Short-term Migration Costs: Evidence from India *

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Abstract

This paper provides new evidence on short-term (or seasonal) migration decisions. Using original survey data collected from a high out-migration area in rural India, we find that a public works program significantly reduces short-term migration. Workers who choose to participate in local public works rather than migrating forgo much higher earnings outside of the village. We estimate a structural model of migration decisions which suggests that the utility cost of one day away may be as high as 60% of migration earnings. We show that under reasonable assumptions up to a half of this cost can be explained by higher living costs in urban areas and the variability of migration earnings. The other half reflects high non-monetary costs from living and working in the city.

Keywords: Internal Migration, Workfare Programs, India, Urban, Rural.

JEL Classification: H53, J22, J61, O15, R23

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1 Introduction

Conventional models of migration within developing countries consider migration as a long term decision (?). Yet considerable evidence outside of economics (???) and an increasing number of studies within economics (????) suggest that a significant fraction of work migration within developing countries is short-term. According to nationally representative data from the National Sample Survey (hereafter NSS), long-term migration in India is low. In 2007-08, 1.2 million rural Indian adults settled in urban areas for work and 0.8 million urban Indian adults settled in rural areas for work in 2007-08. By comparison, short-term trips are much more frequent: in the same year, 8.5 million rural adults spent one to six months away for work in urban areas.[1]

Short term and long term migration decisions are qualitatively different. Short-term migrants do not have to sell their land, or to lose the support of informal insurance networks, and hence do not have to pay the same large fixed cost as long term migrants (?). Short-term migration is used by the rural poor as a consumption smoothing mechanism (?). It is often seasonal, driven by the lack of earnings opportunities in rural areas during the agricultural off-season (?). Some authors have recommended government policies encouraging short-term migration as an effective way to reduce rural poverty (??). However, we still have little empirical evidence on how profitable short-term migration really is.

In this paper, we present unique empirical evidence on the costs and benefits of short-term migration. We use data collected in 2010 from a high out-migration area located at the border of three Indian states, with detailed information on seasonal migration (?). We then exploit variation in the implementation of a large rural workfare program, the National Rural Employment Guarantee Act (NREGA), to shed light on migration decisions.[2] The effect of the program on migration is a priori ambiguous. On the one hand it provides additional income and relaxes cash constraints, which may increase migration (?). On the other, it provides local employment opportunities when agricultural work is scarce, thus offering an alternative to migration (?).[3]

We find that availability of NREGA work has a strong negative effect on short-term migration. Our estimates imply that when one more day of public employment is provided per rural adult, migration trips are shorter by 0.6 days (from an average 23 days) and the probability of migrating decreases by 0.8 percentage points (from an average of 48%). Given that earnings outside of the village are much higher than NREGA wages, our results suggests that utility costs associated with migration are large. We estimate a simple model of migration decisions and show that utility costs may be as high as 60% of migration earnings. Under reasonable assumptions, we can explain half of the estimated migration costs by higher living costs in urban areas and income risk associated with migration. The other half likely

[1] Author's calculations based on NSS Employment-Unemployment Survey 2007-08.

[2] Workfare programs are common antipoverty policies. Recent examples include programs in Malawi, Bangladesh, India, Philippines, Zambia, Ethiopia, Sri Lanka, Chile, Uganda, and Tanzania.

[3] The insurance effects of the program are equally ambiguous. On the one hand, the program reduces income risk, which may encourage migration (?). On the other, it offers an alternative risk-coping strategy, which may crowd-out distress migration (?)

reflects the disutility from living in the city with no formal shelter and away from the family.

To evaluate the effect of the NREGA on short-term migration, our identification strategy relies on variation in program implementation across states and seasons. For this, we exploit the design of the survey, which collected retrospective information on migration trips in 35 village pairs formed of 35 villages in Rajasthan and 35 villages just across the border in Madhya Pradesh (25 villages) and Gujarat (10 villages).[4] We first show that virtually all NREGA employment is provided during the summer months (mid-March to mid-July), and that significantly more work is provided in Rajasthan villages than in villages in other states. These differences in NREGA employment do not seem to reflect differences in demand for NREGA work, which is as high in the winter (mid-November to mid-March) as in the summer and uniformly high across states.[5] We next find that in Rajasthan, during the summer, workers are less likely to leave the village for work and make shorter trips when they do, which we interpret as evidence that the program reduces short-term migration on the intensive and extensive margin. We perform a number of robustness checks to show that our estimates are indeed identifying the effect of the NREGA and not differences in rural poverty and migration patterns unrelated to the program. First, there is no difference in migration across states in the winter, when short-term migration is high but no NREGA employment is provided. Second, our estimates do not change at all when we control for worker characteristics and include village pair fixed effects. Third, our results remain when we use only village pairs between Rajasthan and Madhya Pradesh, which have comparable levels of public service provision. Finally, we find no significant differences in reported levels of migration across states in 2005, before the NREGA was implemented.[6]

It is perhaps surprising that migration appears to be so strongly affected by the workfare program, given that daily earnings outside of the village are nearly twice the level of daily earnings on public works. The gap in earnings could simply reflect differential productivity between migrants and participants in the government program, but the wage differential persists even for adults who report both working for the government program and migrating. The large wage differentials combined with high demand for work under the workfare program suggest substantial migration costs. We investigate this question formally by modeling short-term migration decisions in a framework similar to **?**. Short-term migration provides a higher monetary return than local work but requires a fixed cost. Workers also incur a flow cost for each day spent away. We compare the daily earnings of migrants who report wanting to work more for the workfare program with the government wage provided by the program. Since these individuals have already paid the fixed costs of migration, this difference is informative of the minimum marginal costs migrants incur along the intensive margin. We find that for the average migrant, the flow costs of migration are 60% of daily earnings in the city.

The utility cost of migration may be due to a wide range of factors, which we attempt to quantify. We first consider differences in living costs between the village and the city. Using consumer price indexes from rural and urban areas, we find that price differences amount to

[4] Villages were matched based on population composition and agricultural production (see Section **??**).

[5] There is abundant evidence that demand under the NREGA is rationed (**??**).

[6] Due to imperfect recall, we cannot exclude that migration levels were in fact different if respondents were to systematically over-report migration in Rajasthan and under-report migration in other states.

up to 10% of migration daily earnings. We next quantify the utility cost of income risk. To measure the variance of migration earnings, we use either variation in earnings for the same individual across years or variation in residuals of a Mincer equation across individuals for the same year. Under reasonable assumptions about risk aversion, we find that the disutility of income risk may amount to up to 20% of migration daily earnings. The remaining cost of migration is likely due to the disutility of migration itself, i.e. rough living and working conditions. We find that it is higher for older migrants, and adults with young children.

This paper contributes to the literature in three ways. First, we present evidence that even workfare programs operating during the agricultural off-season may have a significant impact on private sector employment, and that for many workers the opportunity cost of time is considerably greater than zero. The literature on labor market impacts of workfare programs is mostly theoretical (**??**). Recent empirical studies focus on the impact of workfare programs on rural labor markets (**???**). Other studies and papers have suggested that the NREGA may be impacting migration (**???**). This paper confirms the findings of a companion paper (**?**), who argue that the NREGA reduces rural to urban short-term migration and increases urban wages.

Second, we use demand for employment on public works among migrants to shed light on the determinants of migration decisions. The literature highlights the importance of opportunity costs (i.e. local employment opportunities) and financial constraints in migration decisions (**??**). **?** find that a transport cost subsidy in rural Bangladesh has long term positive effects on seasonal migration to urban areas. They explain their results by uninsured risk of failed migration and lack of information on returns to migration. In the context we study, households are well informed about potential migration earnings. The fact that migrants decide to stay in the village when work is available suggests that short-term migration decisions are mostly driven by opportunity costs, rather than financial constraints or risk aversion.

Third, we quantify migration costs based on information of earnings for the same worker performing the same task in and outside of the village. This helps overcome selection issues which plague the debate on the source of the rural-urban wage gap in developing countries. The literature often interprets differences in real wages, or productivity per worker between rural and urban areas as evidence of "wedges", or barriers to migration (**???**). However, **?** argues that the entire gap can be explained by the fact that production in urban areas is more skill intensive, and attract more skilled workers. Our contribution is to show that the same workers earn twice as much on urban construction sites than on local public works. To rationalize the fact that most of them still prefer to join the program, migration costs have to be high. We explain half of these by differences in living costs and income risk.

The following section describes the workfare program and presents the data set used in the paper. Section **??** uses variation in public employment provision across states and seasons to estimate the impact of the program on short-term migration. Section **??** uses detailed information on migration and program participation to provide structural estimates of migration costs. Section **??** concludes.

2 Context and data

In this section we first describe employment provision under the India's employment guarantee (NREGA). We next present the data we use in the empirical analysis, which comes from an original survey implemented in a high out-migration area at the border of three states (Rajasthan, Gujarat and Madhya Pradesh).

2.1 NREGA

The rural workfare program studied in this paper is India's National Rural Employment Guarantee Act (NREGA). The act, passed in September 2005, entitles every household in rural India to 100 days of work per year at a state-level minimum wage. The NREGA is the largest workfare program in the world: in 2010-11 it provided 2.27 billion person-days of employment to 53 million households.[7] These figures however mask a substantial amount of heterogeneity across states and even districts (**??**). Figure **??** shows public employment provision in rural India by state in 2009-10 based on nationally representative data from the National Sample Survey Organization (NSS). The number of days on public works per adult ranges from almost zero in Haryana (HR) to 12 in Andhra Pradesh (AP). Implementation varies widely between the three states of our study: Rajasthan (RJ) provides 11 days of public works employment per adult, Madhya Pradesh (MP) 2.6 days, and Gujarat (GJ) 1.4 days.[8] **?** argue that cross-states differences in NREGA implementation does not reflect underlying demand for NREGA work. Rather than socio-economic conditions, the quality of NREGA implementation seem to be explained by some combination of political will, existing administrative capacity, and previous experience in providing public works (**??**).

