

## **Social Identity and Inequality: The Impact of China's *Hukou* System\***

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## ABSTRACT

We conduct an experimental study to investigate the causal impact of social identity on individuals' response to economic incentives. We focus on China's decades old household registration system, or the *hukou* institution, which categorizes citizens into urban and rural residents, and favors the former over the latter in resource allocation. Our results indicate that making individuals' *hukou* status salient and public significantly reduces the performance of rural migrant students on an incentivized cognitive task by 10 percent. This leads to a leftward shift of their earnings distribution – the proportion of rural migrants below the 25<sup>th</sup> earnings percentile increases significantly by almost 19 percentage points. However, among non-migrants the proportion with earnings below the 25<sup>th</sup> percentile drops by 5 percentage points, and the proportion above the 75<sup>th</sup> percentile increases by almost 8 percentage points, albeit insignificantly. The results demonstrate the impact of institutionally imposed social identity on individuals' intrinsic response to incentives, and consequently on widening income inequality.

Keywords: social identity, *hukou*, inequality, field experiment, China

JEL Classification: C93, D03, O15, P36

## 1. Introduction

A large body of literature documents significant and increasing income inequities in the fastest growing economies of the world (in *China*: Kanbur and Zhang, 1999; Chen, 2002; Yao, Zhang and Hanmer, 2004; Ravallion and Chen, 2007; in *India*: Deaton and Dreze, 2002; Datt and Ravallion, 2002). Empirical research suggests that rising income inequality lowers poverty reduction at any given positive rate of growth (Ravallion, 1997). If we incorporate the psychology and sociology of an individual's identity into economic models of behavior, however, the implications of socio-economic inequality may be much wider. For instance, Akerlof and Kranton (2000) incorporate individuals' social identity into a theoretical model of poverty and show that social exclusion can lead to equilibria in which the 'excluded' individuals avoid economic activities that are remunerative. Thus identifying oneself with an underclass can perpetuate and exacerbate socio-economic inequities.

In this paper we attempt to expand the literature on social identity by analyzing its potential impact on economic inequality in an experimental framework. We focus on China's household registration system, or the *hukou* institution, which categorizes citizens into urban (nonagricultural) residents and rural (agricultural) residents, and favors the former in resource allocation. We study whether an individual's social identity is influenced by this institution and has a *causal* impact on her response to incentives. If yes, how does the response to incentives affect individuals' performance on cognitive tasks and thereby the distribution of earnings among these different socio-economic groups?

The *hukou* system in China is uniquely positioned to shed new light on these questions. The system of assigning agricultural households a rural status and thereby restricting their access to subsidized public goods and job opportunities for generations emerged after the communist revolution six decades ago. Thus, unlike race, caste or ethnicity, migrant identity in urban China may have been administratively created and reinforced through decades of differential treatment of rural-urban residents. We, therefore, have an opportunity to test whether even in an otherwise ethnically homogenous society

(China's population is 91.5 percent ethnic Han, National Bureau of Statistics 1994-2003) systemic disparity between households may have been *internalized* by individuals through a manifestation of their social identity. If yes, this provides us with powerful evidence on the impact of social exclusion in creating identities. Further, this internalized identity may influence individuals' response to incentives in the market economy and hence affect their economic decisions and outcomes. If so, the intrinsically distorted response to incentives could serve as an important, yet unexplored, avenue through which social identities may contribute to socio-economic inequality.

We design a framed field experiment (Harrison and List, 2004) to explore the effect of the *hukou* institution on individuals' incentives. To introduce an exogenous variation in identity salience we adopt a methodology from psychology called priming (Bargh, 2006). Specifically, our experiment randomly assigns primary school students in Beijing, with different *hukou* backgrounds, to the identity treatment and the control treatment. In the identity treatment we prime students' *hukou* identity and make it salient through a pre-experiment questionnaire followed by a public verification of their *hukou* status (Shih, Pittinsky and Ambady, 1999; Hoff and Pandey, 2006). In the control treatment individual's *hukou* identity is kept private. We then compare participants' performance in incentivized cognitive tasks, solving puzzles, between the two treatments in order to examine the effects of *hukou* identity on economic inequality.

Our results indicate that when rural migrant students' 'inferior' *hukou* status is made salient and public, they significantly underperform by 10 percent in the incentivized cognitive task compared to when their identity is kept private. The performance of local urban students, the 'high' status *hukou* holders, insignificantly improves when their *hukou* status is primed. Although these changes in individual behavior have an insignificant impact on aggregate efficiency, the significant underperformance by rural migrant students leads to a drastic shift in the experimental earnings

distribution. The ranking of rural migrant students in the earnings distribution shifts to the left – the proportion of rural migrant students below the 25<sup>th</sup> percentile increases significantly from 11.9 percent to 30.3 percent. In contrast, when *hukou* identity is primed the proportion of urban students below the 25<sup>th</sup> percentile drops from 22.2 percent to 17.2 percent, and the proportion above the 75<sup>th</sup> percentile increases by almost 8 percentage points, albeit insignificantly. We conclude that the *hukou* system distorts individuals' response to incentives and may have a causal impact on widening the income gap between migrants and non-migrants in urban China.

The findings of this paper have two important implications. First, theoretical and empirical literature suggests that high levels of inequality may have adverse implications for economic growth (Persson and Tabellini, 1994; Alessina and Rodrik, 1994). Our results, thus, highlight the importance of designing policies that ensure inclusive and sustainable economic growth in developing countries. Second, the findings underline the need for more research on the impact of social exclusion on individual behavior and the effectiveness of existing redistributive policies that aim at reducing social exclusion. For instance, while affirmative action has generated tremendous policy debate, there is limited evidence of its impact on social cohesion as well as economic efficiency.

The remaining sections of the paper are organized as follows. Section 2 places this study in the context of existing literature. Section 3 provides a brief background on the *hukou* system in China. Section 4 describes the experimental design and the data. The results of the analysis and its discussion are presented in Section 5. Section 6 concludes.

## **2. Literature Review**

The importance of incorporating social identity into economic analyses is being increasingly stressed in economics (Akerlof and Kranton 2000). An expanding theoretical (Smith, 2005; Shayo, 2005; Fang and

Loury, 2005; Benabou and Tirole, 2007; Horst, Kirman and Teschl, 2006) and experimental literature suggests that making identity salient has important effects on individuals' preferences and economic behavior (Ball et al., 2001; Benjamin, Choi and Strickland, *forthcoming*).

However, there is little empirical research on the impact of social identity on economic outcomes in developing countries, with one exception. In a study in rural India, Hoff and Pandey (2006) find that social identity – a product of history and culture – shapes one's belief system and has a pronounced impact on behavior in response to economic incentives through its effect on expectations. They show that making caste salient to middle school male students lowers the performance of low-caste participants relative to high-castes even when rewards for performance depend solely on individual effort. Thus social identity may have important implications for economic inequality and the distribution of gains from economic growth in developing countries.

Concerns about rising economic inequality accompanying rapid economic growth have been growing in recent years. In China, income inequality has risen significantly since economic reforms were initiated in 1978 (Ravallion and Chen, 2007; Yao, Zhang and Hanmer, 2004; Chen, 2002; Kanbur and Zhang, 1999). While the contribution of rural-urban inequality to overall income inequality was about 70 percent over 1983-1995, the contribution of intra-urban inequality has increased by 96 percent over the same period (Kanbur and Zhang, 1999). Behind these inequality statistics lie rapid urbanization (Ravallion and Chen, 2007) and the accompanying labor migration from rural to urban areas – the largest in world history. According to the 5th Population Census conducted in 2000, about 144.39 million rural residents, or 11.6 percent of the total population of China, migrated into cities and towns in that year (National Bureau of Statistics of China, 2002). China's unique *hukou* or household registration system, however, does not grant migrants urban citizenship. This 'floating' population, a majority of who are unskilled rural laborers (Kanbur and Zhang, 1999), is treated as an 'outsider' with limited

access to economic resources and opportunities (Liu, 2005).

Research suggests that on average those with a rural *hukou* are socio-economically worse-off than those with an urban *hukou* in China. Using a national representative sample from the Chinese Household Income Project (1995), Liu (2005) finds that compared to urban residents those who obtained urban *hukou* later in their lives have significantly lower educational attainment and healthcare benefits. Lu and Song (2006) conduct an individual-level survey to find that local urban workers in Tianjin earn substantially higher hourly wage than those who do not have local urban *hukou*. In a recent study, Whalley and Zhang (2007) show that removing *hukou* barriers to domestic labor mobility will significantly reduce inequality and increase economic efficiency gains. However, there exists little evidence on the *causal* effect of *hukou* status on economic behavior and income distribution in China.

Secondary sources of data based on either surveys or direct field observations to test whether the differences in the economic outcomes are due to *hukou* status are unable to establish *causality* between *hukou* status and perceptions of self and economic behavior due to confounding unobservable individual characteristics. The current literature almost entirely focuses on restricted labor mobility and discrimination in the allocation of economic resources in the *hukou* system as an explanation for rural-urban and intra-urban economic inequities (Liu, 2005; Lu and Song, 2006; Whalley and Zhang, 2007). Moreover, existing research does not provide a complete picture of the extent of urban inequality in China, primarily due to paucity of data. The presence of the household registration system implies that only permanent or registered urban households are included in official survey data, thereby underestimating urban income inequality (Ravallion and Chen, 2007).

This study aims to contribute to the literature on social identity and inequality in the following ways. First, we show how social identities can causally impact individual decision making even in relatively ethnically homogenous societies. Second, our study will highlight the role of identity in

perpetuating and exacerbating income inequities, particularly in the context of rapidly growing economies.

### **3. The *Hukou* System and Social Identity in China**

The household registration or *hukou* system as it is known today evolved gradually following the success of the communist revolution in China in 1949. It provided the main mechanism whereby the new communist government regulated the mobility of its citizens until the end of the 1970s. Restricted labor mobility was deemed necessary for implementing the government's strategy of prioritizing industrial growth by keeping the proportion of non-agricultural population low. Under this system every citizen was legally bound to register her or his single permanent place of residence (*hukou suozaidi*) say city *x* in province *y*, and the type of *hukou* (*hukou leibie*) which was either agricultural (rural) or non-agricultural (urban). Strict controls were imposed on movement of rural *hukou* holders to urban areas (Mallee, 1995).<sup>1</sup> While temporary residence in rural areas (by an urban *hukou* holder) did not require registration, a temporary residence certificate was required in order for a rural *hukou* holder to stay longer than three days in an urban location. These rules were enforced strictly thereby controlling mobility, both temporary and permanent, from rural to urban areas.

