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Migration and Discrimination in Urban China: A Decomposition Approach*

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Currently, about 150 million migrant workers reside in the major Chinese cities, where they are treated like second-class citizens by the local city governments and denied access to government jobs and welfare entitlements, with large differences existing in their treatment across the cities. In this paper, we use a new and unique dataset of urban natives and rural to urban migrants from 15 different cities in China to document this differential treatment. We apply a relatively new non-parametric technique, Nopo decomposition, which takes into account differences in the distribution of observable characteristics to decompose the wage gap that exists between the two groups and estimate the extent of discrimination faced by the migrants. Rural-to-urban migrants are found to be discriminated in the urban labour market, but to a lesser extent than has been argued in the literature. We also find that a large gap exists between the national legislation on the treatment of migrants on one hand and the implementation and enforcement by city governments on the other, and that this differential treatment helps explain part of the level of discrimination.

JEL Codes: J7, J33, O15

Keywords: migration, discrimination, wage gap decomposition

1 Introduction

China's household registration system (also known as the hukou system) was set up in 1951 to restrict the "blind flow" of migrants into the cities. Established as a law in 1958, the hukou system effectively blocked upward social mobility for most rural citizens by preventing them from taking up opportunities in the cities. Chinese citizens were required by law to be registered with their local regions (*hukou suozaidi*), and were assigned either an "agricultural" (rural) or "nonagricultural" (urban) hukou (Yu, 2002; Wang, 2005), which effectively tied access to government services to the place of registration. Its functions went far beyond controlling population mobility, in that it allowed the urban hukou holders to monopolize access to high-paying jobs, cheap housing, grain rationing, health care, inexpensive education, and a cradle-

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to-grave social security system (Knight *et al*., 1999; Zhao, 2000; Meng and Zhang, 2001).

China's economic reforms towards the end of 1978 relaxed the controls that had restricted migration from the rural regions.[1] These changes unleashed large waves of migration from the rural agricultural sector to the urban cities, resulting in the world's largest ever peacetime migration. The number of rural-to-urban migrants doubled, from 25 million in 1990 to 52 million in 1999 (World Bank, 2009). Over the past decade alone, the scale of migration has almost tripled, to reach about 145 million in 2009 (NBS, 2010) and 155 million in 2010 (Cai *et al*., 2011).[2] These rural-to-urban migrants residing in the Chinese cities can be classified into two distinct groups following Chan and Zhang (1999): those with "local" residency rights (*bendi* hukou) (hereafter, hukou migration) and those without any hukou residency rights (non-hukou migration). In China, only official hukou migration is considered *qianyi* ("migration"), while the latter is referred to as a "floating population". Yet, the dominant form of migration to the Chinese cities since the mid-1980s has been spontaneous or unofficial migration, not associated with any changes in hukou registration.

Where urban natives enjoy a range of social and economic benefits, rural-to-urban migrants are treated as second-class citizens in the cities and denied "access to institutions that provide capacities and resources" (Chan, 1994; Solinger, 1999), creating an "invisible wall" in the Chinese cities. China's National People's Congress brought about a number of labour market reforms in 1995, covering areas such as working hours, wages, worker safety, social insurance, and labour disputes. In recent years, following criticisms from different groups, the central government has pursued an even more positive approach towards the elimination of discrimination against these rural-to-urban migrants. The new Labour Contract Law, implemented from January 1, 2008, has expanded the types of allowable labour contracts beyond those included in the 1995 reform and entitled migrant employees of both state- and foreign-owned enterprises to minimum wages, social insurance payments and other rights in line with the urban hukou holders. When implemented properly, this law is expected to bring an end to discrimination against migrant workers. However, a large gap exists between the establishment of a law and its implementation and enforcement, and migrants residing in the Chinese cities still remain deprived of their correct welfare entitlements (Frijters *et al*., 2010). The issue of non-enforcement of the central equality-based legislation was still a concern in 2013, when the Chinese Communist Party (CCP) prioritized dismantling the "two-tier hukou system" that has emerged in China's cities.

[1]Administrative regulations restricted migrants' access to certain job positions, and also imposed fees on migrant workers and their employers (Knight *et al*., 1999; Knight and Yueh, 2004; Zhao, 2005).

[2]China's urbanization is occurring at twice the rate of that experienced by the European nations during their Industrial Revolution. The percentage of the population living in the cities in Europe increased from 10 percent in 1800 to 51.3 percent in 1950 (De Vries, 1984; UN, 2012). In contrast, China's urban share in the total population increased from about 11.8 percent in 1950 to 19.4 percent in 1980 and stood at 49.2 percent in 2010. The percentage of the population residing in the urban areas is expected to increase to 77.3 percent by 2050 (UN, 2012).

In this paper, we use a new and unique dataset from 15 different Chinese cities to examine the association between migrant status and wage compensation in the labour market in urban China. We apply a relatively new non-parametric technique, Nopo decomposition, to decompose the compensation gap (hereafter referred to as "hukou premium") that exists between the natives and migrants in urban China. Instead of obtaining only average unexplained differences in earnings based on an "out-of-support assumption,"[3] the proposed technique considers the differences in the distribution of the observable characteristics of the two groups of urban residents[4] to measure the extent of the gap and the level of discrimination. The detailed nature of the data also allows us to examine whether discrimination against migrants varies widely across Chinese cities. We extend on the recent papers that have already looked at compensation differences between migrants and non-migrants (Meng and Zhang, 2001; Démurger *et al*., 2009; Liu *et al*., 2004; Deng, 2007; Frijters *et al*., 2010; Gravemeyer *et al*., 2010; Lee, 2012), by using a unique dataset that is more representative of the migrant population and by applying a new technique better suited for analysing wage differences across very different populations.

The paper is structured as follows. Section 2 describes our data and the main variables in our analysis. We then outline our estimation method and the decomposition approach applied in this paper in Section 3, followed in Section 4 by the documentation of our results. Section 4 provides the estimates for the hukou premium, and decomposes the wage gap to get an insight into the extent of discrimination against migrants. A subsection on sensitivity analysis and another on the differences in effect by cities is also presented in Section 4. The paper ends with a brief conclusion.

