Migrants' Earnings and Human Capital in the Urban Informal Sector: The Case of Cycle Rickshaw Pullers in Delhi, India[*]

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Abstract: This paper empirically examines the correlates of earnings by cycle rickshaw pullers in Delhi, India, using a unique dataset of 1,320 rickshaw pullers that represent the whole area of Delhi, collected in 2011. Among potential correlates, we focus on human capital measured in schooling and job experience. As the majority of cycle rickshaw pullers are migrants from rural parts of India and the job of cycle rickshaw pulling is not regulated by the government, the descriptive analysis allows us to examine the relationship between migrants' earnings and human capital in the urban informal sector in a developing country, which is rare in the literature. We find that the relationship between human capital and income is non-linear, with positive correlation at the very low level of education and experience, turning into negative correlation with more accumulation of human capital. We interpret the latter as the effect of selection (only those with less ability among the relatively human capital rich remain in the business) and the result of decreasing work effort or morale (short term migrants have a strong incentive to earn from the job even if it is not sustainable in the long run). The finding suggests that accumulating more human capital and shifting to occupations that reward such human capital are required to move out of poverty in the long-run.

Keywords: migration, informal sector, human capital, job experience, urban poverty, India.
JEL classifications: O17, R23, J24, J61.

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1. Introduction

The inflow of migrants from rural to urban areas where informal jobs are expanding has been one of the central themes of development economics (e.g., Williamson, 1988). As originally modeled by Todaro (1969), individuals migrate if their expected earnings from migration are higher than what they would earn by staying. The expected earnings after migration depend on the probability of finding a job in the formal sector and the earnings differentials between formal and informal jobs in cities. The importance of the issue was highlighted again in 2009, when UNDP's *Human Development Report* focused on migration, both within and beyond borders (UNDP, 2009), and the World Bank's *World Development Report* focused on economic geography, especially the growth of cities (World Bank, 2009). The existing literature has shown that when a low-income developing economy entered into the era of high economic growth, the speed of rural-urban migration is accelerated.

This is indeed happening in India today. According to a National Sample Survey (NSS) report on migration, 25.9% of urban population are migrants in 2007-08, defined as those who live in the enumeration area for more than six months and whose previous place of residence anytime in the past is different from the current place of residence (Government of India, 2010). Especially among the male population in urban areas, more than 50% of these migrants migrated for reasons related with their own employment (the other reasons include education, marriage, and family migration). Despite rapid economic growth with rural-urban migration, India's persistent poverty remains a serious concern. According to the government estimate based on another NSS survey, the poverty head count ratios for 2009-10 were 33.8% in rural areas and 20.9% in urban areas (Government of India, 2012). The combined ratio showed that 29.8% of the Indian population lived below the poverty line in 2009-10, implying that more than 350 million persons were classified as poor. The remaining urban-rural disparity suggests that the flow of migrants from rural to urban areas in search of jobs is likely to continue in the near future.

In response to this reality, the empirical literature on migration in India has been expanding. For instance, when migrants decide to move, social networks play an important role, as empirically analyzed by Munshi (2011) for the case of diamond workers in Mumbai. He shows that restrictive traditional networks are in decay while new networks are in formation. Another new focus in the literature is short-term or seasonal migration, in which villagers expect to come back to their home villages immediately after earning some money in cities (Keshri and Bhagat, 2012; Tsujita and Oda, 2012). Nevertheless, empirical research focused on urban poverty with due considerations paid to rural-urban migration and the urban informal sector is limited, if we focus on those studies based on microeconometric approaches

using representative data. For instance, Hayami et al. (2006) analyzed the case of waste pickers in Delhi, whose majority are migrants from villages. They showed the existence of job ladder, to which the access is limited, depending on networks available for individual pickers. Although interesting, it is not clear how representative their findings are. NSS migration surveys provide useful information with representative micro data, as analyzed by Keshri and Bhagat (2012). The NSS data, however, do not contain detailed information on networks, family members not living together, job history, and so on. The study by Mitra and Tsujita (2008) is worth mentioning regarding the data representativeness. They randomly chose slums for their study from the population list of slums prepared by the government and then randomly sampled households from the chosen slums. This approach is an exception, however.

To fill in the research gap, this paper empirically examines the correlates of earnings by cycle rickshaw pullers in Delhi, India, using a unique dataset of 1,320 rickshaw pullers that represent the whole area of Delhi. A cycle rickshaw is a three-wheeled, bicycle-like vehicle driven by human power. It is one of the most popular transports hired for a taxi service for a short distance. In most parts of India, cycle rickshaw pulling is a typical informal job as the government regulations rarely function (Sood, 2012). The informality exactly applies to the case of Delhi (Kurosaki et al., 2012). There is no official statistics for the total number of cycle rickshaw pullers in Delhi, while our previous estimate indicated that it is something in the range of 100,000 to 400,000 (Kurosaki et al., 2012). The majority of these rickshaw pullers are self-employed migrants, renting a cycle rickshaw from owners (Deshingkar et al., 2006; Kurosaki et al., 2007; 2012). Cycle rickshaw pulling is thus a typical informal sector job, open to new migrants if they can find a personal guarantor (Kurosaki et al., 2007; 2012). Another benefit of renting rather than owning a cycle rickshaw is that migrant rickshaw pullers can return to their villages during the peak farming period without worrying about the security of their asset. Seasonal and/or temporary migration is thus more in line with the rickshaw rental market. By conducting a detailed survey employing as the target population a particular type of urban informal job filled with migrants, we can deepen our understanding of poverty mechanism related with rural-urban migration and the informal sector.[1]

Among potential correlates of rickshaw pullers' earnings, we focus on human capital measured in schooling and job experience. The analysis in this paper thus allows us to examine the relationship between migrants' earnings and human capital in the urban informal sector in a developing country, which is rare in the literature. The analysis is descriptive in nature, without

[1] This motivation implies that our study is highly complementary to studies using the rural population (potential sender of migrants) or the urban population (potential recipients of migrants) as the target population of research. As an example of the former, see Keshri and Bhagat (2012) who analyzed characteristics of migrants in comparison to non-migrants in the village, using the NSS data.

controlling for endogeneity bias. This is because the main motivation of the analysis is to quantify the net correlation, controlling for other observable factors. The net correlation reflects the causal impact of human capital on earnings as well as the result of selection. In interpreting the results, we postulate that the selection works through two routes, both of which imply a negative correlation between earnings and human capital. The first route is through ability. Our results suggest that only those with less ability among the educated remain in the rickshaw pulling business. The second route is through effort. Our results suggest that short term migrants have a stronger incentive to earn from rickshaw pulling even if it is not sustainable in the long run than settled migrants. As a result of mixing causal and selection impact, we find that the relationship between human capital and income is non-linear, with positive correlation at the very low level of education and experience, turning into negative correlation with more accumulation of human capital. The finding of the negative correlation due to selection among the informal sector workers is new in the literature, with rich implications to development policies with respect to labor markets and human capital.

The remainder of the paper is organized as follows. Section 2 explains the research background and data used in this study. Section 3 describes the level of earnings and human capital observed among the sample rickshaw pullers. Section 4 proposes the empirical strategy. Section 5 provides the results of the regression analysis. Section 6 concludes.

2. Data and Background

2.1 Urban Transport in Delhi

Since India began economic liberalization policies in the early 1990s, Delhi has seen a huge growth in the number of private and personal automobiles, such as cars, jeeps, motorcycles, and scooters. Public transport such as taxis, buses, and auto-rickshaws has, however, lagged behind (Kurosaki et al., 2007). In the meantime, the coverage of Delhi Metro is continuing to expand, since its opening in December 2002.

Such developments in modern modes of transport have not, however, displaced traditional modes such as cycle rickshaws, handcarts, and tongas. The city has retained a demand for these traditional modes. In particular, cycle rickshaw pullers often transport people in residential areas of the city as well as on its outskirts. It is even possible that the demand for short-distance transport from a Metro station to individual houses or stores will increase once citizens become accustomed to traveling in an air-conditioned Metro coach (Kurosaki, 2012). Such demand is more likely to be facilitated by cycle rickshaws, because auto-rickshaws rarely service short-distance travel requests.

For regulatory purposes, cycle rickshaws fall within the jurisdiction of the Municipal

Corporation of Delhi (MCD).[2] According to MCD statistics, the number of cycle rickshaws in Delhi increased rapidly during the late 1990s, from a little over 46,000 in 1995/96 to over 70,000 in 1999/2000; however, the statistics show erratic trends since then, possibly because of the MCD's failure to keep correct records (Kurosaki et al., 2007).

The use of cycle rickshaws is regulated by the Cycle Rickshaw Bye-Laws of 1960 framed under the Delhi Municipal Corporation Act of 1957 (66 of 1957) and its subsequent amendments. The cycle rickshaw sector must abide by the following three main rules (MCD, 2008):

(1) No person shall keep or ply for hire a cycle rickshaw in Delhi unless he himself is the owner thereof and holds a license granted in that behalf by the MCD.

