Short-term Migration, Rural Workfare Programs and Urban Labor Markets: Evidence from India *

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Abstract

We study the effect of a large rural public works program on short-term migration from rural to urban areas in India. Using cross-state variation in public employment provision for identification, we find that participation to the program significantly reduces short-term migration. Since rural short-term migrants represent a significant share of unskilled labor supply in urban centers, a simple calibration exercise suggests that small changes in short-term migration can have large impacts on urban labor markets. We use a gravity model to predict short-term migration flows across India and measure the extent to which each urban center relies on short-term migrants from rural districts with high levels of public employment provision. We find evidence that urban centers which are more exposed to a drop in short-term migration due to the program experience a relative increase in wages for unskilled, short-term work.

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1 Introduction

Conventional models of migration within developing countries consider migration as a long term decision (Harris and Todaro, 1970). Yet considerable evidence outside of economics (Haberfeld et al., 1999; Mosse et al., 2002; Smita, 2008; Deshingkar, 2006) and an increasing number of studies within economics (Banerjee and Duflo, 2007; Badiani and Safir, 2009; Morten, 2012) suggest a significant fraction of migration within developing countries is short-term. According to nationally representative data from India's National Sample Survey, in 2007 8.5 million rural adults undertook short-term migration trips (one to six months) for work in urban areas (see Figure 1). The number of short-term migrants is significant, as compared to net rural to urban long-term migration flows during the same year (2 million). The influx of migrants is also large relative to the number of urban residents who engaged in short-term wage work (15 million).[1] These figures suggest short-term migration plays an important role in labor reallocation from rural to urban areas. This also implies that beyond their direct impact on rural households, policies which affect short-term migration could have large spillover effects on urban labor markets.[2]

In this paper, we study the effect of a large rural workfare program, India's National Rural Employment Guarantee Act (NREGA) on short-term migration and its impact on urban labor markets. Workfare programs, which hire rural workers during the off-season of agriculture with the goal of increasing the income of the poor are common antipoverty policies, and may have ambiguous effects on migration.[3] On the one hand they relax cash constraints and mitigate income risk, which may encourage migration. On the other, they improve local employment opportunities, which increases the opportunity cost of migration. Using cross state variation in the implementation of NREGA for identification, we find evidence that NREGA significantly reduced short-term migration flows. We next use a simple theoretical framework which suggests that by reducing short-term migration, the program may also have a large impact on urban labor markets. We investigate this empirically by predicting short-term migration flows from rural to urban areas, and then examining the consequences of the program for different urban labor markets that rely more or less heavily

[1] According to our estimates, long term rural to urban adult migration is equivalent to 0.5% of the rural working age population.Munshi and Rosenzweig (2009) obtain similar results with a different methodology: using census data, they estimate net rural to urban migrations to be 4-5% among 15-24 years old for every decade between 1961 and 2001.

[2] For example, Bryan et al. (2014) evaluate the effect of travel subsidies offered to rural workers in Bangladesh and find a large and sustained positive impact on short-term migration.

[3] Recent examples include programs in Malawi, Bangladesh, India, Philippines, Zambia, Ethiopia, Sri Lanka, Chile, Uganda, and Tanzania.

on short-term migrants from rural areas with high or low NREGA implementation. We find that in urban labor markets with higher predicted migration rates from rural areas where NREGA is implemented experience relative increases in wages for unskilled labor.

We present three pieces of evidence suggesting that participation in the workfare program reduces migration. First, using detailed survey data from a matched sample of villages located in a high out migration area spanning three states, we find eight percent of surveyed adults report that had they chose not to migrate because they received work under the program. In addition, about twelve percent of surveyed adults report both migrating and participating in the workfare program in the same season. Second, we find that adults living in a state that provides more days of government work, spend less time outside the village for work compared with other states, even conditional on demand for government work. Reassuringly, this cross-state difference in days spent outside the village for work is statistically significant only during the summer months when most of the government work is provided. Third, using nationally representative data from NSS 2007-08, we find lower incidence of short-term migration in districts selected to implement NREGA first ("early districts") and in states which actively implemented the scheme ("star states"). This difference is robust to controlling for district characteristics and is absent in 1999-00, before the program is implemented.

We next consider the impact of the program on the labor market equilibrium in urban areas. A simple theoretical framework suggests that under reasonable assumptions, a small decline in rural to urban short-term migration caused by NREGA may have large effects on urban wages. We combine NSS data on short-term migration and census information on long term migration to build a matrix of migration flows from each rural to each urban district in 2007-08. We then estimate a gravity model of short-term migration based on baseline characteristics, which allows us to predict migration flows independently from the effect of the program. Finally, we compare changes in labor market outcomes in urban centers which rely more or less heavily on migration from early districts in star states, where most NREGA employment is provided. We find evidence of a relative increase in wages between 2004-05 and 2007-08 in urban centers which are more exposed to a decline in short-term migration. By contrast, we find no significant effect on wages for salaried workers, who are effectively not participating in the same labor market as rural migrants, and find no significant change in casual wages between 2007-08 and 2011-12, once NREGA is rolled out in all rural districts, which suggest that our results are not driven by long run trends, or economic shocks unrelated to the program.

This paper contributes to the literature in three ways. First, we present evidence that workfare programs can have important effects on labor markets beyond their direct impact on beneficiaries. The literature on labor market impacts of workfare programs is mostly theoretical (Ravallion, 1987; Basu et al., 2009). Recent empirical studies focus on the impact of workfare programs on rural labor markets (Azam, 2012; Berg et al., 2013; Imbert and Papp, 2014a; Zimmermann, 2013). Other studies and papers have suggested that the NREGA may be impacting migration without providing direct evidence of this effect (Jacob, 2008; Ashish and Bhatia, 2009; Morten, 2012). To our knowledge, our study is one of the first to estimate the impact of a public works program on rural to urban short-term migration.

Second, we estimate the impact of changes in short-term migration on urban labor markets. The migration literature has traditionally focused on estimating the impact of inflows of international migrants on local labor markets (Card, 1990, 2001; Friedberg, 2001; Borjas, 2003). Recent studies have investigated the impact of labor flows within countries following a productivity shock or an initial inflow of international migrant at origin (Kleemans and Magruder, 2011; Badaoui et al., 2014; Monras, 2014). Closer to our study, Boustan et al. (2010) use variation in the generosity of New Deal program and study the impact of induced changes in migration on wages and employment in US cities during the Great Depression. Our contribution is to show that short-term (seasonal) movements of labor are reactive to policy changes and may have large impacts on urban labor markets.

Third, we present evidence that a commonly used anti-poverty policy significantly affects the extent of labor reallocation towards the urban non agricultural sector. The recent literature on structural transformation identifies the lack of labor mobility as an important obstacle to development, which may be due to multiple factors, such as subsistence constraints, transportation costs and village based informal insurance (Gollin and Rogerson, 2014; Morten and Oliveira, 2014; Munshi and Rosenzweig, 2013). Some studies have also suggested that there is scope for policies to reduce poverty and promote economic development by encouraging migration (Jalan and Ravallion, 2002; Kraay and McKenzie, 2014). We show that by reducing short-term migration, anti-poverty programs which generate public employment in rural areas have significant effect on the private sector in urban areas.

The following section describes the workfare program and presents the data set used throughout the paper. Section 3 uses cross-state variation in public employment provision to estimate the impact of the program on short-term migration. Section 4 uses nationally representative data from NSS Surveys to estimate the impact of the program on urban labor markets across India. Section 5 concludes.

2 Context and data

In this section we describe employment provision under the National Rural Employment Guarantee Act. We next present the two data sources we use in the empirical analysis. We use two rounds of the National Sample Survey (1999-00 and 2007-08), which provide nationally representative data on short-term migration flows and labor market outcomes in rural and urban areas. Our analysis also draws from an original household survey in a high out-migration area at the border of three states (Gujarat, Rajasthan and Madhya Pradesh), which collected detailed information on short-term trips outside of the village.

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 specific minimum wage. The act was gradually introduced throughout India starting with 200 of the poorest districts in February 2006, extending to 130 additional districts in April 2007, and to the rest of rural India in April 2008. The assignment of districts to phases was partly based on a backwardness index computed by the Planning Commission, using poverty rate, agricultural productivity, agricultural wages and the share of tribal population as poverty criteria Planning Commission (2003). In the analysis we will call "early districts" the districts in which the scheme was implemented by April 2007 and "late districts" the rest of rural India. Column One and Two in Table 1 present the main differences between early and late districts. Early districts are indeed poorer than late districts. Their poverty rates are higher, and their literacy rates and wages for casual labor are lower.

Available evidence suggests substantial state and even district variation in the implementation of the program (Dreze and Khera, 2009; Dreze and Oldiges, 2009). Figure 2 shows the extent of cross-state variation in public works employment in 2004-05 (before NREGA) and 2007-08 (when NREGA was implemented in phase one and two districts). As in Imbert and Papp (2014a) we use the term "star states" to describe seven states which are responsible for most NREGA employment provision: in Andhra Pradesh, Chhattisgarh, Himachal Pradesh, Madhya Pradesh, Rajasthan, Uttarkhand and Tamil Nadu. (Dutta et al., 2012) argue that cross-states differences in NREGA implementation did not reflect underlying demand for NREGA work. States such as Bihar or Uttar Pradesh, which have a large population of rural poor have provided little NREGA employment.

Columns Four and Five in Table 1 present averages of socio-economic indicators in star and non-star states.[4] Star states do not seem systematically poorer than the other states: the poverty rates are lower, the literacy rate and the fractions of scheduled castes are the same, the proportions of scheduled tribes are higher. Star states have a larger fraction of the labor force in agriculture, but the agricultural productivity per worker and the wage for casual labor in agriculture are the same. They have lower population density, which translates into larger amounts of cultivable land per capita, both irrigated and non irrigated. Finally, they have built more roads under the national program PMGSY in 2007-08, and have better access to electricity (according to 2001 census data), which suggests that they may be more effective in implementing public infrastructures programs.