2 Data and Summary Statistics

The data used in this study is the Rural Urban Migration in China and Indonesia (RUMiCI) dataset, initially collected to investigate the impacts of internal migration within China and Indonesia. It contains detailed longitudinal data on Chinese migration in a large set of cities and provinces. The Chinese part of the RUMiCI dataset, to be referred to as RUMiC, contains three independent surveys: the Urban Household Survey, the Rural Household Survey, and the Urban Migrant Survey.[5] For the purpose of our analysis, we only use data from the first

[3]Decomposition techniques (such as Blinder–Oaxaca) based on the linear regression estimation of the earnings equations assume that the linear estimators are valid out of the support of the individual characteristics and thus do not consider differences in the supports or the distribution of the unexplained differences (Nopo, 2008).

[4]Even though migrants are not entitled to the benefits and subsidies provided by the city governments, owing to their lack of legal residency status, they are still considered residents of the city—therefore both urban natives (to be used synonymously with urban hukou holders) and non-native rural-to-urban migrants will be referred to as urban residents.

[5]Migration is an extremely dynamic process, with migrants moving back and forth from the rural areas or changing cities frequently. The difficulties associated with tackling this "floating" migrant population can be illustrated by the fact that United Nations researchers (UN, 1999) have called the migrants "statistically invisible." The attrition rate is therefore relatively high in the migrant sample. Some old households from the year 2008 were later replaced with new households in 2009. We combine the old migrant households with the new households from the second survey and refer to them as

two rounds (2008 and 2009) of the Urban Household and Migrant Surveys.[6] The dataset contains detailed information regarding the respondent's personal and household characteristics, educational background, employment situation, health status, children's education and health, general wellbeing, social and family relationship, major life events, assets, income and expenditure, housing and living conditions, and so on. Specific questions were also included in the questionnaires targeting particular types of respondents; for example, questions on migration history were included in the Urban Migrant Surveys.

Covering about 5,000 urban households in 19 cities and 5,000 migrant households in 15 cities, these surveys were carried out in the major migrant-sending or migrant-receiving provinces in China. The Migrant Survey was conducted in eight cities from the coastal regions (Shanghai, Nanjing, Wuxi, Hangzhou, Ningbo, Guangzhou, Shenzhen, and Dongguan); five from the central inland regions (Zhengzhou, Luoyang, Hefei, Bengbu, and Wuhan); and two from the west (Chengdu and Chongqing). The sampling procedure was designed to ensure that migrants in the database constituted a representative sample of the migrants in each of these cities. We focus on the 15 cities that are common to both the Urban Household and Migrant Surveys, and therefore do not include Urban Household Surveys from Anyang, Jiande, Leshan, and Mianyang in our analysis. In total, we have 14,719 urban hukou holders and 8,444 migrants from the first round, and 14,754 urban hukou holders and 8,445 migrants from the second round of the survey. For the purpose of our analysis, we restrict the study to urban residents aged 16–50 years, who are wage or salary earners with non-zero income, and we finally use 4,870 natives and 4,886 migrants from 2008 and 4,588 natives and 4,496 migrants from the 2009 survey. We restrict our dataset to urban residents aged 16–50 years for two reasons: (i) migrants residing in the Chinese cities are relatively younger, with only 4.73 percent older than 50 years, meaning that the over-50s are highly selective; and (ii) the retirement age for the urban hukou holders varies between 50 and 65. Therefore, the exclusion of the above-50 age group increases the comparability between the two groups of residents in the urban labour markets. Even with this extra condition, we have enough differences in the age distribution of the two groups. We have re-run the whole set of regressions and decompositions without this extra restriction and find that our results are robust to the inclusion of those in the above-50 age group. Results can be made available upon request.

Descriptive statistics for our key variables are presented in the supplementary online Appendix 1, in Table A1. As individual characteristics and labor market outcomes may vary widely across both gender and hukou status, we report our summary statistics separately for males and females. The first three columns in Table A1 relate to the summary statistics of the urban hukou holders (for the full

"migrants" in general. We also include all migration in our analysis from the countryside, irrespective of the duration of stay in the destination cities.

[6]Both urban and migrant household surveys were conducted every year from 2008 to 2011, but at the time of analysis, data for only two years were available. We have used two rounds of the RUMiC dataset even though they are not far apart for two reasons: (i) to check the robustness of our results; and (ii) to see if the Great Recession of 2007–9 affected the level of discrimination faced by the rural-to-urban migrants.

sample and then separately for the male and female samples), while the next three columns correspond to the migrants in the dataset, for the first round of the survey. On average, migrants are about 8 years younger, have completed only junior high school, and are highly inexperienced, with just 3 years of experience, compared to an average urban native. A higher percentage of migrant workers are found to be "never married" males, with relatively better health status than their urban counterparts. Migrants also work comparatively longer hours, about 34 percent more, to compensate for their relatively lower wages and social insurance payments. Male migrants are relatively older, more educated, more experienced, healthier, and more frequently single compared to their female counterparts. Access to employer-provided insurance, hourly earnings, and compensation is also higher for male individuals, irrespective of their migrant status in the cities.

Employers in the Chinese cities are required by law to contribute a certain proportion of their employees' annual wage bill to their individual insurance accounts, called "Five Insurances, One Fund," a term that refers to unemployment, pension, work injury, health, and housing fund insurance. Each city specifies both a base amount and the percentage of the employee's wages that has to be paid by each employer towards insurance payments for each item. As a rule of thumb, employers are required by law to pay 20 percent of the worker's wages towards pensions, 1 percent for work injuries, 8 percent for medical insurance, 2 percent for unemployment insurance, 5 percent for the housing fund, and less than 1 percent for maternity insurance; however, insurance payments vary widely across cities. Local governments, however, often fail to enforce the labour market regulations, as the insurance payments constitute a major portion of the aggregate wage bill. Moreover, due to the temporary and seasonal nature of this migration, the migrants will not be in a position to gain a lot of detailed knowledge about their rights; nor do they have the ability to demand the enforcement of these government-specified insurance payments, meaning that the implementation is mainly up to the city governments. As a result, insurance payments vary widely by migrant status and the city of residence. While 72.59 percent of the urban hukou holders have access to pension insurance in 2008, the figure is just 21.67 percent for migrants. Similarly, 60.16 percent and 53.90 percent of urban hukou holders have unemployment and work injury insurance respectively, compared to just 14.65 percent and 21.84 percent for migrant wage earners.