By controlling rural-to-urban labor mobility, between the 1950s and 1970s, the system perpetuated discrimination against rural *hukou* holders. First, urban employment was primarily determined by the prospective employees' *hukou* status which favored urban residents (Chan and Zhang, 1999). Second, state-subsidized food and other necessities were distributed preferentially to urban

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<sup>1</sup> A migration certificate had to be obtained, in addition to presenting proof of urban employment or enrolment in an urban educational institution or proof of grant of in-migration by urban authorities to the household registration office (Mallee, 1995).



residents through a national rationing system. Urban *hukou* holders were eligible for the ration stamps that guaranteed low price products but not rural *hukou* holders (Liu, 2005). Third, urban residents (particularly employees of the state-owned enterprises) were granted various fringe benefits including subsidized housing, health services and education. In contrast, such benefits to rural residents were provided by their communes or villages, which were usually of inferior quality and whose availability and reliability varied widely (Lin, Cai and Li 1996; Cheng and Selden, 1994).

A household's *hukou* was (and continues to be) inherited by the next generation. *Hukou* status and thereby educational attainment and eventually employment opportunities of the next generation of rural populace was restricted by birth.<sup>2</sup> Thus the institution divided the Chinese population into two social groups: an agricultural population which was socio-economically disadvantaged compared to the non-agricultural population (Chan and Zhang, 1999).

Following China's transition from a centralized to a market economy starting in the late 1970s, the *hukou* system gradually lost its control over spatial migration (Chan and Zhang, 1999). The number of people migrating in search of jobs surged following market reforms (and abolition of communes) and an easing of government regulations on spatial migration. As a result, the past three decades have witnessed a drastic increase in the number of 'temporary' non-*hukou* residents (either registered or non-registered) in urban centers.<sup>3</sup> These migrants or temporary residents are not entitled to urban benefits unless they convert to a full urban *hukou*. While pilot programs granting permanent urban residency to rural migrants in certain small cities and townships (subject to job and residency requirements) have been

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<sup>2</sup> Before 1998, the children of rural-urban couples had to follow the mothers' *hukou* status (Chan and Zhang, 1999). They are now allowed to inherit either the father's or the mother's *hukou*.

<sup>3</sup> Temporary Residence Certificates (TRC) are usually valid for one year and are renewable (Chan and Zhang, 1999)

recently approved, in medium and large cities, which are more attractive for rural migrants, conversion to an urban *hukou* is daunting if not impossible for an average rural migrant. These conversions are granted through very limited channels including direct purchase of an urban *hukou* as local governments seek additional revenue sources following China's fiscal decentralization in the 1980s (Lin and Liu, 2000).<sup>4</sup>

As of when this study was conducted, the following major and persistent gaps between rural migrants and urban residents continued to exist in large urban centers: (1) labor market and occupational segregation: employment in government offices and state-owned enterprises in cities continued to be unavailable to rural migrant workers unless they converted to an urban *hukou*; (2) lack of social insurance benefits for rural migrant workers such as unemployment and health benefits; (3) absence of state subsidized social welfare benefits. In addition, government subsidized low-rent housing in large cities is only available for local urban *hukou* holders. That these socio-economic gaps created by the *hukou* institution persist to this day is evident in the Chinese Premier Wen Jiabao's address to the National People's Congress in March 2010 promising to reform the household registration system and

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<sup>4</sup> Chan and Zhang (1999) list the channels for converting one's *hukou*: recruitment by state-owned enterprises, promotion to a senior administrative position, enrollment in higher education institutions, demobilization from military services and land requisition by the state. All are controlled by the state's labor laws and have fixed quotas. Besides the fact that quotas can be very small, it is also possible that only one family member recruited by the state is permitted to move to the urban locale and thereby separated from her (his) family for long periods. Since 1992 urban *hukous* are also sold for high fees but eligibility is limited to investors, property buyers and professionals. In Shanghai in 1997, for instance, an urban *hukou* could be purchased for ¥ (yuan) 1 million (which was 150 times an average rural migrant's income) and after meeting strict job, residential and legal requirements (Wang and Zuo, 1999)!

bridge the divide between rural migrants and non-migrants.<sup>5</sup>

It is important to realize that these factors, along with the resulting social segregation of migrants, suggest that the experience of a rural migrant in China is *not* transitory like in other developing countries (Chan, 1996; Solinger, 1999). Geographical control of rural populace until the 1970s has been replaced by economic and social divisions between rural and urban *hukou* holders within urban areas of China. The social hierarchy, shaped by the institution of *hukou* and made conspicuous by vast migrant populations in fast-growing cities, has affected people's daily life so ubiquitously that it constitutes an important aspect of one's social identity in urban China even today.

### *The Hukou System and Schooling in Urban China*

Since our subjects in the experimental study are public school students with different *hukou* backgrounds, in this subsection we discuss the *hukou* institution's effects on the schooling system in urban China.

Children are entitled to subsidized public education only in the area of their legal permanent residency. Even after the reforms in the *hukou* system, in most cities non-local *hukou* holders cannot enroll their children in local schools unless the schools have quotas for 'guest' students. These 'guests'

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<sup>5</sup> "...We will carry out reform of the household registration system and relax requirements for household registration in towns and small and medium-sized cities. We will solve employment and living problems rural migrant workers face in cities and towns in a planned and step-by-step manner, and gradually ensure that they receive the same treatment as urban residents in areas such as pay, children's education, healthcare, housing, and social security....We will allow eligible workers who have left agricultural work to gradually become urban residents, and develop a beautiful rural environment where farmers can live a happy life."

URL: [http://english.gov.cn/official/2010-03/15/content\\_1556124\\_9.htm](http://english.gov.cn/official/2010-03/15/content_1556124_9.htm).

usually have to pay higher fees than local *hukou* holders which can be a significant proportion of migrants' incomes (Xinhua News Agency, July, 2002).<sup>6</sup> Private schools exclusively for migrant children are typically opposed by local authorities, or stringent physical and financial requirements are imposed on them to obtain a legal status. In several urban areas private migrant schools are, therefore, considered illegal.

There are four categories of students to be found in public schools admitting both local and non-local *hukou* students. Due to the *hukou* classification system, urban areas contain both non-agricultural and agricultural *hukou* population (Chan and Zhang, 1999). Thus the population in large cities such as

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<sup>6</sup> Quoting the Xinhua report: "According to statistics from Beijing educational authorities, there are now 123 schools set up by migrants accommodating over 17, 000 children in the capital city. These schools teach between 20 and 3,000 students each and charge about ¥300 (US\$36.1) each term. *When migrant children go to public schools, their parents have to pay ¥500 (60.2 US dollars) in tuition fees each term, plus ¥1,000 (120.5 US dollars) for selection of the school and ¥1,000 to ¥30,000 (3614.5 US dollars) as sponsorship... Migrant schools are cheap and affordable for migrant workers. And children here don't suffer from the discrimination they face in public schools, because they have similar family backgrounds...* Beijing's educational authorities (have) decided to cut charges for teaching migrant children in public schools in the upcoming school year. Fees for primary school will be reduced to ¥200 (24.1 U.S. dollars) from the previous ¥500, and for secondary school to ¥500, a 50 percent drop from the previous charge." (<http://www.10thnpc.org.cn/english/China/36594.htm>).

Migrant laborers in Chinese cities earn an average of ¥966 per month in 2006 according to a National Bureau of Statistics Survey Report.

([http://english.peopledaily.com.cn/200610/22/eng20061022\\_314208.html](http://english.peopledaily.com.cn/200610/22/eng20061022_314208.html))

Beijing and Shanghai (also called municipalities and equivalent to a province) usually consist of four different *hukou* categories: local urban, non-local urban, local rural, and non-local rural *hukou* holders. Although the latter three are on average socio-economically disadvantaged relative to the local urban *hukou* holders, they fare differently amongst themselves.

Non-local rural *hukou* holders are migrants from rural areas of provinces outside the municipality. Since, on average, they are likely to be less educated, have lower paying jobs, and live in poorer conditions compared to their urban counterparts, they are usually considered to be at the bottom of the social hierarchy within the municipality. Local rural *hukou* holders are residents of the rural areas of the municipality. Non-local urban migrants, i.e., permanent urban residents from economically less-developed cities, are on average relatively more educated than their rural counterparts, more likely to have white-collar jobs and be better paid. But the comparison of socio-economic status between local rural and non-local urban is not clear. Due to this ambiguity and the constraints we faced in subject recruiting, we excluded the local rural and non-local urban *hukou* holders from this study, and focused on the two sharply disparate groups. Specifically, since our experiment was conducted in Beijing, we considered Beijing urban (hereafter **H**igh) and non-Beijing rural (hereafter **L**ow) *hukou* holders in this study.

#### **4. Experimental Design**

Our experiment adopts the design of Hoff and Pandey (2006). On the one hand we manipulate *hukou* salience – subjects' *hukou* status is made salient and public in the identity treatment, and is kept private in the control treatment. On the other hand, we vary the payment regime by using piece rate and tournament games in both control and treatment groups. We elaborate on the experimental design below, starting with discussion on subject selection which is a crucial part of the study's design.

*Selection of subjects* Participants in our experiment were 8-12 year old students recruited at

four elementary public schools in Beijing. Since at the time of enrollment evidence of a student's *hukou* status was required to determine the amount of tuition and other miscellaneous fees, individual *hukou* records were available and were obtained by us in advance from the schools' registrar's office for subject selection.<sup>7</sup> We chose these schools for our study because they suited the requirements of our experiment on several fronts. First, the schools admitted non-Beijing *hukou* students. Second, the proportion of students from migrant families was comparable to the migrant population of the Beijing metropolitan area.<sup>8</sup> Finally, these schools were located in districts where per capita GDP was comparable to the average in the Beijing municipal area.

The study focuses on primary school students rather than adults for several reasons. First, the validity of the assumption of *exogenous hukou* declines with age since the possibility of rural-to-urban *hukou* conversion increases with one's level of education. Thus, focusing on young individuals allows us to avoid using selective samples of people whose decision to migrate to urban areas may be systematically correlated with their abilities and intrinsic preferences. Second, the ideal subjects for our experiment would be those whose *hukou* status cannot be differentiated *a priori* from observable characteristics so that any difference in average outcomes between the identity and control treatments can be solely attributed to the identity prime in the 'laboratory'. Using adult subjects may introduce potential confounds since observable characteristics –accent and clothing –usually provide clues to where the subjects originate from and give away their *hukou* status even in the absence of the *hukou*

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<sup>7</sup> Specifically, the miscellaneous fee in the spring semester of 2007 was ¥80 for the local urban students, compared to ¥40 for the non-local rural students. The schools usually charge other off-the-record fees to the non-local rural students.

<sup>8</sup> Migrants who resided in Beijing for more than 6 months constituted 23 percent of Beijing's total population in 2005 (Beijing Municipal Bureau of Statistics, 2005).

identity prime.<sup>9</sup> Since our subjects wore identical school uniforms and relative to adults the young tend to pick up local accents easily, the choice of subject pool ensured that it was difficult to observationally infer one's *hukou* type. Finally, a growing number of experimental economics studies show that any difference between the behavior of children and adults is insignificant when it comes to rational choice behavior, altruism, and strategic behavior (Harbaugh et al., 2001; Harbaugh and Krause, 2000). Although our sample was young, almost all participants in the experiment understood what their *hukou* status was.