An important question is whether differences in economic conditions can explain differences in public employment provision under NREGA between star and non star states. Figure 3 plots for each state the average residual from a regression of the fraction of time spent on public works by each prime age adults on the whole list of district characteristics presented in Table 1. The ranking of states in terms of employment provision remains strikingly similar to Figure 2. This provides support to the idea that differences in NREGA implementation are not mainly driven by differences in economic conditions, but by some combination of political will, existing administrative capacity, and previous experience in providing public works (Dutta et al., 2012).[5]

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 work-sites closed throughout the fall so they do not compete with the labor needs of farmers (Association for Indian Development, 2009). According to the National Sample Survey 2007-08, the average number of days spent on public works per adult was above one day during the first and second quarter of the year (January to June), and about a quarter of day during third and fourth quarter (July to December).

Work under the act is short-term, often on the order of a few weeks per adult. In the

[4] Appendix A details how we construct these indicators.

[5] For example, in the Congress ruled Andhra Pradesh NREGA was well implemented while in Gujarat the BJP government refused to implement what it viewed as a Congress policy. In Rajasthan the BJP government adopted NREGA as part of the state's long tradition of drought relief. In Maharashtra the scheme was not implemented, because it was perceived as a repetition of the State Employment Guarantee started in the 1970s, which eventually failed to guarantee employment to rural households (Ravallion et al., 1991).

migration survey sample described below, 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 agricultural year 2009-10, 45% of Indian households wanted work under the act but only 25% of Indian households benefited from the program.[6] The rationing rule is at the discretion of local officials: workers tend to wait passively to be recruited rather than actively applying for work(The World Bank, 2011).

2.2 NSS Employment Surveys

The main obstacle to studying migration is the scarcity of reliable data. The migration literature traditionally focuses on long term migrants, who appear in population censuses. Studying short-term migration is more challenging, as it requires dedicated data collection efforts, which are often targeted to particular rural areas known to have high levels of seasonal migration (Bryan et al., 2011). In this study we combine two data sources, the nationally representative NSS survey and an original survey from 70 villages located in a high out-migration area.[7]

Our primary source of information is the Employment and Unemployment Survey carried out by the National Sample Survey Organisation (here on, "NSS Employment Survey"). The NSS Employment Survey is a nationally representative household survey conducted at irregular intervals which collects information on employment and wages in urban and rural areas, with one specialized module whose focus changes from round to round. For the purpose of our analysis, we use the 1999-00, 2004-05 and 2007-08 rounds, of which only the 1999-00 and 2007-08 rounds contain questions on migration history of each household member.

Our analysis with NSS data focuses on district level outcomes.[8] The NSS Employment survey sample is stratified by urban and rural areas of each district. Our sample includes districts within the twenty largest states of India, excluding Jammu and Kashmir. We exclude Jammu and Kashmir since survey data is missing for some quarters due to conflicts

[6] Author's calculations based on NSS Round 66 Employment and Unemployment Survey.

[7] To our knowledge, no comparable data exists for India as a whole. ARIS REDS data for the year 2006 does contain information on seasonal migration, but no information on job search, work found and living conditions at destination.

[8] Districts are administrative units within states. The median district in our sample had a rural population of 1.37 million in 2008 and an area of 1600 square miles.

in the area. The remaining 497 districts represent 97.4% of the population of India. The NSSO over-samples some types of households and therefore provides sampling weights (see National Sample Survey Organisation (2008) for more details). All statistics and estimates computed using the NSS data are adjusted using these sampling weights.[9]

2.2.1 Short-term migration

In order to measure short-term migration, we use NSS Employment surveys 1999-00 and 2007-08, which are the only two recent rounds that include a migration module. NSS 1999-00 asks whether each household member has spent between two and six months away from the village for work within the past year. NSS 2007-08 asks a slightly different question, whether each household member has spent between *one* and six months away from the village for work within the past year. For this reason, one would expect 2007-08 data to report higher levels of short-term migration than 1999-2000. Indeed, the percentage of short-term migrants among rural prime age adult is an estimated 1.67% in 1999-00 and 2.51% in 2007-08.[10]

For those who were away, NSS 2007-08 further records the number of trips, the destination during the longest spell, and the industry in which they worked. The destination is coded in seven categories: same district (rural or urban), other district in the same state (rural or urban), another state (rural or urban), and another country. Figure 4 draws the map of short-term migration across rural Indian districts. short-term migration is not widespread, with most districts having migration rates lower than 1%. It is highly concentrated in poorer districts of the North-East (Bihar, Uttar Pradesh) and the West (Gujarat and Rajasthan), which report migration rates above 5%.

2.2.2 Employment and wages

We further use NSS Employment Surveys to construct measures of employment and wages at origin and destination. The NSS Employment Survey includes detailed questions about the daily activities for all persons over the age of four in surveyed households for the most recent seven days. We restrict the sample to persons aged 15 to 69. We then compute for each person the percentage of days in the past seven days spent in each of six mutually

[9] See Appendix A for details on the construction of sample weights.

[10] Authors calculation based on NSS Employment Surveys 1999-00 and 2007-08. In the migration survey described below, we find 32% of adults were away from one to six months in the last 12 months and 23% were away for two to six months. This suggests sample the fraction of short-term migrants who are away for less than two months is a third in both samples.

exclusive activities: public works, casual wage work, salaried wage work, self-employment, unemployed and not in the labor force. The NSSO makes the distinction between two types of waged work depending on the duration and formality of the relationship with the employer: salaried work is long term and often involves a formal contract, and casual work is temporary and informal. In our analysis, we will focus on casual work, which is the dominant form of employment for short-term migrants from rural areas. We compute the average earnings per day worked in casual labor (the "casual wage") and in salaried work (the "salaried wage"). Finally, in order to estimate the total number of workers engaged in casual work in each district we use the NSSO question on the occupation of each household member in the last year and categorize as "casual worker" every household member who reports casual work as her principal or subsidiary occupation.

2.3 Migration Survey

2.3.1 Sample Selection

Figure 4 shows the location of villages selected for the migration survey, and provides a map of the survey area. Migration survey villages were selected to be on the border of three states: Gujarat, Rajasthan, and Madhya Pradesh. The survey location was selected because previous studies in the area reported high rates of out-migration and poverty (Mosse et al., 2002), and because surveying along the border of the three states provided variation in state-level policies.

The migration survey consists of household adult and village modules. The sample includes 705 households living in 70 villages in the states Gujarat, Rajasthan and Madhya Pradesh. 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. In 69 of the 70 villages, a local village official answered questions about village-level services, amenities and labor market conditions.

The analysis in this paper focuses entirely on those adults who completed the full one-on-one interviews. Table 2 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 that spend most of the year away from the village are underrepresented in our sample.

To assess how the adults in our sample compare with the rural population in India, the fifth column of Table 2 presents means from the rural sample of the nationally representative NSS Employment and 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 our 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.

2.3.2 Measuring Migration

The survey instrument was specifically designed to measure migration, cultivation, and participation in the NREGA, which are all highly seasonal. It collected data for each individual over the course of one full agricultural year and included questions 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 3 presents descriptive information about short-term migration trips. As expected, migration is concentrated during the winter and the summer and much lower during the peak agricultural season (from July to November). short-term migrants cover relatively long distances (300km on average during the summer), and most of them go to urban areas (84%).

A majority works in the construction sector (70%), with short-term employer-employee relationships (only 37% of them knew their employer or the 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, only a minority (16%) migrates alone; in the sample most migrants travel and work with family members. Column Four presents national averages from NSS survey. Migration patterns are similar along the few dimensions measured in both surveys. The average rural short-migrant in India as a whole is less likely to go to urban areas (68%), and more likely to work in the manufacturing or mining sector (18%) than in the migration survey sample.

3 Program effect on migration

In this section, we use the migration survey to investigate the effect of NREGA on short-term migration and estimate migration costs. 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. Finally we use nationally representative data to compare changes in public employment and short-term migration between 1999-00 and 2007-08 in districts which provided NREGA employment in 2007-08 as compared to other rural districts.

3.1 Migration and NREGA work

We first investigate the correlation between demand for NREGA work, program participation and short-term migration in the migration survey sample.

In the fourth column of Table 4 we see that across all states, only 14% of surveyed adults report not migrating and not wanting NREGA work (First row). The largest group (43%) is composed of adults who do not migrate and participate or would like to participate in NREGA (Second row). Demand for NREGA work is proportionally even higher among migrants: among the 35% of adults who migrated, only one out of seven report not wanting to work for NREGA (4%). Thirty percent of the sample migrate and participate in NREGA or want to work for NREGA (Fifth). Based on these subjective questions, these individuals may be ready to substitute away from migration towards NREGA work. However, this is only a lower bound on the impact of the NREGA on migration. An additional 8% of adults report that they would have migrated had they not worked for the NREGA (Fourth row).

Only 1% of adults are migrants and would not have migrated without NREGA work (Third row).

These results suggest that NREGA work reduced or could potentially reduce migration for 38% of adults or 80% of migrants. Comparing the first, second and third columns of Table 4 also reveals important differences across states in the sample. In particular, the proportion of adults who declare they stopped migrating because of NREGA increases from 3% in Gujarat to 8% in Madhya Pradesh and 10% in Rajasthan (Fourth row). In the following sections, we use cross-state variation in the quality of NREGA implementation to estimate the impact of the program on short-term migration.

3.2 Effect on migration in the survey sample: strategy

As explained in section 2, the migration survey villages 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 it impact on migration. Table 4 shows that the fraction of adults who worked for NREGA during the summer 2009 is 50% in Rajasthan, 39% in Madhya Pradesh, and 10% only in Gujarat. Conditional on participation, NREGA workers receive 31 days in Rajasthan on average, 22 days in Madhya Pradesh and 25 days in Gujarat. Interestingly, the number of days of NREGA work adults would want to work is the same in all borders, which confirms that 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.