Public employment provision is also highly seasonal. Local governments start and stop works throughout the year, with most works concentrated during the first two quarters of the year prior to the monsoon. The monsoon rains make construction projects difficult to undertake, which is likely part of the justification. Field reports, however, document government attempts to keep worksites closed throughout the fall so they do not compete with the labor needs of farmers (**?**). Figure **??** shows variation in time spent on public works across quarters of the year for the three states of our study (Gujarat, Madhya Pradesh and Rajasthan). Public employment drops from 2.5 days to 1.25 between the second and third quarter, and stays below one day in the fourth and first quarter.

Work under the act is short-term, often on the order of a few weeks per adult. Households with at least one member employed under the act during agricultural year 2009-10 report a mean of only 38 days of work and a median of 30 days for *all* members of the household during that year, which is well below the guaranteed 100 days. Within the study area as well as throughout India, work under the program is rationed (**?**). During the agricultural year 2009-10, an estimated 19% of Indian households reported attempting to get work under the act without success.[9] The rationing rule is at the discretion of local officials: workers

[7] Figures are from the official NREGA website nrega.nic.in.

[8] Authors' calculations based on the NSS Employment-Unemployment survey Round 66.

[9] Author's calculations based on the NSS Employment-Unemployment Survey Round 66.

are actively recruited for work by village officials rather than applying for work(**?**).

2.2 Survey

2.2.1 Sample Selection

Our analysis draws from an original survey carried out in Western India in 2010 (**?**). Figure **??** shows the location of the 70 sample villages. The selection of sample villages proceeded in three steps. First, one district in Rajasthan and three neighbouring districts, one in Gujarat and two in Madhya Pradesh were selected. The survey location was chosen because previous studies in the area reported high rates of out-migration and poverty (**?**), and because surveying along the border of the three states provided variation in state-level policies. Second, villages in Rajasthan were matched with villages across the border in Gujarat and Madhya Pradesh based on seven criteria: distance, fraction of Scheduled Castes (SC), fraction of Scheduled Tribes (ST), cultivated area, irrigated and non irrigated cultivated area and population per cultivated area.[10] Finally, the 25 best matches along the Madhya Pradesh border and the 10 best matches along the Gujarat border were selected to be part of the survey sample. As Panel A of Table **??** shows, this procedure ensured that village pairs were well balanced along these dimensions.

The survey itself consisted of three modules: village, household, and adult modules.[11] The household module was completed by the household head or other knowledgeable member. One-on-one interviews were attempted with each adult aged 14 to 69 in each household. The analysis in this paper focuses mostly on those adults who completed the full one-on-one interviews. Table **??** presents means of key variables for the subset of adults who answered the one-on-one interviews as well as all adults in surveyed households. Out of 2,722 adults aged 14-69, we were able to complete interviews with 2,224 (81.7%). The fourth column of the table presents the difference in means between adults who completed the one-on-one interview and those who did not. The 498 adults that we were unable to survey are different from adults that were interviewed along a number of characteristics. Perhaps most strikingly, 40% of the adults that we were unable to survey were away from the village for work during all three seasons of the year compared with eight percent for the adults that we did interview. It should therefore be kept in mind when interpreting the results that migrants who spend most of the year away from the village are underrepresented in our sample. These migrants are also less likely to be affected by the NREGA: they are twice less likely to have ever done NREGA work as other adults in the sample. [12]

To assess how the adults in our sample compare with the rural population in India, the fifth column of Table **??** presents means from the rural sample of the nationally representative

[10] Village characteristics used for matching were measured in the 2001 census, before the NREGA.

[11] In 69 of the 70 villages, a local village official answered questions about village-level services, amenities and labor market conditions. We do not use this data in the analysis.

[12] We can include adults that were not interviewed personally in the analysis by using information collected from the household head and check that our results are not affected. We choose not to use this information in our main specification to maximize precision of our estimates, but include it later as a robustness check.

NSS Employment-Unemployment Survey. Literacy rates are substantially lower in the study sample compared with India as a whole, reflecting the fact that the study area is a particularly poor area of rural India. The NSS asks only one question about short-term migration, which is whether an individual spent between 30 and 180 days away from the village for work within the past year. Based on this measure, adults in our sample are 28 percentage points more likely to migrate short-term than adults in India as a whole. Part of this difference may be due to the fact that the survey instrument was specifically designed to pick up short-term migration, though most of the difference is more likely due to the fact that the sample is drawn from a high out-migration area. The sixth column shows the short-term migration rate is 16% for the four districts chosen for the migration survey according to NSS, which is half the mean in sample villages but well above the all-India average.

2.2.2 Migration patterns

The survey instrument was specifically designed to measure migration, cultivation, and participation in the NREGA, which are all highly seasonal. The survey was implemented at the end of the summer 2010, i.e. when most migrants come back for the start of the agricultural peak season. Surveyors asked retrospective questions to each household member about each activity separately for summer 2010, winter 2009-10, monsoon 2009, and summer 2009. Most respondents were surveyed between mid summer 2010 and early monsoon 2010, so that in many cases, summer 2010 was not yet complete at the survey date. As a result, when we refer to a variable computed over the past year, it corresponds to summer 2009, monsoon 2009, and winter 2009-10. Respondents were much more familiar with seasons than calendar months, and there is not an exact mapping from months to seasons. Summer is roughly mid-March through mid-July. The monsoon season is mid-July through mid-November, and winter is mid-November through mid-March.

Table **??** presents descriptive information about short-term migration trips. As expected, migration is concentrated during the winter and the summer and is much lower during the peak agricultural season (from July to November). Short-term migrants travel relatively long distances (300km on average during the summer), and a large majority goes to urban areas and works in the construction sector. Employer-employee relationships are often short-term: only 37% of migrants knew their employer or labor contractor before leaving the village. Living arrangements at destination are rudimentary, with 86% of migrants reporting having no formal shelter (often a bivouac on the work-site itself). Finally, most migrants travel and work with family members, only 16% have migrated alone. Column Four presents national averages from the NSS survey. Migration patterns are similar along the few dimensions measured in both surveys. The average rural short-term migrant in India as a whole is less likely to go to urban areas, and more likely to work in the manufacturing or mining sector than in the survey sample. As before, averages from NSS for the four districts of the survey sample are closer to the survey estimates (Column Five).

2.2.3 Measuring Demand for NREGA Work

An important variable for the following analysis is whether an individual wanted to work more for the NREGA during a particular season. Specifically, the question is, "if more NREGA work were available during [season] would you work more?" for individuals who had worked for the NREGA. For individuals who did not work for the NREGA, we asked "did you want to work for the NREGA during [season]?" One should be skeptical that the answer to these questions truly indicates a person's willingness to work. Appendix Table **??** shows that the correlations between the response to the resulting measure of demand and respondent characteristics are sensible: demand for NREGA is lower for adults with secondary education, and those who have a formal salaried job. We also check the reasons given by respondent*s* for why they did not work if they wanted to work and why they did not want to work if they reported not wanting to work. Appendix Table **??** shows that the closure of worksites and the inaction of village officials are the main reasons given by respondents who wanted more NREGA work while other work opportunities, studies, and sickness are the the main reasons given by respondents who did not want more NREGA work.

2.2.4 Measuring Earnings

In order to assess the costs of migration, we require reliable measures of the wage that NREGA participants and migrants earn. Given the short-term nature of most migrant jobs, the same migrant might work for multiple employers for different wages within the same season. For this reason, the survey instrument included questions about earnings, wages, and jobs for each trip within the past four seasons up to a maximum of four trips. Some migrants still might hold multiple jobs and therefore earn different wages within the same trip, but daily earnings and wages are more likely to be constant within the same migration trip than within the same season. In total, this yields wage observations for 2,749 trips taken by 1,125 adults. So that we do not overweight migrants who took more frequent, shorter trips relative to migrants who took less frequent, longer trips, we calculate the average wage for each migrant for each season that the migrant was away. Finally, we take into account the possibility that migrants do not always find work at destination by using earnings per day away, rather than earnings per day worked as our main measure of migration returns.[13]

3 Program effect on migration

In this section, we evaluate the effect of the NREGA on short term migration. We first present descriptive statistics on program participation, demand for NREGA work and migration. We next estimate the program effect by comparing public employment provision and migration in Rajasthan villages with matched villages in Gujarat and Madhya Pradesh.

[13] Appendix **??** describes the construction of the earnings measures in more detail.

3.1 Descriptive statistics

We first investigate the correlation between demand for NREGA work, program participation and short-term migration. Survey data shows that in the village sample as in the rest of India NREGA work provision is highly seasonal, with 40% of all adults working for NREGA in the summer, 0% during the monsoon and 6% only during the winter (Fourth Column of Table **??**). It also confirms the high, unmet demand for NREGA work; 80% of all adults would have worked more for NREGA during the summer if they were provided work. During the summer, when both migration and NREGA work coexist, we find that 12% of all adults both migrated and did NREGA work. Since 35% of all adults migrated during that season, this implies that migrants are less likely to work for NREGA than the average adult. Demand for NREGA work, however, is higher among migrants than for the population as a whole: 86% of migrants declare they would have done more NREGA work. Furthermore, 8% of all adults declare they would have migrated during the summer if there had not been NREGA work. These results suggest that NREGA work reduced or could potentially reduce migration for 38% of adults or 90% of migrants.