(2) No person will be granted more than one such license (Provided further that commissioner may grant more than one license to a widow or a handicapped subject to a maximum of five licenses).

(3) No person shall drive a rickshaw for hire unless he holds a driving license granted in that behalf by the commissioner.

Thus, two licenses are necessary: one for the owner of the rickshaw and the other for its driver (e.g., a driving license). However, in reality, a migrant rickshaw puller neither knows nor cares about the formal system of rickshaw transport in Delhi described above. All he does is to go to an entity called an owner-contractor (*Thekedar*), usually through an acquaintance, rent a cycle rickshaw, use it, return it, and pay the rent to the contractor on time. If caught for an infringement of law, he points this out to his contractor who, in turn, deals with the concerned MCD or police official. Despite this critical role played by *Thekedars*, they are not recognized as a legal entity and as such carry on their businesses in contravention of the MCD bye-laws. The MCD, the regulatory authority for rickshaw transport, knows only the number of rickshaw licenses it has issued. According to the information we obtained in 2011, the total number of cycle rickshaw licenses issued in Delhi was 84,377 (Kurosaki et al., 2012). However, it is a common perception that there are many times more rickshaws than the number licensed (Kurosaki et al., 2007).

These MCD regulations were attacked in courts by several NGO groups who made the plea that the regulations were discriminatory because no such cap on motor vehicles exists and against the fundamental right of property rights. In April 2012, the Supreme Court of India upheld the plea, implying that any individual can own as many rickshaws as they can afford to

[2] The National Capital Territory (NCT) of Delhi is divided into three areas: MCD; the city centre area covered by the New Delhi Municipal Council, where the union Government has its seat; and the area under the Delhi Cantonment Board. Cycle rickshaws are not permitted to trade in the latter two. However, the population residing in the latter two areas represents less than 3% of the total NCT population.

purchase and the holder of a driving license need not be the owner of a rickshaw. The court then directed the MCD to prepare a comprehensive plan to streamline cycle rickshaw operations in Delhi. By the timing of this writing, however, no concrete reforms have been implemented and the uncertain policy situation is likely to continue for some time to come.

2.2 Primary Survey in 2010/11

On the basis of an earlier pilot survey of rickshaw pullers in a north-east district of Delhi (Kurosaki et al., 2007), we surveyed cycle rickshaw pullers and *Thekedars* in order to draw a representative picture of the current rickshaw sector in Delhi (Kurosaki et al., 2012). The survey was conducted in December 2010−February 2011, using structured questionnaires in Hindi. In the survey, we collected information on a number of factors: the social characteristics of rickshaw pullers and owner-contractors, their migration statuses, the forward and backward linkages regarding migration, the economic situations of migrants in their places of origin, earnings and living conditions in Delhi, rickshaw rental contracts, debt and credit situations, the licensing of rickshaws, opinions on treatment by police and MCD officials, microfinance facilities, and the impact of Delhi Metro on rickshaw transport.

Given the absence of a formal register of the population of rickshaw pullers and *Thekedars*, drawing a representative sample was a challenging task. To overcome this problem, we adopted an areal approach following Minten et al. (2010), who surveyed informal street vendors in Delhi. In the areal approach, the administrative tiers in Delhi are used as the sampling framework. The first tier is termed a zone. There are 12 zones in the MCD, out of which 11 have licensed rickshaw pullers. The present survey thus covered these 11 zones of the MCD (the excluded zone was the south zone). In each zone, two wards, and then from each ward, five colonies were randomly selected for the survey. A colony is a term used by the MCD to indicate a residential area.

In order to sample rickshaw pullers in the sample colonies, the field investigator first carried out a census survey to find out how many focal points (in this case, rickshaw stands) were in the colony and how many rickshaw pullers were in each stand. The researcher then selected two focal points randomly, and finally selected six rickshaw pullers randomly from the census list of rickshaw pullers in the selected focal point. This provided a sample of 12 rickshaw pullers in each selected colony, 60 (12 × 5) in each selected ward, and 120 (60 × 2) in each selected zone, resulting in a total sample of 1,320 rickshaw pullers (120 × 11).

By combining the list of all colonies and wards in each zone obtained from the MCD with our sample data, we calculated the sampling probability, from which we estimated the population of rickshaw pullers in MCD areas. The point estimate for the total population was

approximately 104,000 (Kurosaki et al., 2012), which is larger than the number of licenses issued but smaller than indicated by common perception. Conceptually, we estimated the total number of rickshaw pullers working on the survey day, which may be smaller than the actual number of potential rickshaw pullers.[3] We also surveyed 132 *Thekedars*, although we do not use the data in the main part of this paper. From this dataset, we estimated the population of rickshaws owned by *Thekedars* at approximately 440,000 (Kurosaki et al., 2012). However, because of the small sample size and the lack of sampling weight information for *Thekedars*, this estimate may be imprecise.

2.3 Characteristics of Sample Rickshaw Pullers

As shown in Table 1, more than 98% of sample rickshaw pullers have their permanent address outside Delhi. In this broader sense, the majority of cycle rickshaw pullers in Delhi are migrants. We can instead adopt a stricter definition of a migrant rickshaw puller by classifying a puller as a migrant by meeting all four of the following criteria (Kurosaki et al., 2012): permanent address outside Delhi; no ration card for the Public Distribution System in Delhi; not registered for election in Delhi; and sends remittance to his family in his home village. Under this strict definition, 68.2% of sample rickshaw pullers in our sample are migrants (based on unweighted statistics).

Though not reported in the table, 1,303 out of the 1,320 sample rickshaw pullers were born outside of Delhi. Out of the 1,303 born-out-of-Delhi rickshaw pullers, 97 replied that they would come back to their home soon, 759 replied that they would come back after a while, and 233 replied that they would not come back (the rest: 209 replied that they had no idea; five did not reply to this question). This also shows the migrant nature of cycle rickshaws. Out of the 1,303 born-out-of-Delhi rickshaw pullers, 25 stayed in Delhi for less than a year. Out of the remaining 1,278, their length of stay in Delhi is ranged between 1 to 59 years, with its median at 10 years. However, the 1,278 pullers also came back to their origin places frequently for festivals and family events, usually a few to six months a year.

As shown in Table 1, the largest origin state for migrant rickshaw pullers is Bihar. This is consistent with the result based on the 64th NSS in 2007-08 that the state of Bihar accounts for the largest number of migrants in India (Government of India, 2010; Keshri and Bhagat, 2012). This also reflects the historical tendency of out-Bihar migration dating back to the colonial period (de Haan, 2002). Because of network-based migration (Kurosaki et al., 2012), migrants from one place tend to concentrate on one zone out of the eleven zones in Delhi.

[3] Another reason for this underestimation may be that we missed smaller focal points in the census survey (Kurosaki et al, 2012).

Table 1 also shows the socio-economic statuses of sample rickshaw pullers. First, their education levels are low.[4] Approximately 45% of them are illiterate, while only 6.2% went to secondary school or more. Second, the shares of scheduled castes (SC), schedules tribes (ST), and Muslims are above average.[5] These two characteristics imply that cycle rickshaw pullers are from the lower stratum of Indian society. Within our survey, sample cycle rickshaw pullers are less settled in Delhi than sample *Thekedars*; sample cycle rickshaw pullers have lower education than sample *Thekedars*; sample cycle rickshaw pullers are more likely to come from SC, ST, and other backward classes (OBC) than sample *Thekedars*.

The length of job experience measured in years ranges between 0.5 and 42 years. Its unweighted mean is 8.8 years. The majority of sample rickshaw pullers have job experience in the range of 2 to 10 years, as shown in Figure 1.

Looking at previous jobs (Table 2), the most popular job among rickshaw pullers is casual employment by others. This category also includes agricultural wage work employed by neighbor farmers in their home villages. Although the majority of rickshaw pullers are migrants from rural areas, self-employment in farming was not a major job before they came to Delhi. This is because the origin households in the village were mostly poor, with no or very marginal land holding. Rural workers from such landless or land-poor households engage themselves in various kind of casual employment, both agricultural and non-agricultural.

In contrast, the majority of *Thekedars* were self-employed before they began the business of rickshaw renting. Especially important is that a substantial portion, 44% namely, of *Thekedars* have their previous jobs related with cycle rickshaws (employed as a rickshaw repair worker, self-employed in rickshaw pulling, and self-employed in rickshaw repairing). This indicates the existence of "rickshaw ladder," parallel to the job ladder found by Hayami et al. (2006) among waste pickers in Delhi.