In order to estimate the impact of the NREGA on days worked on public works and days spent outside the village we exploit the cross-state variation in program implementation and compare Rajasthan with the other two states Gujarat and Madhya Pradesh. We also take advantage of public works seasonality of public employment provision and compare the summer months, where most public 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 5 and village pair fixed effects. Standard errors are clustered at the village level.[11]

In order for β_3 to be an estimate of NREGA impact, villages in Rajasthan need to be comparable with their match on the other side of the border either in Gujarat or in Madhya Pradesh in all other respects than NREGA implementation. Potential threats to our identification strategy are that villagers across the border live in different socio-economic conditions, have different access to infrastructures, or have benefited from different state policies (in education, health etc.). For this reason it is important to test whether the villages are indeed comparable along these dimensions. Table 5 presents sample mean 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, 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 infrastructures 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. For robustness, 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 Effect on migration in the survey sample: 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 1. The first column of Table 6 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.

[11] 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).

The inclusion of controls and village pair fixed effect changes very little to the estimated coefficients (Column Two). Panel B in Table 6 presents the estimates obtained without villages 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 days more on average on NREGA work-sites than adults in Madhya Pradesh (who work seven days and half on average).

Columns Three of Table 6 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 winter 2009. Adults in the Rajasthan spent a day less away for work, but the difference is not significant. By contrast, adults in Rajasthan villages spent five and half fewer days on average working outside the village than their counterpart on the other side of the border, who are away for 24 days on average. We estimate the same specification without the village pairs that include Gujarat villages. The magnitude of the effect increases to eight and half days per adult (Column Three Panel B of Table 6). The estimated coefficients hardly change with the inclusion of controls and village fixed effects. Assuming villages in Madhya Pradesh provide a valid counterfactual for the village in Rajasthan, these estimates suggest that one day of additional NREGA work reduces migration by approximately 1.2 days.

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 6 estimate Equation 1 taking as 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% lower in Rajasthan villages and the difference is highly significant. Panel B Column Five of Table 6 presents the estimates when we compare only villages in Madhya Pradesh and Rajasthan. We find that the probability of migrating during the summer months is 10 percentage point lower for adults in Rajasthan. The estimates are very robust to the inclusion of controls and pair fixed effects.[12]

As detailed in Coffey et al. (2011), there are many important differences among adults living in Rajasthan, Madhya Pradesh and Gujarat. As a result, these differences in migration

[12]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).

could be partly due to preexisting differences among the states 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.[13] The migration survey included retrospective questions about past migration trips. Using non missing responses, we find no significant difference in migration levels in 2004 and 2005, i.e. before NREGA was implemented. Unfortunately, less than 50% of respondents remembered whether they migrated before 2005, so we cannot exclude that migration levels were in fact different.

3.4 All-India effect on migration: empirical strategy

A natural question is whether our finding that public employment provision under NREGA reduces short-term migration is limited to the migration survey villages or whether it holds across India. We investigate this using nationally representative data from NSS 1999-00 and 2007-08. In order to estimate the impact of the program on migration and labor markets, we use variation in NREGA implementation documented in section 2. When the second NSS survey was carried out between July 2007 and June 2008, NREGA was implemented in 330 early districts, but not in the rest of rural India. As discussed in section 2, the quality of NREGA implementation varied across states, with seven "star states" providing most of NREGA employment. Our empirical strategy builds on these observations and estimates the impact of the program by comparing changes in employment and migration in early districts of star states with other rural districts between 1999-00, before the program was implemented anywhere, and 2007-08, when the program was active in early districts. We exclude from the analysis the last quarter of 2007-08, because the NSS survey year ends in June 2008, and NREGA was extended to all rural districts in April 2008.

Let Y_{iot} be the outcome for individual i in rural district o in year t. Let $Early_o$ be a binary variable equal to one for early districts, and $Star_o$ a binary variable equal to one for star states. Let $\mathbf{Z_o}$ denote a vector of district characteristics which do not vary with time, $\mathbf{X_{ot}}$ a vector of district characteristics which do vary with time. District controls are listed in Table 1. Let $\mathbf{H_i}$ a vector of individual characteristics, including dummies for gender, education levels, caste, religion and age ranges. Let η_t and μ_o denote time and district fixed effects respectively. We use data from NSS 1999-00 and 2007-08 and estimate the following

[13] 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 A.1).

equation:

$$\begin{aligned} Y_{iot} &= \beta_0 Early_o \times \mathbf{1}\{t > 2006\} + \beta_1 Star_o \times \mathbf{1}\{t > 2006\} + \beta_2 Early_o \times Star_o \times \mathbf{1}\{t > 2006\} \\ &+ \delta \mathbf{Z_o} \times \mathbf{1}\{t > 2006\} + \gamma \mathbf{X_{ot}} + \alpha \mathbf{H_i} + \eta_t + \mu_o + \varepsilon_{iot} \end{aligned}$$

The main identifying assumption is that absent NREGA early phase districts of star states would have the same trends in public employment and short-term migration as the rest of rural India. This prompts us to implement the same difference in difference specification using NSS 2007-08 and 2011-12 data, in order to test whether differences in public employment persist three years after the program has been extended to the whole of rural India. For short-term migration, however, we face two important data limitations. First, as explained in section 2.2 short-term migration is defined differently in NSS 1999-00 and 2007-08, so that changes in measured migration may in part reflect different prevalence of migration trips of one to two months, which are counted in 2007-08 but not in 1999-00. Second, we do not dispose of data on short-term migration for earlier or late years which would allow us to test for the existence of differential trends after NREGA roll-out.

3.5 All-India effect on migration: results

Estimates of the program impact on public employment are presented in Column One and Two of Table 7. The estimated coefficient of the early district dummy is very small and insignificant, which suggests that outside of star states, adults living in districts selected to implement NREGA did not spend any more time on public works between 1999-00 and 2007-08, as compared to adults living in districts selected to receive the program later. There is no evidence of an increase in public employment in districts of star states not selected to implement NREGA. By contrast, the estimated coefficient of the interaction term shows that public employment increased by more than five days per adult per year in districts which implemented NREGA. After controls are included (Column Two) the point estimate decreases slightly to five days but the difference remains highly significant. These results confirm that NREGA significantly increased public employment in rural areas during its roll out in early phase districts, but the effect is limited to seven "star states" which actively implemented the scheme.

Estimates of the program impact on short-term migration are presented in Column Three and Four Table 7. According to the estimates with controls (in Column Two) within non star states, the proportion of rural adults in early districts which made short-term migration

trips during the last year increased by .8 percentage points between 1999-00 and 2007-08, as compared to rural adults in late phase districts. In late phase districts of star states, the relative increase in the proportion of short term migrants was similar, about .7. The estimated coefficient on the interaction term is negative and significant, and the point estimate suggests that short-term migration in early districts of star states increased by only .2. This is suggestive evidence that rural districts where more NREGA work is provided have lower short-term migration than other districts in the same states and than early districts with similarly low level of development in other states. It is however difficult to estimate the program effect based on this dataset, because of the changes in the definition of migration between 1999-00 and 2007-08.

These results, taken together with the results based on the migration survey sample, suggest that the NREGA has had a significant impact on short-term migration. Since migrant workers from rural areas represent an important fraction of the unskilled labor force in urban areas, rural public works program such as NREGA may have significant effects on urban labor markets. We investigate this issue in the next section.

4 Equilibrium effect of the program

In this final section, we explore the impact of NREGA on urban labor markets via a change in migration flows from rural areas. We first outline a simple theoretical model which suggests that under reasonable assumption small changes in rural to urban areas may have large impacts on urban labor markets. We next estimate a gravity model to predict migration flows from rural to urban districts and construct a measure of reliance of each urban center on rural migration from districts with high NREGA employment and from other rural districts. Finally, we estimate the effect of the program on urban labor market by comparing changes in outcomes in urban districts which are more or less exposed to changes in migration due to NREGA.

4.1 Urban labor market equilibrium model

We first outline a simple model of the labor market equilibrium in urban areas. Let D_u denote labor demand in urban areas, L_u labor supply of urban workers and L_m short-term migration flows between rural and urban areas. Assuming the urban labor market is competitive and that residents and short-term migrants are perfect substitutes, the urban wage w_u clears the market: $D_u = L_u + L_m$. Let us consider the effect of an exogenous change in migration

inflow dL_m due to the implementation of a public works program in the rural area. Let $\alpha = \frac{L_m}{L_u}$ denote the ratio of labor supply from rural migrants divided by the labor supply of urban workers. The higher α, the more the urban center relies on migrant labor to satisfy its demand for labor. Let η_D and η_S denote labor demand and labor supply elasticities, respectively. One can express the elasticity of the urban wage with respect to migration as a function of α, η_D and η_S:

$$\frac{dw}{w} / \frac{dL_m}{L_m} = -\frac{\alpha}{\eta_S - \eta_D(1+\alpha)} \tag{2}$$

Unless the elasticity of labor supply is negative and large, the elasticity of the urban wage with respect to migration is negative, i.e. a decrease in migration caused by the introduction of a public works program in rural area will increase urban wages. As long as the elasticity of labor demand is lower than one, the elasticity of urban wages with respect to migration is increasing in α, i.e. the more an urban area relies on migrant labor, the more sensitive the wage to changes in migration inflows.

A simple calibration may provide a better idea of the potential magnitude of the effect of a change in rural short-term migration on urban labor markets. From NSS 2007-08 data, the estimated number of rural short-term migrants is 8.1 millions and the number of urban adults who declare doing casual labor as primary or secondary occupation is 15 millions. This yields an estimate of α for urban India $\widehat{\alpha} = 0.53$. For the sake of the calibration, let us now assume that the elasticity of labor demand in urban India is $\eta_D = -0.3$ and the elasticity of labor supply is $\eta_S = 0.1$. The implied elasticity of urban wages to migration is -0.95, i.e. a decrease of short-term migration from rural areas by 1% would increase urban wages by .95%. Given the size of the rural population (476 million adults, according to NSS 2007-08), a 1% decline in migration would require that only a very small fraction of rural adults (0.02% or 80 thousands workers) stopped migrating. Assuming higher labor demand and labor supply elasticities would yield lower estimates, but under reasonable assumptions one expects modest changes in rural short-term migration to have large impacts on urban wages.[14]

It is straightforward to extend the model to the case of two rural locations (denoted 1 and 2), of which only location 1 experiences an exogenous change in migration due to the implementation of a public works program. With obvious notations we denote $\alpha_1 = \frac{L_m^1}{L_u}$ and $\alpha_2 = \frac{L_m^2}{L_u}$ the ratio of labor supply of migrants from rural area 1 and 2 respectively, divided

[14] Due to the much larger size of the rural workforce, the effect of changes in short-term migration on rural wages is likely to be small. Imbert and Papp (2014a) study the effect of the program on rural wages.

by the labor supply of urban workers. Let us denote by η_M the elasticity of migration with respect to the wage. The elasticity of urban wages with respect to an exogenous change in migration from location 1 is given by

$$\frac{dw}{w}/\frac{dL_m^1}{L_m^1} = -\frac{\alpha_1}{\eta_S + \eta_M\alpha_2 - \eta_D(1+\alpha_1+\alpha_2)} \quad (3)$$

Assuming that the elasticity of migration with respect to a change in urban wages is positive, a drop in migration from location 1 increases migration from location 2, which in turn mitigates the effect of the program on urban wages. For a given level of migration from rural areas with the program, one would hence expect urban centers which receive more migration from rural areas without the program to experience lower increases in wages.

