural migrants and urban locals is attributable to between-occupation earnings differentials rather than to unequal pay within each occupation. Hence, we conclude that the overall earnings disadvantages of rural migrants result mainly from occupational segregation in urban China's labor markets.

The propensity score matching analysis further revealed that, after being matched with their urban counterparts based on chosen observed attributes (i.e., after a great deal of bias attributable to observed characteristics between the two groups was removed), rural migrants surprisingly enjoyed advantages in hourly wages over urban local workers, and only in government agencies/state institutions did their disadvantages persist. These results, in sharp contrast to the findings from the group comparisons and multivariate regression analyses, provide even stronger evidence to support the claim that the rural migrants' overall earnings disadvantage is derived from occupational segregation rather than within-occupation wage discrimination against them by employers. In addition, the earnings advantage of rural migrants in public enterprises and private sectors relative to their matched urban local counterparts is at odds with their overall disadvantage that is commonly observed, suggesting that we need a comprehensive understanding of the labor market performance of this marginal group in urban China.[17]

The differential access to occupations between rural migrants and urban locals is attributable partly to their characteristics associated with earnings, among which education is a prominent one. Yet *hukou* status plays an independent role in determining access to occupation, a phenomenon that could be understood in terms of social exclusion. Social exclusion

[16] To address the concern about the regional heterogeneity, we also conducted the same analyses separately for the eastern, central, and western subsamples. Results are largely consistent with our findings for the whole sample: rural migrants earned less than their urban local counterparts in government agencies/state institutions ($p < 0.05$ for the eastern and western subsamples and statistically insignificant for the central subsample), but earned more than urban locals in private enterprises ($p < 0.01$ for the central and western subsamples and statistically insignificant for the eastern subsample). In public enterprises in all regions, there is no statistically significant difference between the two groups.

[17] Note that our finding of rural migrants' earnings advantage, though not the focal point of this article, should be interpreted with caution for two reasons. First, wage or salary in China is only one component of individuals' income, and this is more so for local urban residents than for rural migrants. Rural migrants may receive more cash earnings but fewer benefits than local workers in public and private enterprises. Second, rural migrants may be more selective than local workers in urban labor markets, especially in lower-status occupations, which are accessible to both groups. For example, compared to urban locals, migrants may be more determined and willing to work harder to improve their living conditions. Those with serious health problems would often return to their home villages and thus would not be included in the urban sample (Chen, 2011).

refers to the process in which individuals or social groups are systematically blocked from or denied various rights, opportunities and resources that are normally available to other members (Silver, 1994; Wu and Zhang, 2015).

The *hukou* status, instituted by the state policy since the 1950s, divided all Chinese citizens into rural and urban classes, based on which resources and life chances were distributed and migration was controlled under state socialism (Wu and Treiman, 2004). After decades of economic reform, while its influence on migration has diminished, the *hukou* system continues to be explicitly employed by many local governments as the basis for providing employment opportunities and allocating subsidies and welfare to the local permanent residents. Therefore, unlike the transnational immigrants in western countries who are, at least on the surface, protected from discrimination and afforded equal opportunities by various legal, social and economic policies for socioeconomic assimilation (Farley and Alba, 2002), Chinese rural migrants face occupational segregation and economic disadvantages in urban labor markets as a direct result of the state/local government exclusionary policies.

Such "institutional discrimination" against rural migrants in terms of access to certain types of occupations and entitlement to fringe benefits becomes more evident if we compare the patterns of occupational segregation and earnings inequality between the two groups in government/state institutions, public enterprises and the private sector, which, in our view, can be seen as a continuum representing the decline in the influence of the state and the rise in market forces in labor markets in the course of China's economic transition. As the reform proceeds and the redistributive state gradually retreats from the economic sphere to give way to a competitive labor market, those who used to be suppressed by the socialist state (e.g., rural *hukou* holders and migrants) would gain more opportunities by virtue of their education, skills, efforts, and productivity, whereas those who used to be under the protection of the state egalitarian policies would lose out and face more disadvantages in the labor markets. Our finding of the varying pattern of segregation across sectors thus sheds light on the changing stratification dynamics in post-socialist urban China.