Comparing the first, second and third columns of Table **??** reveals important differences across states in the sample. As explained in Section **??**, the villages of our surey were selected in part because they were located at the intersection of the three states of Rajasthan, Madhya Pradesh, and Gujarat. The objective was to exploit differences in implementation of the NREGA across the border to estimate its impact on migration. Table **??** shows that the fraction of adults who worked for the NREGA during summer 2009 is 50% in Rajasthan, 39% in Madhya Pradesh, and 10% in Gujarat. Conditional on participation, NREGA workers receive 31 days of work in Rajasthan on average, 22 days in Madhya Pradesh and 25 days in Gujarat. Interestingly, the fraction of adults who report wanting to work for NREGA and the number of days of NREGA work they desire are very similar across states, between 78 and 81%, and between 41 and 48 days, respectively. This suggests that in the sample as in the rest of India variation in NREGA employment provision are due to differences in political will and administrative capacity in implementing the scheme rather than differences in demand for work (**?**).

Table **??** provides descriptive evidence that higher NREGA work provision is associated with lower migration. The proportion of adults who declare they stopped migrating because of NREGA in the summer increases from 3% in Gujarat to 8% in Madhya Pradesh and 10% in Rajasthan (Panel A). In the following sections, we use variation in NREGA employment provision across states and seasons to estimate the impact of the program on short-term migration.

3.2 Strategy

In order to estimate the impact of the NREGA on days spent on local public works and days spent outside the village we exploit the variation in program implementation across states and compare Rajasthan with Gujarat and Madhya Pradesh. We also take advantage of the seasonality of public employment provision and compare the summer months, when most

employment is provided, to the rest of the year. The estimating equation is:

$$Y_{is} = \alpha + \beta_0 Raj_i + \beta_1 Sum_s + \beta_3 Raj_i * Sum_s + \gamma \mathbf{X_i} + \varepsilon_{is} \quad (1)$$

where Y_{is} is the outcome for adult i in season s, Raj_i is a dummy variable equal to one if the adult lives in Rajasthan, Sum_s is a dummy variable equal to one for the summer season (mid-March to mid-July) and X_i are controls. The vector X_i includes worker characteristics (gender, age, marital status, languages spoken and education dummies), households characteristics (number of adults, number of children, religion and caste dummies, landholding in acres, dummies for whether the household has access to a well, to electricity, owns a cell phone or a TV), village controls listed in Table **??** and village pair fixed effects.[14] Standard errors are clustered at the village level.

In order for β_3 to identify the impact of the NREGA, villages in Rajasthan need to be comparable with their match on the other side of the border in all respects other than NREGA implementation. Potential threats to our identification strategy include differences in socio-economic conditions, access to infrastructures, or state policies (education, health etc.). It is hence important to test whether the villages are indeed comparable along these dimensions. Table **??** presents sample means of village characteristics for village pairs in Rajasthan and Madhya Pradesh and village pairs in Rajasthan and Gujarat. Across all states, villages have similar demographic and socio-economic characteristics. They have the same population size, proportion of scheduled tribes, literacy rate, fraction of households who depend on agriculture as their main source of income, same average land holding and access to irrigation. There are however significant differences in infrastructure across states. Villages in Madhya Pradesh are significantly further away from the next paved road than matched villages in Rajasthan, but the difference is relatively small (600 meters). Villages in Gujarat are closer to railways, to towns, have greater access to electricity and mobile phone networks. As a robustness check, we include all these characteristics in our analysis as controls. Since villages in Gujarat seem systematically different from matched villages in Rajasthan along some important dimensions, we also implement our estimation excluding pairs with Gujarat villages.

3.3 Results

We first compare public employment provision across states and seasons. We use days worked for the NREGA in each season as an outcome and estimate Equation **??**. The first column of Table **??** confirms that across states, less than one day of public employment is provided outside of the summer months. During the summer, adults in Madhya Pradesh and Gujarat, work about six days for NREGA. The coefficient on the interaction of Rajasthan and summer suggests that in Rajasthan nine more days of public employment are provided. The estimated coefficients do not change at all after including controls and village pair fixed effects (Column 2). Panel B in Table **??** presents the estimates obtained without villages

[14] We also estimate our specification including a dummy variable for whether the adult reported being willing to work more for the NREGA in this particular season and find similar results (not reported here).

on the border of Gujarat and Rajasthan. Comparing villages on either side of the border between Rajasthan and Madhya Pradesh, adults in Rajasthan work twice as many days on average on NREGA work-sites than adults in Madhya Pradesh (who work on average seven and a half days).

Columns three of Table ?? repeats the same analysis with days spent outside the village for work as the dependent variable. Estimates from Panel A suggest that the average adult in Madhya Pradesh and Gujarat villages spent 11 days away for work during the monsoon and the winter 2009. Adults in Rajasthan villages spent a day less away for work, but the difference is not significant. By contrast, in the summer 2009 adults in Rajasthan villages spent five and a half fewer days on average working outside the village than their counterpart on the other side of the border, who were away for 24 days on average. The estimated coefficients hardly change with the inclusion of controls and village fixed effects. As a robustness check, we estimate the same specification without the village pairs that include Gujarat villages. The magnitude of the effect increases to eight and a half days per adult (Column 3 Panel B of Table ??). Assuming villages in Gujarat and Madhya Pradesh provide a valid counterfactual for villages in Rajasthan, these estimates suggest that one day of additional NREGA work reduces migration by 0.6 to 1.2 days.[15]

This effect is the combination of a reduction in the probability of migrating (extensive margin) and the length of migration trips conditional on migrating (intensive margin). Column five and six of Table ?? estimate Equation ?? taking as the outcome a binary variable equal to one if the adult migrated during the season. In Madhya Pradesh and Gujarat villages, 20% of adults migrated at some point between July 2009 and March 2010. The probability is exactly the same in Rajasthan villages. During the summer 2009, on average 39% adults migrated in Madhya Pradesh and Gujarat villages. The proportion of migrants was 7 percentage points lower in Rajasthan villages and the difference is highly significant. Panel B Column Five of Table ?? presents the estimates when we compare only villages in Madhya Pradesh and Rajasthan. We find that the probability of migrating during the summer is 10 percentage point lower for adults in Rajasthan. The estimates are robust to the inclusion of controls and pair fixed effects.[16]

The differences we observe in migration patterns between Rajasthan, Madhya Pradesh and Gujarat could be partly due to preexisting differences unrelated to the NREGA. The fact that we do not find any significant difference in monsoon and winter, when the program is not implemented, gives some reassurance that migration patterns are not systematically different across states. We also compare the number of long-term migrants across-states, i.e. individuals who changed residence and left the household in the last five years, and find no significant differences (see Appendix Table ??). Finally, the survey included retrospective questions about migration trips in previous years. Using non missing responses, we find no

[15]We repeat the same analysis including adults who were not interviewed personally but about whom information was collected from the household head. The results, shown in Appendix Table ?? are extremely similar. As discussed in Section ?? adults who were not interviewed personally are more likely to migrate in all seasons, and hence less likely to change their migration behavior in response to the NREGA.

[16]We find no significant differences in the number of trips made during the season between villages in Rajasthan and villages in Gujarat and Madhya Pradesh (results not shown).

significant difference in migration levels in 2004 and 2005, i.e. before the NREGA was implemented. Unfortunately, less than 50% of respondents remembered whether they migrated before 2005, hence we cannot exclude that migration levels were in fact different.

4 Migration Costs

In this section, we briefly outline a theoretical model to understand the impact of the program on migration decisions by rural workers, and use it to structurally estimate the flow cost of migration.

4.1 Theoretical framework

Let us consider an individual living in a rural area. She splits her time T between work in the village L_r and work outside the village $T - L_m$. In-village earnings take the form $f(L_r)$ with $f(\cdot)$ increasing and concave and $f'(0) >> 0$. Leaving the village requires a fixed cost c_f and a variable cost c_v per unit of time spent outside the village. While outside the village, migrants earn w_u per day away. Time spent in the village L_r solves:

$$\max_{L_r} f(L_r) + (w_u - c_v)L_r - c_f \mathbb{1}\{L_r < T\}$$
$$\text{such that } L_r \in [0, T]$$

For any interior solution $L_r < T$, the optimal period of time spent in the village is L_r^* such that $f'(L_r^*) = w_u - c_v$. Let M_0 be a dummy variable which is equal to one when the invidual migrate. Leaving the village for work is optimal if and only if:

$$M_0 = 1 \quad \Leftrightarrow \quad (w_u - c_v)(T - L_r^*) - c_f > [f(T) - f(L_r^*)] \tag{2}$$

The model assumes that the utility function is linear in earnings and that there is no leisure choice. More generally, one could think of $f(L_r)$ as capturing utility from time spent in the village after the individual has optimally chosen work outside of the village $T - L_r$ and leisure given a time constraint of T, and one could interpret $(w_u - c_v)L_r - c_f \mathbb{1}\{L_r < T\}$ as capturing utility from time spent outside the village. The variable cost c_v would then include the value of leisure outside the village.