Other characteristics of the sample rickshaw pullers are extracted from Kurosaki et al. (2012). All of the rickshaw pullers are male (rickshaw pulling is definitely a male job in the Indian context). Regarding the ages of rickshaw pullers, the majority are in their twenties or thirties (median 32, minimum 16, maximum 70). When migrants left their origin village, about 60% already had an information contact in Delhi about general labor markets in Delhi, about

[4] In the survey, the schooling outcome of the rickshaw pullers was asked using the 4 categories shown in Table 1. We came across no rickshaw puller who had more than 12 years of education.

[5] The Constitution of India provides various affirmative actions to the population designated as Scheduled Castes (SCs) and Scheduled Tribes (STs). SCs correspond to those formally known as untouchables while STs correspond to aborigine people. In various socioeconomic variables, SCs and STs are associated with lower achievement than others. Affirmative action has been extended to other backward classes (OBCs) in recent years as well. OBCs' socioeconomic conditions are often slightly better than SCs and STs. Religion-wise, Muslim population is associated with underachievement in various development indicators.

41% already had a source person in Delhi who had connection with the rickshaw pulling job. This type of network plays a critically important role in facilitating migration, as discussed in the literature.

3. Level of Earnings and Human Capital

3.1 Compilation of Earnings Data

Of the 1,320 sampled rickshaw pullers, 91% (1,205) use a rental rickshaw owned by a *Thekedar*. In all cases, the contract is a fixed rental per day, paid every day when the rickshaw is returned. To avoid the rickshaw puller disappearing with the rickshaw, the majority of *Thekedars* use a surety man (personal guarantor) as a substitute for collateral. The rental rate ranges between Rs. 25 and Rs. 60 per day, with an average of Rs. 37.6 and median of Rs. 40 per day.[6] The rickshaw pullers who own a rickshaw managed their purchase using their own savings. At the time of the survey, typical prices of a new rickshaw were Rs. 7,000 and Rs. 7,500.

As already discussed, the job experience length and schooling are diverse across rickshaw pullers. Combining such human capital and the physical capital of a rickshaw, how much do they earn and what are the factors for a successful rickshaw puller?

We begin with the latter based on the field observations. The work of rickshaw pulling is purely a hard labor. A healthy body is the prerequisite for a successful rickshaw puller. As *Thekedars* rarely intervene with individual pullers' business of rickshaw pulling as long as the pullers pay the rental fee on time, the critical ability for a successful rickshaw is to find good customers and transport them with minimum energy. According to rickshaw pullers, good customers include regular commuters to schools or offices and those out of Metro station. To save energy, geographic knowledge around the working area helps. As there is no regulation on the taxi fee, rickshaw pullers' ability to bargain with customers is also an important factor. In short, the job of a rickshaw puller is a typical self-employment where the entrepreneurship ability and effort of the puller make a huge difference in earnings.

Based on our dataset, we compiled information on earnings, working hours, and consumption (Table 3). Average daily gross earnings are slightly less than Rs.260, ranging between Rs. 120 and Rs. 500. Rickshaw pullers earned these amounts by working for 10 to 11 hours a day. Out of 1,320 rickshaw pullers, 2 responded with the maximum hours of working at 16 hours (62 responded with 15 hours of work). The median of the number of working days in the last 15 days was 14, implying that they did not afford to have a one day off a week. Instead, they took a day (or less) off every two weeks.

[6] "Rs" refers to the Indian rupees. At the time of our survey, US$1 was approximately equal to Rs. 45.1.

Not all of the gross earnings from rickshaw pulling become the disposable income for a rickshaw puller. If he owns a rickshaw puller, he has to spend on repairs and maintenance. If he rents a rickshaw puller from a *Thekedar*, he has to pay the rental fee as well as small repairs and maintenance off the garage (major repairs and maintenance are the responsibility of a *Thekedar* and conduced in *Thekedar*'s garage). We calculated the monthly cost of running the rickshaw pulling business by multiplying the rental fee by the number of working days out of 30 days, and added to the amount the monthly expenditure on repair/maintenance actually paid by rickshaw pullers. As shown in Table 3, the cost ranges between 0 and Rs. 3,000, with its median at around Rs. 1,000. The average amount is reasonable, corresponding to a case of renting a rickshaw at Rs. 35 per day and working for 28 days in a month, for example.

The monthly income from the rickshaw pulling business was then calculated as (average daily gross earnings)*(number of days worked during the last 15 days)*2 – (monthly cost of running the rickshaw pulling business). As none of the sample rickshaw pullers had other earning sources and there is no tax or subsidy regarding the rickshaw pulling business, the net earnings calculated in this way corresponds to a disposable income for each rickshaw puller. As average figures, the median was Rs. 6,000, the weighted average was approximately Rs. 6,200, and the unweighted average was approximately Rs. 6,100. This level is slightly higher than the income level for unskilled casual workers in construction work in Delhi. If we compare this level with estimated profit levels enjoyed by *Thekedars* from their rickshaw renting business (Kurosaki et al., 2012), the rickshaw pullers' income level is comparable to that of *Thekedars* owning equal to or less than 50 rickshaws (Rs. 5,600 per *Thekedar*) but much lower than that of Thekedars owning more than 50 rickshaws (Rs. 41,000 per *Thekedar*).[7]

Out of this disposable income, rickshaw pullers have to spend on their food and housing. In the survey, we collected data on meals (noted as "Food excluding those below" in Table 3), tea, snack, and *paan* (noted as "Tea and snack"), alcohol, tobacco, cinema, etc (aggregated as "Entertainment"), and housing. The median of the total monthly expenditure was approximately Rs. 3,600, ranging between Rs. 1,056 and Rs. 8,100. Some of these consumption expenditures are shared with co-residing family members, if any. However, 845 out of the 1,320 sample rickshaw pullers live alone in Delhi. The official poverty line is set at Rs. 1,040 (monthly per-capita consumption expenditure) for urban areas in Delhi, 2009-10 (Government of India, 2012). Thus the majority of our sample rickshaw pullers' consumption level is likely to above the official poverty line. However, the official poverty line in India is infamous for underestimation especially regarding urban areas. Our field observations indicate

[7] The difference was mainly due to the disparity in business size. In addition to it, scale economies also exist for *Thekedars*, for instance, in managing garages.

that these rickshaw pullers' living standard is at the barely minimum level.

In Table 3, we calculated the "surplus," defined as the monthly income less monthly consumption expenditure. This is a measure of net savings, which are potentially sent back to the origin households if a rickshaw puller is a migrant. It ranges from minus Rs. 3,980 to plus Rs. 11,200, with its medians and means at around Rs. 2,100 – 2,400. Out of the 1,320 rickshaw pullers, the surplus was negative for 73 pullers. The potential remittance of Rs. 2,100 – 2,400 is substantial. For instance, the official poverty line in rural Bihar is set at Rs. 780 per capita per month (Government of India, 2012).

3.2 Human Capital and Earnings

How are the earnings, working hours, consumption, and surplus from the rickshaw pulling work related with the level of human capital of rickshaw pullers? The bivariate relation is shown in Table 4 for the five variables of average daily gross earnings, average daily work time over the last 15 days, monthly income from the rickshaw pulling business, monthly consumption expenditure, and monthly surplus. Among these five, higher values of the four variables measured in Rs. indicate a higher welfare. In contrast, lower values of the work time indicate a higher welfare, as rickshaw pulling is a hard labor.

Regarding the job experience, we report in Table 4 the results when it is classified into 4 categories of "Less than 1 year", "1 year to less than 5 years," "5 years to less than 10 years," and "10 years and more." Actual distribution of the job experience and earnings-related variables is shown in Figure 2, with a non-parametric regression line.

Both Table 4 and Figure 2 indicate a weak association between human capital and earnings. In Table 4, *p*-values indicate that the average daily gross earnings and work time are not independent of schooling level of rickshaw pullers. However, the correlation appears non-linear, increasing initially and then decreasing. For the job experience, an inverted U-shape appears for the average daily earnings, monthly income, and monthly surplus, although the correlation is not strong, as shown by a large variation in Figure 2.

From a standard theory of human capital, the returns may be non-linear, with a diminishing reward if the contribution of human capital to the business success is associated with diminishing returns. However, it is difficult to think of a non-linearity to the extent that further accumulation of human capital is detrimental to the business success. We discuss in this paper that the correlation between human capital and earnings becomes negative at a higher level of human capital because of selection.

Before formally stating this hypothesis with our empirical strategy, we show how human capital is distributed in our sample. Table 5 shows how the schooling level of rickshaw

pullers is correlated with their socioeconomic characters and job experience. First, the correlation between the education level and community group dummies is statistically significant. However, the direction of correlation is different from what we expect if the population of rickshaw pullers is randomly drawn from the whole population of Bihar. The share of rickshaw pullers with middle or higher education is higher among SC rickshaw pullers than OBCs or other Hindus. It is a common knowledge that the SC population's schooling level is lower than other Hindus and OBCs. Nevertheless, in our sample, which is representative as far as rickshaw pullers are concerned, the SC pullers' schooling level is higher than others. This appears to indicate that among educated population, SCs have a higher tendency to become a rickshaw puller, which is regarded as a job where higher education does not matter because of the nature of the labor. This suggests a possibility that the selection functions in a way that relatively-more educated individuals with unobservable character that makes them not attractive in jobs where higher education matters select themselves into the job of a rickshaw puller.