We recruited subjects from among 3-6 graders at three schools and among 3-5 graders in one.<sup>10</sup> Each session of the experiment consisted of six subjects of the same gender with three from each of the H and L *hukou* types. To ensure that the effect of identity, if any, comes purely from the identity prime great effort was exerted to minimize the probability that students knew one another *a priori* when we assign them to experimental sessions. To do this, we obtained the student roster from the schools and stratified the sample by gender, grade, grade section, and *hukou* type. Then the three students of the same *hukou* type were randomly selected, each from a different grade.<sup>11</sup> The two students from the same

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<sup>9</sup> Although China is ethnically homogeneous, people from different geographic regions have their own local dialects, or speak mandarin with dramatically different accents.

<sup>10</sup> We were unable to obtain school permission to recruit the 6<sup>th</sup> graders at the fourth school because of upcoming middle school entrance exams.

<sup>11</sup> At the school where only 3-5 graders were recruited, each of the three H students was randomly selected from a different grade, and so were the three L students. Then the two students from the same grade (hence by design had different *hukou* types) were selected from different class sections. The similar method was used when we recruited 3-6 graders at the other three schools. To further reduce the probability of prior acquaintance at these three schools, we made sure that one H student and one L

grade (with different *hukou* types) were randomly selected, each from a different class section. The sessions in both treatments were formed in the same way.

*Identity manipulation* The identity treatment and control treatment differ only in the use of the approach in psychology of identity manipulation called priming. Priming introduces certain stimuli (called ‘primes’ including image, audio, or text such as a questionnaire and an article) to activate subjects’ knowledge of social structures (see Bargh, 2006 for a review). A large body of work in psychology shows that priming social identities often influence people’s behavior and attitudes beyond their awareness and control (Bargh and Chartrand, 1999). Identity priming has only recently been adopted in the field of economics to study the effects of social identity on individual behavior (Benjamin, Choi and Strickland, *forthcoming*; Hoff and Pandey, 2006).

In this study, we made *hukou* identity salient in the identity treatment by using a survey *and* publicly verifying subjects’ *hukou* status at the beginning of the experiment, while in the control treatment subjects’ *hukou* identity was private and not primed. In the pre-experiment survey used only in the identity treatment, subjects were asked where they were born, whether they spoke Beijing dialect at home, whether they (or their classmates or teachers) considered themselves as a Beijing local, and how much miscellaneous fees they were charged by the school at the beginning of the semester. They were also asked to compare Beijing local students with ‘guest’ students on academic performance, class participation, extracurricular activities and achievement, and daily spending. After the survey the experimenter verified in public with every student his/her name, month and date of birth as well as the student came from two different grades. For example, if H students were recruited from grades 3, 5, and 6, L students were then selected from grades 3, 4, and 6. Again the two students from the same grade were selected from different class sections. The average number of class sections per grade was 3.3. The size of a class section varied from 24 to 68 students, with a mean size of 35.8.



*hukou* background.<sup>12</sup> In the control treatment, the sessions started with neither the survey nor the public verification of *hukou* and proceeded directly to the experimenter's illustration of how to solve the assigned cognitive task.

*Incentivized cognitive task* The experiment was conducted in a standard classroom setting with six subjects (3 H and 3 L type) seated at separate desks with a fairly large distance from one another. Before the experiment started participants were greeted by a female experimenter and each paid 3 Chinese yuan (¥3) participation fee upon arrival.<sup>13</sup> The experimenter then explained the tasks and rules. We followed Gneezy, Niederle, and Rustichini (2003), Niederle and Vesterlund (2007), and Hoff and Pandey (2006) in adopting the maze puzzles from Yahoo! games.<sup>14</sup> A sample maze with the solution is included in Appendix A. The task was to find a path through the field from one side to the other without crossing the walls (solid lines in the figure). The experimenter explained the rules using a simple maze, and showed how to solve another one of similar difficulty level as those used in the experiment. Both mazes were posted in front of the classroom during the illustration. Then subjects were given five

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<sup>12</sup> The experimenter said in public, "According to the information from the school's registrar office, your *hukou* belongs to [province/city] and it is a(n) [agricultural/non-agricultural] *hukou*." When verifying the information on date of birth, we did not publicly reveal the *year* of birth to avoid affecting their self-confidence given that the subjects were from three different grades.

<sup>13</sup> An ID number was randomly assigned to each subject before they entered the classroom. The numbers determined where they sat. The ¥3 participation fee was enclosed in an envelope on each desk. Subjects were told that the money was theirs to keep upon arrival. This participation fee was offered up front to gain their trust in the incentivized scheme.

<sup>14</sup> The mazes can be found at <http://games.yahoo.com/games/maze.html>. The difficulty level varies from 1 (easy) to 5 (hard). The mazes we used were level 2.

minutes to practice with an additional maze while the experimenter assisted based on individual needs. After the practice round subjects participated in two 15-minute blocks of experiment. In each block, they were given a booklet of 15 mazes, and had up to 15 minutes to solve as many as possible. All the thirty mazes were of identical difficulty level. The two-block structure of the design allows us to analyze efficiency in learning, i.e., how their performance improves over time. It also allows us to compare the effects on performance of the homogeneous versus heterogeneous reward regimes.

The homogeneous reward system (hereafter the Pure Piece Rate regime) used piece rate compensation in both blocks – subjects were rewarded with ¥1 for each maze solved correctly. The heterogeneous reward system (hereafter the Mixed Tournament regime) consists of piece rate in the first block (¥1 per maze), and tournament in the second block in which only the winner was rewarded with ¥6 per maze and other subjects received zero.<sup>15</sup> The winner was the one who solved the most number of mazes in the session. In the case of a tie, each of those subjects who solved the highest number of mazes was rewarded with ¥6 per maze.

Subjects were told that the task consisted of two blocks. But the instruction for the second block, including the payment scheme, was not given until they completed block one. Therefore, the payment structure is identical in block one for the Pure Piece Rate regime and the Mixed Tournament regime. At the end of each block maze booklets were collected and left outside the labs to be picked up by a research assistant and handed to the graders in a separate room. The procedure prevented the graders from knowing the subjects' identities and *hukou* status. Since the experimenters never left the labs at any point of time during the session, subjects were aware that their mazes were not graded by their experimenters. At the end of block 2 of the maze solving tasks a survey was conducted to collect

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<sup>15</sup> We use the Mixed Tournament regime, rather than tournament in both blocks, to alleviate the problem of earning inequality in the experiment.

demographic information. Thereafter, the grading results were handed to the experimenters, subjects were then informed about their performance (and results of the tournament if applicable), paid individually in private, and dismissed.

The experiment was conducted in four public schools in suburban Beijing in May and December 2007, and December 2008. At each school the experiment included four conditions including the Pure Piece Rate control treatment, Pure Piece Rate identity treatment, Mixed Tournament control treatment, and Mixed Tournament identity treatment. Table 1 summarizes the features of experimental sessions. All the sessions were conducted during class breaks on the days when school was in session, and were conducted separately for boys and girls to control for any potential gender differences. In total we conducted 72 sessions, including 48 male sessions and 24 female sessions with mixed *hukou* types. The total number of subjects was 418 or 25 percent of the eligible population in the schools. Each identity treatment session lasted approximately one hour whereas each control session lasted about forty five minutes.<sup>16</sup> Average earnings per subject were ¥19.70 for those in the control treatment and ¥19.60 for those in the identity treatment. The average experimental earnings were about three times the average weekly allowance that these students received from their parents.

The summary statistics presented in Table 2 show no statistically significant difference in the demographics and other related variables between the identity and control treatments, indicating successful randomization of students across these experimental treatments. Two thirds of subjects were male. Subjects' average age was 10 years at the time of participation. About 65 percent of the fathers and 60 percent of mothers had high school or above education. The average number of other students in an

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<sup>16</sup> The instructions are adopted from Hoff and Pandey (2006) and slightly revised. The English translation of the experimental instruction and surveys are included in Appendix B – D.

experimental session that a subject had prior acquaintance with was 1.4.<sup>17</sup> Among the L *hukou* students, 22 percent were born in Beijing. The remaining L subjects had lived in Beijing for 5.5 years on average, or more than 50 percent of their current life time. Although the L subjects spoke in a perfect local accent and dressed in a way that was indistinguishable from their local counterparts, their self-image was highly correlated with their *hukou* status. According to the survey data, only 9 percent of L subjects (compared to 85 percent of H subjects,  $p < 0.01$ ) considered themselves Beijing locals and only 33 percent of L subjects compared to 89 percent of H subjects ( $p < 0.01$ ) expected to be considered a Beijing local by their fellow students or teachers.

## 5. Results

In this section, we will examine the impact of publicly revealing individuals' *hukou* identity on individual behavior and economic outcomes. Results are discussed at the end of this section.

In the analysis, the two blocks in the Pure Piece Rate regime and the first block in the Mixed Tournament regime are referred to as the *piece rate blocks* since they all involve the piece rate payment method. The second block in the Mixed Tournament regime is referred to as the *tournament block*. Data in the first blocks of both payment regimes are pooled whenever appropriate because of the identical experimental design. For the tests based on aggregate data, the student t test of mean comparison is used for male sessions whereas Wilcoxon rank sum test is used for female sessions due to the small number of observations. Two tail test  $p$  values are reported unless noted otherwise.

Figure 1 shows the average number of mazes solved by gender and *hukou* with panel A pertaining

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<sup>17</sup> This is comparable with the 1.4 average number of subjects a student knew in his session in Hoff and Pandey (2006) study.

to the first block of both payment regimes, panels B and C pertaining to block 2 of the Pure Piece Rate regime and block 2 of the Mixed Tournament regime, respectively. Several observations emerge. Panel A shows that conditional on gender there is little difference in the intrinsic ability of maze solving between the H and L *hukou* groups in the baseline control treatment: H boys solved 6.7 mazes compared to 6.5 by L boys ( $p > 0.10$ ); H girls solved 5.6 mazes compared to 5.5 by L girls ( $p > 0.10$ ). In fact, we cannot reject that the H and L subjects are drawn from the same distribution of maze-solving ability ( $p > 0.10$  for both boys and girls). Therefore, the divergence in performance between the H and L groups, if observed in the treatment, can be attributed to the difference in their responses to the *hukou* identity priming.