Table A2 in the supplementary online Appendix 1 shows the percentage of individuals with unemployment and pension insurance in different Chinese cities in 2008 and 2009. There exists a large gap between the hukou holders and migrants in terms of the percentage of individuals with access to employer-provided insurance benefits: 6.09 percent and 31.73 percent of migrants in Shenzhen have unemployment insurance and pension insurance respectively in 2008, compared to 32.78 percent and 43.53 percent for migrants in Dongguan, another city in the province of Guangdong. Even though very few migrants in the cities of Zhengzhou and Luoyang have access to unemployment and pension insurance, the relative situation of the rural-to-urban migrants is worst in Shanghai, one of the major cities and the most populated city in China. In Shanghai, where 85.19 percent and 89.94 percent of the natives have unemployment and pension coverage in 2008, less than 10 percent of the migrants receive

social security payments. However, more than 60 percent of the migrants have some form of insurance benefit in Wuxi in 2008, which is not very different from the insurance coverage of the urban hukou holders (about 75 percent). Regional governments have often established their own criteria for migrant benefits that undermine the guidelines of the central government, effectively refusing to enact central legislation and discriminating against their migrants.

In our analysis, we consider six types of employer-provided insurance payments: unemployment, pension, work injury, on-the-job insurance payments, housing fund payments, and maternity insurance payments, to arrive at the total annual insurance benefits received by the urban residents in the cities. Annual earnings and total insurance payments add up to the total annual compensation variable. The employer contribution has been valued equally with actual wages on the assumption that the cost of insurance to employers translates into an equivalent expected benefits to employees, following Frijters *et al*. (2010).

As migrants work 34 percent more on average compared to the urban hukou holders, annual, monthly, or even weekly variables may be highly sensitive to the hours worked in a week and could downward bias the extent of the hukou premium if hourly variables are not considered. Therefore, we calculate hourly earnings and hourly compensation by deflating the annual variables using the hours worked in a year.[7] We find that hourly wage earnings for urban natives are on average about twice of that of migrants, and two and a half times when hourly compensation is considered.

The mean hourly compensation for urban hukou holders and migrant workers in each of the 15 cities from the first and second rounds of the survey is reported in the supplementary online Appendix 1, in Table A3. The raw differential is then the difference, where large differences are found to exist between cities. For example, for cities such as Guangzhou, Dongguan, and Shenzhen, the urban hourly compensations are more than twice that of migrants. Migrants are, however, found to be comparatively better off in Wuxi and Bengbu in terms of hourly compensation. One might worry that migrants are not reliable when reporting their insurances, as they might have only just arrived or they may be unsure as to whether they will ever get to receive the insurance levels. While there will be an element of that, we think the measures are unlikely to be highly biased: for one thing, insurance rates self-reported by migrants were high in some cities even though they were recent migrants, so the migrants seem to be able to respond. Relatedly, migrants are extremely aware of their income packages and many change jobs frequently to get better-paying jobs, so they have every incentive to know what they get with different employers. Second, the issue of just how much they will get eventually is tricky, as it will differ from city to city (and employer to employer!), which is why we have to rely on self-reported measures, so that we can tap into the knowledge of the migrant as to how much they get into accounts that they consider theirs.

[7]We have run the decompositions for full year, full time workers (those working for 40 hours and higher) and find that our overall results are somewhat robust. Results will be made available upon request.

3 Methodology

To get a comparison with the standard approach in the wage-compensation literature, we start with a standard Mincer-type human capital earnings regression to estimate the wage equation in the urban labour market in China. That is, we run the following regression specification:

$$\log W_j = X_j\beta + H_j\gamma + \sum_{k=1}^{K} I_k\delta_k + \sum_{k=1}^{K}(I_k \times H_j)\delta_k^{\text{hukou}} + \epsilon_j, \tag{1}$$

where the outcome variable takes the form of either the log of hourly earnings or hourly compensation. X_j is a row vector of individual- and firm-specific observable characteristics of respondent j, and ϵ_j is the individual-specific error term. We control for age, age squared, gender, years of education, experience, experience squared, marital status, height (measured in centimetres), health status, and firm size (for a brief discussion of the variables, see the supplementary online Appendix 1). We are particularly interested in the sign and value of the parameter γ associated with the variable H_j, which represents the hukou status of individual j (a dichotomous variable that takes a value of 1 if individual j is an urban native with hukou registration and 0 if j is a migrant) and estimates the conditional mean wage compensation differential in urban China. We also include city-specific fixed effects and a city–hukou status interaction effect. I_k is a dummy variable, which takes a value of 1 if the individual resides in city k and captures the city-specific intercepts. The associated parameter vector δ_k therefore presents the differences in wage earnings and compensation across cities. Finally, we have the interaction between the city-specific dummies (I_k) and the hukou status of the individual (H_j). The coefficients in δ_k^{hukou} are normalized to add up to zero, so that they capture the variation in treatment of the migrants in different cities relative to the average hukou premium. To account for any correlation in errors across cities, we compute clustered standard errors across the city of residence. We run all specifications by gender.