Next, we consider what happens when L_g days of government work (NREGA work) are offered within the village at wage w_g. We assume L_g is small relative to the usual duration of migration trips ($L_g < T - L_r^*$) and fixed, i.e. workers choose whether or not participate to the program, but not the number of days they work. Let c_p denote the cost of participation to the program.[17] Let M_1 be a dummy variable which is equal to one when the individual

[17] These assumptions are consistent with the fact that demand for NREGA work is heavily rationed (see Section ??). During the summer 2009 less than 15% of adults who worked for NREGA received more than 32 days, but more than 85% of adults who migrated were away for more than 32 days.

migrate and P a dummy variable which equals to one if the individual participates to the program. Participation and migration decisions are made jointly: individuals choose among four options, with the following pay-offs:

$$\begin{array}{l|l} M=0,\ P=0 & U_1 = f(T) \\ M=0,\ P=1 & U_2 = f(T-L_g) + w_g L_g - c_p \\ M=1,\ P=0 & U_3 = f(L_r^*) + (w_u - c_v)(T - L_r^*) - c_f \\ M=1,\ P=1 & U_4 = f(L_r^*) + (w_u - c_v)(T - L_r^* - L_g) - c_f + w_g L_g - c_p \end{array}$$

Let us first consider options 1 and 2. Conditional on not migrating, individuals participate to the program if and only if $U_2 > U_1$, i.e. if:

$$w_g L_g - c_p > f(T) - f(T - L_g) \tag{3}$$

Assuming zero cost of participation and letting L_i^g tend towards zero, this condition becomes $f'(T) < w_g$, i.e. individuals who do not migrate participate to the program if the marginal productivity of their time in the village is lower than the NREGA wage.

Let us next consider options 3 and 4. Conditional on migrating, individuals participate to the program if and only if $U_4 > U_3$, i.e. if:

$$w_g L_g - c_p > (w_u - c_v) L_g \tag{4}$$

Assuming zero cost of participation, this condition becomes $w_g > w_u - c_v$. Migrants participate to the program if and only if the NREGA wage is higher than the earnings from one day away minus the flow cost of migration. This is the condition we use to estimate the flow cost of migration.

4.2 Migration Costs Estimation

We now build on our theoretical framework to provite structural estimates of migration costs. From Equation **??** and assuming away the cost of participation, current migrants participate to the program if and only if $c_v > w_u - w_g$, i.e. the flow cost of migration is higher than the difference between migration daily earnings and the NREGA wage. Suppose for each individual i, we observe potential earnings per day outside the village (w_u^i), earnings per day of government work (w_g^i) and a dummy variable for whether the individual would work more for the government program if provided work ($WANT_i$). We interpret $WANT_i$ as the participation decision in a hypothetical situation were migrants would not have to pay the cost of participation ($c_p = 0$). Since we focus on current migrants, we can put a higher bound on migration costs by assuming that on average the flow cost of migration is lower than daily earnings from migration ($c_v < w_u$). Suppose that variable migration costs within the population of current migrants are distributed according to $N(\mu_c, \sigma_c)$. Then the likelihood of μ_c, σ_c conditional on w_u, w_g and $WANT_i$ is:

$$\begin{aligned} L(\mu_c, \sigma_c|_{w_g^i, w_u^i, WANT_i}) = & \sum_{WANT_i=1} \log\Big(\Phi(\frac{w_u^i - w_g^i - \mu_c}{\sigma_c})\Big) \\ & + \sum_{WANT_i=0} \log\Big(\Phi(\frac{w_u^i - \mu_c}{\sigma_c}) - \Phi(\frac{w_u^i - w_g^i - \mu_c}{\sigma_c})\Big) \end{aligned} \tag{5}$$

Table ?? presents earnings per day spent outside the village for migrants and per day worked for the NREGA for adults who worked outside of the village in the summer 2009.[18] For the average migrant, earnings outside of the village are 61% higher than earnings on NREGA work sites (Column 1). Column 2 and 3 further split the sample of migrants into those who report wanting more NREGA work and those who report not wanting more NREGA work. As expected, the differential between daily earnings outside the village and NREGA earnings is much higher for migrants who do not want NREGA work (85% higher). But even for migrants who want NREGA work the difference in earnings is substantial: workers earn 59% more per day outside of the village than per day worked on NREGA worksites. Of course, a majority of migrants did not actually work for the NREGA, so that these comparisons are based on predicted rather than actual earnings. As a check, the last column restricts the sample to adults who both worked outside the village and did NREGA work in the summer 2009. The pattern is very similar: earnings outside of the village are much higher (55%) than earnings from NREGA work.

We next estimate the distribution of variable migration costs using the framework set out in the previous section. Table ?? presents the results. For the average migrant (Panel A), the flow utility cost per day away is 60.5 rupees which is 59% of the average daily earnings per day away from the village. Our estimation relies on the assumption that when migrants declare that they would have liked to do more NREGA work, they compare utility from one day away and one day working on the program. This rules out any consideration of fixed costs associated with migration (c_f in the model) or participation to the program (c_P). We test the robustness of our results in two ways. First, we restrict the sample to migrants who declare wanting a number of NREGA days lower than the number of days they were away, so that even if they had participated to the program as much as they wanted they would still have migrated (paid c_f). Second, we restrict the sample to migrants who have worked for the NREGA during the season, so that they have already paid the cost of participation (c_P). As Panel B and C of Table ?? show, the estimated flow cost of migration is very similar in either sample, between 51 and 62% of migration earnings. These structural estimates suggest that the flow cost of migration needs to be very high to explain that many migrants are ready to forgo higher wages at destination and do NREGA work in the village.

4.3 Differences in living costs

We next try to assess the relative importance of three possible sources of migration costs: higher costs of living at destination, uncertainty about earnings from migration and disutility cost from leaving dependants behind.

Living in urban areas is more expensive than living in the village, and migrants may need to pay for goods they would get for free or cheaply at home. Since our estimation relies on nominal comparisons, any difference in living costs will enter the flow cost of migration. Existing evidence on urban-rural wage gaps in India suggests that adjusting for living costs may be important. Using NSS 2009-10 Employment Unemployment surveys and

[18] The construction of these variables is described in detail in Section ?? and Appendix ??.

state poverty lines as deflators, ? show that urban-rural real wage gaps are zero, or even negative at the bottom of the distribution of wages. Deflators used for urban residents may not be however appropriate for short-term migrants if their respective consumption baskets are very different. As we saw from Table ??, 86% of migrants in the summer 2009 had no formal shelter but bivouacked on the worksite, and most of the remaining 14% stayed with friends and family. This suggests that very few migrants actually paid for housing, which is an important part of living costs of urban residents. Similarly, expenditures on education, health and durable goods are likely made at home and not at destination. Food is perhaps the only type of expenditures short-term migrants need to make at higher prices in urban areas.[19]

In order to evaluate what fraction of the estimated flow cost of migration can be explained by differences in living costs, we consider two deflators for migration earnings. We first follow ? and consider the ratio of the urban poverty line to the rural poverty line in 2009, which is equal to $578/446 = 1.30$ (?). Assuming that when they are at destination, migrants spend their income as urban residents do, higher costs of living amount to 30% of migration earnings, i.e. half of estimated migration costs. However, if migrants expenditures at destination only include food items, a more appropriate deflator applies urban prices only to food, and rural prices to other expenditures. We use NSS Employment Unemployment Survey to estimate food shares in urban and rural areas for households whose per capita expenditures are within 5% of the poverty line. Let P_r and S_r (resp P_u and S_u) denote the poverty line and the share of food expenditures for households at the poverty line in rural (resp. urban) areas. The new deflator is: $\frac{P_u * S_u + P_r * (1-S_r)}{P_r} \approx 1.13$. In the absence of detailed consumption data at origin and destination for migrants, these figures provide suggestive evidence that differences in living costs between destination and origin may amount to 13% of migration earnings, or 22% of the estimated flow cost of migration.[20]

4.4 Risk in migration earnings

Another source of utility cost associated with migration is income risk: migrants may not find work at destination or may have to work for lower wages than expected. ? argue the risk of failed migration is an important barrier to seasonal migration during the hunger season in Bangladesh. They also find evidence of individual learning on migration risk, but little evidence of peer effects, which suggests that risk is idiosynchratic. In contrast with ?, individual learning has already taken place in the context we study: 71% of short term migrants in the Summer 2010 report having migrated in the Summer 2009, and only 8.6% have never migrated before. We can use information on migration earnings from repeated trips to estimate the idiosynchratic risk migrants are exposed to. Earnings are defined as earnings per day away, which allows us to account for both employment and wage risk. We restrict the analysis to 435 migrants for whom we have earnings per day away for both

[19] Migrants anticipate this and often bring large quantities of food from the village.