We also note that our results as presented in Figure 1 are largely consistent with the findings in the gender gap literature that show competition enhances performance relative to a noncompetitive environment for males but not for females (Gneezy, Niederle, and Rustichini, 2003; Gneezy and Rustichini, 2004). Comparing subjects' performance in block 2 between piece rate (panel B) and tournament (panel C), we find that H boys solve significantly more mazes (8.4 vs. 10.2,  $p < 0.05$ ), and girls solve fewer (8.3 vs. 7.3 for L girls,  $p > 0.10$ ) or about the same number of mazes (7 vs. 7.2 for H girls,  $p > 0.10$ ) in the tournament. L boys solve fewer mazes in the tournament compared to in the noncompetitive environment but the difference is not statistically significant (9.3 vs. 8.6,  $p > 0.10$ ).

Since the research question of primary interest in this paper is the influences of *hukou* identity we focus on comparisons between the identity and control treatments next. In panels A and B, the comparison between the two treatments implies that under the piece rate payment method the influence of *hukou* on one's *effort* may depend on the H or L *hukou* type. Specifically, making *hukou* salient increases the number of mazes solved by H boys (6.7 mazes in the control vs. 6.9 in the identity treatment in block 1,  $p > 0.10$ ; 8.4 vs. 9.4 in block 2,  $p > 0.10$ ) and by H girls (5.6 vs. 5.8 in block 1,  $p >$

0.10; 7 vs. 7.8 in block 2,  $p > 0.10$ ); making *hukou* salient *decreases* the performance for L boys (6.5 mazes in the control vs. 5.9 in the identity treatment in block 1,  $p > 0.10$ ; 5.5 vs. 5 in block 2,  $p > 0.10$ ) and for L girls (9.3 vs. 8.4 in block 1,  $p > 0.10$ ; 8.3 vs. 6.8 in block 2,  $p < 0.05$ ). In contrast, panel C suggests that the impact of *hukou* on *competitiveness* may be contingent on gender. In the tournament regime both H and L boys perform less well, and both H and L girls perform better in the identity treatment than in the control although these differences in performance are statistically insignificant ( $p > 0.10$ ).

Figure 2 presents subjects' earnings in the Pure Piece Rate regime.<sup>18</sup> We find that when the *hukou* background is kept private in the control treatment there is no significant difference in experimental earnings between the L and H subjects – this is true for both boys and girls ( $p > 0.10$ ). This again confirms that H and L students do not differ in their intrinsic ability in the task of maze solving. However, both L boys and L girls earn significantly *less* compared to their H counterparts when their *hukou* identity is publicly revealed in the identity treatment. H boys earn an average of ¥16.5, compared to ¥14.1 by L boys ( $p < 0.05$ ). H girls earn an average of ¥13.9, compared to ¥11.9 by L girls ( $p > 0.10$ ). Figure 3 further contrasts the distribution of experimental earnings across the two treatments in terms of earnings percentiles.<sup>19</sup> Panel A shows that revealing *hukou* makes H subjects move up the earning distributions ( $p < 0.10$ , two-side rank sum test). In contrast, panel B shows that revealing *hukou* shifts

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<sup>18</sup> The earnings do not include the ¥3 participation fee. Since ¥1 is paid for each maze under piece rate, the numbers presented in Figure 2 equal the average total number of mazes solved in blocks 1 and 2 under the Pure Piece Rate regime. Subjects' earnings under the Mixed Tournament regime are not the focus here due to the large variance in earnings because of the winner-take-all rule.

<sup>19</sup> See FigureA1 in the appendix for similar conclusion when we analyze the distribution of actual experimental earnings in yuans rather than earnings percentile.

the rankings of L subjects towards the left tail of the distribution ( $p < 0.10$ ).<sup>20</sup> These results suggest that *hukou* identity may lower the effort of L type subjects.

Figure 4 summarizes subjects' improvement in maze solving ability over time, or degree of learning, which is measured by the increase in the number of mazes from block 1 to block 2. We find that the degree of learning is similar across the two treatments for H boys, H girls, and L boys ( $p > 0.10$ ). However, for L girls, learning is marginally *less* efficient in the identity treatment (1.7 mazes) than in the control (2.7 mazes,  $p < 0.10$ ) under the Pure Piece Rate regime, and significantly *more* efficient in the identity treatment (3.6 mazes) than in the control (1.9 mazes,  $p < 0.05$ ) under the Mixed Tournament regime. It suggests that when the low social status is publicly revealed for L girls in the identity treatment, a competitive environment improves their performance more effectively than a noncompetitive environment.<sup>21</sup>

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<sup>20</sup> Note we pool data of the females and males for each *hukou* type. The pattern is similar if the distributions are separated by gender.

<sup>21</sup> This result pertains to an interaction effect of low social status and competitive environment on females' performance, hence is not contradictory to the main findings in the gender gap literature (e.g., Gneezy, Niederle, and Rustichini, 2003; Gneezy and Rustichini, 2004) that implicitly assumes equal intra-gender social status. In fact, our results in the *control* treatment (without the identity prime) are largely consistent with the previous findings. In the control treatment, the improvement in performance (from block 1 to block 2) is significantly higher for H boys in the Mixed Tournament than in the Pure Piece Rate regime (3.0 vs. 2.1,  $p = 0.05$ , one-side t test). The improvement in performance across the two payment schemes is about the same for H girls (1.4 vs. 1.6) and L boys (2.5 vs. 2.4). For L girls, the improvement in performance reduces from 2.7 in the Pure Piece Rate regime to 1.9 in the Mixed Tournament ( $p > 0.10$ ). Unlike previous studies, our results suggest that a gender heterogeneous

The above results, based on aggregate statistics, may be confounded by unobservable school characteristics. Thus, to further investigate the influences of *hukou* identity on individual’s behavior and economic outcome, we now turn to regression analyses which allow us to control for unobservable school characteristics. We pool data of both H and L subjects, boys and girls so that the impacts of publicly revealing *hukou* identity can be directly compared across *hukou* status and gender. The following school fixed effect model applies throughout the regression analysis:

$$Y_{is} = \beta_0 + \beta_1 \text{salient hukou}_i + \beta_2 L_i + \beta_3 (L_i \cdot \text{salient hukou}_i) + \beta_4 \text{female}_i + \beta_5 (\text{female}_i \cdot \text{salient hukou}_i) + \beta_6 \text{grade}_i + \beta_7 \text{block2}_i + \alpha_s + \eta_{is}$$

$Y_{is}$  denotes the dependent variable of interest - number of mazes solved, (experimental) earnings percentile, or learning by individual  $i$  in school  $s$ . The independent variables include dummy variables for the identity treatment variable (*salient hukou*), low *hukou* type ( $L$ ) (the omitted category is the H type), and gender (*female*). The treatment variable *Salient hukou* is interacted with  $L$  (or gender) to allow the impact of revealing *hukou* identity to differ with one’s *hukou* type (or gender). In addition, we control for *grade*, and *block 2* when applicable.<sup>22</sup> School fixed effects,  $\alpha_s$ , control for unobservable, school-specific characteristics.  $\eta_{is}$  is the error term. The regression results are presented in Table 3.<sup>23</sup>

We first investigate individual performance in solving mazes. The dependent variable is the number of mazes solved. Column 1 of Table 3 focuses on the piece rate payment method which includes

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response to a competitive environment may be contingent on one’s status in the societal hierarchy. More discussion of this result is provided at the end of this section.

<sup>22</sup> The correlation between grade and subjects’ age is 0.7 ( $p < 0.01$ ). Results are consistent using age or grade. However, using grade yields a higher (adjusted)  $R^2$ .

<sup>23</sup> An ordered probit model is used in column (4) and OLS is used in all other columns.



both blocks of the Pure Piece Rate regime and block 1 of the Mixed Tournament regime. We include a dummy variable *block 2* to control for learning. Since each subject in the Pure Piece Rate regime is associated with two observations standard errors are clustered at the individual level to take account of the interdependence of these observations. Column 2 focuses on the tournament block. Results in column 1 show that in the piece rate blocks, making *hukou* salient insignificantly increases H group's effort (coefficient 0.300,  $p > 0.10$ ). However, it significantly *decreases* the L group's effort since the coefficients of *salient hukou* and its interaction with *L* suggest that L subjects solved 0.772 ( $p < 0.01$ ) less mazes in the identity treatment than in the control.<sup>24</sup> This impact is both statistically significant and economically substantial. Given that the L group solved 7.6 mazes on average in the two blocks of the Pure Piece Rate regime in the control treatment, this effect of *hukou* identity can be interpreted as a 10 percent drop in effort by the L group. In the tournament block (column 2), the *hukou* identity has insignificant impact on one's competitiveness for the H and L groups ( $p > 0.10$ ). In both columns 1-2, the effects of other covariates are consistent with our expectations. Boys solved more mazes than girls. The higher the grade, the better is the individual's performance. The covariate *block 2* enters with a significantly positive sign, suggesting an improvement in performance over time due to learning.

The above analysis leads to our first result.

**Result 1** (Effort). In the piece rate blocks when one's *hukou* identity is made salient, the L subjects significantly reduce their effort level, and the H subjects insignificantly increase their effort level.

Result 1 implies that one's *hukou* identity, when publicly revealed, may distort individual's effort level in response to incentives. What does this distortion entail regarding the income distribution across

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<sup>24</sup> The coefficients of *salient hukou* and its interaction with *L* are 0.300 and -1.072, respectively. It suggests that the impact of publicly revealing *hukou* on L *hukou* group's effort is 0.772 ( $p < 0.01$ ).

different *hukou* groups? Presume that the control treatment simulates the ‘state’ *without hukou* whereas the treatment condition simulates the ‘state’ *with hukou*. If we then rank subjects (regardless of gender and *hukou* background) based on their experimental earnings in the control and the identity treatment, respectively, any difference in the distribution of earnings between the two states can be inferred as evidence of the impact of the *hukou* system in distorting individuals’ response to incentives. Descriptive statistics on earnings percentiles (Figure 3) show that 53 percent of H subjects and 38 percent of L subjects rank below the median earning in the control treatment, whereas 41 percent of H subjects and 58 percent of L subjects rank below the median earning in the treatment condition.<sup>25</sup> This suggests that the number of L subjects in the low earning bracket rises due to their reduced effort ( $p < 0.05$ , two-side test of proportion) in the state with *hukou*.

To check the robustness of this finding we run a regression analysis in column 3 of Table 3 with subject’s earnings percentile as the dependent variable. The coefficient of *salient hukou* is 7.458 ( $p > 0.10$ ), suggesting that priming *hukou* identity insignificantly increases H *hukou* group’s ranking in the earnings distribution. The sum of the coefficients of *salient hukou* and its interaction with L (-11.74,  $p < 0.05$ ) suggests that publicly revealing one’s *hukou* identity significantly decreases a migrant student’s ranking in the earnings distribution by 11.74 percentiles. In column (4) we also report the results from an ordered probit regression with four earnings categories (see Figure 3) as the dependent variables.<sup>26</sup> The results are consistent with those in column (3). We also find that girls generally ranked lower than boys

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<sup>25</sup> The median earning (excluding the participation fee) in both the control and the treatment conditions is ¥15. The average earning is ¥14.51 in the control condition, and ¥14.52 in the treatment condition.