Equation (1) allows us to estimate the average wage compensation differential, "netting out" many individual- and firm-level observable characteristics. Apart from looking at the coefficient γ, the traditional Blinder–Oaxaca (B–O) decomposition approach has been used widely in the literature to obtain a measure of discrimination (Blinder, 1973; Oaxaca, 1973; Meng and Miller, 1995; Meng and Zhang, 2001; Liu *et al*., 2004; Démurger *et al*., 2009; Lee, 2012). It has been used to decompose the wage gap that exists between males and females (Oaxaca, 1973; Joy, 2003; Machin and Puhani, 2003), between natives and migrants[8] (for China, Meng and Zhang, 2001; Démurger *et al*., 2009; Lee, 2012—for Hong Kong, Liu *et al*., 2004), between different racial groups (Fairlie, 1999; Altonji and Doraszelski, 2005) and between different sectors (for China, Chen *et al*., 2005; Gagnon *et al*., 2011). The B–O approach decomposes the hukou

[8]Other studies which have analyzed the earnings differentials between natives and immigrants are Long (1980), Borjas (1985), Gabriel and Schmitz (1987), George and Kuhn (1994) and Kee (1995).

premium ($\triangle$) between the urban hukou holders (U) and rural-to-urban migrants (M) into two distinct parts:

$$\triangle = \hat{\beta}^{U}(\bar{X}^{U} - \bar{X}^{M}) + \bar{X}^{M}(\hat{\beta}^{U} - \hat{\beta}^{M}) = \triangle_{x} + \triangle_{0}, \tag{2}$$

where the characteristics effect ($\triangle_x$) measures the part of the hukou premium that exists because the two groups have, on average, different characteristics and are paid differently based on these characteristics (which is usually referred to as the explained component of the wage gap). The coefficient effect ($\triangle_0$), on the other hand, is the part of the gap that exists even when individuals have the same observable characteristics, arising from the various constraints that limit the migrants' ability to access welfare payments, better jobs, and other benefits. This is the unexplained part of the wage gap and measures the extent of discrimination against the migrants.

Econometric studies such as Gravemeyer *et al*. (2010) using the B–O decomposition analysis found that 52.9 percent of the wage gap between workers with urban and rural hukou in Shenzhen in 2005 cannot be explained by differences in characteristics and is hence interpreted as discrimination. Meng and Zhang (2001) find that 49.18 percent of the wage gap for Shanghai in 1995/6 is unexplained, and is attributed to discrimination.The authors use the Brown *et al*. (1980) extension of the B–O approach to account for occupational differences and measure earning differences within occupations more sensitively. Deng (2007), using the China Household Income Project (CHIP) data, which covers different regions in China, finds that 60 percent of the income gap between urban hukou holders and rural-to-urban migrants originates from unexplained factors. Using the 2008 Urban Household and Migrant Surveys from the RUMiC data, Frijters *et al*. (2010) found that 51 percent of the compensation differentials between the two groups of urban residents remain unexplained in terms of the observable characteristics.

The B–O decomposition has been applied as a successful tool to decompose the average difference (Dolton and Makepeace, 1987) in wages between two groups of individuals. However, the linear regression models underlying it depend strongly on linearity in the whole range of support to shed light on the extent of discrimination and therefore fail to account for potential non-linearities in the effects of characteristics. To see the potential importance of this in our case, Figure 1 presents the distribution of the observable characteristics by the hukou status of the individual respondents. It shows that the age distribution and the education distribution are very different for the two groups, with almost no common support for very low levels of education (had by many migrants) or very high levels of education (had by many urban workers). The differences in experience are also stark, which means that any potential non-linearities could create large biases in a simple linear specification.

When there is such a lack of common support, one can over-estimate the component of the gap attributable to differences in the rewards for individuals' characteristics. Quantile regressions (Buchinsky, 1994; Albrecht *et al*., 2003;

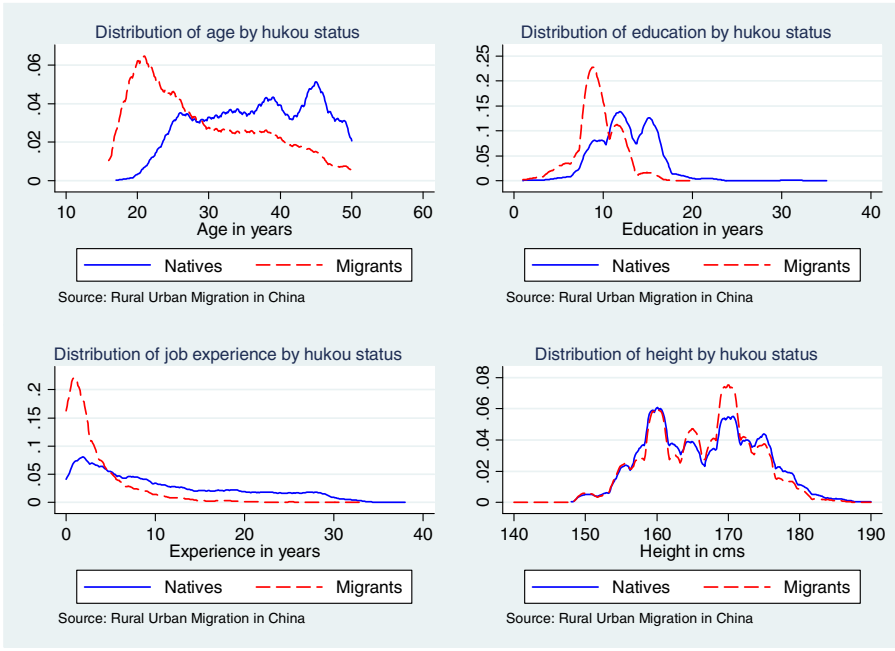

Figure 1. The distribution of selected observable characteristics by hukou status
Source: Urban Household and Urban Migrant Surveys, 2008.

Machado and Mata, 2005; Chernozhukov *et al*., 2013) and Generalized Lorenz Curves (Jenkins, 1994; Hansen and Wahlberg, 2005) have been used in the literature to overcome this distribution limitation, but none of these applications restrict comparisons to individuals in the common support, as they still assume that the "out-of-support assumption" holds. The use of a suitable matching technique[9] that considers the distributions of the individual characteristics is then another avenue. Propensity score matching has been used by Barsky *et al*. (2002) to decompose the racial wealth gap in the United States and by Pratap and Quintin (2006) to measure the wage gap between the formal and informal sectors in Argentina. The disadvantage of these approaches is that they specify a propensity score function that itself involves an "out of support" assumption (Pratap and Quintin, 2006) or else restricts the propensity to a single variable (Barsky *et al*., 2002).