4.2 Predicting short-term migration flows

In order to estimate the effect of NREGA on urban labor markets, we first need to predict short-term migration flows from rural to urban areas.

For this, we combine information on destination in NSS 2007-08 with data on the state of last residence of migrants who came from rural to urban areas between 1991 and 2000, according to the 2001 census. Specifically, we use information on the district of residence and the state of origin of long term migrants who live in urban areas and come from rural areas to predict the district of destination of short-term migrants living in rural areas who go to urban areas. The underlying assumption is that short and long term migration follow the same geographical patterns. This assumption can be justified by the role of family, village and sub-caste networks in migration decisions, which give rise to "chain migration". The details of our method are described in Appendix A. This provides us with an estimate of m_{od} is the number of short-term migrants from rural parts of district o to urban parts of district d in 2007-08.

We next build a gravity model that predicts migration flows based on district characteristics independent of NREGA. For this we use the distance between district o and district d (which we denote δ_{od}) and an index of language proximity between origin and destination (I_{od}).[15] We also use average real wages at origin and destination (w_o and w_d respectively), the number of casual workers at origin and destination (N_o and N_d respectively) estimated from NSS 2004-05. We include a dummy which equals to one when origin and destination belong

[15]The index is the probability that two individuals picked at random from origin and from destination share a common language. Details of the construction of the index can be found in appendix.

to the same state ($S_o = S_d$) and a dummy which equals to one when origin and destination are in the same district ($o = d$). The model is estimated using Poisson-quasi maximum likelihood, which has the advantage of taking into account pairs of districts with no migrants, and has been shown to perform well in trade gravity models (Silva and Tenreyro, 2006). The estimating equation writes:

$$\begin{aligned} m_{od} &= \beta_1 log(\delta_{od}) + \beta_2 log(w_o) + \beta_3 log(w_d) + \beta_4 log(N_o) \\ &+ \beta_5 log(N_d) + \beta_6 I_{od} + \beta_7 1\{S_o = S_d\} + \beta_8 1\{o = d\} + \varepsilon_{od} \end{aligned} \quad (4)$$

Finally, we construct for each urban center the empirical counterparts of α^1 and α^2 in the theoretical framework, i.e. the measure of exposure to changes in migration from districts where public employment is provided and from districts where no public employment is provided. $\widehat{m_{od}}$ is predicted short-term migration from rural district o to urban district d. Let L_d denote the number of casual workers living in urban district d in 2004-05 (estimated as explained in Section 2.2). In order to measure the exposure of each urban district to migration flows, we construct the two following ratios:

$$\widehat{\alpha_d^1} = \frac{\sum_{o \in StarEarly} \widehat{m_{od}}}{L_d} \; and \; \widehat{\alpha_d^2} = \frac{\sum_{o \notin StarEarly} \widehat{m_{od}}}{L_d}$$

α_d^1 and α_d^2 are the ratio of the number of predicted short-term migrants to district d coming from early districts of star states and from other rural districts respectively, divided by the estimated number of casual workers living in d.

We first estimate equation 4 to predict migration flows between rural-urban district pairs. As Table A.2 in Appendix shows, the determinants of migration all have a significant impact on migration flows, and their effect has the expected sign. Distance negatively affects the number of migrants. Wages at destination and origin have a positive and negative impact on migration, respectively. We predict more migration between districts with a larger number of casual workers. Migrants are more likely to go to districts where the probability of finding somebody who speaks the same language is higher. Finally, rural short-term migrants are more likely to migrate to urban centers in the same state. These effects are robust to the model used, and to different definitions of the outcome variable. In the following we use predictions from the Poisson model, whose estimates are shown in Column Four of Table A.2.

We next use predicted migration flows to compute the two ratios α^1 and α^2, which measure the importance of migration flows from early districts in star states and from other

rural districts respectively, as a fraction of the urban casual labor force. Table A.3 in Appendix presents the weighted average of these estimates for each state. States in which urban areas rely heavily on short-term migrants from early districts of star states are some of the star states themselves (Andhra Pradesh, Madhya Pradesh and Rajasthan). Delhi, Himachal Pradesh and Haryana receive high levels of migration both from early districts of star states and from other rural districts. Many states with high levels of rural migration do not rely on rural migrants from early phase districts of star states. We use this variation across urban labor markets to identify the effect of changes in migration induced by NREGA.

4.3 Program effect on urban labor markets: strategy

We use our measures of dependence to estimate the impact of the program on urban labor markets. Our identification strategy consists in comparing changes in wages in urban centers which rely more on short-term migration from rural areas where the program is implemented (high α_d^1) to outcomes in centers for which migration is less important relative to the resident casual workforce (low α_d^1). For a given level of α_d^1, we further compare urban centers which attract migrants from rural areas without the program (high α_d^2) to districts who do not. We predict relative increase in wages in urban centers which rely more on migrants coming from rural areas where the program reduces migration, and we predict wages to remain stable or decrease in urban centers which rely more on migrants coming from rural areas where the program is not implemented.

Let Y_{idt} denote the outcome for individual i living in urban district d in quarter t. Let Z_d and X_{dt} denote a vector of time-invariant and time varying characteristics of district d. Let H_i denote a vector of individual characteristics. Finally let η_t and μ_d denote time and district fixed effects. In order to estimate the impact of the program on urban labor market outcomes, we use data from 2004-05 and 2007-08 and compare changes in outcomes in urban centers for which migration from early districts of star states is more or less important. Our outcomes are log deflated casual earnings, and salaried earnings, time spent on casual wage work, salaried wage work, self employment, domestic work, unemployment and out of the labor force. We estimate the following equation by ordinary least squares:

$$\begin{aligned} Y_{dt} &= \beta_0 + \beta_1 \widehat{\alpha_d^1} \times \mathbf{1}\{t > 2006\} + \beta_2 \widehat{\alpha_d^2} \times \mathbf{1}\{t > 2006\} \\ &+ \delta Z_d \times \mathbf{1}\{t > 2006\} + \gamma X_{dt} + \alpha H_i + \eta_t + \mu_d + \varepsilon_{dt} \end{aligned} \tag{5}$$

For inference purposes, we need to account both for the fact that regressors $\widehat{\alpha_d^1}$ and $\widehat{\alpha_d^2}$

are estimated from equation 4 and that error terms in equation 5 are likely correlated for observations pertaining to the same district. We hence bootstrap standard errors through repeated estimations of models 4 and 5 on random district draws.

A potential threat to our identification strategy is that urban centers which hire more migrants from early districts of star states may be on different economic trends, and hence would exhibit differential changes in labor market outcomes even without NREGA. As a first robustness check, we use a placebo strategy and compare trends in labor market outcomes in urban districts which have more or less exposure to migration from early districts of star states between 2007-08 and 2011-12, i.e. after NREGA was rolled out across India. As a second robustness check, we estimate the same equation using salaried wages as a dependent variables. Salaried workers are skilled workers hired on long term contracts, and hence do not belong to the same labor market as unskilled short-term migrants. Depending on the level of complementarity between skilled and unskilled workers, a change in unskilled wages could affect wages for skilled workers. However, the effect on skilled wages is likely to be small, as compared to the effect on unskilled wages. Hence if we find that salaried earnings exhibit very different trends in labor markets which hire more or less migrants from early districts of star states, it would suggest they may be on different economic trajectories unrelated to the program. As a third check, we estimate 5 including time specific trends for early phase districts, for star states and for early phase districts in star states, in order to control for direct effects of public employment provision and for state specific policies or macro-economic shocks which may have affected urban wage growth. Finally, we estimate our specification without Delhi, which as Appendix Table A.3 shows is an outlier with high migration rates.

4.4 Program effect on urban labor markets: results

Table 8 presents the estimated effect of changes in migration due to NREGA on urban wages. We find that between 2004-05 and 2007-08, urban centers with higher dependence on short-term migrants from early districts in star states have experienced a relative increase in wages. The estimated coefficient suggests that a 10% higher migration rate from early districts in star states translates into an increase in wages by 6%. The magnitude of the estimate declines slightly with the inclusion of district and worker controls to 4.7% and remains significant. As expected, for a given level of migration from early districts of star states, urban centers with higher predicted levels of migration from other rural districts experienced lower wage growth. The magnitude suggests that a 10% higher migration rate from rural districts where

little NREGA employment is provided translates into 1.3% lower wages.