Our research contributes to the sociological literature on occupational segregation by extending the analysis in western societies, typically based on gender, race, or ethnicity, to China, this time based on *hukou* status. Urban China provides us a unique setting, in which individuals with different *hukou* status work under comparable institutional and opportunities structures, to examine the role of the state in the dynamics of occupational segregation. Empirically, our findings also bear important policy implications. Because the occupational segregation plays an important role in creating the disadvantages of rural migrant workers, efforts should be made to reduce occupational segregation and remove other structural barriers, to help them gain equal access to a variety of occupations, especially the higher status ones, in urban China's labor market. Not incidentally, on February 23rd, 2012, the State Council of China issued a policy notice calling for proactive and stable reform of China's *hukou* system (Hu, 2012). It stated that all new employment, education and skills training policies must not be linked to the *hukou*, and migrants in county-level cities could apply for local *hukou*. How such policy changes would affect the patterns of occupational segregation and economic disparities between migrants and local workers remains to be investigated.

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Appendix I

An Evaluation of Income Data in China's Population Mini-Census, 2005

The one-percent population survey, also known as the mini-census, was conducted by the National Bureau of Statistics (NBS) of China. Unlike previous censuses and mini-censuses, the survey in 2005, for the first time, collected information on respondents' earnings, employment status, occupation (two-digit code), work unit sector, working hours, and fringe benefits, in addition to *hukou* status, place of *hukou* registration, current place of residence, education and other demographic characteristics that are also collected in the 2000 census (Wu and He, 2015).

Since we employ monthly earnings as the main measure of labor market outcomes in this research, a legitimate concern is to what extent the estimate is consistent with data from other sources, given the fact that income is more sensitive than other social/demographic information conventionally collected in censuses. The mini-census solicited the information on monthly income with one item from individuals (R25), "income in the last month" (i.e., October 2005), which includes all work income but not nonworking income such as property income and transferred income). We compute the average annual income

(monthly income multiplied by 12) in the mini-census and check it against comparable information in the period around 2005 obtained from the following urban surveys:

- Urban Household Income and Expenditure Survey (UHS). This is the official urban household survey that has been carried out by another subsidiary unit of NBS since 1984, based on which the per capita household disposable income is reported in the China Statistical Yearbook. While the systematic/systemic documentation of the sample designs, population coverage, and sample size and weighting have never been released, Wang (2008: 183–192) provides a description of the relevant information and assessment of data quality before 2000. The sampled households from 226 cities and towns vary by year, increasing from 45,317 in 2002 to 64,675 in 2008. The time series can be obtained from the NBS website (http://data.stats.gov.cn/). We report the per capita annual income (total household income divided by the number of working adults). The data here are not deflated.
- Chinese Household Income Project (CHIP). This is a four-wave household survey (1988, 1995, 2002, and 2007), jointly designed by economists from China and western countries, using a subsample of the UHS above. In 2002, 6835 urban households were surveyed in 70 cities within 11 of the 22 provinces covered in the UHS. In 2007, 10,000 urban households of a UHS subsample were surveyed in 16 provinces. These households, like those in the UHS sample in general, consisted of urban residents with local household registration (*hukou*). The sizable group of migrants in cities was largely omitted from the sample. To address this concern, the investigators of CHIP designed an add-on (sample consisting of/survey involving?) 2000 rural-urban migrant households from the capital city plus one middle-sized city in the selected provinces in the 2002 survey, and 5000 (rural-urban?) migrant households from 9 of 16 selected provinces in the 2007 surveys (Chen, 2012). The migrant household surveys were conducted separately. In addition, with a special research design for the purpose of deriving household income that is internationally comparable, detailed questions on income were asked and some components (e.g., rent of private housing) were imputed. As such, the per capita household income in CHIP is expected to be higher than that reported in UHS. If migrant households were included in the analysis, the mean per capita household income would be lower. A weight is needed to pool the special sample of migrants into the urban sample for the calculation of the mean per capita household income. Figures here are drawn from Li et al. (2013).
- Chinese General Social Survey (CGSS). The CGSS is an annual survey of a national representative sample of the adult population aged 18 or above in all provinces except Tibet, conducted jointly by Renmin University of China and the Hong Kong University of Science and Technology. Four waves of data collected in 2003 (urban sample only), 2005, 2006, and 2008 have been publicly released. The CGSS adopted a multi-stage stratified random sampling method: 125 principal sampling units (PSU) were selected from 2798 counties or county-level districts, stratified by region, rural and urban populations, and education level; then, 4 second-level sampling units (SSU) were selected from each selected PSU and two third-level sampling units (TSU) were selected from each selected SSU; finally, 10 households were selected from each selected TSU. One eligible person aged 18 or above was randomly selected from each sampled household to serve as the survey respondent. These surveys yielded 5,894, 6,098, 6,013, and 3982 respondents from urban samples in 2003, 2005, 2016, and 2008, respectively (see details in Bian and Li, 2012). Sample weights are also available in the data released. One problem with CGSS is that the migrant population was significantly undercounted in the sampling frame of the survey. The problem has been partially addressed in the 2008 CGSS following a similar practice to that adopted for the 2005 mini-census (Wu and He, 2015). Respondents reported monthly income from work in each wave, which was converted to annual income for comparison (not deflated).
- China Health and Nutrition Survey (CHNS). The CHNS data were conducted by University of North Carolina, Chapel Hill, in collaboration with the Chinese Center for Disease Control and Prevention in 1989, 1991, 1993, 1997, 2000, 2004, 2006, and 2009. We focus on the urban sample in 2004 (4146 adults from 1477 households) and 2006 (4635 adults from 1485 households). While the CHNS sample, drawn from 9 provinces (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong), is not nationally representative, it is diverse, with variation found in a wide-ranging set of socioeconomic factors (income, employment, education, and modernization) and other related health, nutritional and demographic measures (http://www.cpc.unc.edu/projects/china). In our calculations, working adults' income consisted of non-retirement wages/bonuses, retirement, income, and income from household business. The calculation was based on about 2100 adults with reported income. Note that a significant number of migrant workers were overlooked in the CHNS sample.