Second, the correlation between the education level and job experience is statistically significant, where illiterate pullers are more likely to have longer job experience. This suggests that as rickshaw pulling is not an attractive job for those with some education, they tend to leave this job quicker than the illiterate. This mechanism can be extended to unobservables as well. Those rickshaw pullers who have high ability or effort, which are unobservable, are more likely to leave the job of rickshaw pulling job so that among those who stay in the rickshaw pulling job for a long period, the share of those with lower ability or effort or morale becomes higher.

The length of job experience is positively correlated with age, by construction to some extent. This is because, for example, if a rickshaw puller is 20 years old, we cannot expect his job experience to be longer than 10 years or so. This is confirmed in the last panel of Table 6. The correlation between age and job experience is highly significant. Another point worth mentioning in Table 6 is that there is no significant correlation between the job experience and religion/castes. In other words, once entered the job of rickshaw pulling, the social class does not matter much in deciding when to leave the job. In sharp contrast, education (and unobserved ability and morale) appears to matter substantially in deciding when to leave the job.

4. Empirical Strategy

Given bivariate correlation between human capital (schooling and job experience) and earnings, the main motivation of empirical analysis in this paper is to quantify the net

correlation between human capital and earnings, controlling for other observable factors. The net correlation reflects the causal impact of human capital on earnings as well as the result of selection. The analysis is thus descriptive in nature, without controlling for endogeneity bias. We present the net correlation results because they provide us with rich implications to development policies with respect to labor markets and human capital. Separately identifying the causal and selection effects is left for further study.

Using variables in Table 4, we estimate the following cross-section model:

$$Y_i = b_0 + \Sigma_k b^S_k S_{ki} + \Sigma_k b^E_k E_{ki} + X_i b^X + u_i, \quad (1)$$

where Y_i is one of the earning-related variables for rickshaw puller i (average daily gross earnings, average daily work time over the last 15 days, monthly income from the rickshaw pulling business, monthly consumption expenditure, and monthly surplus; either in levels or in natural logs), b's are parameters to be estimated, S_{ki} is the dummy for schooling level k, E_{ki} is the dummy for job experience level k, X_i is a vector of other observable characteristics of rickshaw puller i that affect the earnings, and u_i is a zero-mean error term. The vector X_i includes age, origin place for a migrant, religion/caste, dummies for information sources when a migrant moved from his origin place to Delhi, the ownership status of a rickshaw, the level of the rental fee paid by a rickshaw, and fixed effects corresponding to eleven MCD zones. The MCD fixed effects control for unobservable factors specific to each zone, such as difference in rickshaw taxi demand, transport policies, etc.

Estimating equation (1) with carefully chosen reference category, we can obtain parameter b_0, which shows the expected value of rickshaw earnings conditional on the reference characteristics. Our main coefficients of interest are b^S_k and b^E_k, which show that how much does the expected value of rickshaw earnings change, if the human capital category is changed from the reference characteristics. To obtain unbiased estimates for these expected values, we do not need any econometric correction for the endogeneity bias. An OLS regression does the purpose, as long as our main interest is on the conditional means, not on the causal impact of human capital on earnings.

As we have information on the job experience in years, we can use them as continuous variable (as shown in Figure 2) rather than the category dummies (as shown in Table 6). As the degree of freedom is low and the job experience in years is positively correlated with age, we replace $\Sigma_k b^E_k E_{ki}$ and $X_{age,i}$ in equation (1) by linear and quadratic terms of the job experience in natural logs. This is to be reported as a robustness check.

What do OLS estimates for b^S_k and b^E_k show in terms of economics, not as a mere

statistical notion of conditional means? The economic model we have in mind is

$$Y_i = \beta_0 + \Sigma_k \beta^S{}_k S_{ki} + \Sigma_k \beta^E{}_k E_{ki} + X_i \beta^X + \alpha_i + e_i, \quad (2)$$

where S_{ki}, E_{ki}, and X_i are defined similarly but now assumed to be exogenous, α_i is unobservable heterogeneity for rickshaw puller i, which affects the level of earnings, such as ability, effort, and morale, and e_i is an error term uncorrelated with any of the explanatory variables including the fixed effect. Parameters $\beta^S{}_k$ and $\beta^E{}_k$ then show the causal impact of human capital (schooling and job experience) on earnings. The common sense in the human capital literature predicts that $\beta^S{}_k \geq 0$ and $\beta^E{}_k \geq 0$ if k is associated with a higher level of human capital than the reference category. Even for a job like rickshaw pulling, we have no reason for more education (experience) to damage the prospect to earn.

As we find difficulty in finding valid instrumental variables or other methodology to control the endogeneity of S_{ki} and E_{ki}, we estimate equation (1) by OLS. However, this contains the endogeneity bias as we expect S_{ki} and E_{ki} on the one hand and α_i in equation (2) to be correlated. As our discussion in the previous section suggests, this correlation is likely to be negative, both for S_{ki} and E_{ki}. In other words, what we obtain from OLS regression applied to equation (1) is

$$b^S{}_k = \beta^S{}_k + \mathrm{E}[\partial \alpha_i / \partial S_k], \quad b^E{}_k = \beta^E{}_k + \mathrm{E}[\partial \alpha_i / \partial E_k], \quad (3)$$

where E[.] is an expectation operator across all individuals. In interpreting the OLS results, we fully use our common sense regarding the causal impact of human capital and the selection process.

5. Regression Results

5.1 Main Results

The main regression results are reported in Table 7. For all five dependent variables, *F*-tests for zero slopes reject the null at the 1% level so that the correlates listed in Table 7 are statistically significant as a whole. The intercepts (b_0 in equation (1)) are close to the unconditional means reported in Table 3, confirming that our choice of the reference category is appropriate. See the notes of Table 7 for the description of the reference characteristics.

Regarding the coefficient $b^S{}_k$, the change in conditional means associated with the change in schooling level in comparison to the reference category (i.e., illiterate), non-linear patterns are suggested. Those rickshaw pullers with primary or middle education earn Rs. 7 or

Rs. 15 more per day than the illiterate, but those rickshaw pullers with secondary or more education earn almost the same level as the illiterate. The daily earnings by those with secondary or more education are significantly lower than those by middle-educated rickshaw pullers (statistically significant at the 10% level). A similar non-linearity is found for the monthly income from the rickshaw pulling business. Those rickshaw pullers with the middle school education earned more per month than the illiterate and the secondary-educated pullers.

The reason for positive association up to the middle school education could be a causal impact of human capital investment. The experience of communicating with others at the school and learning the basics of writing and arithmetic could have improved workers' ability to earn as a rickshaw puller. The negative correlation between education and earnings after the middle level could better be attributed to the selection. As rickshaw pulling is regarded as a job not suitable for those with secondary education, only those with less ability among the educated enter and remain in the business. It is also possible that those rickshaw pullers with secondary education have lower morale in doing the job as well. We conjecture that these routes result in a highly negative value of the second term of the right-hand-side of equation (3) so that we observe that secondary-educated rickshaw pullers earn the least.

Regarding the coefficient b^E_k, the change in conditional means associated with the change in job experience in comparison to the reference category (i.e., "5 years to less than 10 years"), similar non-linear patterns are found (Table 7). The reference category earned the same amount daily and monthly as the category of "1 year to less than 5 years," while they earned significantly more than the fresh entrants ("Less than 1year") and veterans ("10 years and more"). The same inverted-U shape is observed for the monthly surplus as well. In contrast, we find a monotonic increase in average daily work time. Veterans with 10 years or more experiences work 18 minutes more than the reference category and 36 minutes more than the fresh entrants.

We conjecture that the positive association up to 1 year mainly occurred due to a causal impact of human capital investment. A new migrant who begins the rickshaw pulling job for the first time in Delhi is likely to have difficulty in finding good customers and efficient transport routes. The business knowledge about customers and transport routs is learned by rickshaw pullers quickly. After a year or so, a rickshaw puller becomes knowledgeable enough to work efficiently. At the same time, the positive correlation between job experience and earnings at the early stage could also be due to selection. As new migrants are still searching for better fit for their work, those with better match with rickshaw pulling remain in the job while those without quit the job. We conjecture that the negative correlation between job experience and earnings after 10 years of experience was due to selection. As rickshaw pulling

is regarded as a job not suitable for those with higher entrepreneurship ability, only those with less ability remain in the business. It is also possible that those rickshaw pullers who continue with the job for so many years have lower morale in doing the job as well. In contrast, those rickshaw pullers who intend to go back to their origin place as soon as possible are likely to pay high effort, earn relatively well, and leave the job quickly. The ability-based selection could also explain why the relationship between working hours and job experience is monotonically positive. Only those with healthy body to work long hours are able to continue the job and those with relatively low ability to earn efficiently (in terms of per-working minute) are likely to remain in the job. As a result, the correlation between working hours and job experience is monotonically positive.