This paper applies a relatively new non-parametric technique, Nopo (2008) decomposition, to decompose the existing native–migrant wage gap into four additive components, considering the differences in the distribution of the individual-level observable characteristics and limiting the comparison to individuals in the common support. The Nopo approach matches each individual in the treated group to individuals in the control group with similar individual

[9]The matching framework has also been used by other papers such as LaLonde (1986), Heckman *et al*. (1997), Dehejia and Wahba (2002), and Smith and Todd (2005).

characteristics (Nopo, 2008), instead of matching them based on their estimated propensity scores, as in Rosenbaum and Rubin (1983) and Pratap and Quintin (2006).

Following notations similar to those of Nopo (2008), we denote the conditional cumulative distribution functions of individuals' characteristics X for migrants and natives by $F^{\mathrm{M}}(.)$ and $F^{\mathrm{U}}(.)$ respectively, and let $\mathrm{d}F(.)$ denote the implied probability measures. Here, $\mu(S)$ is defined as the probability measure of the set S under the distribution $\mathrm{d}F(.)$; that is, $\mu(S)=\int_S \mathrm{d}F(.)$ and the expected value of earnings conditional on characteristics and migrant status is $g(x)$. The wage gap between the urban natives (U) and migrants (M) can then be rewritten as follows:

$$\triangle = \int_{S^{\mathrm{U}}} g^{\mathrm{U}}(x)\mathrm{d}F^{\mathrm{U}}(x) - \int_{S^{\mathrm{M}}} g^{\mathrm{M}}(x)\mathrm{d}F^{\mathrm{M}}(x). \tag{3}$$

Considering the differences in the support of the distribution of characteristics across hukou status, each integral can be split over its respective domain into two parts: one that restricts the comparison to the common support and the other outside the common support, which—after a number of arithmetic operations and rearrangement—can be expressed in the following way (for a detailed discussion of the decomposition approach, see Nopo, 2008):

$$\begin{aligned}\triangle = &\left[\int_{\overline{S^{\mathrm{M}}}} g^{\mathrm{U}}(x)\frac{\mathrm{d}F^{\mathrm{U}}(x)}{\mu^{\mathrm{U}}(\overline{S^{\mathrm{M}}})} - \int_{S^{\mathrm{M}}} g^{\mathrm{U}}(x)\frac{\mathrm{d}F^{\mathrm{U}}(x)}{\mu^{\mathrm{U}}(S^{\mathrm{M}})}\right]\mu^{\mathrm{U}}(\overline{S^{\mathrm{M}}}) + \\ &\int_{S^{\mathrm{M}}\cap S^{\mathrm{U}}} g^{\mathrm{U}}(x)\left[\frac{\mathrm{d}F^{\mathrm{U}}}{\mu^{\mathrm{U}}(S^{\mathrm{M}})} - \frac{\mathrm{d}F^{\mathrm{M}}}{\mu^{\mathrm{M}}(S^{\mathrm{U}})}\right](x) + \\ &\int_{S^{\mathrm{M}}\cap S^{\mathrm{U}}} [g^{\mathrm{U}}(x) - g^{\mathrm{M}}(x)]\frac{\mathrm{d}F^{\mathrm{M}}(x)}{\mu^{\mathrm{M}}(S^{\mathrm{U}})} + \\ &\left[\int_{S^{\mathrm{U}}} g^{\mathrm{M}}(x)\frac{\mathrm{d}F^{\mathrm{M}}(x)}{\mu^{\mathrm{M}}(S^{\mathrm{U}})} - \int_{\overline{S^{\mathrm{U}}}} g^{\mathrm{M}}(x)\frac{\mathrm{d}F^{\mathrm{M}}(x)}{\mu^{\mathrm{M}}(\overline{S^{\mathrm{U}}})}\right]\mu^{\mathrm{M}}(\overline{S^{\mathrm{U}}}),\end{aligned} \tag{4}$$

where S^{U} denote the support of the distribution of characteristics for urban hukou holders, S^{M} the support of the distribution of characteristics for migrants, and $\overline{S^{\mathrm{M}}}$ and $\overline{S^{\mathrm{U}}}$ represent outside the common support of the distribution of characteristics for migrants and urban natives respectively. The complete set of migrants and hukou holders is partitioned into "matched migrants," "matched hukou holders," "unmatched migrants," and "unmatched hukou holders" by matching each migrant in the sample (selected without replacement) to a 'synthetic' hukou holder taken as the average of all hukou holders who share the exact same observable characteristics as the selected migrant.

Using this matching criterion, the Nopo decomposition technique breaks down the wage gap ($\triangle$) into four components:

$$\triangle = \triangle_{\mathrm{U}} + \triangle_x + \triangle_0 + \triangle_{\mathrm{M}}. \tag{5}$$

Two of these components, $\triangle_x$ and $\triangle_0$, relate to the common supports and are similar to those from the B–O decomposition. The other two components are related to the out-of-support characteristics—those that cannot be matched to individuals from the other group, $\triangle_{\mathrm{U}}$ and $\triangle_{\mathrm{M}}$. The part of the gap between the two groups of urban residents that exists due to characteristics of the hukou holders that cannot be matched to migrant characteristics is estimated by $\triangle_{\mathrm{U}}$. It is computed as the difference between the expected wage of the urban natives out of the common support and those in the common support, weighted by the probability measure. On the other hand, $\triangle_{\mathrm{M}}$ estimates the same for two groups of urban migrants—those who have characteristics that can be matched to native characteristics and those who cannot. Out of the four additive components, three factors ($\triangle_{\mathrm{U}} + \triangle_x + \triangle_{\mathrm{M}}$) can be attributed to differences in observable individual characteristics while the fourth, $\triangle_0$ is due to differences in rewards and hence constitutes the unexplained part of the wage gap, which we will refer to as "hukou-based discrimination."