As a robustness check, we estimate the same specification using data from 2007-08 and 2011-12, i.e. once the program was rolled out across India, we find no significant difference in wage trends between urban centers with more migration from early districts in star states and the others. The estimated impact on salaried wages is positive but smaller and insignificant, which suggests that our results are not driven by differences in economic trends unrelated to the program. We also estimate our specification with specific trends for early phase districts, for star states and for early phase districts of star states. The results estimates, presented in Appendix Table A.4, provide some reassurance that our findings not driven by direct effects of public employment provision in districts where NREGA is implemented or by state-level economic shocks or policy which could be correlated with NREGA implementation.[16]

Table 9 presents the estimated impact on time allocation of urban workers with and without district controls. In urban centers where we predict short-term migration has declined, urban residents spend more time in casual employment. The effect is only significant after we include district controls, but the magnitude remains the same: a 10% increase in the migration rate from early districts of star states is correlated with a 0.5 percentage point increase in time spent doing casual labor. This effect is large relative to the fraction of time spent on casual labor by the average urban adult (6%). With controls, we also find that urban centers with higher predicted migration rates from rural areas without the program experience relative declines in casual employment (decline of 0.3 percentage point for a 10% increase in migration rate). Taken together, these results suggests resident workers substitute for rural short-term migrants (Boustan et al., 2010). We find some evidence of a decline in self employment in urban centers with more rural short-term migrants from early phase districts of star states, and an increase in self employment in urban centers with more short-term migrants form other districts, but the effect is not robust to the inclusion of controls. The estimates lack precision, but suggest there may be complementarities between manual work provided by short-term migrants and self employed workers, e.g. bosses who hire migrants for construction work. Overall, these empirical results confirm that short-term migration may have large impacts on urban labor markets.

[16]When we estimate our main specification on a reduced same excluding Delhi, which is a large urban center with high predicted levels of migration we find similar results (See Appendix Table A.5).

5 Conclusion

The previous analysis suggests that a substantial fraction of adults either chose NREGA work over short-term migration or would have done so if more NREGA work were available. Because short-term migrants are not firmly attached to urban labor markets, their decision to migrate is easily influenced by rural (or urban) anti-poverty programs. In the case of a rural workfare program, which provides only a short period of relatively high wage work, short-term migrants can easily stay back in the village for a few more days and migrate later.

Our results contrast with Angelucci (2013) findings that a Mexican cash transfer program increases migration to the US. Long term migration decisions are largely driven by financial constraints, because of the large fixed cost which rural households have to pay to change residence (Bazzi, 2014). By contrast, short term migration decisions may be more sensitive to opportunity costs. In a companion paper, we use information on migrants' preferences for public works to show that the utility cost of one more day away from the village is substantial Imbert and Papp (2014b).

Our results also suggest that the program had a significant impact on urban areas. Large urban-rural wage gaps and significant barriers to permanent migration explain that short-term migration flows play an important role in labor reallocation across space and across economic sectors in developing countries. The relative sizes of the rural and urban labor force are such that even a small change in rural migration can have large impacts on urban labor markets. These spillovers effects need to be taken into account while designing rural anti-poverty policies.

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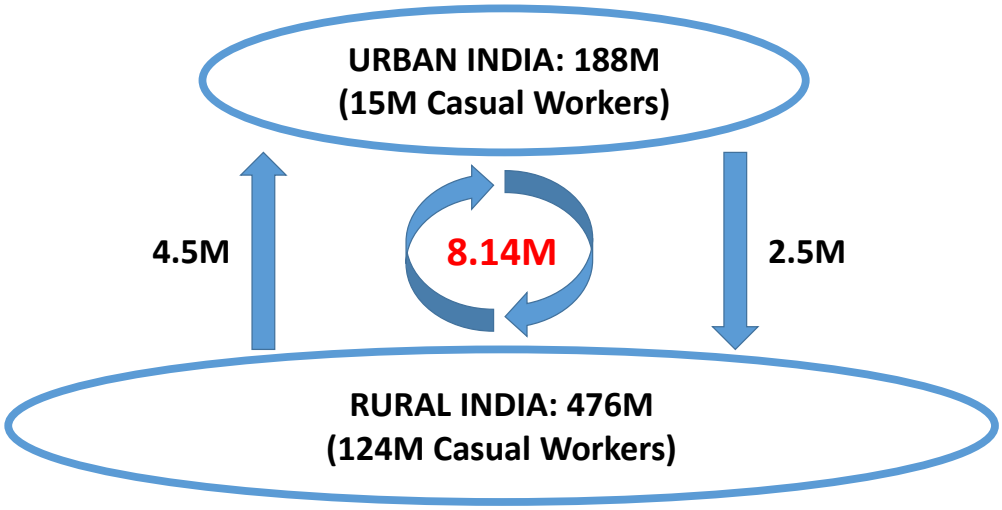
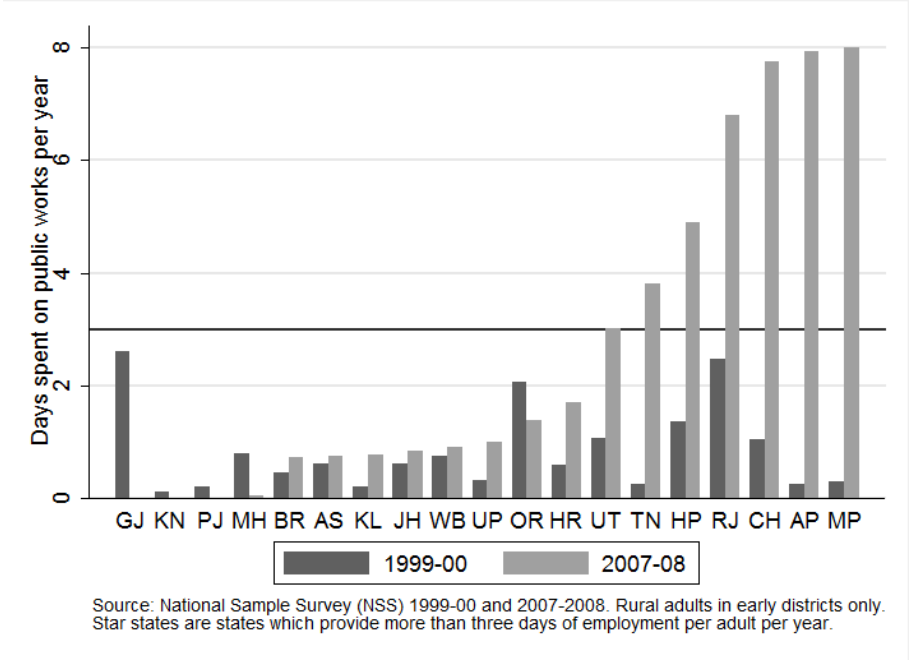
Figure 1: Migration flows in India 2007-08



Source: NSS Employment-Unemployment Survey 2007-08. Straight arrows denote long term migration, i.e. adults who changed residence in the last year. Circular arrows denote short-term migration, i.e. rural adults who left the village from two to six months for work in urban areas in the last year. Casual workers are adults who report having done casual work as their principal or secondary occupation in the the last year.

Figure 2: Cross-state variation in public employment provision



Source: National Sample Survey (NSS) 1999-00 and 2007-2008. Rural adults in early districts only. Star states are states which provide more than three days of employment per adult per year.