Coefficients on other explanatory variables are as expected. Bihar migrants earn more and spend less than others, which could be due to higher morale to earn and remit to family members living in the poorest state of India and a positive role of network density among Bihar migrants (the majority group in migrants to Delhi). The dummies for information sources when a migrant moved from his origin place to Delhi had insignificant or negative coefficients if the information is about jobs, while the correlation is positive if a migrant found his accommodation through the help of his *Thekedar*. The latter could indicate the advantage of using Thekedar's network in living in Delhi. Those rickshaw pullers with that connection are not only able to reduce expenditure (through lower payment for his housing) but also to increase daily earnings (for example, through introduction to regular customers who commute to their office or school). Rickshaw-owning pullers earn more per month than rickshaw-renting pullers, because they can save the rental fee payment. An interesting finding is that the coefficients in Table 7 indicate a pattern consistent with predictions of a standard leisure-consumption choice theory. If we calculate the monthly cost of running the rickshaw pulling business in Table 3 separately for owners and non-owners, owners spent Rs. 850 less per month (unweighted average). On the other hand, the monthly income difference according to Table 7 is only Rs. 360. The difference was due to shorter hours of work among owner rickshaw pullers than others by 29 minutes per day. As rickshaw-pulling is a hard labor, if the per-labor return goes up permanently due to the rickshaw ownership, it is rational for the rickshaw puller to reduce the labor supply.[8] A positive correlation between rental fees and daily gross earnings could be explained by a higher demand for rickshaw taxi services where rental fees are higher (Kurosaki, 2012) or a higher effort induced by higher rental fees or a better quality of rickshaws reflected in higher rental fees.

[8] Readers may compare our results with the seemingly irrational behavior of New York taxi drivers (e.g., Crawford and Meng, 2011). Unlike our case, the change in per-labor return in the Nye York taxi case was temporary.

5.2 Robustness Check

The results regarding rickshaw pullers' earnings and human capital were found robust to alternate specifications. First, the results were not sensitive to how we process the job experience. For instance, marginal changes in thresholds in defining job experience categories did not change the results. We obtained similar results when we employed linear and quadratic terms of job experience in natural logs, instead of discrete dummies for the job experience. The latter results are shown in the first panel of Table 8. The inverted-U pattern was found for the daily gross earnings, monthly income, and monthly surplus, as in Table 7. A monotonically increasing pattern was found for the working minutes, as in Table 7.

Second, instead of levels, natural logs were employed as dependent variables. Theoretically, as equation (2) is motivated by the Mincer equation, it could be better to use logs rather than levels regarding the dependent variable. The reason why we adopted the level regression as the default is that out motivation of estimating equation (1) is descriptive and we were interested in obtaining the conditional means in units that make sense in the empirical settings. Parameter estimates for b_0 have an intuitive meaning only when the dependent variables are in levels. As shown in the second panel of Table 8, the natural log specification does not change our main findings at all. Non-linearity in earnings remains intact for schooling. However, in terms of the standard Mincerian interpretation, the coefficients on schooling are small. A coefficient of 5.43 on the middle-education dummy in the 100*ln(daily gross earnings) regression implies the annual rate of return at only 0.7% if the middle school education is converted into eight years of education. It could be possible that the positive coefficient was attenuated due to the selection we discussed above. With the use of logs as dependent variables, non-linearity in earnings remains intact for job experience; monotonicity in hours of work for job experience also remains the same qualitatively.

Other robustness checks include the addition of explanatory variables extracted from the previous job information reported in Table 2, weighted least squares instead of OLS to reflect the difference in sampling probability, addition of cross-terms of Bihar migrant dummy and other explanatory variables (considering the possibility that Bihar migrants' behavior is systematically different), using the subset of rickshaw pullers who were born out of Delhi (the number of observations is 1,303 instead of 1,320), and the addition of colony-tax-category fixed effects (Kurosaki, 2012) to control for the unobservable colony-level heterogeneity. These alterations did not affect our parameter estimates for human capital variables.[9]

[9] Full results of these robustness checks are available on request from the author.

6. Conclusion

In this paper, we empirically examined the correlates of earnings by cycle rickshaw pullers in Delhi, India, using a unique dataset of 1,320 rickshaw pullers that represent the whole area of Delhi. Among potential correlates, we focus on human capital measured in schooling and job experience to infer the relationship between migrants' earnings and human capital in the urban informal sector in a developing country. We robustly found that the relationship between human capital and income is non-linear, with positive correlation at the very low level of education and experience, turning into negative correlation with more accumulation of human capital. We interpreted the former as a causal effect of human capital (schooling experience up to 5 or 8 years contributes to better skills in running the rickshaw taxi business and job experience up to 1 year contributes to accumulation of business skills and knowledge). We interpreted the latter as an effect of selection (only those with less ability among the relatively human capital rich remain in the business) or the result of decreasing work effort (short term migrants have a strong incentive to earn from the job even if it is not sustainable in the long run).

In discussing poverty eradication, accumulation of human capital is often regarded as a key in improving the poor's productivity and earnings. Our study shows that this does not hold if the occupational mobility is limited and the poor are locked into a job where a higher level of education or experience is not highly respected, such as the rickshaw pulling business. On the other hand, in our dataset, we also find that remittances sent from these rickshaw pullers are invested in human capital of their children. We speculate that such remittance motive is strengthened if a migrant remains as a rickshaw puller and wishes his children to be employed in a job where education and experience are highly rewarded.[10] In other words, our finding suggests that accumulating more human capital and shifting to occupations that reward such human capital are required to move out of poverty in the long-run over generations.

As far as the current paper is concerned, our empirical analysis mixes the causal and selection impacts. Separately identifying them is left for further study. In such attempts, modeling the decision making process regarding entry and exit in the rickshaw pulling business appears especially promising. Such modeling, backed by quantitative analysis, would clarify the occupational choice and poverty dynamics at the individual level.

[10] The climbing the rickshaw ladder discussed in this paper does not fit this story, however. If a migrant rickshaw puller renting a rickshaw puller becomes the owner of the rickshaw, the monthly income would increase only marginally, as shown in this paper. Purchasing more rickshaws through savings and becoming a *Thekedar* do not bring sufficient earnings, if the size of operation is small. Only when *Thekedars* combine the rickshaw renting business with other businesses or the size of operation is big, their earnings become sufficient.

References

Crawford, V.P. and J. Meng (2011) "New York City Cab Drivers' Labor Supply Revisited: Reference-Dependent Preferences with Rational-Expectations Targets for Hours and Income," *American Economic Review*, 101(5): 1912-32.

de Haan, A. (2002) "Migration and Livelihoods in Historical Perspective: A Case Study of Bihar, India," *Journal of Development Studies*, 38(5):115-142.

Deshingkar, P., S. Kumar, H.K. Chobey, and D. Kumar (2006) "The Role of Migration and Remittances in Promoting Livelihoods in Bihar," Working Paper, December 2006, Overseas Development Institute, London.

Government of India (2010) *Migration in India, 2007-08*, NSS Report No. 533, Government of India, National Sample Survey Organisation.

----- (2012) "Press Note on Poverty Estimates, 2009-10," Government of India, Planning Commission, March 2012.

Hayami, Y., A.K. Dikshit, and S.N. Mishra (2006) "Waste Pickers and Collectors in Delhi: Poverty and Environment in an Urban Informal Sector," *Journal of Development Studies*, 42(1): 41-69.

Keshri, K. and R.B. Bhagat (2012) "Temporary and Seasonal Migration: Regional Pattern, Characteristics and Associated Factors," *Economic and Political Weekly*, 47(4): 81-88.

Kurosaki, T. (2012) "Urban Transportation Infrastructure and Poverty Reduction: Delhi Metro's Impact on the Cycle Rickshaw Rental Market," PRIMCED discussion paper no. 24, March 2012, Hitotsubashi University.

Kurosaki, T., Y. Sawada, A. Banerji, and S.N. Mishra (2007) "Rural-urban Migration and Urban Poverty: Socio-economic Profiles of Rickshaw Pullers and Owner-contractors in North-East Delhi," COE discussion paper no. 205, February 2007, Hitotsubashi University.

Kurosaki, T., A. Banerji, S.N. Mishra, and A.K. Mangal (2012) "Unorganized Enterprises and Rural-Urban Migration in India: The Case of the Cycle Rickshaw Sector in Delhi," PRIMCED discussion paper no. 28, July 2012, Hitotsubashi University.

MCD [Municipal Corporation of Delhi], 2008. "Compliance of Cycle Rickshaw Bye-Laws," Public Notice published in major newspapers.

