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This article examines discrimination based on *hukou* status, a legal construct that segregates locals and migrants in urban China. Local and migrant household helpers were recruited as experimental participants to interact in a standard gift exchange game (GEG) as well as a new variant of the GEG, called the wage promising game (WPG). The WPG uses non-binding wage offers and final wages that employers set after observing effort. In the GEG, both statistical and preference-based discrimination may motivate employers to offer lower wages to migrants than to locals, whereas in the WPG the statistical motive is excluded. Results reveal discrimination against migrants and show that preference-based discrimination is an important employer motive.

More than 200 million migrant workers are affected by the Chinese *hukou* (household registration) system (Chan 2015: 31; Kuhn and Shen 2015: 1), which legally segregates local and migrant workers based on where they are registered. The system was established at the national level in 1958 with the aim of regulating migration. *Hukou* includes two characteristics: occupational category and location. Every citizen is registered in an agricultural (rural) or non-agricultural (urban) occupation and in a location...
where he or she is required to live and work. Individuals can migrate for work but remain registered at their original location. Furthermore, hukou status is passed from parents to their children, meaning that most workers today inherited their hukou status from the previous generation.

A large body of literature documents the disadvantageous living conditions faced by migrants, as they cannot access many important institutional benefits (e.g., public housing, employment, education, and health services). In addition, evidence indicates that labor market discrimination against migrants occurs. In this article we investigate if hukou status, in addition to legal discrimination, also leads to individual-level wage-setting discrimination. Furthermore, we test if discrimination in wage-setting is purely statistical, that is, based on average productivity differences between local and migrant workers, or based on a preference to pay migrant workers less. This distinction is important, as statistical wage discrimination based on observable attributes correlated with productivity may be justifiable on economic grounds. Conversely, preference-based discrimination leads to inefficiency because resources are not allocated based on productivity. Being a migrant, as indicated by hukou status, is not necessarily a valid indicator of higher or lower productivity, but could be used for preference-based discrimination. This type of discrimination may result in additional efficiency losses and increase wage differentials if migrants (correctly) perceive that they are routinely treated unfairly by employers, respond by reducing their effort, and are consequently less productive.

We study discrimination against migrants in a laboratory experiment that allows us to capture the statistical and preference-based motives of employers. Our participants are local and migrant household helpers. Both locals and migrants originate from Nanjing or nearby and have similar characteristics, but they inherited different hukou status, and hence are classified as a local or a migrant based on this status. In the experiment, locals and migrants interact in the roles of employers and workers in a gift exchange game (GEG), which allows us to study wage-setting. In the GEG, employers pay wages without knowing how much effort a worker will provide. Workers consider the wage and decide how much effort to provide, which is costly to them and increases the profit of employers. We also introduce the wage promising game (WPG), a variant of the GEG that allows us to investigate whether discrimination is statistical (i.e., based on [expected] productivity differentials) or preference-based. In the WPG the employer first makes a non-binding wage offer, which is considered by the worker before he or she decides the level of effort they will provide. The employer then observes the worker’s effort and determines the final wage for a given effort. As a result, in the WPG differences in productivity between locals and migrants, as measured by effort, are known before wages are set. Hence, when interacting with migrants, expectations of lower effort, or effort with a higher variance, cannot be used to explain lower wages. Discrimination in the GEG, where wages are set before effort is observed, may be preference-based and
statistical, but the statistical rationale does not explain discrimination in the WPG because the employer knows how much effort the worker has provided. We find evidence for preference-based wage-setting discrimination against migrant workers.

Our contribution to the literature is threefold. We focus on discrimination in wage-setting, which is not captured in audit studies but is important for understanding wage differentials between groups. Furthermore, we investigate how statistical and preference-based discrimination influence wage-setting. This approach is important because wage-setting affects the perceived fairness of wages, which in turn influences productivity. Finally, we examine individual-level discrimination based on hukou status. This legal attribute does not, by itself, indicate productivity, but its effect on individual-level decisions merits further study.

**Background and Literature**

In the early years after the implementation of the hukou registration system in 1958, migration within China was almost impossible because migrants (non-locals in Chinese) were unable to gain access to public services, including food rations. Migration was facilitated in the mid-1980s, when migrants were allowed to reside in cities as temporary residents with limited access to public services. Restrictions were further eased when food rationing was lifted in the 1990s and the hukou conversion process, which allows individuals who meet specified criteria to change their hukou status, was reformed. Changing status had always been possible, but on a very limited scale.\(^1\) Two steps were necessary to change migrant agricultural status—the most common for migrant workers—into local urban status. The first step was changing from agricultural to non-agricultural (nongzhuanfei); the second, changing from migrant to local status. Before the reform, nongzhuanfei was tightly controlled by the central government, whereas local status was easier to attain and often considered to not be of great importance. After the reform, nongzhuanfei was decided at the regional or local level and was less restricted, but the conversion to local status became both more difficult to obtain and more important to gain access to social services (Chan and Buckingham 2008). As a result, the dualistic structure that divided locals and migrants remained in place, even after the reform (Chan and Zhang 1999; Chan 2010; Chan 2015).