4 Discrimination and Wage Decomposition Results

The results from our basic estimation equation (1) are presented in Table 1. Panel A of Table 1 illustrates the association between our dependent variables (log hourly wage earning and compensation) and hukou status for the first round of the survey. Similarly, Panel B reports the coefficients from the second round of the survey. Each of the regressions uses the full set of controls and includes both city fixed effects and the city–hukou status fixed effects, as discussed in the last section. We are particularly interested in the sign and value of the parameter γ, which measures the conditional mean wage differential. We only report the estimated OLS regression coefficient ($\hat{\gamma}$) for the hukou status variable in Table 1 (for the complete set of regression results, see the supplementary online Appendix 1, Tables A4 and A5).

The results are consistent with the rest of the literature on wage earnings of urban natives and migrants in China (Meng and Zhang, 2001; Liu *et al*., 2004; Démurger *et al*., 2009; Frijters *et al*., 2010). The average hukou premium is significantly positive for both hourly earnings and compensation variables.[10] The hourly earnings for urban hukou holders (from Panel A) are about 25.1 percent more than for their migrant counterparts, whereas the hourly urban compensation is found to be about 36.4 percent more than the migrant hourly compensation. The hukou premium is significantly positive for both male and female samples, although the gap is larger for males than that for females in 2008: the mean

[10]Interestingly, we find that if we look at annual earnings and thus neglect the issue of differences in hours worked and insurance payments, on average migrants earn significantly more than natives in 2009, though this reverses for annual compensation, which takes insurance payments into account. Looking just at compensation, we find the annual compensation gap for both males and females to be about 24 percent less when compared to the hourly compensation gap: it is about 16.1 percent and 10.6 percent for males and females, respectively, in 2008 and 9.4 percent and 8.9 percent in 2009. This indicates that migrants do close a large part of the labour market hourly compensation gap by working comparatively longer hours, and that differences in insurance payments contribute significantly to the native–migrant compensation gap. Regression results with annual variables are presented in the supplementary online Appendix 1, in Table A6.

TABLE 1
Regression Results for 2008 and 2009

Panel A: Regression adjusted	Log hourly wage earnings			Log hourly compensation		
Estimates for the first round (2008)	Full sample	Male sample	Female sample	Full sample	Male sample	Female sample
Hukou status	0.251***	0.280***	0.236***	0.364***	0.391***	0.349***
	(0.028)	(0.031)	(0.031)	(0.028)	(0.029)	(0.034)
Panel B: Regression adjusted	Log hourly wage earnings			Log hourly compensation		
Estimates for the second round (2009)	Full Sample	Male sample	Female sample	Full sample	Male sample	Female sample
Hukou status	0.215***	0.218***	0.229***	0.341***	0.345***	0.355***
	(0.018)	(0.020)	(0.022)	(0.020)	(0.023)	(0.023)

*, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, with clustered standard errors in parentheses.
Source: Urban Household and Urban Migrant Surveys, 2008 and 2009.

hourly compensation gap for males is about 39.1 percent, compared to about 34.9 percent for females. There has also been a significant decline in the labour market compensation gap for males over time, but the situation has worsened for females: the hourly compensation gap declined significantly from 39.1 percent to 34.5 percent for males but increased slightly from 34.9 percent to 35.5 percent for females between 2008 and 2009 (see Panel B of Table 1).

Finally, we decompose the hourly compensation and the hourly earnings gap between the natives and the migrants into the four separate components using the new non-parametric Nopo decomposition approach, as discussed in the last section. The decomposition results[11] presented in Table 2 have been calculated using the following observable characteristics: three age group dummies (16–24, 25–34 and 35–50), years of experience and years of formal education as continuous variables, gender dummy, married dummy, healthy dummy and three height group dummies (125–160, 161–172, 173+). We do not consider the sorting of urban workers into different occupations (in both Nopo and Oaxaca decomposition), as this is part of the discrimination against rural-to-urban migrants. The urban labour market is segregated between local residents and migrant workers and, as discussed by Meng (2001) and Frijters *et al*. (2015), it remains very difficult for rural-to-urban migrants to enter the formal labour market, and so accounting for sorting into different occupations will take away part of the discrimination effect, which we intend to capture.

The decomposition results presented in Panel A of Table 2 suggest that the hukou premium using hourly wage earning is about 37 percent, compared to 46.4 percent for hourly compensation, which includes both hourly wage earning and insurance payments. When our preferred outcome, hourly compensation, is considered (presented in column 4 in the top panel of Table 2), the hukou premium $(\triangle)$ is 46.4 percent of the migrant hourly compensation in 2008. After decomposing the existing hourly hukou premium using the Nopo approach, we find that 16 percent (represented as D Urban $\triangle_{\mathrm{U}}$ in Panel A of Table 2) is the part of the gap that refers to the urban hukou holders with characteristics out of the common support earning more than those within the common support, whereas 3.1 percent (D Migrant $\triangle_{\mathrm{M}}$ in Panel A) refers to migrants in the common support earning more than those who cannot be matched. Urban natives also earn 14.9 percent more than the migrants, because they are more likely to have the higher-paying characteristics than migrants within the common support$(\triangle_x)$. The remaining 12.4 percent therefore denotes the higher compensation that urban workers with the same characteristics as migrant workers get, and is our estimated degree of discrimination $(\triangle_0)$.

Differences in the distribution of observable characteristics can therefore explain 73.28 percent of the hukou premium between the natives and the migrants in the urban labour market in China. The remaining unexplained part of the gap presented in the top panel of Table 2 is therefore only about 26.72 percent of the total hukou premium in 2008 and can be attributed to labour market discrimination. This is the part of the hukou premium that will disappear if both migrants and natives are treated equally. The extent of discrimination is also significantly higher when hourly compensation is considered instead of hourly wage earning. This confirms our suspicion that failure to enforce the labour market regulations

[11]Nopo decomposition results for the annual variables are also available upon request.