[20] We also compute poverty lines and food shares for the three states where the survey sample is located (Gujarat, Madhya Pradesh and Rajasthan) and obtain similar results. The ratio of poverty lines and the ratio of food poverty lines between urban and rural areas of these states are 1.30 and 1.06, respectively.

summers 2009 and 2010. Their average daily earnings in the Summer 2009 are 100 Rs. We then run a regression of earnings per season on season and migrant fixed effects and estimate the standard deviation of the residuals, which is a reasonable approximation of the amount of idiosynchratic risk migrants are exposed to. The estimated standard deviation is 25Rs.[21]

We next use the estimated mean and variance of migration earnings to compute the relative risk premium, i.e. the amount one would need to guarantee to migrants at home to make them indifferent between migrating and not migrating, expressed as a fraction of daily migration earnings. If we assume migrants utility has constant relative risk aversion ρ then the relative risk premium (RPP) can be approximated as a simple function of the mean $\widehat{\mu}$ and standard deviation $\widehat{\sigma}$ of daily migration earnings:

$$RRP \approx \frac{\rho \widehat{\sigma}^2}{2\widehat{\mu}^2} \approx \frac{\rho}{32}$$

Even assuming a very high level of relative risk aversion $\rho = 10$ the relative risk premium is only .31, i.e. half of the estimated flow cost of migration. For more moderate levels of risk aversion $\rho \approx 1.5$, which **?** find match the evidence on migration decisions relatively well, the relative risk premium is slightly below .05, or 8% of our estimate of the flow cost of migration. As an alternative calibration, we use **?** results on risk aversion of Indian farmers. **?** uses lotteries to elicit Z, the increase in expected returns needed to compensate for an increase in the standard deviation of gains, and finds that for the majority of farmers it ranges from 0.33 to 0.66. We can use these figures to obtain a relative risk premium ($RRP = Z\frac{\sigma}{\mu}$) which ranges from .08 to .16. According to these estimates, income risk explains between 13 and 27% of the estimated flow cost of migration.

4.5 Non-monetary costs of migration

Taken together, our findings suggest that under reasonable assumptions differences in living costs and migration risk may account for a half of the estimated utility cost of migration, but are unlikely to explain it all. The disutility cost of bivouacking for months in the city, leaving family behind is presumably also important, but harder to quantify. In order to provide evidence on this non-monetary dimension of migration costs, we explore the heterogeneity of migration costs across migrants. Specifically, we express the flow cost of migration as a linear function of X_i, a vector of five migrant characteristics: gender, age (dummy for being less than 30 years old), marital status, a dummy for having children less than six years old and education (dummy for having more than primary education). Formally, we assume that:

$$c_v^i = \beta_v X_i + \varepsilon_v^i, \ with \ \varepsilon \sim N(\mu_v, \sigma_v)$$

This allows us to estimate β_v, μ_v and σ_v using a probit model.

[21] Alternatively, one can use only cross-sectional variation and estimate idiosynchratic risk as the standard deviation of the residuals of a regression of daily migration earnings in the Summer 2009 on workers characteristics, migration history and village fixed effects. The estimated standard deviation is 29Rs, close to, but higher than our preferred estimate.

The estimates are presented in Appendix Table ??. Due to the small sample size, the bootstrapped standard errors of the estimates are large. The estimated standard deviation of the residual is only slightly lower than estimated standard deviation of the costs of migration presented in Table ??, which suggests that observable characteristics only capture a small part of individual heterogeneity in migration costs. We find that male migrants have higher migration costs, which may be due to more difficult work conditions when migrating as compared to NREGA work relative to female workers. We find that older migrants, and migrants with young children have higher disutility of migration. Our analysis does not allow us to disentangle between the effect of differents tastes with respect to migration and different migration conditions which may also be correlated with migrants characteristics. However, these results provide indirect evidence that non-monetary factors play a significant role in short-term migration decisions.

5 Conclusion

This paper provides unique evidence on the costs and benefits of short-term migration, which is an important part of labor reallocation between rural and urban areas of developing countries. Our analysis relies on original survey data from a high out-migration area in Western India and proceeds in two steps. First, we show that when employment is available on local public works, rural workers shorten their migration trips or stop migrating altogether. This is despite the fact that earnings per day outside of the village are 60% higher than daily earnings from the program. Second, we use a simple structural model to quantify the utility cost of migration implied by the preference of a majority of migrants for public works. We find that the flow cost of migration is equivalent to 60% of daily earnings away from te village. We manage to explain up to half of this cost by higher living costs in urban areas and the riskiness of migration earnings. The other half reflects non-monetary costs associated with rough living and working conditions in the city.

Our results provide a useful complement to ? experimental findings on seasonal migration in Bangladesh. ? find that a small transport subsidy durably increases migration to the city. They argue that the net benefits of short-term migration are large, but rural workers lack information about urban employment opportunities and / or are too risk averse to migrate. By contrast, in the context of our study, workers are well informed of migration opportunities, but decide to stay back when employment is available locally, even for a much lower pay. We show that income risk is only part of the explanation. Hence, while rural workers may reap large monetary gains from migrating temporarily to the city, they also incur sizeable costs, many of which are non-monetary. Our findings have important implications for development policy. They suggest that improvements of working and living conditions of migrants in urban areas may go a long way in reducing rural poverty and improving the allocation of labor in developing countries (??).

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Figure 1: Map of short term migration

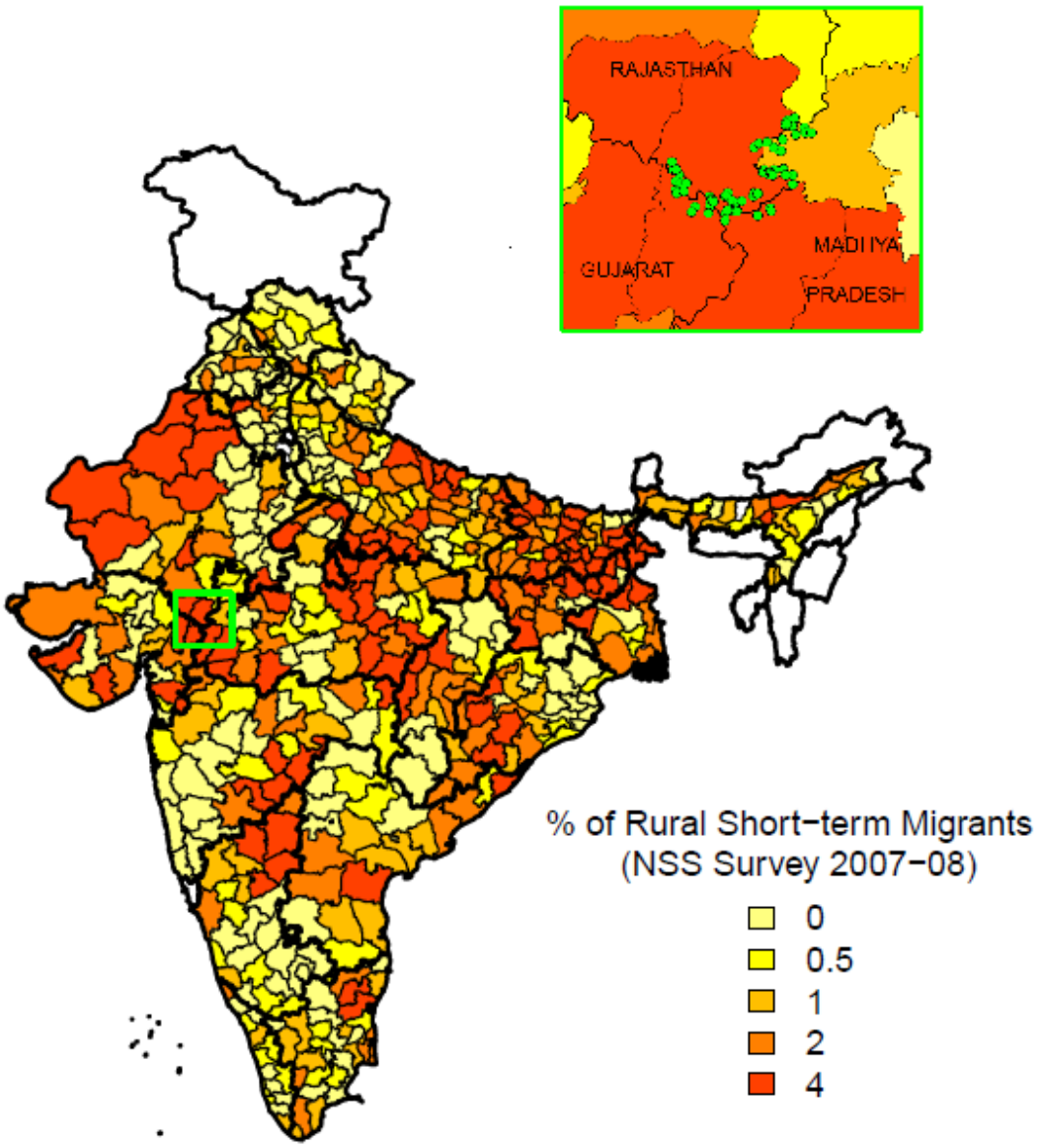
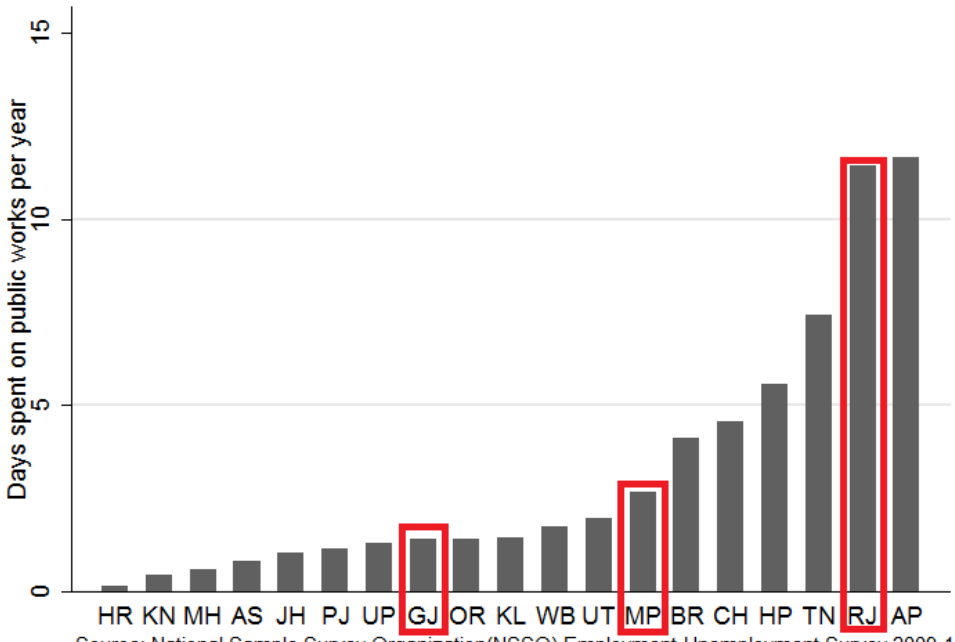
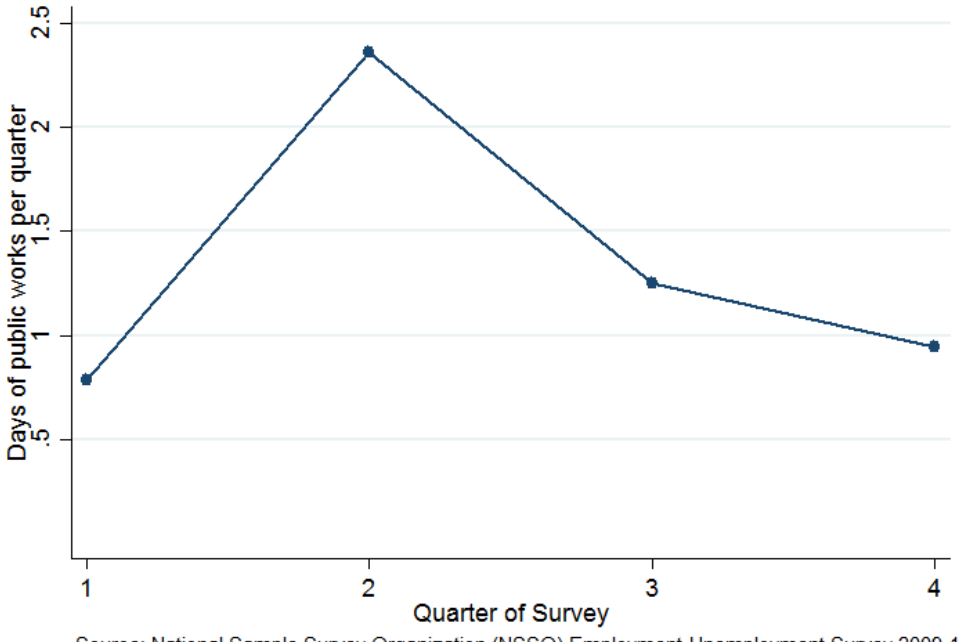