<sup>26</sup> The dependent variable ‘earnings distribution category’ in column (4) takes values of 1, 2, 3 and 4 if one’s earning in the Pure Piece Rate regime is below the 25<sup>th</sup> percentile, between the 25<sup>th</sup> and 50<sup>th</sup>, between the 50<sup>th</sup> and 75<sup>th</sup>, and above the 75<sup>th</sup> percentile of the distribution.

( $p < 0.01$ ), and students from higher grades ranked higher than those from lower grades ( $p < 0.01$ ). This finding leads us to result 2.

**Result 2** (Earnings distribution). Under the Pure Piece Rate regime, priming *hukou* identity significantly decrease the L type subjects' ranking, and insignificantly increases the H type subjects' ranking in the earnings distribution.

The results for learning are presented in column 5 (the Pure Piece Rate regime), columns 6 and 7 (the Mixed Tournament regime) of Table 3. The dependent variable is the increase of the number of mazes from block 1 to block 2. Column 5 shows that making *hukou* salient does not affect subjects' learning under the Pure Piece Rate regime ( $p > 0.10$ ). For the Mixed Tournament regime, we add the *salient hukou* and *female* interaction term in column 7 since the summary statistics in Figure 4 suggest that the impact of *hukou* identity on learning may vary across different gender groups. Results in column 7 show that under the Mixed Tournament regime *hukou* identity affects the learning efficiency of girls but not boys. Specifically, learning is 1.22 mazes ( $p < 0.05$ ) higher for L girls and 1.02 mazes ( $p < 0.10$ ) higher for H girls in the identity treatment than in the control, both representing 63 percent increase in learning efficiency compared to the control treatment.<sup>27</sup> In addition, we find that the extent of learning is on average lower for girls than for boys ( $p < 0.10$  in column 5;  $p > 0.10$  in columns 6 and 7). The higher the grade a student was in, the better the learning was ( $p < 0.01$ ). This leads us to result 3.

**Result 3** (Learning). Under the Mixed Tournament regime priming *hukou* identity improves subjects' learning efficiency significantly for L girls and marginally for H girls.

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<sup>27</sup> In the control condition under the Mixed Tournament regime, the increase in the number of mazes from blocks 1 to 2 is 1.93 mazes for L girls and 1.60 mazes for H girls.

While results 1-3 focus on the impact of *hukou* identity on *individual* behavior and earnings we next ask whether the *hukou* system affects *aggregate* production efficiency. In this study, aggregate production efficiency can be measured in terms of the average total number of mazes solved by all the subjects (regardless of *hukou* types) or per group in an experimental session. However, since some sessions had fewer than six subjects due to school absence of some pre-selected subjects, we use the average number of mazes solved per subject to evaluate production efficiency of sessions. Table 4 provides a summary on this measure of efficiency along with the  $p$  values of the test of means. Data in the first block of the Pure Piece Rate regime and the Mixed Tournament regime are pooled again because of the identical design. We find that per capita mazes solved are similar across the control and the identity treatments regardless of gender and payment regime. In some cases (e.g., block 1 for male and female groups) per capita mazes solved are slightly lower in the identity treatment than in the control; in other cases (e.g., block 2 piece rate for the male group, block 2 tournament for the female group) they are slightly higher in the identity treatment than in the control. In all cases the difference between the identity treatment and the control is statistically insignificant ( $p > 0.10$ ). This suggests that the positive impact of *hukou* on the H status group and its negative impact on the L status group are counterbalanced, and the *hukou* system may not affect aggregate productivity. We, therefore, conclude that:

**Result 4** (Aggregate production efficiency). The presence of the *hukou* institution does not affect the aggregate production efficiency regardless of the payment regime.

### *Discussions of Results*

Our results indicate that individuals' behavior is distorted by the *hukou* institution in terms of their response to incentives. This suggests that the practice of permanently assigning households to a rural status and discriminating against them for half a century has profoundly shaped citizens' social identities, especially for the socially 'excluded' *hukou* groups in China. This social identity may have been *internalized* by children of rural migrants in urban areas thereby adversely impacting their performance on cognitive tasks. It is, thus, probable that their educational performance as well as their outcomes in the labor market may be negatively affected. While the literature in development economics and transitional economics attributes China's intra-urban income inequality to the disparity in resource allocations due to the discriminatory system, this study suggests that the *internalized* inferior social identity may serve as another avenue through which the *hukou* system exacerbates intra-urban income inequality in China.

Our results may be explained by stereotype threat, a well-established finding in social psychology. The stereotype threat literature show that making social identity salient in a laboratory often makes subjects behave consistently with the stereotypes associated with that social group, and hence may activate the *negative* stereotypes and hurt subjects' performance in relevant tasks. For example, Steele and Aronson (1995) find that African Americans who are stereotyped to be poor students underperformed on academic tests when they were asked to indicate their race prior to taking the test. Similar findings on underperformance are documented for Hispanic Americans in Aronson, Quinn and Spencer (1998), and are extended to individuals from low socio-economic background by Croizet and Claire (1998). Since rural workers generally migrate from economically less developed areas to more developed ones for better work opportunities in China, these rural migrants are generally stereotyped to be "uneducated, ignorant, dirty and having higher propensities to be criminals" (Wang and Zuo, 1999). Migrant children are stereotyped to be less intelligent and have low academic achievement. These

negative stereotypes may be reinforced repeatedly and internalized by the migrant students. In our study, this self-image may be activated for migrant students following the priming of their ‘inferior’ *hukou* background, and may prevent these students from performing to their full potential in the assigned tasks.

There are two other possible explanations for identity impacts addressed by Hoff and Pandey (2004). First, the intimidation effect, i.e., knowing that they are evaluated along with their local urban counterparts may hurt migrant students’ self confidence in the identity treatment. This is unlikely to be the primary driver of the results in this paper for the following reasons. In Hoff and Pandey’s study, subjects were recruited individually from their homes in different villages, and were transported to the laboratory set up at a local junior high school the next day. The experiments were conducted while schools were closed. This recruiting process and logistical arrangement was more likely to introduce an intimidation factor when subjects’ castes were publicly revealed in the identity treatment, compared to the control treatment in which their castes were kept private.<sup>28</sup> In contrast, our subjects were recruited from schools where migrant students and their local urban counterparts studied and interacted on a daily basis. All the experimental sessions were conducted at subjects’ regular schools during class breaks on days when their school was in session. Therefore, the intimidation factor, if any, is held constant across the control and the identity treatments because subjects were randomly assigned to the sessions. As a result, the findings based on the comparison across the two treatments should be net of the intimidation effect. In addition, the substantial increase in migrant girls’ competitiveness in the tournament regime in the identity treatment indicates that our results are least likely to be driven by the intimidation factor.

The second hypothesis is experimenter discretion, i.e., in our case, L subjects may expect to be discriminated by the experimenters, all of who spoke Chinese Mandarin with an urban accent and may

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<sup>28</sup> The authors control for this possibility by running extra pure-caste sessions that consisted of either the high or the low caste, and comparing the results with those in the mixed-caste sessions.

have been perceived as Beijing locals. There are two reasons why we discount this possibility. First, as pointed out in the discussion of experiment design, only the experimenters in a session knew the *hukou* status of each assigned ID. However, the maze puzzle booklets, after each block, were handed to graders outside the laboratory who did not know the *hukou* status of any ID number. The experimenters did not leave the laboratory throughout the session. Although the grading procedure was not announced to the subjects in advance, we conjecture that the subjects were aware, particularly in block 2 of a session, that the experimenters were present in the laboratory throughout and unlikely to influence the grading process. Second, the above belief is borne out by the data as well. For instance, if our results were driven by experimenter discretion in the piece rate payment method we would observe a *lower* degree of performance reduction (when identity was publicly revealed) in block 2 than in block 1, since in block 2 subjects knew for certain that the experimenters were unlikely to influence the grading process. Nevertheless, we observe the opposite, i.e., the reduction in performance is actually *higher* in block 2. Figure 1 shows that for L boys the performance reduction from the identity treatment to the control is 0.6 in block 1 ( $p < 0.10$ , one-side t test of mean comparison) and 0.9 in block 2 ( $p < 0.10$ , one-side t test of mean comparison). The corresponding performance reduction is 0.5 ( $p > 0.10$ , one-side Wilcoxon rank sum test) and 1.5 ( $p < 0.05$ , one-side Wilcoxon rank sum test) for L girls. This suggests that experimenter discretion is unlikely to be a contributing factor in our results.

Our findings also suggest that migrant girls are more likely to improve their learning efficiency *in competition* in response to the public revelation of their inferior socio-economic status. As noted earlier in the paper, this result focuses on an interaction effect of inferior social status and competitive environment on females' performance, which extends the previous findings that competition enhances performance relative to a noncompetitive environment for males but not for females (Gneezy, Niederle, and Rustichini, 2003; Gneezy and Rustichini, 2004). We conjecture that our result may be explained by

the twin identity of being of the female gender and of *L hukou* status. Typically, migrant girls have to face *dual* discrimination in their lives – discrimination against rural migrants and gender discrimination. It is well accepted that in traditional Chinese society boys are preferred to girls and parents are likely to invest more in boys' education than girls'. This gender bias is more apparent in the rural areas than in the urban areas (Park and Rukumnuaykit, 2004) and in rural migrant families than in local urban families. In addition, rural families are more likely to have an additional child if the first child is a girl.<sup>29</sup> Therefore, compared to other students, migrant girls are on average more likely to have siblings and thereby more likely to compete for allocation of intra-household resources. Specifically, given the higher opportunity costs of sending girls to school for migrant parents, it is possible that if these girls do not excel academically, relative to their brothers, parents may discontinue their education. For these reasons we presume that migrant girls exert greater effort in a competitive environment which enhances

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<sup>29</sup> In a study of childbearing behavior of rural-urban migrants in Shenzhen, Feldman, Haifeng, Shuzhuo and Xiaoyi (2008) finds that the sex ratio of migrant children is as high as 163 male births per 100 female births while it is 118 per 100 female births for mainland China, on average. They also found that the later in the birth order, the higher the sex ratio for the child, i.e., the sex ratio is 1.52 for the first birth and rises steeply to 1.80 for the second birth, peaking at 1.94 for the third and above birth. This suggests that migrants have a stronger son preference than an average Chinese. Further, under China's One Child Policy rural families are currently allowed to have an additional child subject to government approvals, if the first child is a girl, in some provinces subject to income or health constraints. Rural *migrant* households are also more likely to 'illegally' have additional children than local urban households since many rural migrants do not register with the local government in their host cities, which makes it more difficult for the government to monitor the number of child births among rural migrants.



their learning efficiency in the Mixed Tournament games. However, more research needs to be conducted to explore this result further.