Because of its social and economic consequences—limiting migrants’ access to public education, housing, and employment—the labor market discrimination inherent in the hukou system has been extensively discussed in

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\(^1\)Local governments can grant local hukou status to individuals who previously had migrant hukou status if they own significant real estate or assets in the city. Hukou status conversion may also compensate for loss of land when rural districts are integrated into an expanding city designation. Very few migrants are wealthy enough, however, to change their status on this basis and the effects of geographical incorporation are small.
the literature. Wang and Zuo (1999) outlined the precarious conditions of urban migrants, arguing that they work longer hours and are paid lower wages. Meng and Zhang (2001) described how hukou creates a two-tier labor market, with wage differentials resulting from occupations unavailable to migrants as well as within-occupation discrimination. Discrimination may also originate from profit-sharing by managers of state-owned enterprises who view locals as insiders and migrants as outsiders and, therefore, share more of the profit with locals (Meng 2002). Démurger, Gurgand, Li, and Yue (2009) documented unstable working conditions and lower wages for migrants, mainly attributable to limited access to certain jobs. Lu and Song (2006) described worse working conditions for migrants, who do not receive the fringe benefits available to locals. Furthermore, institutional discrimination reduces the jobs available to migrants, increases their job search costs, and makes them more likely to remain in positions with less-desirable working conditions and lower wages (Zhang 2010). Changing legal status improves the situation of migrants, as those who switch to local hukou status may fare even better than original locals do (Wang, Oropesa, and Firebaugh 2013; see also Frijters, Gregory, and Meng 2015 for a discussion of rural-to-urban migration and labor market discrimination in China).

In addition to discrimination at an institutional level, hukou status may lead to discrimination in employer-worker relations. Guang and Kong (2010) qualitatively analyzed job advertisements and job fair interviews and found discrimination based on hukou status. Maurer-Fazio (2012) and Maurer-Fazio and Lei (2015) conducted audit studies on online job boards in China and observed discrimination based on gender and minority-group membership, which is a possible indicator of migrant status. Kuhn and Shen (2015) directly studied the effects of hukou status, using information on callbacks to real job applicants who responded to postings on an online job board. They found that employers preferred to hire migrants, potentially due to higher productivity in the jobs that were investigated. Hence, the empirical literature on individual- and firm-level discrimination provides mixed evidence, as it appears that sometimes migrants are favored and at other times they are discriminated against.

Our article adds to the existing literature in two ways. First, we investigate wage-setting discrimination after a worker has been hired. Many experiments have explored labor market discrimination at the hiring level using audit studies and callback rates based on assessments of fictitious résumés (e.g., Bertrand and Mullainathan 2004). This method allows researchers to control for worker characteristics but does not permit testing for wage-setting discrimination that may occur once employers and workers interact. Although both types of discrimination may lead to income differentials, the implications of wage-setting and hiring-level discrimination differ with respect to fairness of wages as perceived by workers, which is important for performance (Rees 1993; Fehr, Goette, and Zehnder 2009). In our study,
Hukou status may influence what employers and workers believe fair wages to be. For example, migrants may perceive low wages as unfair, conjecturing that others receive more, and retaliate by providing lower effort. However, they may also perceive a given wage as fairer due to a lower reference point based on the pay they receive in the real world. Similarly, locals may have different views on what is a fair share, in terms of wages relative to effort, for locals and migrants.

Our second contribution is that, unlike other studies, our experiment controls for differences in productivity. Hukou status may affect migrant productivity, blurring if discrimination is statistical or preference-based. For example, Afridi, Li, and Ren (2015) conducted a task-solving experiment with children, varying the salience of their hukou status, and found that salience decreased the performance of migrants. Discrimination based on (expected) differences in the productivity of locals and migrants could be purely statistical. Or, it could be based on a preference (not) to interact with individuals from a specific out-group, such as migrants. Preferences to discriminate against migrants may also entail different notions of what is locals’ and migrants’ fair share of the social surplus generated through work. The idea of what is a fair share may possibly be outside of the decision-maker’s awareness and hence be categorized as implicit discrimination (Bertrand, Chugh, and Mullainathan 2005). Our design allows us to differentiate between statistical and preference-based motives when quantifying discrimination.

Although it is a potentially important phenomenon in the real world, our experiment does not allow us to capture wage-setting discrimination based on hukou status because of differences in the market power of locals and migrants. Our experiment eliminates differences in employer monopsony power between locals and migrants because their bargaining power is determined by their (randomly allocated) role and not their status. Real-world differences in monopsony power between locals and migrants, however, may still lead to discrimination if participants take their bargaining power experience into the laboratory. Greater labor market rigidity for migrants in the real world could increase their job search costs (Boal and Ransom 1997; Ashenfelter, Farber, and Ransom 2010), which provides employers with monopsony power and results in lower wages to migrants (Staiger, Spetz, and Phibbs 2010). Hotchkiss and Quispe-Agnoli (2012) and Hirsch and Jahn

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Discrimination against a group of outsiders, such as migrants, is often explained using in-group/out-group frameworks, in which an in-group may discriminate against out-group members without apparent objective reasons, such as productivity differences. Ben-Ner, McCall, Stephane, and Wang (2009) and Haley, Bornstein, and Sagiv (2008) found preferences to cooperate with in-group rather than out-group members in laboratory experiments. This may be explained by group identity, which creates a feeling of belonging (Akerlof and Kranton 2000), and preferences to interact with those sharing a common identity. Our study-group membership is based on inherited legal hukou status and, consequently, is unchangeable for most workers who are migrant hukou. To our knowledge, individual-level discrimination regarding inherited legal status has not previously been studied in labor market experiments.
(2015) observed lower wages to migrant workers and higher monopsony profits of employers in the United States and Germany, respectively.\footnote{Monopsony power and fairness perceptions may also have an interactive effect, because fairness reference points are higher in the presence of an outside option (Schmitt 2004) and increase with the size of this option (Hennig-Schmidt, Irlenbusch, Rilke, and Walkowitz 2017). Correspondingly, lower wages may be perceived as fair by migrant workers. However, if the weaker position of migrants is exploited by employers and workers become aware of this exploitation, they may provide lower effort (Nikiforakis, Oechssler, and Shah 2014).}

### Hypotheses, Methods, and Data

#### Hypotheses

In our study, we hypothesized that individual-level discrimination against migrants would be observable in our laboratory experiment. We expected migrants to receive lower wages for a given effort, reflecting discrimination against migrants in the real world.