TABLE 2

NOPO DECOMPOSITION RESULTS FOR 2008 AND 2009

Panel A: Decomposition	Log hourly wage earnings			Log hourly compensation		
Results for the first round (2008)	Full sample	Male sample	Female sample	Full sample	Male sample	Female sample
Hukou premium ($\triangle$)	0.370	0.392	0.367	0.464	0.479	0.473
Characteristics effect($\triangle_x$)	0.117	0.146	0.087	0.149	0.175	0.125
D Urban ($\triangle_U$)	0.145	0.135	0.180	0.160	0.147	0.197
D Migrant ($\triangle_M$)	0.028	0.029	0.024	0.031	0.034	0.024
Coefficient effect($\triangle_0$)	0.080	0.082	0.076	0.124	0.123	0.127
% of gap explained[a]	78.38	79.08	79.29	73.28	74.32	73.15
% of gap unexplained	21.62	20.92	20.71	26.72	25.68	26.85
Perc Urban in common support	0.317	0.346	0.286	0.317	0.346	0.286
Perc Migrant in common support	0.503	0.508	0.496	0.503	0.508	0.496
Panel B: Decomposition	**Log hourly wage earnings**			**Log hourly compensation**		
Results for the second round (2009)	Full sample	Male sample	Female sample	Full sample	Male sample	Female sample
Hukou premium ($\triangle$)	0.332	0.339	0.353	0.414	0.413	0.447
Characteristics effect($\triangle_x$)	0.090	0.120	0.059	0.110	0.138	0.082
D Urban ($\triangle_U$)	0.151	0.139	0.176	0.165	0.149	0.194
D Migrant ($\triangle_M$)	0.014	0.023	0.003	0.016	0.027	0.004
Coefficient effect($\triangle_0$)	0.077	0.057	0.115	0.123	0.099	0.167
% of gap explained[a]	76.81	83.19	67.42	70.29	76.03	62.64
% of gap unexplained	23.19	16.81	32.58	29.71	23.97	37.36
Perc Urban in common support	0.246	0.253	0.238	0.246	0.253	0.238
Perc Migrant in common support	0.622	0.609	0.641	0.622	0.609	0.641

All gaps are expressed as a percentage of the average migrant log hourly outcome.

[a]The explained part of the hukou premium includes the characteristics effect, D Urban, and D Migrant.

Perc Urban and Perc Migrant provide the percentages of urban and migrant wage earners who lie within the common support.

Source: Urban Household and Urban Migrant Surveys, 2008 and 2009.

specified by the central government regarding insurance payments adds significantly to the level of discrimination faced by the migrants. Moreover, while there has been a decline in the compensation gap (hukou premium) between 2008 (46.4 percent) and 2009 (41.4 percent), the overall level of discrimination seems to have increased from 26.72 percent to 29.71 percent (as presented in Panel B of Table 2). Interestingly, discrimination faced by the male migrants decreased from about 25.68 percent in 2008 to 23.97 percent in 2009 but increased significantly for the female sample (from 26.85 percent to 37.36 percent).

We have reproduced the commonly used B–O decomposition results using the RUMiC dataset and present it in Table 3, showing that indeed the implied level of discrimination is again about 50 percent using the B–O technique with our data too. Our headline figure from the Nopo decomposition is that discrimination against migrants account for roughly 25 percent of the native–migrant compensation gap. This is about half of what was found in previous studies (Deng, 2007; Gravemeyer *et al*., 2010; Frijters *et al*., 2010), whose B–O estimates varied between 49 percent and 60 percent. The main difference is thus in the differences in wages for urban and migrants groups outside of the common support, showing the importance of linearity and other comparability assumptions underlying the higher estimates of previous studies.

4.1 *Sensitivity Analysis*

As discussed so far in the results section, the age, years of experience, years of formal education, gender, marital status, self-assessed health status, and height of urban hukou holders and rural-to-urban migrants were used to decompose the existing native–migrant compensation gap in the Chinese cities. The overall results presented in Table 2 suggest that there exists a significant level of discrimination against the Chinese migrants in the cities, as a quarter of the compensation gap cannot be explained by differences in the distribution of observable characteristics. However, as there exists a clear tradeoff between the number of variables that can be controlled for and the percentage of individuals in the common support, we compare the results from four different specifications as a sensitivity analysis, to suggest that the results presented in Table 2 are somewhat robust.

The first specification includes the following variables: three dummies for age, years of formal education, and job experience (which are continuous variables) and three dummies for height of the urban residents. The second specification uses the same dummies as in specification 1 but also adds married dummy, gender dummy, and healthy dummy. The third specification changes specification 1 by replacing the continuous years of education variable with seven dummies and the years of job experience variable with a set of eight dummies. Finally, the fourth specification adds the married, gender, and healthy dummy to specification 3.

The Nopo decomposition results for each of these specifications is presented in the first four columns of Table 4 for the first round of the survey, while the B–O decomposition for the same specifications has been presented in the last four columns, for direct comparison. The results presented in Table 4 confirm that migrants in Chinese cities face discrimination in the urban labour market, a quarter of which cannot be explained by differences in observable characteristics, and

TABLE 3

OAXACA DECOMPOSITION RESULTS FOR 2008 AND 2009

Panel A: Decomposition	Log hourly wage earnings			Log hourly compensation		
Results for the first round (2008)	Full sample	Male sample	Female sample	Full sample	Male sample	Female sample
Urban hukou holders	2.288	2.418	2.149	2.523	2.652	2.385
Rural-to-urban migrants	1.667	1.733	1.567	1.722	1.791	1.618
Hukou premium ($\triangle$)	0.373	0.395	0.371	0.465	0.480	0.474
Characteristics effect ($\triangle_x$)	0.196	0.210	0.196	0.224	0.235	0.230
Coefficient effect ($\triangle_0$)	0.177	0.185	0.175	0.241	0.245	0.244
% of gap explained[a]	52.55	53.16	52.83	48.17	48.96	48.52
% of gap unexplained	47.45	46.84	47.17	51.83	51.04	51.48
Panel B: Decomposition	**Log hourly wage earnings**			**Log hourly compensation**		
Results for the second round (2009)	Full Sample	Male sample	Female sample	Full sample	Male sample	Female sample
Urban hukou holders	2.453	2.592	2.305	2.699	2.840	2.549
Rural-to-urban migrants	1.841	1.928	1.718	1.909	2.002	1.778
Hukou premium ($\triangle$)	0.332	0.344	0.342	0.414	0.419	0.434
Characteristics effect ($\triangle_x$)	0.231	0.253	0.219	0.247	0.268	0.237
Coefficient effect ($\triangle_0$)	0.101	0.091	0.123	0.167	0.151	0.197
% of gap explained[a]	69.58	73.55	64.04	59.66	63.96	54.61
% of gap unexplained	30.42	26.45	35.96	40.34	36.04	45.39

All gaps are expressed as a percentage of the average migrant log hourly outcome.