The data above were collected by either the government statistical agency (UHS), an academic institution in collaboration with a statistical agency (CHIP), or academic institutions independently (CGSS, CHNS) for an extended period. We calculate the national average income from these data sources in selected years and from the mini-census in 2005, and plot them in Fig. A1.

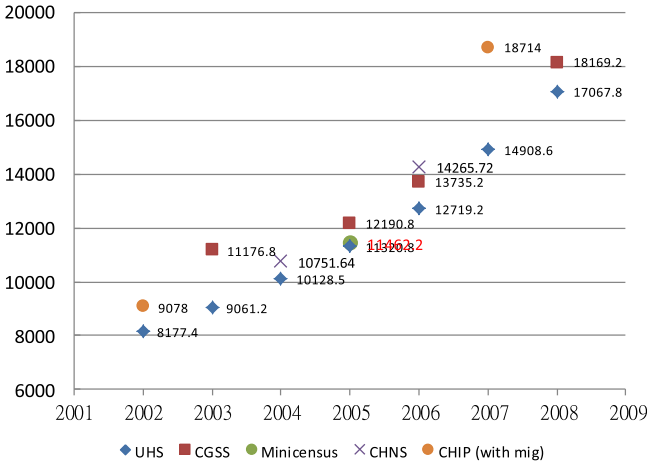

Fig. A1. Comparing annual income from different data sources.

As shown in the figure above, the national average of individuals' income in the 2005 mini-census is consistent with estimates from other data sources. Our estimate (11,462.2 *yuan*) is very close to that from UHS (11,320.8 *yuan*) in 2005, which includes property income and transfer income but does not cover migrants with lower income. The estimate is lower than that from the 2005 CGSS (12,190.8 *yuan*), which covers few migrants, but falls between those from the 2004 CHNS 2004 (10,751.6 *yuan*) and the 2006 CHNS (14,256 *yuan*), and between those from the 2002 CHIP (9078 yuan) and the 2007 CHIP (18,714 *yuan*).