**Hypothesis 1**: Migrants receive lower wages for a given effort, indicating discrimination.

Furthermore, we wanted to disentangle statistical discrimination, treating migrants differently because they are believed to have a different level of productivity, from preference-based discrimination. For this reason, we use two experimental games, the GEG and the WPG, that allow us to determine whether removing uncertainty about worker effort reduces observed discrimination by employers against migrants. In the GEG, lower wages paid to migrant workers could be driven by the belief that migrants provide less effort, or effort with a higher variance, as well as by preference-based discrimination. By contrast, in the WPG, final wage decisions are made after knowing the level of effort. Hence, statistical differences or expectations cannot explain lower wages to migrants once conditioning on effort. The following section provides more detail on the two games.

We assume discrimination to be primarily preference-based, which can include the exploitation of the weaker social status of migrants and preferences outside of the decision-maker’s awareness (implicit discrimination). Therefore, we expect wage discrimination to be the same or higher for final wage decisions in the WPG than for wage offers in the GEG.

**Hypothesis 2**: Discrimination is primarily preference-based.

#### Experimental Design and Implementation

To test our hypotheses, we use a GEG (Fehr, Kirchsteiger, and Riedl 1993; see Figure 1a). The GEG is often understood as a stylized version of a labor market in which employers and workers exchange gifts (wages and effort). The game allows a first mover, the employer, to make a *wage offer* (a suggested transfer) to a second player, the worker. The worker can accept or
reject the offer. If the worker rejects the offer, the game ends and both players receive an outside option. If the offer is accepted, the worker chooses an effort (a return transfer). Effort is costly to the worker but benefits the employer and creates social surplus because the value of effort to the employer is higher than the cost of effort to the worker.

We also use the GEG variant—WPG (see Figure 1b)—described earlier. In the WPG, the employer first makes a non-binding wage offer that the worker can accept or reject. If the worker rejects the offer, the game ends and both players are paid an outside option. If the offer is accepted, the worker chooses his or her effort. The employer then observes this effort and sets the final wage. The WPG allows us to eliminate the role of expectations and risk with respect to effort provided by workers: In the WPG, employers know the level of effort before deciding on the wage, hence wages are not based on expectations. This eliminates statistical discrimination as a rationale for low wages. Hence, if statistical differences or expectations motivate lower wages to migrant workers, wage differentials for a given effort should be lower in the WPG than in the GEG.

We described the game in a labor market context and used payoff functions similar to others in the literature (see Gaechter and Fehr 2002 for a review). Wage offers and final wages had to be between 5 and 100 experimental dollars and were available in steps of 5. Effort had to be between 1 and 10 in steps of 1 if the worker accepted the wage offer. In both games,

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4The WPG is a novel game, but relates to games in which the first tangible decision is made by the worker without knowing the final remuneration (Abeler, Altmann, Kube, and Wibral 2010; Rosaz 2012), or when employers can pay bonuses (Fehr, Klein, and Schmidt 2007).
the payoff for employers and workers if the worker rejected the wage offer was \( \pi^O_{\text{employer}} = \pi^O_{\text{worker}} = 60 \). If the worker accepted, payoffs were \( \pi^*_{\text{employer}} = 50 - \text{wage} + 20 \times \text{effort} \) and \( \pi^*_{\text{worker}} = 50 + \text{wage} -(6 + 4 \times \text{effort}) \). Hence, effort increases social surplus because any additional unit of effort costs the worker 4 but increases employer profit by 20.

We repeated the two games for eight consecutive rounds each. The game order was randomized between groups to control for order effects. Participants received instructions for each game before the first round (i.e., in rounds 1 and 9, respectively). In each of the eight rounds, pairs of one worker and one employer were randomly re-matched. From all 16 rounds, four were randomly chosen for paying participants; this was done to eliminate reputation-building and wealth effects. Participants were assigned worker or employer roles at the beginning of the experiment and remained in their role for all rounds. We matched employers and workers using groups of eight participants, controlling for their \textit{hukou} status, with four possible group compositions: groups that consisted exclusively of locals, groups that consisted exclusively of migrants, groups in which all employers were locals and all workers were migrants, and groups in which all employers were migrants and all workers were locals. Participants interacted twice per game in the same employer-worker pair because they were in fixed groups of eight. They were not informed about the group size, however, and it is unlikely they perceived it because in most sessions there were 24 to 32 participants in the laboratory. Table 1 shows the number of participants in each treatment.