Figure 2: Cross-state variation in public employment provision



Source: National Sample Survey Organization(NSSO) Employment-Unemployment Survey 2009-10.
Rural prime-age adults only.

Figure 3: Seasonality of public employment provision



Source: National Sample Survey Organization (NSSO) Employment-Unemployment Survey 2009-10.
Rural prime-age adults in Gujarat, Madhya Pradesh and Rajasthan only.

Table 1: Migration Survey Sample

	Own Survey				NSS Survey 2007-08	
	All Adults	Full Adult Survey Completed	Adult Survey not Completed	Difference (3) - (2)	All Adults (India)	All Adults (Sample Districts)
	(1)	(2)	(3)	(4)	(5)	(5)
Female	0.511	0.525	0.448	-0.077	0.497	0.494
	(0.0056)	(0.0166)	(0.0067)	(0.019)	(0.001)	(0.0072)
Married	0.704	0.729	0.594	-0.134	0.693	0.720
	(0.0091)	(0.021)	(0.0105)	(0.0233)	(0.0018)	(0.0177)
Illiterate	0.666	0.683	0.590	-0.093	0.388	0.498
	(0.0185)	(0.0325)	(0.0189)	(0.0302)	(0.0029)	(0.0298)
Scheduled Tribe	0.897	0.894	0.910	0.016	0.104	0.655
	(0.0272)	(0.0278)	(0.0287)	(0.0225)	(0.0032)	(0.0592)
Age	32.8	34.1	27.0	-7.11	34.4	32.8
	(0.248)	(0.484)	(0.301)	(0.592)	(0.0463)	(0.4684)
Spent 2-330 days away for work	0.433	0.422	0.482	0.060	--	--
	(0.0179)	(0.0394)	(0.0187)	(0.0412)		
Migrated for Work all Three Seasons	0.119	0.080	0.295	0.215	--	--
	(0.011)	(0.0318)	(0.0101)	(0.0324)		
Ever Worked for NREGA	0.528	0.581	0.291	-0.290	--	--
	(0.0253)	(0.0354)	(0.0259)	(0.0332)		
Spent 30-180 days away for work	0.301	0.312	0.251	-0.061	0.025	0.160
	(0.0159)	(0.0351)	(0.0166)	(0.0362)	(0.0008)	(0.0344)
Adults	2,722	2,224	498		212,848	2,144

The unit of observation is an adult. Standard errors computed assuming correlation of errors at the village level in parentheses. The first four columns present means based on subsets of the adults aged 14 to 69 from the main data set discussed in the paper. The first column includes the full sample of persons aged 14 to 69 for whom the adult survey was attempted. The second column includes all persons aged 14 to 69 for which the full adult survey was completed. The third column includes all persons aged 14 to 69 for which the full adult survey was not completed. The fourth column presents the difference between the third and second columns. The fifth and sixth columns present means computed using all adults aged 14 to 69 in the rural sample of the NSS Employment and Unemployment survey Round 64 conducted between July 2007 and June 2008 for all of India and for the six sample districts respectively. Means from the NSS survey are constructed using sampling weights. "--" denotes not available.

Table 2: Migration patterns

	Survey			NSS	
	Summer 2009	Monsoon 2009	Winter 2009-10	All India 2007-08	Sample Districts 2007-08
	(1)	(2)	(3)	(4)	(5)
Migrated?	35%	10%	29%	2.5%	15.5%
Migrant is female	40%	33%	43%	14%	33%
Migrated with Household Member	71%	63%	74%	43%	82%
Distance (km)	300	445	286	-	-
Transportation Cost (Rs)	116	144	107	-	-
Duration (days)	54	52	49	-	-
Destination is in same state	17%	27%	24%	53%	83%
Destination is urban	84%	88%	73%	68%	70%
Worked in agriculture	14%	21%	35%	24%	30%
Worked in manufacturing and mining	9%	5%	6%	18%	1%
Worked in construction	70%	70%	56%	42%	68%
Worked in other sector (including services)	8%	4%	4%	16%	1%
Found employer after leaving	63%	64%	54%	-	-
No formal shelter in destination	86%	85%	83%	-	-
Observations (All)	2224	2224	2224	212848	2144
Observations (Migrants only)	768	218	646	13682	334

Source: Columns 1 to 3 present means based on the migration survey described in Section 2. The unit of observation is a prime-age adult. Each column restricts the sample to responses for a particular season. Seasons are defined as follows: summer from April to June, monsoon from July to November, winter from December to March. Columns 4 and 5 present means based on the National Sample Survey (NSS). In Column 4 the sample includes all rural adults. In Column 5 the sample is restricted to adults living in the four districts of the migration survey sample

Table 3: Migration and NREGA Work

	Gujarat	Madhya Pradesh	Rajasthan	Whole Sample
Panel A: Summer (March-June 2009)				
Worked for NREGA	10%	39%	50%	40%
NREGA Days Worked	2.5	8.4	15.5	11.2
NREGA Days Worked if Worked	25.3	21.7	31.7	28.1
Would have done more NREGA Work	78%	79%	81%	80%
Total Days of NREGA Work Desired	48.7	41.4	44.3	43.9
Migrated	34%	41%	30%	35%
Days Outside Village for Work	19.4	25.9	17.2	20.5
Worked for NREGA and Migrated	2%	15%	13%	12%
Would Have Migrated If No NREGA Work	3%	8%	10%	8%
Migrated and Would Work More for NREGA	30%	36%	26%	30%
Panel B: Monsoon (July-October 2009)				
Worked for NREGA	0%	0%	1%	0%
NREGA Days Worked	0.0	0.0	0.2	0.1
NREGA Days Worked if Worked	0.0	13.5	29.7	26.1
Would have done more NREGA Work	63%	50%	53%	54%
Total Days of NREGA Work Desired	27.4	17.9	22.1	21.5
Migrated	18%	7%	9%	10%
Days Outside Village for Work	9.6	3.2	4.6	4.9
Worked for NREGA and Migrated	0%	0%	0%	0%
Would Have Migrated If No NREGA Work	0%	0%	0%	0%
Migrated and Would Work More for NREGA	13%	5%	7%	7%
Panel C: Winter (November 2009-February 2010)				
Worked for NREGA	2%	10%	5%	6%
NREGA Days Worked	0.5	1.7	1.0	1.1
NREGA Days Worked if Worked	21.5	16.1	20.1	18.0
Would have done more NREGA Work	75%	74%	76%	75%
Total Days of NREGA Work Desired	45.5	36.4	46.0	42.7
Migrated	35%	28%	28%	29%
Days Outside Village for Work	20.6	14.4	14.2	15.2
Worked for NREGA and Migrated	1%	3%	1%	2%
Would Have Migrated If No NREGA Work	1%	2%	1%	2%
Migrated and Would Work More for NREGA	30%	24%	25%	25%
Observations	330	749	1145	2224

Source: Retrospective questions from the migration survey implemented in summer 2010. The unit of observation is an adult.