Note that our calculation is based on a sample of 119,675 individuals aged between 16 and 60 with reported work income. The 2005 mini-census adopted a new approach to capture the population in both their *de jure* and de *facto* residence at the reference time (0 o'clock on November 1). In the sampled census tract, all Chinese citizens were recorded either where they resided in the current residence or where they were registered in the residence but lived else, thus migrants can be captured in both origins and destinations, regardless of the duration away from their registration residence. In this case, the registered population, floating population, and residential population can all be counted in different ways as needed. Such exploratory designs were indeed adopted in the 2010 population census (Wu and He, 2015). Therefore, the 2005 mini-census presumably captures more migrants than do any of the previous censuses or national representative surveys. Not surprisingly, the average mean income from the mini-censuses is lower than that from other surveys, which typically undercounted the low-income migrant population. We thus conclude that the 2005 mini-census with its large sample size is an indispensable and trustworthy source for the investigation of labor market stratification in China, especially on issues related to migrants.

Appendix II

Table A1
Chinese Standard Classification of Occupations and Converted ISEI Scores

Chinese code	Occupation title	ISCO88	ISEI	Collapsed classification: 38 categories	Broad classification: 5 categories
1	Heads of party organizations	1141	58	1 (n = 1641)	1
2	Heads of government organizations	1120	77		
3	Heads of democratic party and other social organizations	1141	58		
4	Heads of state institutions	1200	68		
5	Heads of enterprises	1200	68		
11	Social science, etc. professionals	2440	65	2 (n = 258)	2
12	Physical, mathematical, & engineering science professionals	2100	69		
13	Architects, engineering, etc. professionals	2140	73	3 (n = 1179)	
14	Electronics & telecommunications engineers	2144	68		
15	Mechanical engineers	2145	67		
16	Other architects, engineering, etc.	2149	69		
17	Agronomists, etc. professionals	2213	79	4 (n = 1199)	
18	Ship & aircraft controllers & technicians	3140	57		
19	Health professionals	2224	74		
21	Business professionals	2410	69	5 (n = 2143)	
22	Finance and sales associate professionals	3410	55		
23	Legal professionals	2420	85		
24	Teaching professionals	2300	69	6 (n = 2390)	
25	Writers & creative or performing artists	2450	61	7 (n = 422)	

(*continued on next page*)

Table A1 (*continued*)

Chinese code	Occupation title	ISCO88	ISEI	Collapsed classification: 38 categories	Broad classification: 5 categories
26	Athletes, sportspersons, etc. associate professionals	3475	54		
27	Authors, journalists & other writers	2451	65		
28	Religious professionals	2460	53		
29	Other professionals and technicians	2000	70		
31	Administrative staff	4100	45	8 (n = 3208)	3
32	Protective services workers	5160	47	9 (n = 1137)	
33	Postal and telecommunications staff	4210	48	10 (n = 797)	
39	Other clerical and related staff	4000	45		
41	Salespersons	5200	43	11 (n = 6503)	4
42	Material-recoding & transport clerks	4130	36	12 (n = 502)	
43	Housekeeping & restaurant services workers	5120	32	13 (n = 1942)	
44	Hotels, travel and fitness entertainment service workers	5132	25	14 (n = 568)	
45	Transport conductors	5112	34	15 (n = 864)	
46	Health supporting service workers	5130	25	18	
47	Social and community service workers	5132	25	16 (n = 1176)	
48		5132	25	17 (n = 1095)	
49	Other service workers	5000	40	18 (n = 496)	
61	Mining, quarrying, exploring, well drilling and salt mining workers	7110	50	19 (n = 520)	5
62	Metal smelting and processing workers	8120	30	20 (n = 371)	
63		8120	30		
64	Chemical workers	8150	35	21 (n = 327)	
65		8150	35		
66	Mechanical manufacturing workers	7210	31	22 (n = 1166)	
67	Machine tool installers	8200	32	23 (n = 1026)	
68		8280	31		
69		7230	34		
71	Machine repairing workers	7230	34	24 (n = 624)	
72	Electronic equipment installing repairing, assembling & Electrical wiremen	7240	40	25 (n = 764)	
73	Installers, repairers, & assemblers of electrical equipment	8283	34	26 (n = 805)	
74	Rubber and plastic products manufacturing workers	8230	30	27 (n = 386)	
75	Textile workers	8260	30	28 (n = 664)	
76	Tailors and sewers	7430	36	29 (n = 1550)	
77	Food and beverage production workers	8270	29	30 (n = 566)	
78	Tobacco preparers and tobacco product makers	8279	29		
79	Medical production workers	8221	30		
81	Wood and related processors & product makers, paper and paper product manufacturing workers	8140	27	31 (n = 530)	
82	Building material production workers	8290	26	32 (n = 405)	
83	Glass, ceramic and enamel product makers	8130	22	33 (n = 169)	
84	Radio & TV equipment operators & cinema projectionists	3132	57	34 (n = 264)	
85	Printing and related workers	7340	40		
86	Arts and handicrafts production workers	7300	34	35 (n = 501)	
87	Stationary and sports goods production workers	7400	33		
88	Construction workers	7120	30	36 (n = 2306)	
89		7230	34		
90	Transportation equipment operators	8300	32	37 (n = 2976)	
91		8300	32		
92	Environmental monitoring and waste management personnel	9160	23		
93	Inspection, measuring, and analysis staff	3150	50		
99	Other production, transportation, and related workers	8000	31	38 (n = 1217)	