Minten, B., T. Reardon, and R. Sutradhar (2010) "Food Prices and Modern Retail: The Case of Delhim" *World Development*, 38(12): 1775–1787.

Mitra, A. and Y. Tsujita (2008) "Migration and Well-Being at the Lower Echelons of the Economy: A Study of Delhi Slums," in H. Sato and M. Murayama (eds.), *Globalization, Employment and Mobility: The South Asian Experience*, Hampshire: Palgrave Macmillan, pp.263-280.

Munshi, K. (2011) “Strength in Numbers: Networks as a Solution to Occupational Traps,” *Review of Economic Studies*, 78(3): 1069-1101.

Sood, A. (2012) “A Future for Informal Services? The Cycle Rickshaw Sector as Case Study,” *Economic and Political Weekly*, 47(42): 95-102.

Todaro, M.P. (1969) “A Model of Labor Migration and Urban Unemployment in Less Developed Countries,” *American Economic Review*, 59(1): 138–148.

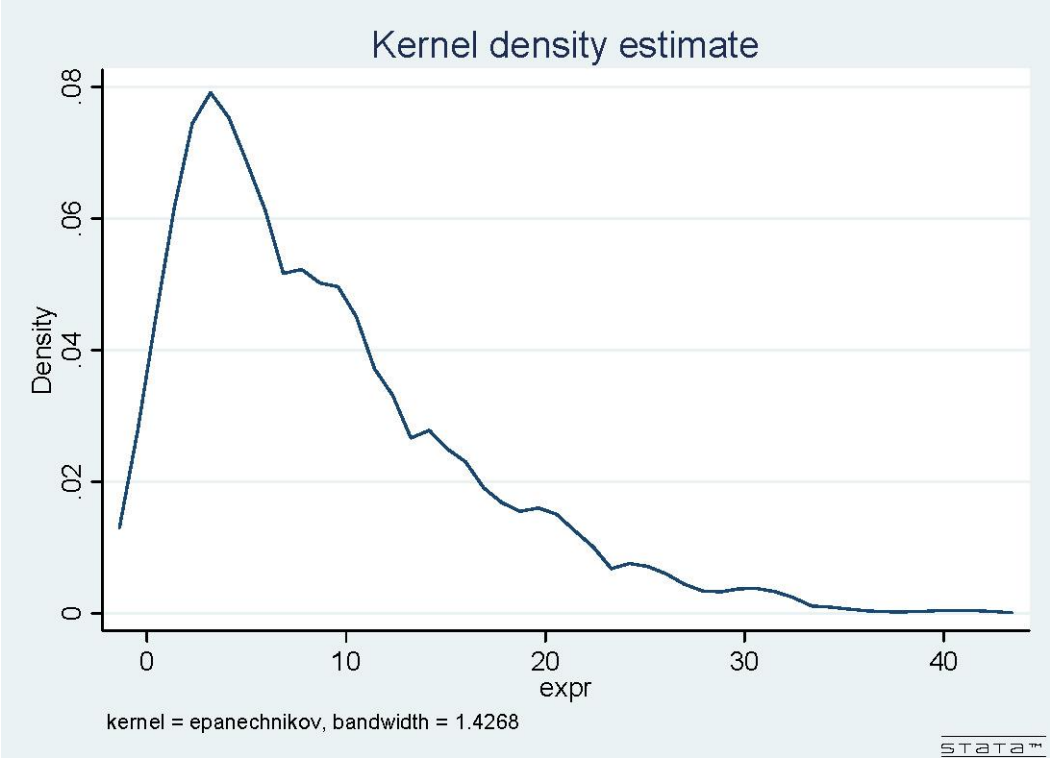
Tsujita, Y. and H. Oda (2012) “Caste, Land, and Migration: A Preliminary Analysis of a Village Survey in an Underdeveloped State in India,” IDE Discussion Paper No. 334, Chiba: Institute of Developing Economies.

UNDP (2009) *Human Development Report 2009: Overcoming Barriers – Human Mobility and Development*. New York: United Nations.

Williamson, J.G. (1988) “Migration and Urbanization,” in H. Chenery and T.N. Srinivasan (eds.), *Handbook of Development Economics, Vol. I*. Elsevier Science, Amsterdam, pp. 425–465.

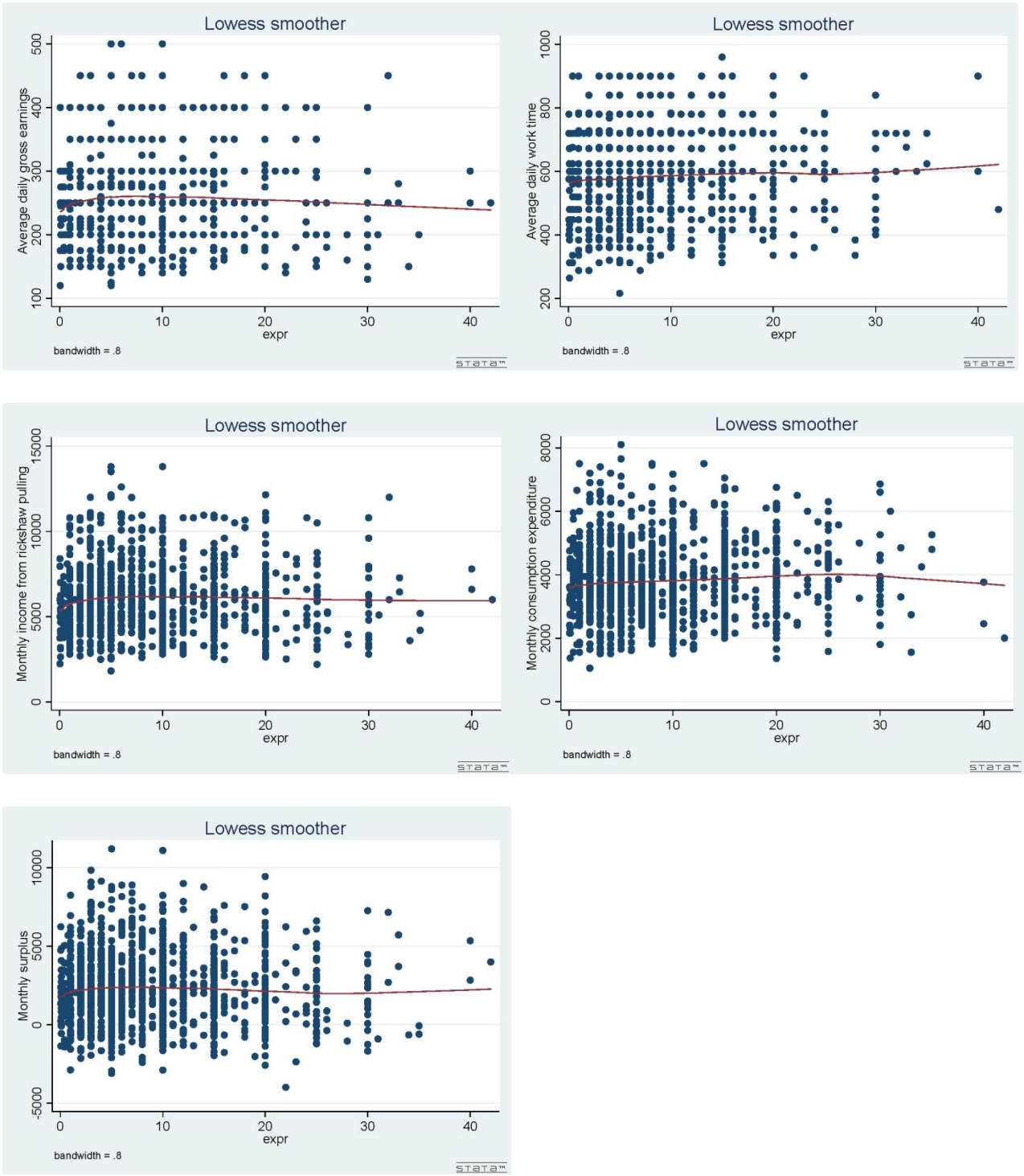
World Bank (2009) *World Development Report 2009: Reshaping Economic Geography*. Washington D.C.: World Bank.

Figure 1. Distribution of rickshaw pulling experiences



Notes: The number of observations is 1,320. The experience is measured in years, whose minimum is 0.5, maximum is 42, and unweighted mean is 8.82 (standard deviation 7.28).

Figure 2. Correlation between rickshaw pulling experiences and earnings



Notes: See Figure 1 for explanations of "expr" (job experience in years). See Table 3 for explanations of the five variables plotted against "expr".