We conducted the experiment in a computer laboratory using the z-tree software (Fischbacher 2007). The experiment lasted from one and a half to two hours. Seating and instructing participants made up the largest part of this time. Our exchange rate from experimental dollars to yuan was 5:1. On average, participants received approximately 80 yuan (minimum 40, maximum 120) for participating in the experiment. In their usual job, our

\[ \text{Both games have a unique subgame perfect Nash equilibrium (in pure strategies) in which both players receive the outside option. Wage payments are always minimal because more than minimum effort, which is (out of equilibrium) the best response of workers, cannot be enforced (GEG) or because minimal final wages are the optimal choice when paid ex post (WPG). Thus, workers reject all offers. Off equilibrium, in the GEG, wage offers above 10 are risky: If the worker accepts the offer and chooses minimum effort, the employer receives less than the outside option. Workers accept wage offers of 20 or more and then choose minimum effort. In the WPG, wage promises are cheap talk as they are not binding for final wages. Any positive effort is hence risky for the worker compared to rejection. The experimental literature suggests that we should expect positive reciprocity in both games. More than minimum effort may also stem from efficiency concerns, as the mutual profit of employers and workers increases with effort. Furthermore, in the WPG, we expect that wage promises are perceived as relevant, at least if employers avoid lying in the signals they send (as in Gneezy 2005), or if guilt aversion (Charness and Dufwenberg 2006) plays a role for employers who avoid going back on their wage promises.} \]

\[ \text{The small number of participants in the migrant employer–local worker treatment resulted from dropping 16 participants because of a mistake in seating them. As we did not have more participants of the required type available at the time, we did not rerun these sessions. We did not play the game reversal in this treatment, as we had already collected sufficient data on the game-order effect. We reduced the sample in this matching and not in others, as it appeared to have the least policy relevance.} \]
participants earn from 15 to 20 yuan per hour. Higher-than-regular market level payments were necessary, as we ran experiments on Sundays, for which participants requested greater compensation.

Whenever locals and migrants interacted, the status of the counterpart was explicitly communicated to participants on their computer screen during the experiment. The instructions screen included a phrase indicating that, in the current group, the role of the employer was always assigned to a person with local *hukou* status, and the role of the worker to a person with migrant *hukou* status, or the reverse. The sentence was not read aloud to participants to avoid demand effects greater than what would be observable in a real-life situation. The full instructions and protocol are included in the Online Supplementary Material (OSM) Appendix.

**Estimation Strategy**

To test our two hypotheses that migrants are discriminated against and that discrimination is primarily preference-based, we used regression analysis. This method allowed us to control for possible differences between locals and migrants and to determine the nature of possible discrimination against migrants. We pooled all treatments and test discrimination using the following equation specifications, which were estimated for both employers and workers.

\[
Y = \beta_0 + \beta_1 M_{other} + \beta_2 M_{self} + \beta_3 X + v + \epsilon \\
Y = \beta_0 + \beta_1 M_{other} + \beta_2 M_{self} + \beta_3 M_{other} \times M_{self} + \beta_4 X + v + \epsilon
\]

**Notes:** The table shows the number of participants for each treatment. The numbers in brackets indicate how many of these played the GEG (or WPG) first.

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**Table 1. Participants by Treatment**

| Worker | Employer | Migrant |
|--------|----------|---------|
|        | Local    | 80 (48,32) | 24 (24,0) |
|        | Migrant  | 96 (56,40) | 80 (32,48) |

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7 *Hukou* status is not directly observable but can easily be verified on a person’s identity card. Similarly, we provided information on status but did not directly point to it, although participants knew that we previously checked their status and provided them with participant numbers based on their name. Hence, our treatment of being matched with a participant with different *hukou* status was only introduced by one sentence on the computer screen. While this can be seen as inducing an experimenter demand effect, discussions between us and some participants after the experiment indicated that they were aware of the status of their counterparts (based on the instructions), but did not regard it as uncommon, nor did they report the impression that *hukou* was the topic of the experiment. Discrimination against migrants may be seen as critical in more-educated populations, but among our participants discrimination based on *hukou* status was not considered special, illegal, or a behavior that would need to be concealed. We therefore regard it unlikely that participants changed their behavior due to a perceived experimenter demand to discriminate (or not discriminate) against migrants.
where $Y$ are employer or worker decisions (wage offers, effort, final wages); $M_{other}$, $M_{self}$ and $M_{other} \times M_{self}$ are binary indicators for whether the decision-maker faces a migrant counterpart ($M_{other} = 1$), for whether the decision-maker is a migrant herself ($M_{self} = 1$), and for treatments in which both players are migrants ($M_{other} \times M_{self} = 1$). $M_{other}$ is our main variable of interest, with $\beta_1$ indicating if wage offers, effort, and final wages are lower when the recipient is a migrant. The coefficient $\beta_2$ on $M_{self}$ indicates if migrant status influences decisions, as there may be level differences between migrants and locals (the OSM Appendix includes further detail on possible level differences). $M_{other} \times M_{self}$ controls for groups with only migrants, hence, $\beta_3$ describes an interactive effect.

$X$ contains controls for game-order and day effects, as well as for wage offers and effort in final wage decisions (WPG) and for wage offers in effort decisions (GEG, WPG). The robustness checks reported in the OSM Appendix also include demographic controls in $X$. The terms $\nu$ and $\epsilon$ describe a random intercept and the error term, respectively. Equation (1) is a reduced form to test our hypotheses. Equation (2) is our preferred specification and is used for our conclusions, as it also controls for $M_{other} \times M_{self}$ and provides more robust results.

Whereas the coefficient on $M_{other}$ indicates general discrimination in all specifications, its size and significance between the games allows us to determine if discrimination is statistical or preference-based, at least for employer decisions. If migrants receive lower wage offers in the GEG, discrimination may be statistical, preference-based, or both, because employers face uncertainty about effort. In the WGP we may again observe lower non-binding wage offers for migrants due to either preference-based or statistical discrimination. However, only preference-based discrimination can motivate lower final wages for a given effort (and for a given non-binding wage offer), because there is no uncertainty about effort. Similarly, if workers discriminate against migrant employers based mainly on their preferences, a possible effect of lower effort provided to migrant employers ($\beta_1 < 0$) would be larger and more significant in the GEG than in the WPG, because workers face no uncertainty about wages in the GEG but final wages are uncertain in the WPG.