Note: Only occupations appearing in our sample are shown above.

Table A2
Rosenbaum Bounds for the Treatment Effect of Rural Migrant Status

	Γ	p-critical	Hidden bias equivalent to	
			Experience (year)	ISEI score
Full Sample	1.00	<0.0001	0	0
	1.05	<0.0001	−0.5	−2
	1.10	<0.0001	−1.0	−4
	1.15	<0.0001	−1.5	−6
	1.20	<0.0001	−1.9	−8
	1.25	<0.0001	−2.3	−10
	1.30	<0.0001	−2.7	−12
	1.35	0.001	−3.1	−13
	1.40	0.131	−3.5	−15
Government agencies/state institutions	1.00	<0.0001	0.0	0
	1.05	0.002	−0.5	−1
	1.10	0.005	−1.0	−3

Table A2 (*continued*)

	Γ	p-critical	Hidden bias equivalent to	
			Experience (year)	ISEI score
	1.15	0.012	−1.5	−4
	1.20	0.023	−2.0	−5
	1.25	0.042	−2.4	−6
	1.30	0.07	−2.8	−8
	1.35	0.109	−3.2	−9
Public enterprises	1.00	<0.0001	0.0	0
	1.05	<0.001	−0.4	−2
	1.10	0.010	−0.8	−3
	1.15	0.053	−1.2	−5
	1.20	0.177	−1.6	−6
Private sector	1.00	<0.0001	0.0	0
	1.05	<0.0001	−0.5	−2
	1.10	<0.0001	−1.0	−5
	1.15	<0.0001	−1.5	−7
	1.20	<0.0001	−2.0	−9
	1.25	<0.0001	−2.4	−11
	1.30	<0.0001	−2.8	−13
	1.35	<0.0001	−3.3	−15
	1.40	<0.0001	−3.6	−17
	1.45	0.009	−4.0	−19
	1.50	0.255	−4.4	−21

Note: The procedure for the sensitivity analysis is as follows. First, we set the level of hidden bias to a certain value Γ, assuming that conditional on observed covariates, individuals differ in their odds of receiving the treatment by as much as a factor of Γ because of the unobservable characteristics. When $\Gamma = 1$, no hidden bias exists; if $\Gamma = 1.5$, for two groups with the same observed characteristics, the odds of receiving the treatment for one group would be 50 percent higher than that for the other group. For each hypothetical Γ, we then calculate an interval of p-values, reflecting the uncertainty due to hidden bias, and report the p-critical value, based on which we determine the value of Γ at which we would have to question our estimated treatment effect. Finally, we equate the magnitude of hidden bias associated with specific levels of Γ in terms of the equivalent effects of experience (measured by age) and the occupation ISEI score, using the coefficients of these covariates in the logit models predicting the propensity scores ($\ln(\Gamma)/\beta_x$ (for more details, see Rosenbaum, 2002). To cast doubt on our estimation, an unobserved covariate would have to increase the odds ratio of treatment by around 40 percent for the full sample, 35 percent for the government/institution subsample, 20 percent for the public enterprise subsample, and 50 percent for the private sector subsample. Moreover, the effect of such an unobserved covariate should also be strong enough (almost perfect) to determine hourly wages (Rosenbaum, 2002: 111). We deem the threshold very high and it is unlikely that such a covariate exists.

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