Table 4: Village Balance

	MP-RJ Pairs			GJ-RJ Pairs		
	RJ	MP	Diff	RJ	GJ	Diff
Panel A: Matching variables						
Frac Population SC	0%	1%	0.09	1%	0%	0.53
Frac Population ST	96%	96%	0.01	98%	99%	0.43
Total culturable land	161	161	0.00	250	235	0.09
Frac culturable land irrigated	25%	25%	0.01	31%	27%	0.20
Frac culturable land non irrigated	59%	59%	0.02	57%	50%	0.30
Population per ha of culturable land	3.5	3.5	0.00	5.7	5.6	0.01
Panel B: Village and household controls						
Total Population	570	576	0.02	1324	1276	0.06
Frac Population Literate	24%	26%	0.20	29%	34%	0.59
Bus Service?	16%	16%	0.00	40%	90%	1.02
Distance to Paved Road (km)	0.3	0.9	0.49	0.5	0.3	0.18
Distance to Railway (km)	50.2	44.7	0.28	73.9	47.2	0.87
Distance to Town (km)	10.5	11.2	0.08	6.1	10.0	0.84
Farm is HH Main Income Source	57%	55%	0.09	42%	42%	0.00
HH Land owned (Acres)	3.0	2.8	0.15	2.4	2.4	0.05
% HH with electricity	23%	33%	0.38	22%	57%	0.99
% HH with cellphone	35%	33%	0.09	33%	55%	0.99
% HH with access to a well	47%	52%	0.19	38%	58%	0.70
% HH that use irrigation	50%	54%	0.12	60%	52%	0.25
Number of villages	25	25		10	10	

Village cA3:H35haracteristics are from the Census 2001 and household characteristics from the 2010 survey. The following acronyms are used for state names: RJ for Rajasthan, MP for Madhya Pradesh and GJ for Gujarat. Differences are normalized, i.e. divided by the standard deviation of the covariate in the sample. A difference of more than 0.25 standard deviations is considered as substantial (Imbens and Wooldridge 2009). All village and household characteristics listed in this table are included as control in our main specification.

Table 5: Effect of NREGA on Short Term Migration

	NREGA Days		Days away		Any migration trip	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All village pairs						
Rajasthan	-0.117	-0.955**	-1.177	-1.119	-0.0114	-0.0124
	(0.183)	(0.474)	(1.671)	(1.700)	(0.0232)	(0.0209)
Summer (March-July)	5.982***	5.982***	13.30***	13.30***	0.187***	0.187***
	(0.802)	(0.807)	(1.746)	(1.755)	(0.0209)	(0.0211)
Rajasthan x Summer	8.990***	8.990***	-5.503**	-5.503**	-0.0703**	-0.0703**
	(1.128)	(1.134)	(2.203)	(2.216)	(0.0268)	(0.0269)
Observations	6,588	6,588	6,588	6,588	6,588	6,588
Mean in MP and GJ from July to March	.67	.67	10.69	10.69	.2	.2
Worker Controls	No	Yes	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes	No	Yes
Panel B: Excluding GJ-RJ Pairs						
Rajasthan	-0.231	-0.335	-0.381	-1.271	-0.000557	-0.0221
	(0.220)	(0.468)	(1.827)	(1.652)	(0.0256)	(0.0220)
Summer (March-July)	7.606***	7.606***	17.24***	17.24***	0.233***	0.233***
	(0.895)	(0.901)	(1.918)	(1.931)	(0.0226)	(0.0228)
Rajasthan x Summer	7.408***	7.408***	-8.640***	-8.640***	-0.107***	-0.107***
	(1.281)	(1.290)	(2.570)	(2.587)	(0.0301)	(0.0303)
Observations	4,677	4,677	4,677	4,677	4,677	4,677
Mean in MP from July to March	.85	.85	8.77	8.77	.18	.18
Worker Controls	No	Yes	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes	No	Yes

The unit of observation is an adult in a given season. Results in Panel B are based on pairs of villages in Madhya Pradesh and Rajasthan only. Column One and Two presents results from a regression of days spent working on the NREGA during a particular season on a set of explanatory variables. In Column Three and Four the outcome is the number of days spent away for work. In Column Five and Six the outcome is a binary variable equal to one if the adult spent some time away for work during a particular season. Rajasthan is a dummy for whether the adult lives within a village in Rajasthan. Summer is a dummy for the summer months (mid-March to mid-July) Standard errors are computed assuming correlation of errors within villages. All regressions include a constant. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

Table 6: Earnings Differentials between Migration and NREGA work

	Migrated	Migrated and Want More NREGA Work	Migrated and Do not Want More NREGA Work	Migrated and Worked for NREGA
	(1)	(2)	(3)	(4)
(1) Earnings per Day Outside Village	101.1	99.1	115.1	99.2
	(2.28)	(2.09)	(7.51)	(3.13)
(2) Earnings per Day of NREGA Work	62.5	62.5	62.7	64.0
	(0.72)	(0.75)	(1.32)	(1.9)
(3) Difference (1) - (2)	38.6	36.6	52.4	35.1
	(2.15)	(2.01)	(7.14)	(3.32)
Observations	763	667	96	266

The unit of observation is an adult. The first row presents the mean earnings per day outside the village during summer 2009 for different subsets of all migrants. For adults with missing earnings, earnings from migration trips taken during summer 2010 are used to predict earnings in summer 2009. The second row presents the mean of earnings per day worked for NREGA during summer 2009. For adults who did not work for NREGA or have missing earnings, earnings are predicted using summer 2010 NREGA earnings and a set of person-level characteristics. Standard errors computed assuming correlation of errors within villages in parentheses.

Table 7: Migration Cost Estimates

Panel A: Whole Sample	
(1) Mean Migration Cost	60.5
	[57.7,63.4]
(2) Standard Deviation of Migration Costs	30.1
	[28.1,32]
(3) Mean Earnings per Day Outside Village	102.5
(4) Migration Costs as % of Earnings	59.0%
(5) Observations	768
Panel B: Number of NREGA days wanted lower than total days away	
(1) Mean Migration Cost	52.4
	[48.8,56]
(2) Standard Deviation of Migration Costs	31.1
	[28.5,33.4]
(3) Mean Earnings per Day Outside Village	102.5
(4) Migration Costs as % of Earnings	51.1%
(5) Observations	487
Panel C: Did NREGA during the season	
(1) Mean Migration Cost	63.7
	[59.5,68.8]
(2) Standard Deviation of Migration Costs	28.9
	[24.9,32.4]
(3) Mean Earnings per Day Outside Village	102.5
(4) Migration Costs as % of Earnings	62.1%
(5) Observations	267

The unit of observation is an adult. The first and second rows present estimates of the mean and standard deviation of the distribution of migration costs per day spent outside the village. Confidence intervals are computed by bootstrapping assuming errors are correlated within villages. Panel A uses the full sample of adults who left the village during the summer 2009. Panel B includes only migrants who report wanting less days of NREGA work than the number of days they were away. Panel C includes only adults who have worked for the NREGA during the summer 2009.

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A Appendix

A.1 Construction of Key Variables

Earnings per Day Worked for Migrants The survey instrument included questions about the frequency of payment and the typical amount per pay period. In most cases (74%), respondents were paid daily and in these cases we used the typical daily payment as earnings per day worked. We also asked respondents how many days per week they typically worked. Respondents worked on average six days per week and the median respondent worked six days. For respondents who were paid weekly, fortnightly, or monthly, we used the reported payment adjusted by the typical number of days per week worked. For example, a migrant paid 800 rupees weekly and working six days per week earns $800/6 = 133$ rupees per day worked. For migrants that were paid irregularly or in one lump sum at the end of work, we used the total earnings from the trip divided by the number of days worked. For migrants with missing values of days worked per week, we assumed they worked six days.

Surveyors were instructed to check whether daily earnings, total earnings, trip length, and days worked per week made sense together. If they did not, they were instructed to ask the respondent for an explanation and write it down. For example, in one case, total earnings from a trip was abnormally high because the respondent was paid for work performed on a different trip. In cases in which the surveyor comments indicated that the reported variables did not accurately measure the earnings per day worked of the respondent, we either adjusted the daily earnings or set the daily earnings to missing.

Finally, five percent of respondents received payment in-kind for their work, being paid in wheat for example. We leave these daily earnings observations as missing.

Earnings per Day Away for Migrants For respondents with non-missing total earnings (62%), earnings per day away was computed using total earnings divided by days away. For respondents with missing total earnings, we used earnings per day worked adjusted downwards using days worked per week away. Table **??** presents summary statistics. The table reveals that during summer 2009, out of 768 migrants, we have non-missing earnings for only 593 (77%). This is because for some adults who took more than four trips, we did not record information for any of the trips taken during summer 2009. For these adults and all adults with non-missing summer 2010 earnings, we construct predicted earnings for summer 2009 by projecting summer 2009 earnings onto summer 2010 earnings and dummies for whether the person was engaged in migrant agricultural labor during summer 2009 and summer 2010. The mean for the resulting earnings per day away is provided in Row 6 of Table **??**.