**Experimental Participants**

We recruited household helpers from Nanjing, so-called *ayis*, as our experimental participants. *Ayis* were particularly suitable for our study because in

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8Game-order and day effects played a significant role. Doing our analysis within each day confirms our results (see the OSM Appendix).

9We use random instead of fixed-effects models because our treatment variable is constant for each participant. Our regressions account for the panel structure of the data, the reciprocal nature of decisions, the different roles taken in the experiment, and our two games. We expect reciprocal relationships (higher wage offers and wage promises lead to higher effort, higher effort to higher final wages), and the data confirm these expectations. The levels of wage offers and effort are similar in the GEG and the WPG. Employers seem unwilling to deviate much from their wage promises, as final wages in the WPG depend on both effort and wage offers. Hence, the wage offer in the WPG is not pure cheap talk. Our regression analysis accounts for the conditional nature of decisions by including wage offers, wage promises, and effort as controls in the respective regressions.
Nanjing both locals and migrants work in this occupation. We use an artefactual field experiment (Harrison and List 2004; List 2007) with a framing similar to participants’ normal environment. Ayis are affected by discrimination based on hukou status in their daily lives, and their hukou status is essentially unchangeable. By contrast, university graduates can often change their status or migrate for their studies, making migrant status a positive signal of their skill or ability. For ayis, both migrants and locals came from the same or similar locations in or near Nanjing but inherited different hukou status. We identify hukou status based on the information contained on participant ID cards.

We hired our participants through their normal labor market channels. Some participants were also recruited through a local trade school (indicated by the variable “job certificate”). More detail on ayis, their labor market in Nanjing, and our recruitment procedures is included in the OSM Appendix. We ran experiments on five days with a total of 37 groups in November and December 2010. Because of a mistake in matching participants, two groups had to be dropped from the sample, leaving us with 280 participants of which 99% were females.

Locals and migrants are similar in terms of their socioeconomic status and cultural background (e.g., their cooking styles or dialects). We also checked for sociodemographic differences between the groups with a questionnaire administered at the end of our experiment. We were unable to ensure that every participant completed the questionnaire, which led to missing values, but most participants answered most questions. Table 2 reports the main summary statistics and confirms our conjecture about general comparability, as most variables are similar for locals and migrants and any differences are as expected. Migrants have more children and siblings, reflecting general demographic patterns in China. They have lived less time in Nanjing but are not necessarily new arrivals, and some (approximately 4%) had lived there all their lives. Some locals had not lived in Nanjing all their life, reflecting, for example, effects of the incorporation of suburbs into the city and resulting changes in hukou status. We cannot identify where a particular individual migrated from or why they are considered to be a migrant or local.

Jointly regressing individual characteristics on hukou status provides the same picture as indicated by the p values in Table 2. However, the table is not informative about latent differences, such as work quality or effort. For example, Meng and Zhang (2001) argued that there may be discrimination against migrants despite equal hourly wages when migrants are more productive than locals.

One concern when studying migrants is that migrant hukou status indicates that the individual originates from a cultural group or an underdeveloped area of the country that may have a negative reputation in the city. Discrimination may then reflect attitudes toward this group, rather than the individuals’ legal status. Honig (1990) and Finnane (1993) described how Subei people have been regarded as uncivilized by residents from Shanghai since the times of imperial China. Subei were easily identified by language and dress standards and have been marginalized historically. Our participants mostly originate from nearby areas in Nanjing but also include some people from Subei and Anhui, both of which are regions close to Nanjing. All in all, our participants originate from nearby areas with similar dialects and customs, and there is no widespread historical prejudice against them in Nanjing, as described by Honig (1990) for Shanghai. This does not mean that the effects of city residents looking down on individuals from rural places or smaller towns (a phenomenon that may be found across the world) are irrelevant for local-migrant relationships. However, hukou status provides a vehicle to make this distinction, which is otherwise more difficult to do.
Our study examines a group with low income, low education, and few communist party members. Locals and migrants differ significantly by level of education. This difference can be explained by lower educational attainment in rural (or non-urban) areas, as indicated in Table 3. We regard differences in education as not indicating underlying ability-based differences between migrants and locals. There is also no significant premium on education for ayis. Nevertheless, education could change the opportunity costs of our participants outside of the laboratory. Controlling for education in robustness checks does not change our results. We may still draw on relatively qualified ayis in terms of education because we required participants to have reading and writing skills (see also Liu, Frijters, and Kong 2012, on selection effects in an experiment in China). However, we do not expect higher education to lead to greater discrimination.

Results

Total Earnings

Do migrants earn less as a consequence of discrimination? Figure 2a compares the total (employer and worker aggregate) earnings of locals and
migrants, showing that migrants earn approximately 10% less than locals do ($p \leq 0.01$). However, the estimate based on total earnings may overstate discrimination because employers appropriate a higher share of total earnings, and there were more participants in the role of local employers than in the role of migrant employers. Figure 2b therefore refines the analysis by comparing earnings for employers when participants are in mixed groups, earnings of workers when they are in mixed groups, and the sum of earnings for employers and workers when they are in homogenous groups. The

Table 3. General Levels of Education in Urban and Rural Areas

| Uneducated (%) | Primary school (%) | Junior high school (%) | Senior high school or more (%) |
|----------------|-------------------|------------------------|-------------------------------|
| Rural          | 10                | 38                     | 42                            | 9                            |
| Urban          | 3                 | 17                     | 35                            | 44                           |

Source: National Bureau of Statistics of China (2010).