## 6. Conclusion

We conduct an experimental study to investigate the causal impact of social identity on individuals' response to economic incentives. We answer this question in the context of the role of China's household registration or *hukou* system in generating migrant identity. Our results indicate that making *hukou* identity salient adversely affects the performance of rural migrants who are lower ranked *hukou* holders. This adverse impact is significant and substantial for rural migrants. Making individuals' *hukou* status salient and public reduces the performance of rural migrant children on assigned tasks by 10 percent. The performance of individuals with a Beijing *hukou* improves, but insignificantly, when *hukou* status is made salient. Although the impact of *hukou* identity on aggregate efficiency is insignificant, the reduced effort of rural migrants in the identity treatment suggests a shift in the earnings distribution to the disadvantage of rural *hukou* holders - the percentage of rural migrants below the 25<sup>th</sup> percentile of earnings in the experimental games increases by almost 19 percentage points.

The findings in this paper are consistent with Hoff and Pandey's (2006) results on caste identities in India which show that publicly revealing young *male* students' caste significantly decreases the performance of the low castes. While they focus on male students this study shows that similar results also hold for low status female students. The evidence in this paper, thus underlines the effect of institutionally created social identity in distorting individuals' *intrinsic* response to incentives and thereby playing a role in generating inequality in the distribution of gains from economic growth in a developing country. Our study also contributes to the literature by broadening the perspectives on social identities beyond race, ethnicity, religion, or caste. It shows that even in an ethnically homogenous

society like China, several-decades-long systemic policy of social exclusion can play a *powerful* role in creating identities and in turn influence individual behavior.

As suggested by Akerlof and Kranton's (2000) identity model of exclusion, the negative impacts of social exclusion are unlikely to disappear unless citizens are fully integrated into a community. Future research should, thus, study the long term impacts of identity on educational attainment and labor market outcomes of low status individuals. This strand of research will provide critical insights for designing redistributive and inclusive policies that aim to achieve more cohesive communities.

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**Table 1: Experimental Design**

Treatments	Primed <i>hukou</i> ?	Reward per maze		Number of sessions	
		Block 1	Block 2	Male	Female
1. Pure Piece Rate control treatment	No	¥1	¥1	9	6
2. Mixed Tournament control treatment	No	¥1	¥6; winner takes all	9	5
3. Pure Piece Rate identity treatment	Yes	¥1	¥1	15	7
4. Mixed Tournament identity treatment	Yes	¥1	¥6; winner takes all	15	6

Note: The experiment consists of 418 subjects.

**Table 2: Summary Statistics**

Variables	Control Treatment			Identity Treatment			Two-side p value <sup>a</sup>
	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	
Grade	4.28	1.04	168	4.37	1.10	250	0.41
Age (years)	9.84	1.32	168	9.80	1.27	250	0.76
Mazes (block 1)	6.19	2.44	168	6.10	2.27	250	0.71
Mazes (block 2)	8.46	2.87	168	8.56	2.84	250	0.74
Total earnings <sup>b</sup>	19.70	21.26	168	19.60	20.77	250	0.96
Years of local residence <sup>c</sup>	5.78	3.40	63	5.60	2.85	91	0.73
Father's education							
High school	0.42	0.50	156	0.38	0.49	247	0.35
College/Graduate degree	0.25	0.43	156	0.25	0.43	247	0.98
Mother's education							
High school	0.40	0.49	155	0.35	0.48	246	0.27
College/Graduate degree	0.23	0.42	155	0.24	0.43	246	0.68
Fraction of subjects who played similar/same games before	0.73	0.45	168	0.68	0.47	250	0.28
Number of others known	1.39	1.47	165	1.36	1.28	250	0.80

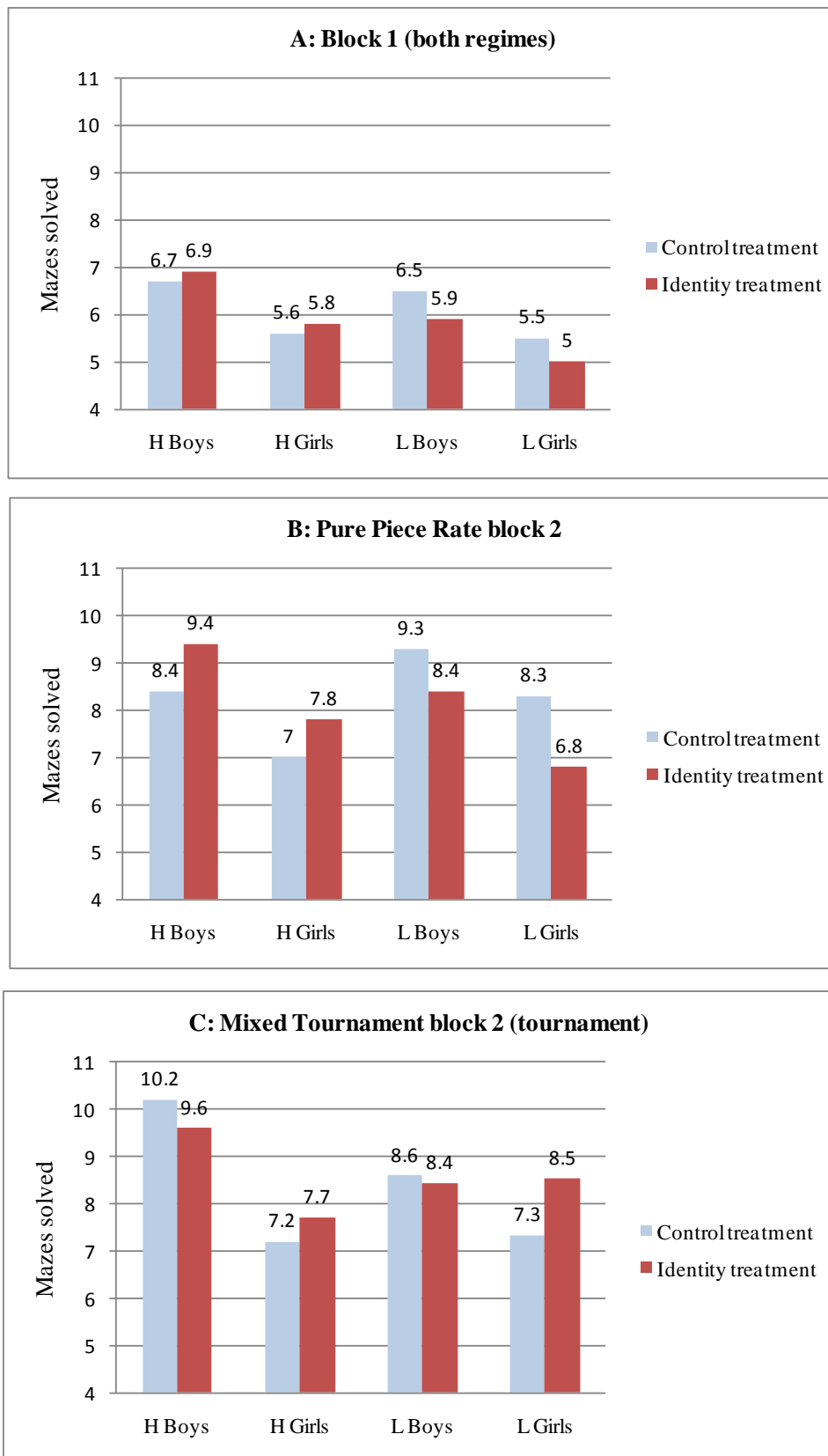
Notes:

a. The two-side p values are based on the t test of means or proportions.

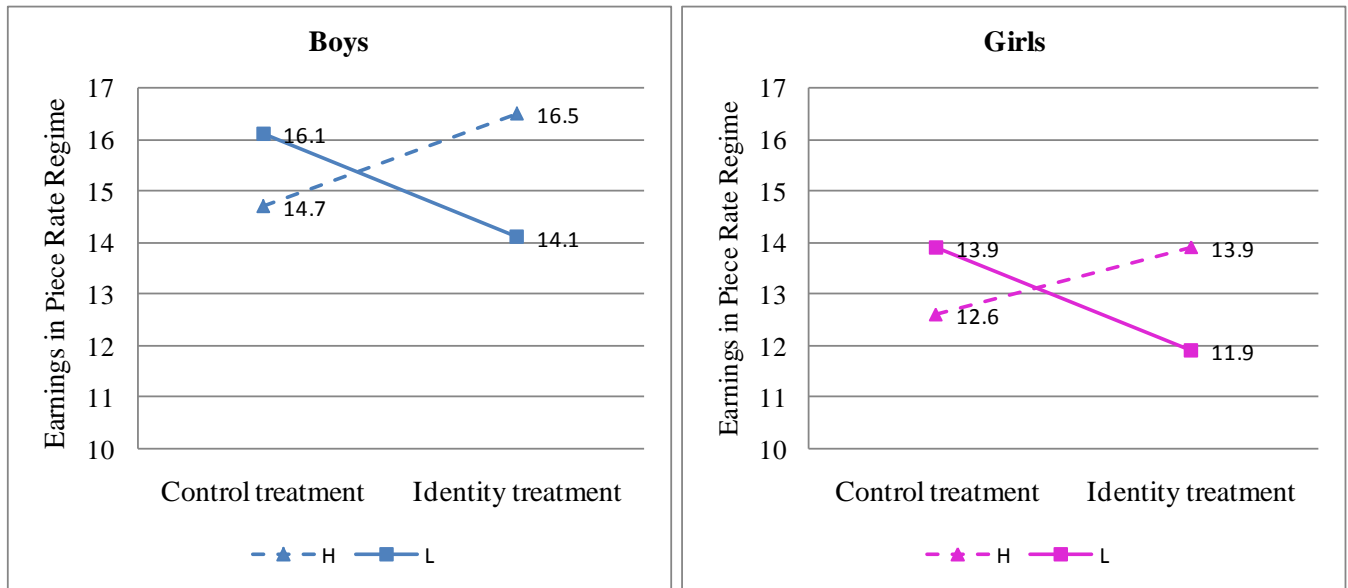
b. Total experimental earnings include the ¥3 participation fee.

c. Years of local residence are for those who were not born in Beijing.