Table 1. Socio-economic characteristics of sample rickshaw pullers and Thekedars

	Rickshaw pullers (N=1,320)			Thekedars (N=132)	
	Number	Distribution (%)		Number	Dist. (%)
		UW	WT		UW
1. Permanent address					
Delhi	18	1.36	2.01	33	25.0
Bihar	679	51.44	54.87	43	32.6
Uttar Pradesh	499	37.80	36.26	38	28.8
Other	124	9.39	6.86	18	13.6
2. Religion and castes					
Hindu	1074	81.36	84.69	89	67.4
Of which:					
Scheduled castes (SC)	214	16.21	17.97	23	17.4
Scheduled tribes (ST)	115	8.71	9.26	0	0.0
Other backward classes (OBC)	601	45.53	47.73	32	24.2
Other Hindu	144	10.91	9.73	34	25.8
Non-Hindu					
Muslim	244	18.48	15.09	32	24.2
Sikh or Christian	2	0.15	0.22	11	8.3
3. Education					
None	596	45.15	46.97	17	12.9
Primary (5th grade)	502	38.03	34.54	34	25.8
Middle (8th grade)	140	10.61	10.72	36	27.3
Secondary & above (10th grade or more)	82	6.21	7.77	55	41.7

Note: "Distribution (%)" shows unweighted statistics ("UW") or weighted statistics ("WT") using the sampling probability.

Source: Prepared by the author using the primary data collected in 2010/11 (the same for the following tables and figures).

Table 2. Previous jobs for sample rickshaw pullers and Thekedars

	Rickshaw pullers (N=1,320)			Thekedars (N=132)	
	Number	Distribution (%)		Number	Dist. (%)
		UW	WT		UW
No job (student, unemployed, no response)					
Sub-total	364	27.58	20.74	25	18.9
Employed by others					
Casually hired, except for rickshaw repairing	591	44.77	47.48	8	6.1
Casually hired for rickshaw repair work	0	0.00	0.00	3	2.3
Regularly hired	298	22.58	25.78	8	6.1
Self-employed					
Farming	12	0.91	1.95	4	3.0
Rickshaw pulling	n.a.			10	7.6
Rickshaw repairing	0	0.00	0.00	45	34.1
Shops	24	1.82	1.93	4	3.0
Vegetable vendors	20	1.52	1.22	1	0.8
Other	11	0.83	0.9	24	18.2

Note: See Table 1.

Table 3. Earnings, working hours, consumption, and surplus from rickshaw pulling

	UW (unweighted stats)			WT (weighted stats)			minimum	maximum
	mean	std. dev.	median	mean	std. dev.	median		
Average daily gross earnings (Rs.)	257.2	68.1	250	258.8	61.9	250	120	500
Average daily working hours if worked (hours)	10.59	2.06	10	10.72	2.06	10	6	16
Number of days worked in the last 15 days (days)	13.76	1.30	14	13.72	1.30	14	9	15
Average daily work time over the last 15 days (minutes)	583.8	131.8	576	589.9	133.8	576	216	960
Monthly cost of running the rickshaw pulling business, including rental fee payment (Rs.)	965.9	327.2	1040	909.1	345.6	960	0	3000
Monthly income from the rickshaw pulling business (Rs.)	6095.8	1924.2	6000	6183.9	1795.9	6000	1820	13800
Monthly consumption expenditure (Rs.)	3794.3	1137.3	3660	3814.7	1170.1	3655	1056	8100
Of which:								
Food excluding those below	2609.7	840.2	2400	2567.5	872.3	2400	900	4500
Tea and snack	475.8	294.1	600	492.4	290.5	600	0	1500
Entertainment	69.5	158.5	10	70.5	158.3	10	0	1620
Housing	639.4	557.1	500	684.3	555.6	550	0	5000
Monthly surplus (Rs.)	2301.5	2198.4	2120	2369.1	2105.2	2250	-3980	11200

Notes: The number of observations is 1,320. See the text for the definition of each variable. The monetary unit is Indian rupee (Rs.), where US$ 1 = Rs. 45.1 at the time of the survey.

Table 4. Earnings and human capital in the rickshaw pulling business (cross table)

	Average of earnings-related variables for each category of human capital (standard deviation in the parenthesis)				
By education:	Illiterate	Primary (5th grade)	Middle (8th grade)	Secondary (10th) & more	*p* -value
Number of observations	596	502	140	82	
Average daily gross earnings (Rs.)	254.3	260.4	265.1	245.0	0.084
	(65.2)	(72.1)	(67.2)	(63.4)	
Average daily work time over the last 15 days (minutes)	588.5	593.1	550.3	549.3	0.000
	(136.8)	(132.9)	(101.6)	(121.1)	
Monthly income from the rickshaw pulling business (Rs.)	6056.4	6158.7	6229.5	5769.0	0.281
	(1839.7)	(2046.4)	(1833.8)	(1892.5)	
Monthly consumption expenditure (Rs.)	3795.9	3733.0	3972.1	3853.7	0.164
	(1140.7)	(1114.7)	(1216.2)	(1095.8)	
Monthly surplus (Rs.)	2260.4	2425.7	2257.4	1915.3	0.222
	(2128.6)	(2372.4)	(1969.0)	(1920.7)	
By job experience:	Less than 1 year	1 year to less than 5 years	5 years to less than 10 years	10 years and more	*p* -value
Number of observations	130	439	366	385	
Average daily gross earnings (Rs.)	241.0	257.7	264.4	255.1	0.008
	(61.6)	(66.7)	(70.9)	(68.3)	
Average daily work time over the last 15 days (minutes)	570.2	576.1	578.6	602.0	0.013
	(138.7)	(129.1)	(134.1)	(129.0)	
Monthly income from the rickshaw pulling business (Rs.)	5559.0	6097.0	6258.7	6120.8	0.005
	(1712.9)	(1907.3)	(1952.0)	(1958.9)	
Monthly consumption expenditure (Rs.)	3624.8	3770.8	3783.2	3888.8	0.123
	(1048.8)	(1176.3)	(1081.7)	(1167.8)	
Monthly surplus (Rs.)	1934.2	2326.2	2475.5	2232.0	0.095
	(2007.0)	(2233.0)	(2226.6)	(2183.5)	

Note: "*p* -value" reports the probability value of ANOVA test statistics for the null hypothesis that the average of earnings-related variables is the same regardless of the human capital category (unweighted).

Table 5. Education status of sample rickshaw pullers

	Education					*p* -value
	Illiterate	Primary (5th grade)	Middle (8th grade)	Secondary (10th) &	Total	
Total	596	502	140	82	1,320	
(row %)	(45.15)	(38.03)	(10.61)	(6.21)	(100.00)	
By community group						0.000
SC (Scheduled Castes)	83	78	39	14	214	0.001
	(38.79)	(36.45)	(18.22)	(6.54)	(100.00)	
ST (Scheduled Tribes)	61	32	13	9	115	0.123
	(53.04)	(27.83)	(11.30)	(7.83)	(100.00)	
Hindu OBC (Other Backward Classes)	260	232	65	44	601	0.362
	(43.26)	(38.60)	(10.82)	(7.32)	(100.00)	
Other Hindu	60	63	11	10	144	0.347
	(41.67)	(43.75)	(7.64)	(6.94)	(100.00)	
Muslim	131	97	12	4	244	0.000
	(53.69)	(39.75)	(4.92)	(1.64)	(100.00)	
Other religion	1	0	0	1	2	0.067
	(50.00)	(0.00)	(0.00)	(50.00)	(100.00)	
By age group (min=16, max=70)						0.001
Teens	24	20	4	6	54	0.434
	(44.44)	(37.04)	(7.41)	(11.11)	(100.00)	
20-29	178	203	47	25	453	0.003
	(39.29)	(44.81)	(10.38)	(5.52)	(100.00)	
30-39	216	160	59	26	461	0.107
	(46.85)	(34.71)	(12.80)	(5.64)	(100.00)	
40-49	116	80	24	24	244	0.029
	(47.54)	(32.79)	(9.84)	(9.84)	(100.00)	
50+	62	39	6	1	108	0.007
	(57.41)	(36.11)	(5.56)	(0.93)	(100.00)	
By job experience (min=0.5, max=42 years)						0.007
Less than 1 year	50	48	14	18	130	0.002
	(38.46)	(36.92)	(10.77)	(13.85)	(100.00)	
1 year to less than 5 years	193	170	49	27	439	0.922
	(43.96)	(38.72)	(11.16)	(6.15)	(100.00)	
5 years to less than 10 years	156	152	41	17	366	0.210
	(42.62)	(41.53)	(11.20)	(4.64)	(100.00)	
10 years and more	197	132	36	20	385	0.129
	(51.17)	(34.29)	(9.35)	(5.19)	(100.00)	

Notes:

"*p* -value" reports the probability value of chi-squared test statistics for the null hypothesis that row and column distributions are independent (unweighted). When the index takes more than two categories, the first row reports the test of the indicator variable, while the next rows report the test for a dummy variable taking one for each category.