Figure 2. Experimental Earnings over All Periods

(a) By hukou

(b) By hukou, role, and group composition
figure confirms that migrants earn less. While hinting at discrimination against migrants, these simple comparisons do not control for all potentially important covariates that may influence earnings. For example, the right panel of Figure 2b indicates that migrants may be less cooperative than locals are in homogenous groups, which can be controlled for in regression analysis.

Employer Decisions

Table 4 shows the regression results for employers. The coefficient of $M_{other}$ indicates if wage offers and final wages are lower when the counterpart is a migrant, the coefficient of $M_{self}$ indicates if migrant employers pay lower wages, and $M_{other} \times M_{self}$ controls for groups made up of only migrants. The results show that migrants are discriminated against ($\beta_1 < 0$, based on $M_{other}$), as they receive significantly lower wage offers in the GEG and are paid lower final wages in the WPG. Discrimination in non-binding wage promises in the WPG is not clearly significant, as the coefficient of $M_{other}$ is either marginally significant (column (3)) or statistically insignificant (column (4), when $M_{other} \times M_{self}$ is included). Estimates for the coefficient of $M_{other}$ across the columns (comparing columns (1) to (3) and (5) or columns (2) to (4) and (6)) indicate that discrimination is preference-based: Discrimination is not lower when uncertainty about worker effort, the source of statistical discrimination, is removed (columns (5) and (6)). It can also be seen that the size and significance level of the coefficient of

| Variable | (GEG) | (WPG) | (WPG) |
|----------------------|--------|--------|--------|
| | Wage offer | Wage offer | Final wage |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $M_{other}$ | -9.57** | -8.93* | -6.42* | -4.87 | -10.38** | -10.89** |
| | (4.08) | (5.29) | (3.63) | (4.93) | (4.26) | (4.48) |
| $M_{self}$ | 7.38* | 9.25 | 0.77 | 5.29 | 5.77 | 4.17 |
| | (4.03) | (10.16) | (3.87) | (10.97) | (3.93) | (9.11) |
| $M_{other} \times M_{self}$ | -2.51 | -6.06 | (11.59) | (12.3) | 2.12 | |
| Effort | 3.57*** | 3.57*** | (0.46) | (0.46) |
| Wage offer | 0.26*** | 0.26*** | (0.06) | (0.06) |
| Day effects | Yes | Yes | Yes | Yes |
| Game-order effects | Yes | Yes | Yes | Yes |
| n (observations) | 1,120 | 1,120 | 1,120 | 1,120 |
| N (individuals) | 140 | 140 | 140 | 140 |

Notes: \( \beta \) coefficients in random-effects models. Standard errors (in brackets) clustered at the level of the individual.

*Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.
for final wages in the WPG is not reduced when $M_{other} \times M_{self}$ is included. Hence, the evidence for discrimination against migrants is most robust when it is only preference-based.

Migrant status of the employer ($M_{self}$) does not have a consistently significant coefficient (except being marginally positive in column (1)), and the coefficient of only migrant groups ($M_{other} \times M_{self}$) is statistically insignificant throughout the results. Hence, we find no clear indication that locals and migrants make decisions differently from each other.

### Worker Decisions

Table 5 includes the results for workers. The coefficient of $M_{other}$ indicates differences in effort when the employer is a migrant, the coefficient of $M_{self}$ indicates if migrant workers provide higher or lower effort, and $M_{other} \times M_{self}$ controls for groups with only migrants. Evidence of discrimination against migrant employers is mixed, as the coefficient of $M_{other}$ is statistically significant in both games in columns (7) and (9), but is statistically insignificant in both games when controlling for $M_{other} \times M_{self}$ in columns (8) and (10). Hence, we find some qualitative indication of discrimination against local employers, but the effect is not robust to the inclusion of the interaction term. Similarly, the results are inconclusive with respect to higher or lower effort by migrant workers (based on $M_{self}$), as the coefficient is statistically insignificant in the GEG (columns (7) and (8)), but statistically significant and negative for migrant workers in the WPG (columns (9) and (10)). $M_{other} \times M_{self}$ does not have a statistically significant effect on decisions, but increases the standard errors of the remaining variables and leads to

### Table 5. Worker Decisions

| Variable       | (GEG)     | (WPG)     |
|----------------|-----------|-----------|
|                | Effort (7) | Effort (8) | Effort (9) | Effort (10) |
| $M_{other}$    | -1.23**   | -1.34     | -1.11**    | -1.49       |
|                | (0.53)    | (0.98)    | (0.48)     | (0.99)      |
| $M_{self}$     | -0.26     | -0.29     | 0.89*      | -1.02*      |
|                | (0.53)    | (0.64)    | (0.50)     | (0.59)      |
| $M_{other} \times M_{self}$ | 0.14     | 0.51      | 0.51       | 1.17        |
| Wage offer     | 0.06***   | 0.06***   | 0.06***    | 0.06***     |
|                | (0.01)    | (0.01)    | (0.01)     | (0.01)      |
| Day effects    | Yes       | Yes       | Yes        | Yes         |
| Game-order effects | Yes   | Yes       | Yes        | Yes         |
| $n$ (observations) | 1,120 | 1,120     | 1,120      | 1,120       |
| $N$ (individuals) | 140   | 140       | 140        | 140         |

**Notes:** $\beta$ coefficients in random-effects models. Standard errors (in brackets) clustered at the level of the individual.

*Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.
discrimination against migrant employers (based on $M_{\text{other}}$) to be statistically insignificant. Hence, Table 5 provides inconclusive evidence with regard to discrimination against migrant employers and for differences in effort between migrants and locals.\(^{12}\)

**Overall Results and Discussion**

The results on employer and worker decisions provide our first result on discrimination, corresponding to our first hypothesis:

**Result 1**: Local employers discriminate against migrant workers. No conclusive evidence shows whether local workers discriminate against migrant employers.

The findings also allow us to determine if discrimination against migrants is based on preferences or on (expected or real) statistical differences, testing our second hypothesis. If locals (correctly or incorrectly) expect lower migrant effort, they have statistical reasons to discriminate. Statistical discrimination, together with preference-based discrimination, can explain lower wage offers to migrants in the GEG, because effort is uncertain. However, expectations and uncertainty should not matter for final wages in the WPG (once controlling for effort) because effort is known. Yet, our results for employers show that discrimination against migrants appears most strongly in employer decisions over final wages.\(^{13}\)

**Result 2**: Discrimination against migrant workers is primarily preference-based.

We interpret this result as indicating that legal *hukou* status provides a basis for individual-level preferences to discriminate against migrant workers. Locals may find taking advantage of workers more justified when the workers are migrants, possibly because they incur lower psychological costs such as feelings of guilt when exploiting workers, or because of dissimilar perceptions of fairness when sharing social surplus between locals and migrants.

How is this preference-based element of discrimination against migrant workers best understood? Becker (1971) introduced the concept of *taste*-based discrimination, arguing that interacting with people from a certain group

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\(^{12}\)When focusing only on specifications that produce statistically significant results, these could be interpreted as qualitative evidence for preference-based discrimination. Discrimination against migrant employers does not decrease (comparing columns (7) and (9)) between estimates in the WPG (when effort is chosen under uncertainty about final wages) and in the GEG (when the wage is certain). Furthermore, Table 5 shows that wage offers are important determinants of effort. Workers reciprocate high wage offers by providing more effort in both games. Although they are not binding, workers treat WPG wage offers as informative and react to them as strongly as in the GEG.

\(^{13}\)Statistical discrimination also explains the lower effort of migrant employers in the WPG, because effort may be reciprocated by lower final wages when employers are migrants. Expectations should not play a role for workers in the GEG, because wage offers are binding. However, worker decisions do not provide a conclusive result with respect to discrimination, hence one may only speculate as to what roles statistical and preference-based discrimination may play.
creates disutility. In our study locals and migrants do not interact directly, but only through the computer interface. Discrimination is therefore better explained by the implicit or explicit views of locals about what migrant workers deserve, perhaps justifying choices to pay migrants less.\textsuperscript{14}

An alternative explanation of this result may be that discrimination against migrants arises from an exploitation of monopsony power. Locals may assume that migrants accept lower wages because they experience lower real-world wages and find these more acceptable. We observe the effects of monopsony power in our experiment, as wage-per-effort ratios are lowest for final wages in the WPG. (The average wage paid for one unit of effort is 22.2 in the GEG and 14.2 in the WPG.) Hence, when employers make the last decision in the game, they pay lower wages relative to effort. Monopsony power is unlikely to explain discrimination in the laboratory though, because local and migrant workers have the same outside option in the experiment—they can reject the wage offer and wait for the next round to interact with a new employer, without higher search costs for migrants than for locals. Furthermore, if real-world monopsony power was the main determinant for paying lower wages to migrants, local employers in the WPG could already discriminate fully in non-binding wage offers. However, they do not make clearly lower wage promises to migrant workers in the WPG, but discriminate strongly against them in the WPG once workers cannot react to lower wages by providing lower effort.

\textbf{Robustness}

We test the robustness of our results in several ways (the results are included in the OSM Appendix). We use the individual characteristics of decision-makers from our post-experimental questionnaire to check for the effect of including additional controls. We test for age, gender, marital status, income, rent, communist party membership, level of education, work hours per week, number of employers, number of children, number of siblings, whether participants had a job certificate, and the number of years lived in Nanjing. We use log-variables for income, hours worked, rental payments, and number of employers to mitigate the effect of outliers. As not all questions were answered by all participants, including additional questionnaire variables led to the loss of observations. We therefore first include a full set of possible control variables in our regressions and successively remove insignificant control variables until only the significant variables are included. The explanatory power of questionnaire variables is low, and including additional variables does not provide further insight into discrimination

\textsuperscript{14}Locals could have distributional preferences depending on their interaction partner and share less with outsiders. This would be in line with in-group/out-group theories and preferences to cooperate less with an out-group. Although locals discriminate against the out-group of migrants, however, this is not observable for migrants, as shown in the OSM Appendix. Hence, the out-group effect would differ between the groups, limiting the explanatory power of the in-group/out-group theory for our results.
against migrants. For wage offers (in either game), no demographic variables are statistically significant. For final wages, the only statistically significant variable is having a job certificate ($p = 0.01$). Including this variable does not change our results for discrimination. Demographic control variables also have limited importance for worker decisions. In the GEG, older, married individuals and those not in the communist party provide higher effort. Effects are statistically significant, with coefficients of 0.08 per year of age ($p = 0.02$), –2.00 for members of the communist party ($p = 0.01$), and 1.13 for married individuals ($p = 0.04$), comparing to an average effort of about 5.28. However, only four participants in the worker role were party members and only 13 were not married. For effort decisions in the WPG, only age is statistically significant ($p = 0.08$), with a small coefficient of 0.05 compared to average effort of 5.82. As for employer decisions, our findings with respect to discrimination are not affected by including these controls.