**Figure 1: *Hukou* Identity and Performance in Solving Mazes**

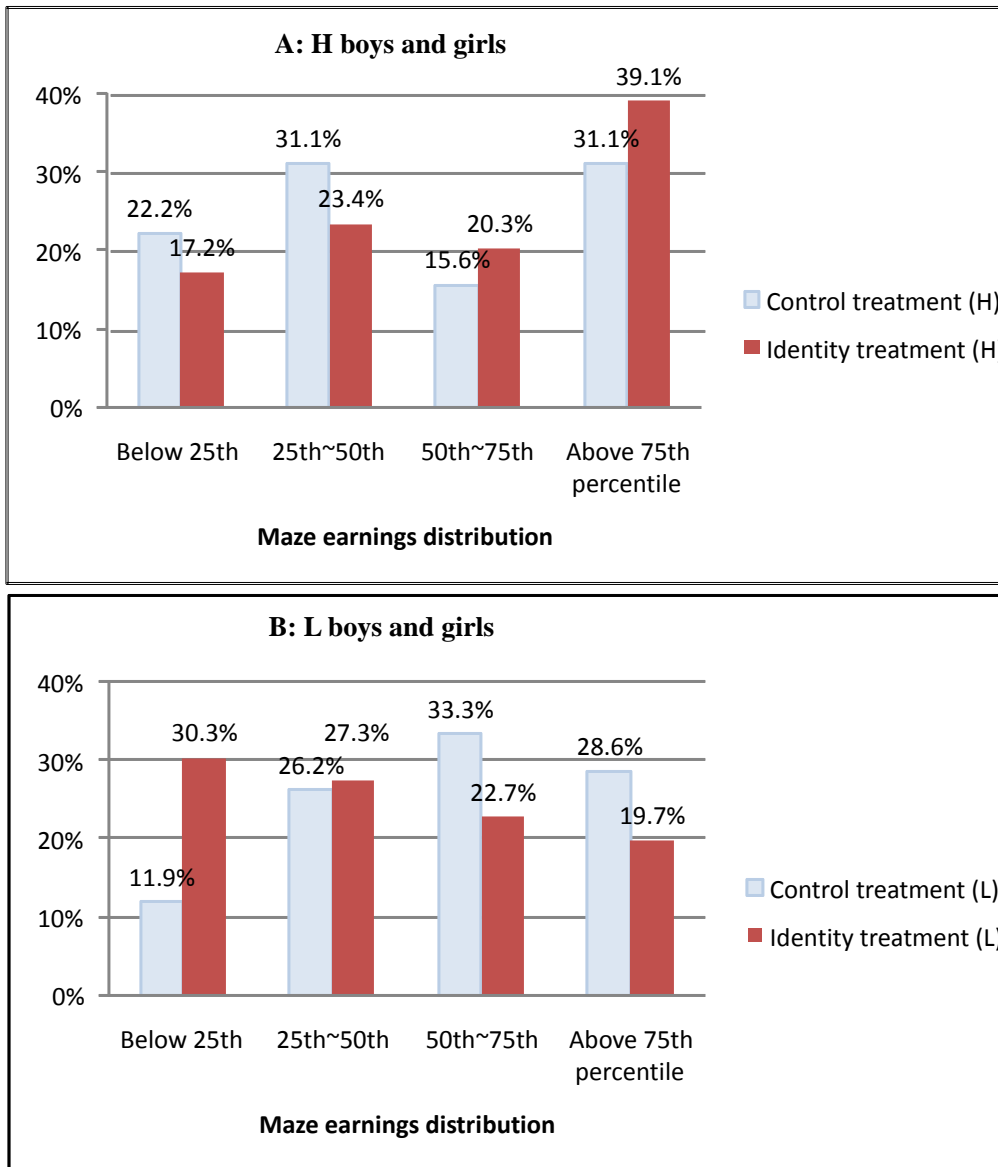


**Figure 2: Hukou *Identity* and Experimental Earnings in the Pure Piece Rate Regime**

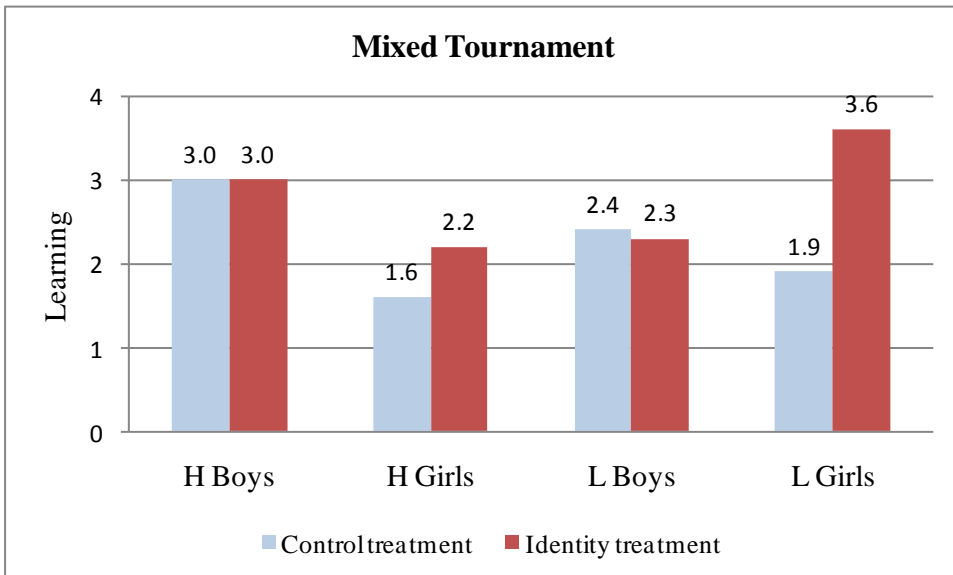
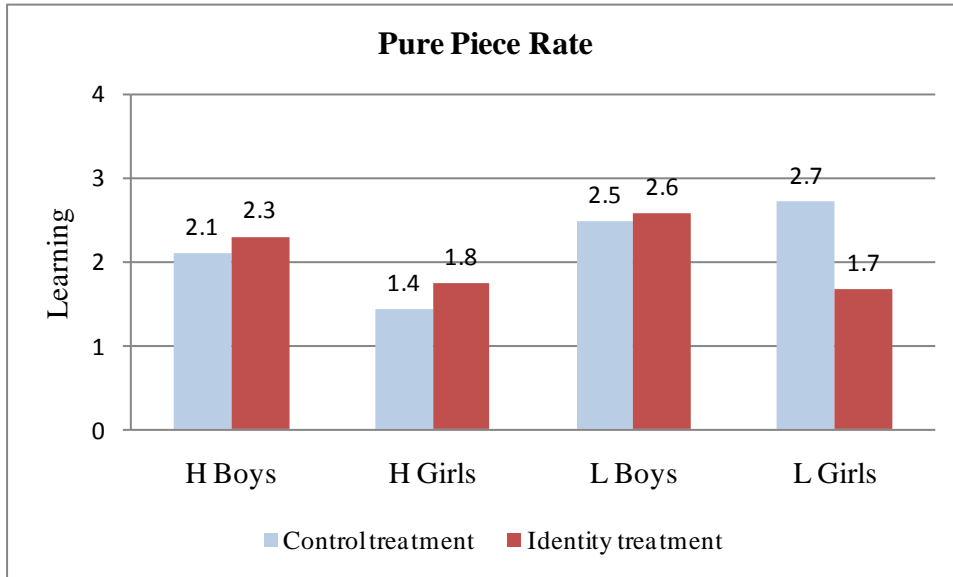




**Figure 3: *Hukou* Identity and Earnings Distribution under the Pure Piece Rate Regime**



**Figure 4: *Hukou* Identity and Learning**



**Table 3: Impact of *Hukou* Identity on Performance, Earnings and Learning**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Empirical model	OLS	OLS	OLS	Ordered probit	OLS	OLS	OLS
Dep. var.	Performance	Performance	Earning percentile	Earnings distribution category	Learning	Learning	Learning
Treatment	Piece rate blocks	Tournament block	Pure Rate regime	Piece Rate Regime	Pure Rate regime	Piece Tournament regime	Mixed Tournament regime
<i>salient hukou</i> (identity)	0.300 (0.360)	-0.297 (0.556)	7.458 (5.103)	0.175 (0.216)	0.166 (0.388)	0.314 (0.401)	-0.055 (0.448)
L	0.386 (0.361)	-0.673 (0.561)	9.185 (5.596)	0.279 (0.234)	0.780* (0.426)	-0.144 (0.432)	-0.162 (0.430)
L × <i>salient hukou</i>	-1.072** (0.457)	0.421 (0.726)	-19.198*** (7.219)	-0.701** (0.304)	-0.479 (0.549)	0.186 (0.558)	0.195 (0.555)
female	-1.046*** (0.251)	-1.313*** (0.395)	-13.935*** (4.023)	-0.498*** (0.170)	-0.551* (0.306)	-0.460 (0.319)	-1.045** (0.453)
female × <i>salient hukou</i>							1.075* (0.596)
grade	0.797*** (0.105)	1.112*** (0.165)	9.653*** (1.705)	0.347*** (0.074)	0.367*** (0.130)	0.360*** (0.131)	0.342*** (0.131)
block 2	2.283*** (0.155)						
Constant	3.139*** (0.559)	4.896*** (0.916)	11.575 (9.443)		0.340 (0.718)	0.530 (0.750)	0.894 (0.772)
Observations	635	201	217	217	217	201	201
Adjusted R <sup>2</sup>	0.304	0.264	0.184	0.067	0.036	0.031	0.042

Notes: Ordered probit analysis in column (1) is based on the Pure Piece Rate regime and block 1 of the Mixed Tournament regime. Standard errors in the parentheses are clustered at the individual level when multiple observations come from the same individual. Analysis in column (2) is based on block 2 of the mixed tournament regime. Consistent with Figure 3, the dependent variable “earnings distribution category” in column (4) takes values of 1, 2, 3 and 4 if one’s earning is below the 25<sup>th</sup> percentile, between the 25<sup>th</sup> and 50<sup>th</sup>, between the 50<sup>th</sup> and 75<sup>th</sup>, and above the 75<sup>th</sup> percentile of the earnings distribution. School fixed effects are included in all the analyses.

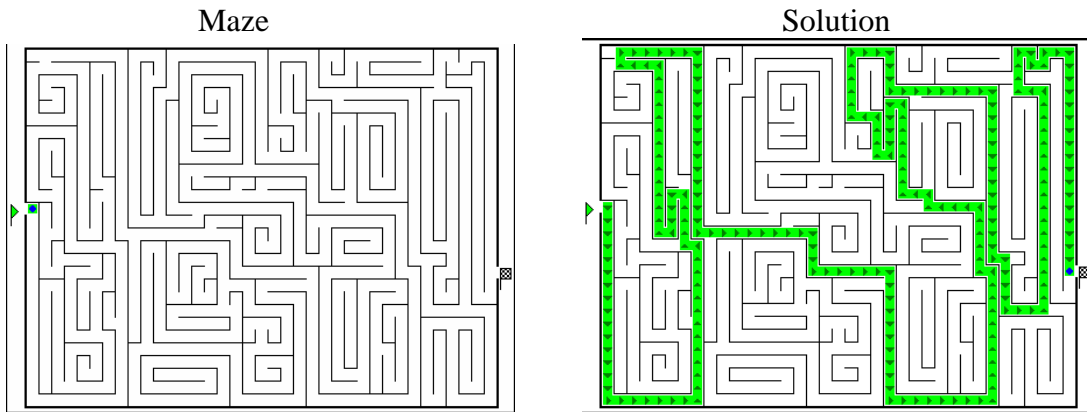
\* significant at 10 percent level, \*\* significant at 5 percent level, \*\*\* significant at 1 percent level.