Figure 3: Unexplained cross-state variation in public employment provision

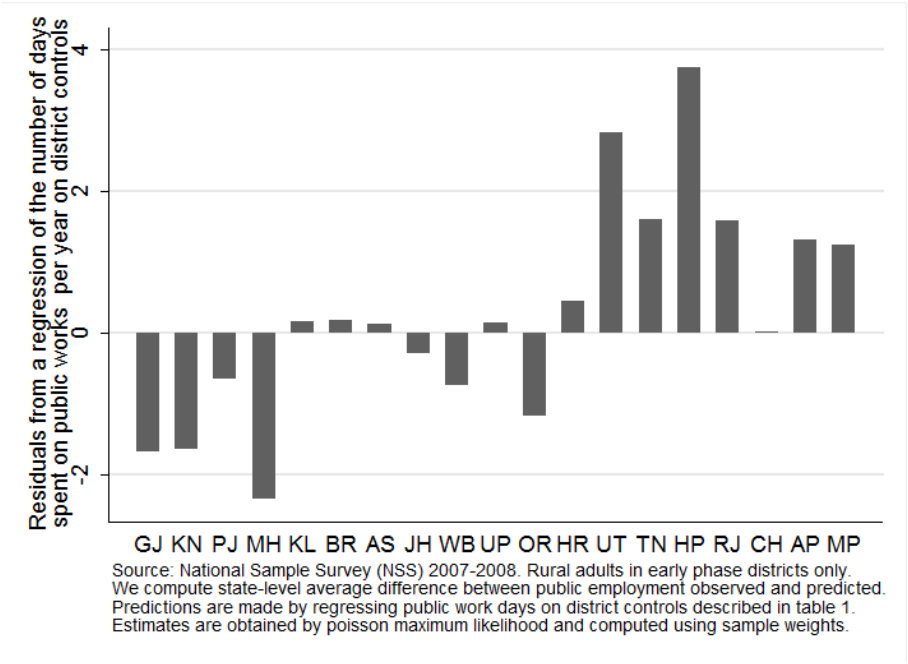


Figure 4: Map of short-term migration

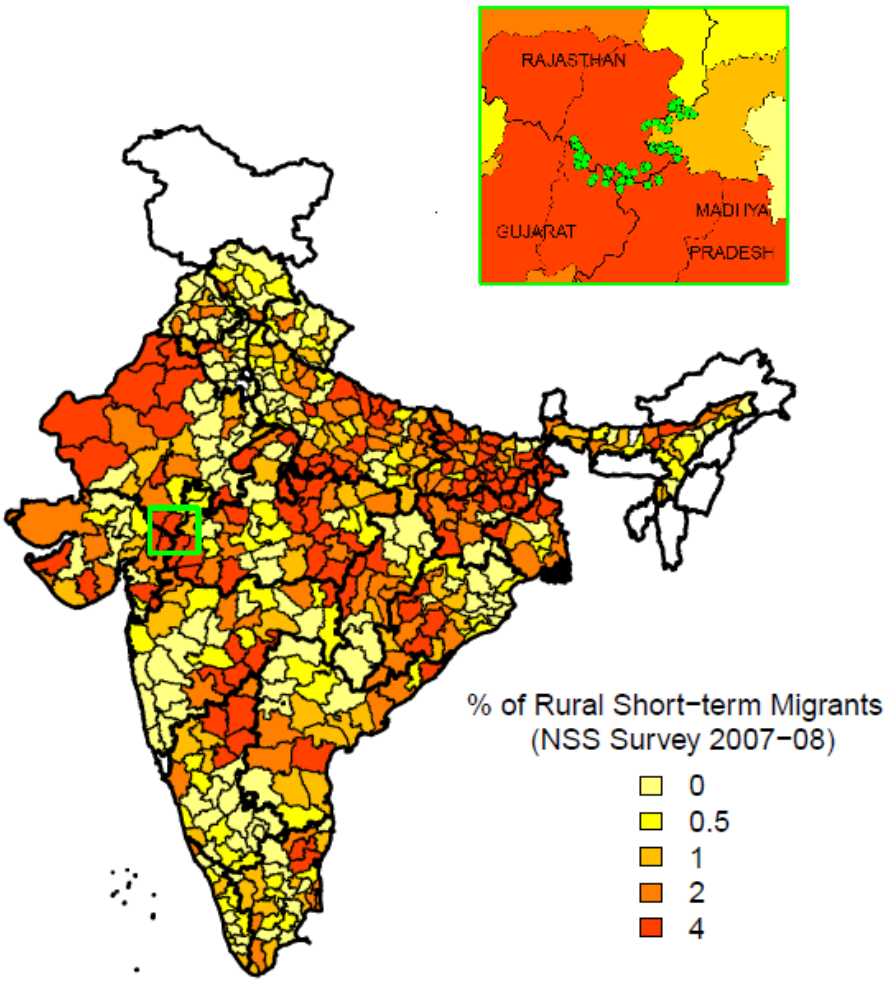


Table 1: District Controls

	Early Districts	Late Districts	p-value	Star States	Other States	p-value	Source	Time-varying?	Rural or Urban Control?
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Literacy Rate	56%	64%	0.00	60%	59%	0.62	2001 Census	No	Both
Fraction Scheduled Castes (SC)	17%	18%	0.76	18%	17%	0.41	2001 Census	No	Both
Fraction Scheduled Tribes (ST)	18%	6%	0.00	17%	11%	0.00	2001 Census	No	Both
Agricultural Productivity per Capita (Normalized)	0.06	0.39	0.00	0.07	0.25	0.00	Ag. Ministry	No	Rural only
Log Daily Wage for Casual Labor	3.66	3.94	0.00	3.74	3.78	0.19	NSS 2004-05	No	Both
Log Daily Wage for Salaried Labor	4.38	4.47	0.09	4.38	4.43	0.32	NSS 2004-06	No	Both
Poverty Rate	32%	19%	0.00	26%	28%	0.24	NSS 2004-05	No	Both
Log Population Density (per sq. km)	1.19	1.17	0.65	0.77	1.37	0.00	2001 Census	No	Both
Employment Share in Agriculture	47%	37%	0.00	50%	40%	0.00	NSS 2004-05	No	Both
Employment Share in Construction	3%	3%	0.20	4%	3%	0.00	NSS 2004-05	No	Both
Employment Share in Manufacturing	4%	6%	0.00	6%	5%	0.03	NSS 2004-05	No	Both
Employment Share in Services	8%	10%	0.00	8%	9%	0.12	NSS 2004-05	No	Both
Fraction Ag Casual Laborers	20%	16%	0.00	21%	17%	0.00	NSS 2004-05	No	Both
Fraction Non-Ag Casual Labor	5%	6%	0.04	6%	5%	0.00	NSS 2004-05	No	Both
Fraction Cultivators	30%	25%	0.00	34%	26%	0.00	NSS 2004-05	No	Both
Fraction Non-Ag Business	9%	10%	0.03	9%	9%	0.86	NSS 2004-05	No	Both
Fraction Salaried Work	4%	7%	0.00	5%	6%	0.89	NSS 2004-05	No	Both
Fraction of Villages accessed by Paved Road	66%	84%	0.00	0.69	0.75	0.00	2001 Census	No	Rural only
Fraction of Villages with Bus Service	49%	69%	0.00	0.60	0.55	0.15	2001 Census	No	Rural only
Log Distance to the nearest town (Km)	2.99	2.65	0.00	3.04	2.77	0.00	2001 Census	No	Rural only
Fraction of Villages with Education Facility	94%	96%	0.00	97%	94%	0.00	2001 Census	No	Rural only
Fraction of Villages with Medical Facility	52%	66%	0.00	62%	55%	0.00	2001 Census	No	Rural only
Fraction of Villages with Post and Telecom Facility	61%	79%	0.00	70%	67%	0.12	2001 Census	No	Rural only
Fraction of Villages with Bank Facility	19%	26%	0.00	22%	22%	0.88	2001 Census	No	Rural only
Fraction of Villages with Electricity	83%	96%	0.00	95%	84%	0.00	2001 Census	No	Rural only
Irrigated Cultivable Land per Capita (ha)	0.08	0.13	0.00	0.12	0.10	0.01	2001 Census	No	Rural only
Non irrigated Cultivable Land per Capita (ha)	0.21	0.16	0.01	0.23	0.17	0.00	2001 Census	No	Rural only
Cumulative Rainfall (normalized) in 2007-08	0.56	0.38	0.02	0.21	0.63	0.00	TRMM	Yes	Rural only
Cumulative Rainfall lagged (normalized) in 2007-08	0.31	0.36	0.53	0.09	0.44	0.00	TRMM	Yes	Rural only
Cumulative Degree Days (>80°F) (2007-08)	421	480	0.01	477	428	0.04	ERA-Interim	Yes	Rural only
Cumulative Degree Days Lagged (>80°F) (2007-08)	559	619	0.00	613	568	0.03	ERA-Interim	Yes	Rural only
Election Year in 2007-08	28%	14%	0.00	39%	15%	0.00	Gov Website	Yes	Rural only
PMGSY Road Construction (log km per year) in 2007-08	2.1	2.1	0.92	2.6	1.8	0.00	Gov Website	Yes	Rural only
Number of District Observations	288	210		169	329				
Number of Individual Observations (rural areas)	133666	79182		64702	148146				

This table presents means of the controls used in the paper for different samples. Only rural areas are used. Column (1) is restricted to districts that received the workfare program prior to April 2008. Column (2) includes only districts that received the program after April 2008. Column (3) presents the p-values of the Student's t-test of equality of means in Column (1) and (2). Column (4) restricts the sample to star states. Star states include Andhra Pradesh, Chhatisgarh, Himachal Pradesh, Madhya Pradesh, Tamil Nadu, Rajasthan, and Uttarkhand. Column (5) includes districts in non-star states. Column (6) presents the p-values of the Student's t-test of equality of means in Column (4) and (5). The details of the construction of each control are given in appendix For the Student's t-test in column (3) and (6) standard errors are computed assuming correlation of individual observations over time within each district.

Table 2: 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 3: Migration patterns (Migration survey)

	Migration Survey			NSS
	Summer	Monsoon	Winter	Year
	2009	2009	2009-10	2007-08
Migrated?	35%	10%	29%	2.5%
Migrant is female	40%	33%	43%	14%
Migrated with Household Member	71%	63%	74%	43%
Distance (km)	300	445	286	-
Transportation Cost (Rs)	116	144	107	-
Duration (days)	54	52	49	-
Destination is in same state	15%	24%	23%	53%
Destination is urban	84%	88%	73%	68%
Worked in agriculture	14%	21%	35%	23%
Worked in manufacturing and minir	9%	5%	6%	18%
Worked in construction	70%	70%	56%	42%
Found employer after leaving	63%	64%	54%	-
No formal shelter in destination	86%	85%	83%	-
Observations (All)	2224	2224	2224	212848
Observations (Migrants only)	768	218	646	13682

Source: Retrospective questions from the migration survey implemented in summer 2010. The unit of observation is an 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 September, winter from December to March.

Table 4: Migration and NREGA Work

Summer (March-June 2009)	Gujarat	Madhya Pradesh	Rajasthan	Whole Sample
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%
Monsoon (July-October 2009)	**Gujarat**	**Madhya Pradesh**	**Rajasthan**	**Whole Sample**
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%
Winter (November 2009-February 2010)	**Gujarat**	**Madhya Pradesh**	**Rajasthan**	**Whole Sample**
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%
Adults	330	749	1145	2224

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

Table 5: Village Balance

	MP-RJ Pairs			GJ-RJ Pairs		
Village and household controls	RJ Mean	MP Mean	Difference	RJ Mean	GJ Mean	Difference
Total Population	570	576	-0.01	1324	1276	0.04
Frac Population Literate	24%	26%	-0.14	29%	34%	-0.43
Frac Population ST	96%	96%	0.00	98%	99%	-0.31
Bus Service?	16%	16%	0.00	40%	90%	-0.83
Distance to Paved Road (km)	0.3	0.9	-0.35	0.5	0.3	0.12
Distance to Railway (km)	50.2	44.7	0.20	73.9	47.2	0.67
Distance to Town (km)	10.5	11.2	-0.06	6.1	10.0	-0.64
Distance to Post Office (km)	6.3	4.2	0.32	2.7	3.4	-0.21
Distance to Hospital (km)	6.6	7.7	-0.12	5.3	7.8	-0.46
Distance to Bank Branch (km)	17.1	12.8	0.25	10.9	10.0	0.08
Farm is HH Main Income Source	57%	55%	0.06	42%	42%	0.00
HH Land owned (Acres)	3.0	2.8	0.10	2.4	2.4	0.03
% HH with electricity	23%	33%	-0.27	22%	57%	-0.79
% HH with cellphone	35%	33%	0.06	33%	55%	-0.79
% HH with access to a well	47%	52%	-0.13	38%	58%	-0.51
% HH which uses irrigation	50%	54%	-0.08	60%	52%	0.17
Number of villages	25	25		10	10	

Village characteristics are from the Census 2001 and household characteristics from the migration 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 6: Impact of NREGA on public employment and migration (Survey Sample)

PANEL A: All village pairs	NREGA Days		Days away		Any migration trip	
	(1)	(2)	(3)	(4)	(5)	(6)
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 (Mar-Jul)	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 Jul to Mar	.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	NREGA Days		Days away		Any migration trip	
	(1)	(2)	(3)	(4)	(5)	(6)
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 (Mar-Jul)	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 Jul to Mar	.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+C7:I43 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 7: Impact of NREGA on public employment and short-term migration (NSS Sample)