[a]Characteristics and coefficient effect correspond to the explained and unexplained parts of the hukou premium respectively.

Source: Urban Household and Urban Migrant Surveys, 2008 and 2009.

TABLE 4
Robustness Check for Decomposition Results for Different Specication for 2008

	Nopo decomposition				Oaxaca decomposition			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Hukou premium ($\triangle$)	0.464	0.464	0.464	0.464	0.465	0.465	0.465	0.465
Characteristics effect($\triangle_x$)	0.193	0.149	0.305	0.275	0.238	0.224	0.243	0.230
D Urban ($\triangle_U$)	0.138	0.160	0.026	0.035				
D Migrant ($\triangle_M$)	0.017	0.031	0.001	0.011				
Coefficient effect($\triangle_0$)	0.116	0.124	0.132	0.143	0.227	0.241	0.222	0.235
% of gap explained[a]	75.00	73.28	71.55	69.18	51.18	48.17	52.26	49.46
% of gap unexplained	25.00	26.72	28.45	30.82	48.82	51.83	47.74	50.54
Perc Urban in common support	0.472	0.317	0.862	0.699				
Perc Migrant in common support	0.755	0.503	0.983	0.861				

All gaps are expressed as a percentage of the average migrant log hourly compensation.

[a]The explained part of the hukou premium includes the characteristics effect, D Urban, and D Migrant.

Perc Urban and perc Migrant provide the percentages of wage earners who lie within the common support.

Source: Urban Household and Urban Migrant Survey, 2008.

the extent of discrimination is also significantly less—about half of that obtained using the B–O decomposition approach. The results are therefore robust to the different specifications considered in our analysis.

4.2 *Differences Across Cities*

In this section of the paper, we attempt to understand how Chinese cities differ in their treatment of the migrants. To start with, we can look at the full estimation results from equation (1) (city effects) presented in Table A5 of the supplementary online Appendix 1. If all the cities treat their residents similarly, then the city coefficients in the wage and compensation equations would not be statistically different from each other, and compensation would just depend on the differences in individual and firm level characteristics. However, log hourly compensation and wage earnings vary widely across cities and the coefficients δ_k associated with the city effects are significantly different from zero, indicating that the city of residence does matter in the determination of wage earning and compensation in urban China. Hourly compensation for the year 2009 is highest in Shenzhen and Ningbo, *ceteris paribus*: Shenzhen and Ningbo pay their residents about 24.61 percent and 2.20 percent more than Guangzhou, while Shanghai pays about the same. Compared to Guangzhou, urban residents (both natives and migrants) residing in Luoyang are being paid as much as 44 percent less (see column 3 of Table A5, in the supplementary online Appendix 1). These differences across the Chinese cities[12] could reflect differences in cost of living, labour market conditions, and productivity levels.

[12]Migrants may be more likely to migrate to cities in which they expect to be treated more favourably, thereby making the size of the hukou–migrant gap at the city level endogenous to migrant destination decisions, which itself is dependent upon unobserved characteristics of the migrants. In this

The city–hukou interaction term, on the other hand, picks up the differential treatment of the urban hukou holders in each of these cities, relative to the average hukou premium in China. The coefficients of δ_k^{hukou}, also presented in Table A5, suggest that compensation varies both across cities and within cities based on the hukou status of the individual residents. Migrants are relatively worse off in Guangzhou, Dongguan, and Shenzhen, all in the same province of Guangdong, and in Shanghai, when compared to the experience of an average migrant in urban China. For example, the average hourly hukou premium is highest in Shanghai, where it was about 30 percent higher in 2008 and 25.2 percent higher in 2009 than the overall Chinese compensation gap. On the other hand, migrants are not only being treated comparatively better in Wuxi and Bengbu than migrants in other cities; they are also being paid 14.8 percent and 4.9 percent more, compared to their urban counterparts with similar observable individual- and firm-specific characteristics in 2008. Thus, hourly compensation is found to vary both across and within cities based on the hukou status of the residents. We did not consider estimating and decomposing the compensation gap at the city level using the Nopo approach, as the number of observations per city were too small in each year to put too much faith on the results from such city-specific decompositions.

5 Conclusion

During the past two decades, China has experienced the world's largest peacetime flow of migration in response to the demand for labourers by cities and the relaxation of the restrictions on mobility imposed by the household registration system. With about 150 million migrant workers already residing in the Chinese cities and hundreds of millions of potential migrants in the countryside, the differential treatment of these migrants compared to the natives of the city is a major issue within China and outside it. Using a novel decomposition technique introduced by Nopo (2008), we found that large differences in hourly compensation exist within Chinese cities, about a quarter of which cannot be explained by any differences in the distribution of the observable characteristics. Our estimate for discrimination is about half of that in the literature, as we found that groups of urban natives with characteristics unknown amongst the migrants (such as high education and long experience) earn particularly high wages. By inferring discrimination only from groups with the same characteristics, we find much lower, though still very high, levels of discrimination.

A major question for future research is the political economy mechanisms that give rise to this discrimination and to the limited ability of the central government to reduce it. Furthermore, the differences across cities suggest that there may be competition effects between cities and differences in the degree to which some cities feel that they have to comply with central legislation.

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paper, we are primarily interested in estimating the hukou premium and the extent of discrimination faced by the migrants in the cities, without focussing much on the decision to migrate.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix 1: Online Appendix and Supporting Documents