**Table 4: Impact of *Hukou* Identity on Economic Efficiency**

Gender	Block 1 (all piece rate)			Block 2 piece rate			Block 2 tournament		
	control	identity	p value	control	identity	p value	control	identity	p value
Boys	6.6	6.41	0.53	8.85	8.87	0.97	9.35	9.03	0.53
Girls	5.54	5.39	0.69	7.63	7.27	0.50	7.27	8.12	0.22

Notes: Two-side p-values are based on the t test of means for boys, and the Wilcoxon rank sum test for girl

## Appendix A. A Sample Maze Game



## Appendix B. Experimental Instruction

*The instruction was given in Chinese. The English translation is presented below with the instructions for experimenters included in the parentheses in italics.*

### I. Piece rate without *hukou* primed

1. Welcome! Each of you will be compensated with 3 yuan for your participation. Please find 3 yuan in the envelope on your desk. It is yours to keep.
2. In addition, you may earn more money in the games. The average earnings will be about 12 to 18 yuan. You will be paid in cash in private at the end of the games. You are under no obligation to let others know how much you earn. You will participate in two rounds of maze solving games. The entire games will last about half an hour. Please do not talk to each other during the experiment. Please raise your hand if you had any questions.
3. First, we will show you what the game looks like and how to solve it. (*Experimenter reveals the first sample maze and explains while drawing on the poster.*) On the left hand side of the maze, it is the entrance indicated by a triangle flag. On the right hand side, it is the exit indicated by a square flag. The black lines are walls. Your task is to find a path from the entrance to the exit without crossing the walls. You may erase or cross out if you make any mistakes.
4. Let's look at the second example. It is similar to what you will need to solve in the games. (*Experimenter reveals the second example and illustrates how to solve it.*)
5. Now you will be given another maze for practice. Everyone will have 5 minutes to do so. If you have any questions, please raise your hand and we will come to you. (*Experimenter offers individual assistance to those who need help.*)
6. Next, we will start the first round of the games. Please find the booklet that says 'Round 1' on the cover. Please don't open the booklet until you are told to do so. There is one maze on each page, and in total 15 games. Everyone will be given 15 minutes to solve as many games as you can. You don't need to solve those games in order. You may skip any game as you like.

7. Now we will explain the rewards. For this round, you will get 1 yuan for each maze you solve correctly. So if you solve one, you will get one yuan. If you solve two, you will get two yuan ...

*(Experimenter reveals the following table on the blackboard and goes through this hypothetical example to make sure every subject follows the calculation of rewards. Experimenter asks subject no. 1, ‘suppose Qiang solve 4 mazes, how much he will earn?’ Then experimenter asks subject no. 2 how much Gang will earn... Hypothetical female names are used in the table if it is female session.)*

Name	Number of mazes solved	Rewards
Qiang	4	
Gang	7	
Peng	9	
Wei	12	
Hao	14	
Dong	5	

8. Recall you will have 15 minutes to solve as many mazes as you can. When 5 minutes remain we will let you know. When time is up, please put down the pencil immediately and close the booklet. Please open the booklet now. You may start. *(Experimenter collects the booklet when round 1 is over.)*

9. Next we will explain the games in round 2. Please find the booklet that says ‘Round 2’ on the cover. Please don’t open it until you are told to do so. The booklet contains another 15 games with the same difficulty level.

**10-PieceRate.** The rules and rewards in round 2 are exactly the same as that in round 1. Let’s review the reward calculation again. *(Experimenter reviews the reward table above without checking with individual subjects.)*

11. Again you will have 15 minutes to solve as many mazes as you can. We will let you know when 5 minutes are left. Please open the booklet now. You may start. *(Experimenter collects the booklet when round 2 is over.)*

12. Please find the booklet that says ‘Survey’ on the cover. While we are grading your games and computing your payoffs please complete the survey. Please try to answer as many questions as you can. We are not going to share individual answers with anyone else including your teachers.

13. You will now be paid in private. Remember you don’t have to tell others how much you earned. Thank you for your participation in our study!

II. Tournament without hukou primed

*(Replace step 10-PieceRate above with step 10-Tournament below. Keep other steps the same as in Piece Rate.)*

**10-Tournament.** Please note that the rules now are different from round 1. In this round, you will compete with each other. Only the winner(s) will get rewards. The winner(s) is/are the person(s) who solve(s) the greatest number of mazes. The reward for the winner(s) is 6 yuan each game. So if he solves one maze, he will get 6 yuan. If he solves two mazes, he will get 12 yuan. If he solves three mazes, he will get 18 yuan... If it’s a tie, all the winners will be compensated. Each of them will get 6 yuan per game. Let’s go over one example.

Name	Number of mazes solved	Winner	Rewards
Qiang	4		
Gang	7		

Peng	9
Wei	12
Hao	14
Dong	5

*(Experimenter adds one more column ‘winner’ in the reward calculation table. Experimenter checks with each subject, e.g., ‘Is Qiang the winner? How much does he earn in this case?’)*

### III. Piece rate with hukou primed

*(Same as I. except that Step 0 is added.)*

0. Welcome! Each of you will be compensated with 3 yuan for your participation. Please find 3 yuan in the envelope on your desk. It is yours to keep. Now please find the booklet that says ‘Survey 1’ on the cover. Please try to answer as many questions as you can. We will keep your answers confidential and will not share them with anyone else including your teachers. *(After everyone completes the survey, experimenter goes to each student, and verifies in public their names, month and date of birth, and hukou information. Students nod and say yes if information is correct.)*

### IV. Mixed Tournament with Hukou Announced

The same as Mixed Tournament except that Step 0 is added.

#### V.A. Mixed Tournament with Hukou Announced, and H Only

The same as Mixed Tournament except that Step 0 is added. Note there are 6 Beijing urban students (H) in this session.

#### V.B. Mixed Tournament with Hukou Announced, and M Only

The same as Mixed Tournament except that Step 0 is added. Note there are 6 Non-Beijing urban students (M) in this session.

#### V.C. Mixed Tournament with Hukou Announced, and L Only

The same as Mixed Tournament except that Step 0 is added. Note there are 6 Non-Beijing rural students (L) in this session.

### Appendix C. Pre-experimental Survey (used in the HL treatment)

1. Place of birth: \_\_\_\_ province \_\_\_\_ city \_\_\_\_ street/village
2. If you were not born in Beijing, when did you move to Beijing? \_\_\_\_\_ year
3. The location of your *hukou*: \_\_\_\_ province \_\_\_\_ city \_\_\_\_ street/village  
 Check here if you don't know the answer.
5. Which dialect do you speak with your parents at home?  
a) Beijing dialect, b) Other, please specify \_\_\_\_\_
6. Do you consider yourself as Beijing local?  
a) Yes, b) Somewhat, c) No, d) Don't know
7. Do your classmates consider you as Beijing local?  
a) Yes, b) Somewhat, c) No, d) Don't know
8. Do your teachers consider you as Beijing local?  
a) Yes, b) Maybe, c) No, d) Don't know
9. Were you charged 40 *yuan* rural guest student fee or 80 *yuan* local student fee at the beginning of this semester?  
a) 40 *yuan* (rural guest student fee), b) 80 *yuan* (local student fee), c) other \_\_\_\_\_
10. Where do the students come from in your class?  
a) All from Beijing, b) Most from Beijing, and some from elsewhere,  
c) Some from Beijing, and most from elsewhere, d) Don't know
11. Compare Beijing local students and those from non-Beijing rural areas, what are your opinions regarding the following questions?
  - i) Who generally study harder?  
a) Beijing local students, b) Students from non-Beijing rural areas,  
c) They study equally hard.
  - ii) Who are more active participating in classes, e.g., ask and answer questions?  
a) Beijing local students, b) Students from non-Beijing rural areas,  
c) They are equally active in class participation.
  - iii) Who are more active participating in extracurricular activities?  
a) Beijing local students, b) Students from non-Beijing rural areas,  
c) They are equally active in those activities.
  - iv) Who are thriftier with money?  
a) Beijing local students, b) Students from non-Beijing rural areas,  
c) They are equally so.



## Appendix D. Post-experimental Survey<sup>30</sup>

1. Place of birth: \_\_\_\_\_ province \_\_\_\_\_ city \_\_\_\_\_ street/village
2. If you were not born in Beijing, when did you move to Beijing? \_\_\_\_\_ year
3. The location of your *hukou*: \_\_\_\_\_ province \_\_\_\_\_ city \_\_\_\_\_ street/village  
 Check here if you don't know the answer.
4. Your father's employer:
  - a) Government, including military, b) State owned company, c) Privately owned company,
  - d) Foreign invested enterprises, e) Self-employed, f) Others, please specify: \_\_\_\_\_
5. Your father's highest level of education achieved:
  - a) Elementary school, b) Middle school, c) High school, d) College, e) University, f) Graduate school
6. Your mother's employer:
  - a) Government, including military, b) State owned company, c) Privately owned company,
  - d) Foreign invested enterprises, e) Self-employed, f) Others, please specify: \_\_\_\_\_
7. Your mother's highest level of education achieved:
  - a) Elementary school, b) Middle school, c) High school, d) College, e) University, f) Graduate school
8. Your average ranking in your class is:
  - a) Top 25%, b) 25%-50%, c) 50%-75%, d) 75%-100 %, e) don't know for sure
9. Do you like living in the current residential area?
  - a) Like it very much, b) Like, c) neutral, d) Dislike, e) Dislike it very much
10. Where will you want to live when growing up?
  - a) Beijing, b) Your hometown, please specify \_\_\_\_\_,
  - c) Other cities in China, please specify \_\_\_\_\_, d) Foreign country, please specify \_\_\_\_\_
11. What is your ideal job when growing up?
12. How much pocket money do your parents give to you per week? (Please exclude the expense on meals and transportation)
  - a) Less than 3.5 *yuan*, b) 3.5-7 *yuan*, c) 7-10.5 *yuan*, d) 10.5-14 *yuan*, e) more than 14 *yuan*
13. Have you ever played this kind of maze game before?
  - a) No, b) Played similar games before, c) Played exactly the same games before
14. How hard did you think these maze games were?
  - a) Very hard, b) Hard, c) Neutral, d) Easy, e) Very easy
15. How many other students in this session do you know by name?
  - a) 0, b) 1, c) 2, d) 3, e) 4, f) 5

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<sup>30</sup> For the treatment sessions, the first three questions were included in the pre-experiment survey.

**Appendix E**

**Figure A1: *Hukou* Identity and Earnings under the Pure Piece Rate Regime**