	Public Work Days		Short-term Migration	
	(1)	(2)	(3)	(4)
Early District	0.0336	-0.296	1.870***	0.825*
	(0.252)	(0.366)	(0.359)	(0.463)
Star State	-0.218	-0.107	0.791**	0.733*
	(0.281)	(0.522)	(0.348)	(0.434)
Early X Star	5.208***	4.948***	-2.099***	-1.323*
	(1.077)	(1.040)	(0.586)	(0.744)
1999-00 Mean Other Districts	.28	.28	1.45	1.45
Observations	411,696	411,696	407,923	407,923
Workers Controls	No	Yes	No	Yes
District Controls	No	Yes	No	Yes

The sample is composed of rural adults surveyd in NSS 1999-00 and 2007-08. Each column presents results from a separate regression. The data is In Columns 1 and 2 the outcome is the estimated number of days spent on public works per adult per year. In Column 3 and 4 the outcome is a binary variable equal to 100 if an adult has spent one to six months away from work (in 2007-08) and two to six months away (in 1999-00). Early District is a dummy variable equal to one for districts in which NREGA is implemented in 2007-08. Star state is a dummy variable equal to one for Andhra Pradesh, Himachal Pradesh, Chhattisgarh, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttarkhand. District Controls are presented in Table 1. All specifications include district and quarter fixed effects. Standard errors are clustered at the district level. ***, ** and * indicate significance at the 1, 5 and 10 percent level. Migration information is missing for 3773 individuals

Table 8: Program effect on urban casual wages

	Log Casual Wages			Log Salaried Wage
	Program		Placebo	Program
	(1)	(2)	(3)	(4)
α_1	0.606***	0.469*	0.193	0.149
	(0.246)	(0.24)	(0.205)	(0.214)
α_2	-0.132*	-0.13*	-0.067	-0.058
	(0.08)	(0.073)	(0.064)	(0.079)
Observations	16,369	16,369	14,197	38,988
District Controls	No	Yes	Yes	Yes
Worker Controls	No	Yes	Yes	Yes

Alpha 1 is the ratio of the predicted number of rural migrants from early districts of star states on the number of urban residents who do casual work. Alpha 2 is the ratio of the predicted number of migrants from other rural districts on the number of residents who do casual work. In column 1 to 3 the sample is composed of urban adults surveyed in NSS 2004-05 and 2007-08. In column 4 the sample is composed of urban adults surveyed in NSS 2007-08 and 2011-12. Each column presents results from a separate regression. In columns 1, 2 an 4, the outcome is log deflated casual earnings. In column 3 the outcome is log deflated salaried earnings. District Controls are presented in Table 1. Worker controls include dummies for gender, education level, caste, age group and religion. Standard errors are bootstrapped to account for the fact that the regressors are predicted and that errors are correlated within districts. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

Table 9: Program effect on time allocation of urban workers

	Casual Labor	Salaried Work	Self-Employment	Unemployed	Not in Labor Force
	(1)	(2)	(3)	(4)	(5)
α_1	4.264	-2.547	-7.110*	2.756	2.252
	(2.997)	(6.372)	(3.921)	(2.113)	(3.893)
α_2	0.0405	-0.714	2.650***	-0.777*	-1.249
	(0.630)	(1.294)	(0.956)	(0.444)	(0.839)
Observations	219,979	219,979	219,979	219,979	219,979
District Controls	No	No	No	No	No
Worker Controls	No	No	No	No	No
	Casual Labor	Salaried Work	Self-Employment	Unemployed	Not in Labor Force
	(6)	(7)	(8)	(9)	(10)
α_1	5.031	-1.41	-4.882	0.698	-1.173
	(3.271)	(4.843)	(5.153)	(2.535)	(7.852)
α_2	-3.607***	2.791*	0.705	-0.506	-1.593
	(1.074)	(1.498)	(1.35)	(0.756)	(2.17)
Observations	219,979	219,979	219,979	219,979	219,979
District Controls	Yes	Yes	Yes	Yes	Yes
Worker Controls	No	No	No	No	No

Alpha 1 is the ratio of the predicted number of rural migrants from early districts of star states on the number of urban residents who do casual work. Alpha 2 is the ratio of the predicted number of migrants from other rural districts on the number of residents who do casual work. The sample is composed of urban adults surveyed in NSS 2004-05 and 2007-08. Each column presents results from a separate regression. The outcome is the fraction of total time spent in each activity. Early districts are those selected for the first and second phase of NREGA implementation. Star states are Andhra Pradesh, Himachal Pradesh, Chhattisgarh, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttarkhand. District Controls are presented in Table 1. Worker controls include dummies for gender, education level, caste, age group and religion. Standard errors are clustered at the district level. ***, ** and * indicate significance at the 1, 5 and 10 percent level.

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A Appendix

A.1 District Controls

Census A number of the district controls are computed from the primary census abstract of 2001. In all cases, we use information for rural areas only, which we then aggregate to the district level. We compute "fraction of scheduled tribes" and "fraction of scheduled castes" by dividing by total population. "Population density" is obtained by dividing total population by total area. "Literacy rate" is computed by dividing the number of literate person. Finally, we use information from the census village directory to compute "irrigated cultivable land per capita" and "non irrigated cultivable land per capita" as well as the fraction of villages accessed by paved road, the fraction of villages with bus service, with education facility, medical facility, Post and Telecom facilities, bank, electricity connection and log distance to the nearest town.

Agricultural Productivity: We compute agricultural productivity per worker for each agricultural year in each district using two sources of data. First, the Ministry of Agriculture publishes yearly data on output and harvest prices of 36 grain and cash crops in every district [17]. This allows us to compute the value of agricultural production for every district-year. Second, we use National Sample Survey data to estimate the number of (self employed and wage) workers active in agriculture for every district-year. NSS survey years match exactly the Ministry of Agriculture definition of agricultural years (July-June). Hence, dividing output value by the number of agricultural workers yields agricultural productivity per worker for each NSS survey year.

Rainfall To control for monthly rainfall at the district level over the period 1999-2010, we use data from the Tropical Rainfall Measuring Mission (TRMM), which is a joint mission between NASA and the Japan Aerospace Exploration Agency (JAXA). The TRMM Multi-Satellite Precipitation Analysis provides rainfall data for every three hours at a resolution of 0.25 by 0.25 degree grid-cell size. Rainfall measurement are made by satellite and calibrated using monthly rain gauge analysis data from the Global Precipitation Climatology Project

[17] Data is available at `http://eands.dacnet.nic.in/`.

(GPCP).[18] The data is then scaled up to obtain mean monthly rainfall for every cell. On average there are 6 grid-cells per district. We compute cumulative rainfall in each district-month as the sum of rainfall since July 1st, and express it as percentage deviation from the 1998-2011 mean for this district-month.

Temperature To control for temperature at the district level over the period 1999-2000, we use data from the ERA-Interim reanalysis produced by the European Center for Medium-Range Weather Forecasts (ECMWF). The Era Interim reanalysis data combines remote-sensing and climatic models to provide 3-hourly surface temperature estimates on a O.75° x 0.75° grid. We follow Burgess et al. (2013) and compute "cumulative degree days", which is a measure of extreme temperatures which could affect agricultural productivity. Degree days are equal to the difference between the maximum daily emperature and 80°F (26.6°C) if the maximum is higher than 80°F, zero otherwise. Cumulative degree days are obtained by summing degree days since the beginning of the agricultural season (July) until the end of the agricultural season (March).

Other district controls "Pre-election year" is a dummy for whether state assembly or Panchayati Raj (local) elections are to be held in the following year. To construct this control, we used online reports from the Electoral Commission of India[19] and from the State Election Commissions of each states. "PMGSY Road Construction" is an estimate of the number of km of road built under the national rural roads construction program Pradhan Mantri Gram Sadak Yozna. We use online reports on each road built under the scheme to compute for each district quarter the average number of km completed per quarter over the last five quarters.[20]

A.2 Rural-Urban Short-term Migration Matrix

In this section we describe in details how we assign rural short-term migrants observed in NSS Employment Survey 2007-08 to a particular district of destination. NSS Employment Survey reports destination into seven categories: same district (rural or urban), other district in the same state (rural or urban), another state (rural or urban), and another country. The issue is hence to predict the district of destination for migrants who went to urban areas of

[18] Data is available at `http://trmm.gsfc.nasa.gov/`. See Fetzer (2013) presents the data in more details.
[19] `http://www.eci.nic.in/ecimain1/index.aspx`
[20] `http://pmgsy.nic.in/`

the same state or went to urban areas of another state. For this purpose, we use Census 2001 information on permanent migrants, i.e. prime age adults living in urban areas who changed residence in the last 10 years and came from rural areas, for which the census records the state of previous residence.

Let M_{od} and m_{od} denote respectively long and short-term migration flows from the rural part of district o to the urban part of district d. Let S_o be the state of origin and S_d the state of destination. From the NSS Employment survey, we observe short-term migration within the same district (m_{oo}), to another district from the same state ($\sum_{d,o\in S_d,o\neq d} m_{od}$)) and to another state ($\sum_{d,S_o\neq S_d} m_{od}$). From Census 2001 data, for each urban destination d, we observe long term migration from the same district (M_{dd}), long term migration from other districts of the same state ($\sum_{i\in S_d,i\neq d} M_{id}$), and long term migration from each state ($\sum_{i\in S_o,S_o\neq S_d} M_{id}$). We combine these pieces of information to predict short-term migration flows m_{od}.