We also test if results are robust to the inclusion of game-inherent control variables, such as lagged variables, controls for decisions in the first period as an indicator of individual type, and effort or wages received in previous periods that could hint at learning over the periods. While some of the controls have a statistically significant effect on decisions, their inclusion did not lead to qualitative changes in our results. Similarly, when using the Tobit specification instead of linear random-effects models, discrimination against migrants is observable with similar levels of statistical significance. We also tested for the best way to cluster standard errors to account for repeated observations. The options we considered were clustering at the group, employer-worker pair (constellation), and individual levels. Individuals were re-matched every period, but would interact with the same individual twice per game over the rounds, thereby motivating a preference for using constellations. However, clustering at the individual level is more conservative than clustering by constellation and by group. We therefore chose the most conservative approach and used clustering by individual.

**Effect Size and Efficiency**

What is the practical significance of discrimination given the effect size of our estimations? Based on the results of Table 4, in the GEG, migrants are offered between 8.93 and 9.57 lower wages, corresponding to 12% to 13% less at the average wage offer (73.53). In the WPG, non-binding wage offers to migrants are not consistently different for locals and migrants (9% in column (3) measured at the average WPG wage of 75.00, and insignificant in column (4)), while final wages to migrants are between 10.38 and 10.89 lower after controlling for effort, or 15% to 17% less at the mean final wage (70.06). Hence, discrimination in WPG final wages is practically large, as migrant workers would have to provide approximately 3 units of effort more (at a mean effort of 6.94) to receive the same final wage. The question of
effect size is less straightforward for worker decisions, as no systematic evidence supports discrimination.\textsuperscript{15}

Legal segregation based on \textit{hukou} status appears to support a pre-existing tendency to discriminate against the weaker social group of migrants, at least for decision-makers in the employer role. This leads to inequality but also inefficiency because it creates a welfare loss, as indicated by the following comparison. When locals interact with migrants instead of with a group whose status they do not know (i.e., as if \textit{hukou} status were absent), total effort is 8\% lower (5.68 instead of 6.15, \textit{p} = 0.01). When migrants interact with locals instead of with a group whose status they do not know, effort is 2\% higher (5.06 instead of 4.95, \textit{p} = 0.64). In conjunction, communicating \textit{hukou} status reduces welfare. The efficiency loss is further increased across our two games, which reflect different labor market contracts. Effort is significantly higher in the WPG (5.28 in the GEG and 5.82 in the WPG, a 10\% difference, \textit{p} < 0.01), because employers use high non-binding wage offers as (true) positive signals. These offers are reciprocated by the provision of higher effort, which, in turn, leads to higher wages. Discrimination against migrants increases, however, when non-binding wage promises become possible in the WPG.

\textbf{Limitations}

Our experimental approach has limitations. We use household helpers as our experimental participants because they share similar sociodemographic characteristics across \textit{hukou} status and because our migrants cannot change their status. This may limit the generalizability of our results, as this group may be more likely than other groups affected by discrimination based on \textit{hukou} status in real life.

We also study discrimination only when locals and migrants interact. Discrimination against migrants may already have taken place at the hiring level though. According to interviews with agents serving as brokers on the \textit{ayis} market in Nanjing, this discrimination occurs as about one-third of clients request that only locals are made available to hire. We focus on wage-setting, which cannot be captured in hiring-level discrimination but also contributes to wage differentials between locals and migrants.

Our study is also limited by our experimental economic methodology. The experiment allows us to study discrimination in employer-worker interaction, which usually cannot be captured in observational data. But it also limits the external validity of our findings because locals and migrants interact in the stylized laboratory environment rather than their natural work environment. Our results are therefore best understood as a contribution to a

\textsuperscript{15}Columns (7) and (9) in Table 5 show a statistically significant effect while columns (8) and (10) do not. When focusing on columns (7) and (9), the effect size would be large. Effort of migrants is 1.23 lower in the GEG (column (7)), corresponding to 23\% at the mean of 5.28 and 1.11 in the WPG (column (9)), corresponding to 19\% at the mean of 5.82.
broader discussion on the potential implications of hukou status for discrimination.

Conclusion

We find discrimination against workers with migrant hukou status, although our experiment eliminates drivers of discrimination present in real life, such as unobservable or perceived work quality. Our results indicate that discrimination is not primarily based on expected differences in worker productivity. Instead, discrimination is highest when expectations cannot explain lower wages to migrants. We therefore conclude that preference-based discrimination best explains our results, which appear to be driven by beliefs that migrant workers deserve a lower share of the social surplus and that exploiting their weaker role is more acceptable. Our findings also show that discrimination against migrants decreases effort, implying that the sum of employer and worker earnings is reduced because of discrimination. Furthermore, we find that discrimination is greatest when employers can make non-binding wage promises—the framework that otherwise leads to the greatest level of effort.

The hukou system was established and used to limit migration to urban areas. Our results show that employers use hukou status to discriminate against migrant workers by establishing a social norm to offer migrants less favorable terms of employment. This, in turn, adds to legal discrimination. This practice can negatively affect social cohesion, adding to inefficiency from wages that are detached from productivity as a result of discrimination.

Finally, we introduce the WPG, which allows us to disentangle wage-setting discrimination based on statistical and other preferences. Our results show that the elimination of uncertainty about worker productivity (i.e., the statistical motive for discrimination) does not necessarily reduce the differential treatment of a disadvantaged group. This phenomenon may also be found in contexts other than those relevant to workers with migrant hukou status.

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