Earnings per Day Away of NREGA work The second half of Table **??** presents the measures of daily earnings for NREGA work. Importantly, some respondents report never having been paid. Out of the 895 adults who worked for the NREGA during summer 2009, 32 (3.6%) report not having been paid in full at the time of the survey. Assuming a wage

of zero for those who were not paid yields a wage of 64.4 rupees per day compared with 67 for only those who were paid. For the following analysis, we will need a measure of daily earnings on NREGA that non-NREGA participants would expect to receive. We predict NREGA earnings during summer 2009 for non-participants with a linear regression using summer 2010 NREGA daily earnings, a gender dummy, age, age squared, and dummies for highest education achieved, and state. Interestingly, none of the predictors except summer 2010 NREGA daily earnings are statistically significant, suggesting that the NREGA wage does not vary with productivity. In contrast, gender and age are good predictors of migration earnings.

Table A.1: Correlates of demand for NREGA work

	Want more NREGA Work		
	(1)	(2)	(3)
Female	-0.0275*	0.0000369	0.00216
	(0.0161)	(0.0165)	(0.0165)
Primary School or Literate	-0.0335	-0.0237	-0.0237
	(0.0215)	(0.0212)	(0.0212)
Secondary or Above	-0.171***	-0.154***	-0.151***
	(0.0295)	(0.0285)	(0.0283)
Monsoon 2009	-0.263***	-0.263***	-0.250***
	(0.0183)	(0.0183)	(0.0169)
Winter 2009-10	-0.0477***	-0.0477***	-0.0447***
	(0.00703)	(0.00703)	(0.00668)
Age	0.0350***	0.0347***	0.0343***
	(0.00348)	(0.00330)	(0.00330)
Age Squared	-0.000481***	-0.000452***	-0.000448***
	(0.0000446)	(0.0000425)	(0.0000425)
Salaried Job	-0.330***	-0.297***	-0.296***
	(0.0653)	(0.0640)	(0.0639)
Migrant (Any Season)		0.121***	0.0961***
		(0.0193)	(0.0216)
Migrated (Current Season)			0.0542**
			(0.0234)
Constant	0.326***	0.217***	0.214***
	(0.0674)	(0.0653)	(0.0651)
Observations	6,669	6,669	6,669

The unit of observation is an adult by season. Standard errors computed assuming correlation of errors within villages. The dependent variable is a dummy variable for whether the individual reports willingness to work more days for the NREGA during a given season if work were available. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

Table A.2: Reasons of demand for NREGA work

	Summer 2009 (1)	Monsoon 2009 (2)	Winter 2009-10 (3)
Panel A: Subsample of Adults Who Want More Work			
Why Did You Not Work More?			
Family Worked Maximum 100 days	0.036	0.003	0.007
Works Finished/No Work Available	0.556	0.817	0.745
No Program ID Card/Name Not on ID Card	0.035	0.044	0.036
Officials Would not Provide More Work	0.058	0.009	0.033
Other	0.306	0.203	0.226
Adults	1,779	1,194	1,673
Panel B: Subsample of Adults Who Do Not Want More Work			
Why Did You Not Want to Work More?			
Working Outside the Village	0.171	0.047	0.123
Other Work in Village	0.126	0.669	0.245
Sick/injured/unable to work	0.101	0.045	0.087
Studying	0.236	0.169	0.307
NREGA Does Not Pay Enough	0.043	0.014	0.038
No Need for Work/Do Not Want to Do Manual Work	0.036	0.015	0.022
Other	0.436	0.152	0.334
Adults	445	1,030	551

The unit of observation is an adult. Each column restricts the sample to responses for a particular season. Panel A includes all adults who completed the adult survey. Panel B restricts the sample to adults who report wanting to work more for the NREGA during the season specified in the column heading. Panel C restricts the same to adults who report not wanting to work more for the NREGA during the season specified in the column heading.

Table A.3: Cross-state comparison of NREGA work and migration (Survey Sample, all adults)

	NREGA Days		Days away		Any migration trip	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All village pairs						
Rajasthan	-0.133	-0.961**	-1.445	-1.111	-0.0160	-0.0115
	(0.182)	(0.473)	(1.784)	(1.707)	(0.0241)	(0.0210)
Summer (March-July)	6.399***	5.951***	12.93***	13.36***	0.181***	0.188***
	(0.872)	(0.807)	(1.742)	(1.762)	(0.0206)	(0.0212)
Rajasthan x Summer	8.618***	9.021***	-5.590**	-5.566**	-0.0700**	-0.0718***
	(1.163)	(1.135)	(2.212)	(2.221)	(0.0268)	(0.0271)
Observations	6,957	6,579	6,957	6,579	6,957	6,579
Mean in MP and GJ from July to March	0.69	0.69	11.67	11.67	0.21	0.21
Worker Controls	No	Yes	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes	No	Yes
Panel B: Excluding GJ-RJ Pairs						
Rajasthan	-0.242	-0.342	-1.070	-1.253	-0.00860	-0.0210
	(0.219)	(0.468)	(1.825)	(1.656)	(0.0260)	(0.0221)
Summer (March-July)	7.958***	7.568***	16.83***	17.35***	0.226***	0.235***
	(1.002)	(0.906)	(1.890)	(1.928)	(0.0220)	(0.0228)
Rajasthan x Summer	7.189***	7.446***	-8.301***	-8.748***	-0.101***	-0.110***
	(1.363)	(1.293)	(2.538)	(2.586)	(0.0295)	(0.0303)
Observations	4,938	4,668	4,938	4,668	4,938	4,668
Mean in MP from July to March	.86	.86	9.49	9.49	.18	.18
Worker Controls	No	Yes	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes	No	Yes

The unit of observation is an adult in a given season. The sample includes adults which were not interviewed personally but for whom NREGA work and migration days have been reported by the household head. Results in Panel B are based on pairs of villages in Madhya Pradesh and Rajasthan only. Column One and Two presents results from a regression of days spent working on the NREGA during a particular season on a set of explanatory variables. In Column Three and Four the outcome is the number of days spent away for work. In Column Five and Six the outcome is a binary variable equal to one if the adult spent some time away for work during a particular season. Rajasthan is a dummy for whether the adult lives within a village in Rajasthan. Summer is a dummy for the summer months (mid-March to mid-July) Standard errors are computed assuming correlation of errors within villages. All regressions include a constant. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

Table A.4: Cross-state comparison of permanent migration in the last five years

	Any Permanent Migrant		Number of Migrants	
	(1)	(2)	(3)	(4)
PANEL A: All village pairs				
Rajasthan	0.0324	0.0235	0.0937	-0.128
	(0.0369)	(0.0326)	(0.181)	(0.136)
Observations	702	702	702	702
Mean in MP	.39	.39	1.23	1.23
Worker Controls	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes
PANEL B: Excluding GJ-RJ Pairs				
Rajasthan	0.0347	0.0208	0.112	-0.0172
	(0.0463)	(0.0367)	(0.216)	(0.165)
Observations	503	503	503	503
Mean in MP	.4	.4	1.24	1.24
Worker Controls	No	Yes	No	Yes
Village Pair Fixed Effect	No	Yes	No	Yes

The unit of observation is a household Results in Panel B are based on pairs of villages in Madhya Pradesh and Rajasthan only. In Column One and Two the dependent variable a a dummy which equals one if any member of the household left within the past five years. In Column Three and Four the Rajasthan it is the number of household members who left within the past five years. Standard errors are computed assuming correlation of errors within villages. All regressions include a constant. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

Table A.6: Heterogeneity in migration costs

	Parameter Estimate	Confidence Interval
(1) Mean Migration Cost	67.2	[60.7,73.4]
(2) Standard Deviation of Migration Costs	29.5	[27.4,31.1]
(3) Female	-12.5	[-18.4,-6.4]
(4) Age<30	-5.0	[-9.7,-0.7]
(5) Married	0.8	[-4.4,5.6]
(6) Children less than 6 years old	8.0	[1.1,15.8]
(7) Education above primary	-6.0	[-12.8,0.8]
(8) Mean Earnings per Day Outside Village	102.5	
(9) Migration Costs as % of Earnings	65.6%	
(10) Observations	768	

The unit of observation is an adult. The first and second rows present estimates of the mean and standard deviation of the distribution of migration costs per day spent outside the village for the sample of adults who left the village during summer 2009. Confidence intervals are computed by bootstrapping assuming errors are correlated within villages.

Table A.6: Wage summary statistics

	Summer 2009 (1)	Monsoon 2009 (2)	Winter 2009-10 (3)	Summer 2010 (4)
(1) Adults Who Migrated	768	197	481	654
(2) Adults with Non-missing Earnings	568	159	408	503
(3) Mean Earnings per Day Worked	118.1	128.4	126.0	123.9
(4) Mean Earnings per Day Away	100.9	107.9	109.8	109.8
(5) Adults with Predicted Earnings	768			
(6) Mean Predicted Earnings per Day Away	101.3			
(7) Adults Who Worked for NREGA	267			
(8) Adults with Non-missing Earnings	259			
(9) Mean Earnings per Day of *Paid* Worked	64.7			
(10) Adults with Predicted NREGA Earnings	768			
(11) Mean Predicted NREGA Earnings	62.6			

The unit of observation is an adult. See the text and appendix for details on construction of the earnings measures. Each column restricts the sample to responses for a particular season.