Table 6. Rickshaw-pulling experience of sample rickshaw pullers

	Experience in years					*p* -value
	Less than 1 year	1 year to less than 5 years	5 years to less than 10	10 years and more	Total	
Total	130	439	366	385	1,320	
(row %)	(9.85)	(33.26)	(27.73)	(29.17)	(100.00)	
By community group						0.374
SC (Scheduled Castes)	23	80	55	56	214	0.443
	(10.75)	(37.38)	(25.70)	(26.17)	(100.00)	
ST (Scheduled Tribes)	9	37	30	39	115	0.645
	(7.83)	(32.17)	(26.09)	(33.91)	(100.00)	
Hindu OBC (Other Backward Classes)	68	196	167	170	601	0.417
	(11.31)	(32.61)	(27.79)	(28.29)	(100.00)	
Other Hindu	14	47	45	38	144	0.76
	(9.72)	(32.64)	(31.25)	(26.39)	(100.00)	
Non-Hindu	15	78	69	82	244	0.095
	(6.15)	(31.97)	(28.28)	(33.61)	(100.00)	
Other religion	1	1	0	0	2	0.205
	(50.00)	(50.00)	(0.00)	(0.00)	(100.00)	
By age group (min=16, max=70)						0.000
Teens	23	26	5	0	54	0.000
	(42.59)	(48.15)	(9.26)	(0.00)	(100.00)	
20-29	68	213	113	59	453	0.000
	(15.01)	(47.02)	(24.94)	(13.02)	(100.00)	
30-39	31	131	170	129	461	0.000
	(6.72)	(28.42)	(36.88)	(27.98)	(100.00)	
40-49	7	56	55	126	244	0.000
	(2.87)	(22.95)	(22.54)	(51.64)	(100.00)	
50+	1	13	23	71	108	0.000
	(0.93)	(12.04)	(21.30)	(65.74)	(100.00)	

Notes: See Table 5.

Table 7. Earnings and human capital in the rickshaw pulling business (OLS regression results)

	Dependent variable:				
	Average daily gross earnings (Rs.)	Average daily work time over the last 15 days (minutes)	Monthly income from the rickshaw pulling business (Rs.)	Monthly consumption expenditure (Rs.)	Monthly surplus (Rs.)
Human capital in schooling (ref = "Illiterate")					
Primary (5th grade)	7.0*	-2.3	111.1	-2.0	113.1
	[3.9]	[8.1]	[108.4]	[74.0]	[128.4]
Middle (8th grade)	15.0**	-11.9	304.2*	89.3	214.9
	[6.4]	[12.5]	[181.4]	[127.6]	[203.3]
Secondary (10th) & more	0.6	-12.3	6.6	-35.3	42.0
	[8.8]	[16.2]	[271.5]	[136.1]	[252.7]
Human capital in job experience (ref = "5 years to less than 10 years")					
Less than 1 year	-15.2**	-18.4	-413.0**	-89.3	-323.7*
	[6.4]	[11.5]	[173.2]	[98.7]	[191.4]
1 year to less than 5 years	-4.1	-3.5	-59.7	22.1	-81.8
	[4.9]	[9.0]	[136.5]	[81.0]	[163.7]
10 years and more	-11.5***	17.8**	-268.3**	38.9	-307.2**
	[4.0]	[8.6]	[119.7]	[77.3]	[136.5]
Other controls					
Age (years)	0.2	0.2	8.4	7.1**	1.3
	[0.2]	[0.4]	[6.0]	[3.2]	[6.5]
Dummy for Bihar origin	17.3***	10.2	403.0***	-52.7	455.7***
	[4.9]	[8.4]	[146.5]	[68.8]	[152.7]
SC dummy	1.1	10.9	17.8	-135.3	153.1
	[7.8]	[13.3]	[218.6]	[122.0]	[241.7]
ST dummy	-19.1**	22.6	-401.2	-145.7	-255.5
	[9.5]	[15.1]	[254.7]	[152.2]	[289.2]
OBC dummy	5.6	15.0	182.4	-103.2	285.6
	[6.0]	[11.7]	[173.1]	[104.7]	[198.3]
Muslim dummy	-4.4	-5.9	-128.1	-83.8	-44.3
	[7.8]	[15.1]	[210.4]	[121.0]	[224.6]
Dummy for a migrant who had a contact in Delhi before migration about general labor markets in Delhi	-1.1	-10.2	-114.8	92.8	-207.6*
	[3.9]	[7.3]	[100.7]	[68.1]	[112.6]
Dummy for a migrant who had a contact in Delhi before migration about rickshaw pulling jobs in Delhi	-12.5**	4.4	-265.3*	-40.1	-225.2
	[5.4]	[9.6]	[156.1]	[86.9]	[155.8]
Dummy for a migrant who found his accommodation through his Thekedar	23.9***	15.5	674.1***	-269.1***	943.1***
	[6.2]	[12.2]	[173.6]	[89.1]	[203.6]
Dummy for using own rickshaw	-17.1***	-28.6*	364.2**	-44.9	409.1*
	[5.1]	[16.6]	[183.4]	[124.1]	[215.6]
Rickshaw rental fee (deviation from the mean)*Dummy for using a rented rickshaw	2.0***	1.4	21.1	0.0	21.2
	[0.6]	[1.0]	[17.7]	[7.8]	[18.4]
MCD Zone fixed effect	Yes***	Yes***	Yes***	Yes***	Yes***
Intercept[#]	264.9***	620.5***	6476.0***	4001.0***	2475.0***
	[9.6]	[18.6]	[273.8]	[204.7]	[337.3]
R^2	0.167	0.171	0.139	0.080	0.147
F-stat for zero slopes	7.229***	6.833***	6.093***	4.816***	7.057***

Notes: The number of observations is 1,320. See Tables 1-6 and the text for the definition and summary statistics of the variables. Cluster-robust standard errors using "colony" as the primary sampling unit are reported in brackets. * p<0.1, ** p<0.05, *** p<0.01. # The intercept shows the expected value of the dependent variable for the reference category. In addition to human capital characteristics, the reference category is aged 33.3 years old, not from Bihar origin, other Hindu or Sikh or Christian, non-migrant or migrant without informant in Delhi before migration, not using Thekedar's help in finding accommodation, renting a rickshaw at Rs. 37.6 per day, and operating in City Zone.

Table 8. Robustness check

	Dependent variable:				
	Average daily gross earnings	Average daily work time over the last 15 days	Monthly income from the rickshaw pulling business	Monthly consumption expenditure	Monthly surplus
1. Instead of job experience categories, natural log of experience years and its squared term are used					
Human capital in schooling (ref = "Illiterate")					
Primary (5th grade)	7.1*	-3.0	110.9	-9.5	120.5
	[3.9]	[8.1]	[108.8]	[74.1]	[128.1]
Middle (8th grade)	15.1**	-12.3	304.6*	81.7	222.9
	[6.5]	[12.5]	[183.5]	[127.7]	[205.6]
Secondary (10th) & more	0.0	-10.9	-2.1	-30.4	28.3
	[8.8]	[16.3]	[272.2]	[138.3]	[254.7]
Human capital in job experience					
ln(job experience in years)	6.6***	10.1***	215.1***	69.9**	145.2**
	[2.0]	[3.3]	[53.2]	[32.2]	[57.7]
ln(job experience in years) squared	-2.1**	0.2	-66.8***	-0.3	-66.5**
	[0.8]	[1.6]	[21.8]	[13.7]	[25.7]
2. Instead of using levels for the dependent variable, its natural log (*100) is used as the dependent variable					
Primary (5th grade)	2.37*	-0.16	1.13	-0.05	2.11
	[1.42]	[1.43]	[1.74]	[2.09]	[6.09]
Middle (8th grade)	5.43**	-1.26	4.71	1.94	5.42
	[2.44]	[2.20]	[2.86]	[3.20]	[9.62]
Secondary (10th) & more	-0.66	-2.11	-1.84	-0.53	13.47
	[3.50]	[3.07]	[4.64]	[3.56]	[9.96]
Human capital in job experience (ref = "5 years to less than 10 years")					
Less than 1 year	-6.69***	-3.65*	-7.94***	-2.28	-22.34**
	[2.49]	[2.04]	[2.95]	[2.96]	[10.67]
1 year to less than 5 years	-1.85	-0.55	-1.62	-0.28	8.36
	[1.81]	[1.56]	[2.18]	[2.15]	[6.38]
10 years and more	-4.19***	3.18**	-4.51**	0.43	-6.29
	[1.54]	[1.52]	[1.93]	[2.07]	[6.42]

Notes: The number of observations is 1,320, except for the regression model for the natural log of "Monthly surplus", estimated using 1,125 due to the drop of 195 observations whose surplus was negative. In specification 1, other explanatory variables reported in Table 7 except for Age were also included; in specification 2, all other explanatory variables in Table 7 were also included. Their estimated parameters are not reported here for brevity. They are available on request from the author. See notes to Table 7 as well.