Our method relies on two assumptions. First, we need to assume that the proportion of short-term migrants who go from district o to another district d of the same state is the same as the proportion of long term migrants in district d who come from another district of the same state. Second, we need to assume that the proportion of short-term migrants who go from district o in state S_o to district d in another state is the same as the proportion of long term migrants in district d who come from state S_o. Formally, we use the following algorithm to predict short-term rural to urban migration flows:

$$\widehat{m_{od}} = \begin{cases} m_{od} & \text{if } o{=}d \\ \frac{\sum_{i\in S_d,i\neq d} M_{id}}{\sum_{j\in S_d}\sum_{i\in S_d,i\neq d} M_{ij}} \sum_{j,S_j=S_o,j\neq o} m_{oj} & \text{if } o\neq d \text{and } S_o = S_d \\ \frac{\sum_{i\in S_o} M_{id}}{\sum_{j\in S_d}\sum_{i\in S_o} M_{ij}} \sum_{j,S_j\neq S_o} m_{oj} & \text{if } o\neq d \text{and } S_o \neq S_d \end{cases}$$

A.3 Weighting

The NSSO provides sample weights which ensure that the weighted mean of each outcome is an unbiased estimate of the average of the outcome for the population National Sample Survey Office (2010). For the purpose of our analysis, we re-weight observations so that the sum of all weights within each district is constant over time and proportional to the rural population of the district as estimated from the NSS Employment Surveys. When we use NSSO survey weights without re-weighting, the results are almost identical to our

main results (results not shown). As compared to using ordinary least squares without any weighting, our approach allows us to make sure that our results are not driven by smaller districts with few observations for casual wages. More concretely, let w_i be the weight for person i, and let Ω_{dt} be the set of all persons surveyed in district d at time t. Then the new weight for person i is $w_i \times \frac{\omega_d}{\sum_{i \in \Omega_{dt}} w_i}$ where ω_d is the population weight for district d.

A.4 Construction of District Panel

During the period covered by the analysis, some districts split while other districts merged together. Constructing the district panel requires matching districts both over time as well as across data sets. Fortunately, the NSS district definitions for surveying stayed constant from 2004 to 2008, despite splits and merges. We therefore use the NSS district definitions from this period and match other data sets to these. We first match the NSS 1999-2000 to 2004-05 and 2007-08 data. All districts could be matched between the two surveys but for five districts missing in 1999-00. However about fifty of them had split between 1999-00 and 2005-05. We adopt the following procedure If a given district has split in x districts (x is most of the time equal to two, sometimes three), we duplicate observations from that district x times so that one set of observation can be matched with one of the newly created district. In order to keep the total weight of that district constant, we divide each weight in the 1999-00 data-set by x. We further match NSS data with Census 2001 survey, NREGA phases 2005, ARIS-REDS 1999-00 survey, PMGSY road construction data from 2001 to 2010

Table A.1: Cross-state comparison of permanent migration in the last five years

PANEL A: All village pairs	Any Permanent Migrant		Number of Migrants	
	(1)	(2)	(3)	(4)
Rajasthan	0.0447	0.0432	-0.0288	-0.197
	(0.0388)	(0.0327)	(0.185)	(0.173)
Observations	702	702	702	702
Mean in MP	.39	.39	1.23	1.23
Worker Controls	Yes	Yes	Yes	Yes
Village Pair Fixed Effect	No	Yes	No	Yes
PANEL B: Excluding GJ-RJ Pairs	Any Permanent Migrant		Number of Migrants	
	(1)	(2)	(3)	(4)
Rajasthan	0.0501	0.0414	0.112	-0.00927
	(0.0472)	(0.0371)	(0.215)	(0.186)
Observations	503	503	503	503
Mean in MP	.4	.4	1.24	1.24
Worker Controls	Yes	Yes	Yes	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.2: Predictions of rural to urban short-term Migration flows

	Migrants OLS (1)	Any Migrant Probit (2)	Log Migrants OLS (3)	Migrants Poisson (4)
Log Distance	-10.36*	-0.127**	-1.230***	-0.469***
	(5.863)	(0.0540)	(0.135)	(0.135)
Log Destination Casual Deflated Wage	15.52***	0.0389	0.568***	0.315**
	(4.914)	(0.0512)	(0.121)	(0.150)
Log Origination Casual Deflated Wage	-14.05**	-0.0212	-1.046***	-1.063***
	(5.871)	(0.0685)	(0.178)	(0.261)
No Casual Worker at Destination	93.54***	0.0555	2.855***	1.656**
	(25.12)	(0.205)	(0.492)	(0.668)
Log Destination Casual Workers	36.25***	0.103***	0.874***	1.055***
	(7.157)	(0.0171)	(0.0442)	(0.0943)
Log Origin Casual Worker	29.31***	0.438***	1.295***	0.939***
	(6.371)	(0.0327)	(0.0748)	(0.120)
Language Proximity	46.47**	0.652***	1.715***	1.788***
	(18.65)	(0.147)	(0.306)	(0.467)
Same State	104.6**	-0.0325	1.593***	0.656*
	(41.93)	(0.136)	(0.313)	(0.359)
Same District	1,840***	-1.026***	-2.957***	0.0459
	(208.2)	(0.305)	(0.801)	(0.733)
Observations	247,506	247,506	147,794	247,506
R-Squared	0.046		0.442	

Each column presents the results of a separate regression. The unit of observation is a pair of one rural and one urban district. The outcome in Column 1 and 4 is the number of migrants going from rural to urban districts. The outcome in Column 2 is a binary variable for whether there is any migrant. The outcomes in Column 3 is the log of the number of migrants. All estimates are computed without sampling weights. Standard errors in parentheses are adjusted for correlation of the errors between state pairs. ***, **, and * indicate significance at the 1, 5, and 10% levels.

Table A.3: Predicted short-term migration inflows from rural areas as share of urban casual labor force

	α_1	α_2	Star State?
STATE	(1)	(2)	(4)
Andhra Pradesh	20%	14%	Yes
Assam	7%	51%	No
Bihar	10%	66%	No
Chhattisgarh	16%	26%	Yes
Delhi	44%	193%	No
Gujarat	4%	32%	No
Haryana	18%	83%	No
Himachal Pradesh	15%	54%	Yes
Jharkhand	7%	33%	No
Karnataka	4%	24%	No
Kerala	2%	14%	No
Madhya Pradesh	20%	41%	Yes
Maharashtra	8%	53%	No
Orissa	5%	37%	No
Punjab	9%	52%	No
Rajasthan	16%	56%	Yes
Tamil Nadu	5%	12%	Yes
Uttar Pradesh	14%	93%	No
Uttaranchal	11%	39%	Yes
West Bengal	4%	63%	No
Total	10%	40%	

Column One present the ratio between the number of rural migrants from late phase districts and from non star states doing short-term trips to urban parts of a given state and the number of casual workers living in urban areas of that state. Column Two presents the ratio between the number of rural migrants from early phase districts of star states doing short-term trips to urban parts of a given state and the estimated number of casual workers living in urban areas of that state. The number of casual workers is estimated using usual principal and subisdiary status of urban prime age adults in NSS 2007-08. Rural to urban migration flows are predicted using the gravity model presented in Table 14.

Table A.4: Program effect on urban casual wages controlling for time trends specific to states and districts with high NREGA employment

	Log Casual Wages			Log Salaried Wage
	Program		Placebo	Program
	(1)	(2)	(3)	(4)
α_1	0.771***	0.633**	0.0530	0.0836
	(0.222)	(0.255)	(0.258)	(0.270)
α_2	-0.161**	-0.152**	-0.0383	-0.0519
	(0.0633)	(0.0611)	(0.0762)	(0.0607)
Early	0.107*	0.0356	-0.0725	0.0650*
	(0.0624)	(0.0410)	(0.0470)	(0.0368)
Star State	0.0648	0.0466	-0.0137	0.0410
	(0.0637)	(0.0466)	(0.0590)	(0.0497)
Early X Star State	-0.222**	-0.173***	0.0905	-0.0429
	(0.0869)	(0.0639)	(0.0786)	(0.0709)
Observations	16,369	16,369	14,197	38,988
District Controls	No	Yes	Yes	Yes
Worker Controls	No	Yes	Yes	Yes

Alpha 1 is the ratio of the predicted number of rural migrants from early districts of star states on the number of urban residents who do casual work. Alpha 2 is the ratio of the predicted number of migrants from other rural districts on the number of residents who do casual work. In column 1, 2 and 4 the sample is composed of urban adults surveyed in NSS 2004-05 and 2007-08. In column 3 the sample is composed of urban adults surveyed in NSS 2007-08 and 2011-12. Each column presents results from a separate regression. In columns 1 to 3, the outcome is log deflated casual earnings. In column 4 the outcome is log deflated salaried earnings. Early District is a dummy variable equal to one for districts in which NREGA is implemented in 2007-08. Star state is a dummy variable equal to one for Andhra Pradesh, Himachal Pradesh, Chhattisgarh, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttarkhand.District Controls are presented in Table 1. Worker controls include dummies for gender, education level, caste, age group and religion. Standard errors are bootstrapped to account for the fact that the regressors are predicted and that errors are correlated within districts. ***, ** and * indicate significance at the 1, 5 and 10 percent level

Table A.5: Program effect on urban casual wages without Delhi

	Log Casual Wages			Log Salaried Wage
	Program		Placebo	Program
	(1)	(2)	(3)	(4)
α_1	0.550***	0.475**	0.142	0.192
	(0.199)	(0.190)	(0.159)	(0.171)
α_2	-0.150	-0.143**	-0.0732	-0.0773
	(0.0933)	(0.0561)	(0.0681)	(0.0506)
Observations	16,210	16,210	14,065	37,097
District Controls	No	Yes	Yes	Yes
Worker Controls	No	Yes	Yes	Yes

Alpha 1 is the ratio of the predicted number of rural migrants from early districts of star states on the number of urban residents who do casual work. Alpha 2 is the ratio of the predicted number of migrants from other rural districts on the number of residents who do casual work. In column 1, 2 and 4 the sample is composed of urban adults surveyed in NSS 2004-05 and 2007-08. In column 3 the sample is composed of urban adults surveyed in NSS 2007-08 and 2011-12. Each column presents results from a separate regression. In columns 1 to 3, the outcome is log deflated casual earnings. In column 4 the outcome is log deflated salaried earnings. District Controls are presented in Table 1. Worker controls include dummies for gender, education level, caste, age group and religion. Standard errors are bootstrapped to account for the fact that the regressors are predicted and that errors are correlated within districts. ***, ** and * indicate significance at the 1, 5 and 10 percent level.